PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

"CORRIGENDUM"

(Reference: PIDC Tender published in print media on 29th June, 2025 & and also uploaded on PPRA EPADS having Tender No F-250687207)

PROCUREMENT OF CONTRACTOR SERVICES FOR INSFRATRUCTURE DEVELOPMENT & ALLIED WORKS AT KARACHI INDUSTRIAL PARK (KIP), KARACHI

1. The Revised tender documents of above-mentioned work are available and can be downloaded free of cost from PPRA EPADS (https://eprocure.gov.pk) or PIDC / PPRA website.
2. The submission date is extended to **18th July 2025** until 11:00 a.m. The Bids will be opened electronically on the same day at 11:30 a.m.

MANAGER TECHNICAL

Pakistan Industrial Development Corporation (PIDC)

2nd Floor, PIDC House, Dr. Ziauddin Ahmed Road, Karachi

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PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

TENDER NOTICE

PROCUREMENT OF CONTRACTOR SERVICES FOR INFRASTRUCTURE DEVELOPMENT & ALLIED WORKS AT KARACHI INDUSTRIAL PARK (KIP), KARACHI

Pakistan Industrial Development Corporation (PIDC), the Procurement Agency (PA) invites e-bids for their project **"Infrastructure Development Works of Block-A on 500 Acres Land of Phase-I (1500 acres) of Karachi Industrial Park (Package-1)"** in accordance with the bidding documents, ONLY through PPRA's **e-Pak Acquisition & Disposal System (EPADS)**, from bidders/firms having similar nature experience, registered with Pakistan Engineering Council in category C-A with relevant codes and must be an active Taxpayer and registered with relevant Tax authorities. **Most Advantageous Bid** will be selected after thorough evaluation of Technical & Financial proposal.

Bidding documents can be downloaded free of cost from PIDC or PPRA websites i.e., https://pidc.com.pk/tenders/ or https://eprocure.gov.pk/.

S. No.	Scope of Work	Bid Security
01	The scope of work includes but not limited to: Complete Road Network, Sewerage and Storm Water drainage System, Water Supply System, Construction of Sub-Stations, UGWT and Pump Room, Construction of Main Entrance Gates and Gate Offices, Construction of Boundary Wall and Watch Towers, Street Lighting System & Road Sleeves, CCTV & Security Surveillance System and electrification.	50 million PKR

1. Bidder must submit an affidavit on stamp paper confirming that the firm is not blacklisted by any Government organization.
2. A Pre-Bid Meeting will be held on **08 July,2025** at **11 am** at the Project office, Bin Qasim Industrial Park (BQIP) Karachi at 11:00 AM to clarify bidder's queries for the captioned work.
3. Interested bidders are requested to submit their bids (Technical & Financial) electronically through PPRA EPADS on **"Single Stage Two Envelope"** on or before **15 July, 2025** till **11 am** to below mentioned address. Technical bids will be opened through PPRA EPADS on the same day at **11:30 am.** Delayed / conditional / telegraphic bids will not be entertained.
4. Bids should be accompanied by a **Bid Security** (refundable) in the form of Call Deposit Receipt (CDR)/ Pay Order or a Security issued by a (a) Scheduled Bank in Pakistan or (b) a foreign bank duly counter-guaranteed by a Scheduled Bank in Pakistan, or (c) an Insurance Company having at least AA rating from PACRA/VIS, in favour of "Pakistan Industrial Development Corporation (PIDC)". Scanned copy of Bid Security shall be submitted along with the technical bid on EPADS; however, the original bid security shall be submitted to PIDC on the address given below before the deadline of submission.
5. Procuring Agency reserves the right to reject all or any bids subject to the relevant provisions of PPRA Rules.
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.

HEAD OF TECHNICAL

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PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

INFRASTRUCTURE DEVELOPMENT WORKS OF BLOCK-A ON 500 ACRES LAND OF PHASE-I (1500 ACRES) OF KARACHI INDUSTRIAL PARK (PACKAGE-I)

CONDITION OF CONTRACT (VOLUME-I)

ISSUED TO_____

PROCUREMENT NO: PIDC/Tender/Tech/33

Lead Firm

JV-Team

June-2025

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CORRIGENDUM

(Reference: PIDC Tender published in print media on 29th June, 2025 & and also uploaded on PPRA EPADS having Tender No F-250687207)

PROCUREMENT OF CONTRACTOR SERVICES FOR INSFRATRUCTURE DEVELOPMENT & ALLIED WORKS AT KARACHI INDUSTRIAL PARK (KIP), KARACHI

1. The Revised tender documents of above-mentioned work are available and can be downloaded free of cost from PPRA EPADS (https://eprocure.gov.pk) or PIDC / PPRA website.
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TABLE OF CONTENTS

INVITATION FOR BIDS ……..

INSTRUCTIONS TO BIDDERS (IB) ……..

BIDDING DATA (BD) ……...

EVALUATION CRITERIA AND QUALIFICATION UPDATING FORMS …….

LETTER OF BID AND SCHEDULES TO BID ……..

STANDARD FORMS …….

CONDITIONS OF CONTRACT ……..

GENERAL CONDITIONS (GC) ……..

PARTICULAR CONDITIONS (PC) ……

Part A - Contract Data…….....

Part B - Special Provisions ……

SPECIFICATIONS (SP) ……

Part A - Specific Provisions ……...

Part B - Technical Provisions ……

INVITATION FOR BIDS

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

TENDER NOTICE
Dated: Sunday, 29th June 2025

PROCUREMENT OF CONTRACTOR SERVICES FOR INSFRATRUCTURE DEVELOPMENT & ALLIED WORKS AT KARACHI INDUSTRIAL PARK (KIP), KARACHI

Pakistan Industrial Development Corporation (PIDC), the Procurement Agency (PA) invites e-bids for their project **"Infrastructure Development Works of Block-A on 500 Acres land of Phase-I (1500 acres) of Karachi Industrial Park"** in accordance with the bidding documents, ONLY through PPRA's **e-Pak Acquisition & Disposal System (EPADS)** from bidders/firms having similar nature experience, registered with Pakistan Engineering Council in category C-A with relevant codes, and must be an active Taxpayer and registered with relevant Tax authorities.

Bidding documents can be downloaded free of cost from PIDC or PPRA websites i.e., https://pidc.com.pk/tenders/ or https://eprocure.gov.pk/.

S. No.	Scope of Work	Bid Security
01.	The scope of work includes but not limited to: Complete Road Network, Sewerage and Strom Water drainage System, Water Supply System, Construction of Sub-Stations, UGWT and Pump Room, Construction of Main Entrance Gates and Gate Offices, Construction of Boundary Wall and Watch Towers, Street Lighting System & Road Sleeves, CCTV & Security Surveillance System and electrification.	50 million PKR

1- Bidder must submit an affidavit on stamp paper confirming that the firm is not blacklisted by any Government organization.
2- A Pre-Bid Meeting will be held on **Tuesday 08th July, 2025** at **11:00 a.m.** at the Project office, Bin Qasim Industrial Park (BQIP) Karachi to clarify bidder's queries for the captioned work.
3- Interested bidders are requested to submit their bids (Technical & Financial) electronically through PPRA EPADS on "**Single Stage Two Envelope**" on or before **Tuesday 15th July, 2025** till **11:00 a.m.** to below mentioned address. Technical bids will be opened through PPRA EPADS on the same day at **11:30 am**. Delayed / conditional / telegraphic bids will not be entertained.
4- Bids should be accompanied by a **Bid security** (refundable) in the form of Call Deposit Receipt (CDR)/ Pay Order or a Security issued by a (a) Scheduled Bank in Pakistan or (b) a foreign bank duly counter-guaranteed by a Scheduled Bank in Pakistan, or (c) an Insurance Company having at least AA rating from PACRA/VIS, in favor of "Pakistan Industrial Development Corporation (PIDC)". Scanned copy of Bid Security shall be submitted along with the technical bid on EPADS; however, the original bid security shall be submitted to PIDC on the address given below before the deadline of submission.
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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.

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INSTRUCTIONS TO BIDDERS (IB)

INSTRUCTIONS TO BIDDERS
Table of Contents

A. General 9
IB 1. Scope of Bid 9
IB 2. Source of Funds 9
IB 3. Eligible Bidders 9
IB 4. Eligible Materials, Equipment and Services 10
IB 5. One Bid per Bidder 10
IB 6. Site Visit 10

B. Bidding Documents 10
IB 7. Contents of Bidding Documents 10
IB 8. Clarification of Bidding Documents, Pre-Bid Meeting 11
IB 9. Amendment of Bidding Documents 12

C. Preparation of Bids 12
IB 10. Cost of Bidding. 12
IB 11. Language of Bid 12
IB 12. Documents Comprising the Bid 12
IB 13. Bid Prices 14
IB 14. Currencies of Bid and Payment 15
IB 15. Bid Validity 15
IB 16. Bid Security 15
IB 17. Alternate Proposals by Bidder 16
IB 18. Format and Signing of Bid 17

D. Submission of Bids 18
IB 19. Sealing and Marking of Bids 18
IB 20. Deadline for Submission of Bids 18
IB 21. Late Bids 19
IB 22. Modification, Substitution and Withdrawal of Bids 19

E. Bid Opening and Evaluation 19
IB 23. Bid Opening 19
IB 24. Process to be Confidential 20
IB 25. Clarification of Bids 20
IB 26. Examination of Bids and Determination of Responsiveness 21
IB 27. Nonmaterial Nonconformities 21
IB 28. Correction of Arithmetic Errors 22
IB 29. Evaluation and Comparison of Bids 22
IB 30. Abnormally Low Bids 23
IB 31. Unbalanced or Front-Loaded Bids 23

F. Award of Contract 23

IB 32. Award Criteria....23
IB 33. Employer's Right to Annul the Bidding Process....24
IB 34. Notification of Award....24
IB 35. Performance Security....24
IB 36. Signing of Contract Agreement....24
IB 37. Integrity Pact....25
IB 38 Instructions not Part of Contract....25
IB 39 Corrupt and Fraudulent Practices....25

Bidding Data....27

Evaluation Criteria and Qualification Updating Forms....33

Letter of Bid and Schedules to Bid....47

Letter of Bid 49
Schedule-A to Bid: Schedule of Adjustment Data 51
Schedule-B to Bid: Bill of Quantities 56
Schedule-C to Bid: Construction Schedule 71
Schedule-D to Bid: Method of Performing the work 72
Schedule-E to Bid: List of Major Equipment 73
Schedule-F to Bid: Organization chart for the supervisory staff and labour 76
Schedule-G to Bid: List of Subcontractors 77
Schedule-H to Bid: Estimated Progress Payments 78
Schedule-I to Bid: Construction camp and housing facilities 79
Schedule-J to Bid: Integrity Pact 80

INSTRUCTIONS TO BIDDERS

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

A. GENERAL

IB.1 Scope of Bid

1.1 The Employer as defined in the **Bidding Data** hereinafter called "the Employer" wishes to receive bids for the construction and completion of works as described in these Bidding Documents, and 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 participate in 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, international organizations 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 ofWorks and its surroundings and obtain for themselves on theirown 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)(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 theInvitation 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 seven (7) 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 of each 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 time in which to take an addendum into account in preparing their bids, the Employer may extend the deadline for submission of bids in accordance with Clause IB.20.

C. PREPARATION OF BIDS

IB.10 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 personsigning 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 of the joint venture;

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

Contract terms and a statement to this effect shall be included in the authorization mentioned under Sub-Para(b) above as well as in the 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 andobligate 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 agreementshall 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 in accordance 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.

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.

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.

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 or an equivalent amount in a freely convertible currency.

16.2 The Bid Security shall be in the form of Call Deposit Receipt (CDR) / Pay Order issued by (a) a Scheduled Bank in Pakistan or (b) a foreign bank duly counter-guaranteed by a Scheduled Bank in Pakistan, or (c) an Insurance Company listed in the Contract Data and rated by PACRA/VIS of rating as provided in Table below:

Bid Price (In Eq. million PKR)	Minimum Rating of Insurance Companies
Up to 1000	A (+)
1001 to no limit	AA
[Note: Insurance Company includes Joint Ventures of Insurance Companies also]	

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 other relevant details/conditions, provided always that the total sum entered 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**.

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 authorized to 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, inwhich case such corrections shall be initialed by the personor 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 Pakistani Embassy in the respective country(ies).

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**.

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.

(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.

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 orwritten notice of withdrawal is received by the Employer prior to the deadline for submission of bids.

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

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

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 and recommendations 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 maylodge 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 informationsubmitted in the Bid without waiting for the Bidder's response.

IB.26 Examination of Bids 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 the information or documentation required in the Bidding Documents.

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 related to 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 earlierto 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 subtotals, the subtotals 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 nonmaterial nonconformities 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.

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 todemonstrate the internal consistency of those prices with the construction methods and schedule proposed. After evaluation of the price analyses, the Employer may require anadditional 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 than25% 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 other lowest 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 of Award

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 constitutethe 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 Bidders that 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 acceptable Performance 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)

BIDDING DATA

IB Clause Reference	Bidding Data
1.1	**Scope of Bid:** **1) Name and address of the Employer:** Head of Technical Pakistan Industrial Development Corporation (PIDC) 2nd Floor, PIDC House, Dr. Ziauddin Ahmed Road, Karachi. Telephone: 021-38266666-69, E-mail: wajid.ali@pidc.com.pk, faizan.khan@pidc.com.pk **2) Name of the Project & Summary of the Works:** Infrastructure Developments Works of Block A on 500 Acres Land of Phase-I of Karachi Industrial Park (Package-I), including:- 1) Complete Road Network. 2) Sewerage and Strom Water drainage System. 3) Water Supply System. 4) Construction of Sub-Stations, UGWT and Pump Room. 5) Construction of Gate Offices, Boundary Wall & Watch Towers. 6) Street Lighting System: • Supply and installation of street lighting poles, luminaires, and mounting brackets • Placement of pole foundations, and junction boxes (where applicable). • Installation of earthing pits and earthing connections for street lighting poles. 7) Underground Conduits & Road Sleeves: • Installation of conduits and road crossing sleeves at predefined locations to facilitate future cable pulling for MV cables and security system and IT network. • Dedicated conduits with pulling rope from pole to pole (only) for street lighting cables to be pulled later. • CCTV Conduit Provisions: Underground conduit network with pulling rope from pole to pole (only) for the security surveillance system.
1.2	**Time for Completion for the Works**: 15 Months
2.1	**Name of the Borrower/Source of Funding:** PSDP
8.1	**Time limit for clarification**: 5 days prior to submission of bids.
8.3	**Venue, time, and date of the pre-Bid meeting:** In order to clarify bidder's queries if any, a pre-bid meeting shall be held on the date, time and venue stated in the Notice for Tender (NIT)
9.3	**Number of days**: Five (05)
11.1	**Bid language**: ENGLISH
12.2	**Maximum Number of JV Partners:** Two (02) [Foreign Constructor must form JV with Local Constructor. Foreign Constructors shall

IB Clause Reference	Bidding Data
	not be eligible to participate in bidding individually. Foreign Constructor shall enter in to joint venture with Pakistani Constructor registered with PEC]. However, the lead partner shall remain responsible for the successful completion of the entire works, as per the defined scope of works, specifications & entire satisfaction of the Client.
14.1	Bidders to quote entirely in Pakistan Rupees (PKR) *[Note: Foreign Currency Requirement are not applicable]*
15.1	**Period of Bid Validity**: 90 days (extendable) after the deadline for bids submission.
16.1	**Amount of Bid Security**: The Bid Security shall be for a fixed amount of **Rs. 50 Million** The ORIGINAL Bid Security must be submitted to the Employer any time before the closing time of bid submission, failing which the bid shall be rejected.
16.2	The Bid Security shall be in the form of Call Deposit Receipt (CDR) / Pay Order or a Security issued in the prescribed form included in the Bidding Documents, by a (a) Scheduled Bank in Pakistan or (b) a foreign bank duly counter-guaranteed by a Scheduled Bank in Pakistan or (c) an insurance company having at least AA rating from PACRA/VIS in favor of Pakistan Industrial Development Corporation (PIDC).
17.1	**Alternative Proposal(s**) by the Bidder shall not be considered.
18.4	**Number of Copies of the Bid to be completed and submitted:** 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.
	The Bidder shall submit with its **Technical Bid** the following documents Original Bid Security as per 16.1 and 16.2 (a) Conditions of Contract (b) Specification- (Part A – Specific Provisions) (c) Proposed Construction Schedule (appendix –C-1) (d) Method of Performing the Work (appendix –D-1) (e) Availability of Critical Equipment (appendix –E-1 to 3) (f) Construction Camp and Housing Facilities (appendix –I-1) (g) List of Sub-contractors (as required) (appendix –G-1) (h) Organization Chart for Supervisory Staff (appendix –F-1) (i) Integrity Pact (appendix –J-1) The Bidder shall submit with its **Financial (Price) Bid** the following documents: (j) Letter of Price Bid (k) Schedule of Adjustment data (appendix –A-1 & A-2) (l) Bill of Quantities (appendix –B-1 & B-2) (m) Estimated Progress Payments (appendix –H-1)

IB Clause Reference	Bidding Data
19.2(a)	**Submission of Bids:** • The process of e-Procurement will be carried out for this tender on **single stage Two envelope method.** • 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. **Manual proposal of only those participants will be accepted who submit their bids through PPRA EPADS**
20.1(a)	**Deadline for submission of Bids:** As stated in Notice for Invitation of Bids.
23.1	**Venue, time, and date of opening:** As stated in Notice for Invitation of Bids.

EVALUATION CRITERIA AND QUALIFICATION UPDATING FORMS

EVALUATION CRITERIA AND QUALIFICATION UPDATING FORMS

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.
The Qualification Requirements on the basis of which the Bidders shall be evaluated for the instant project is all as given hereunder. These shall be provided by the Bidders as 'Technical Proposal/ Qualification Documents' in Envelope-1 of their Bids for Infrastructure development works of Block-A on 500 acres land of Phase-I (1500 acres) of Karachi Industrial Park, if attached documents are proved, wrong, fake or bogus then the client reserves the right to disqualify the firm for further bidding process.
Envelope-2 'Financial Proposal/Bid' shall be opened of only those Bidders that have met all the mandatory requirements as well as minimum Scoring Criteria for Qualification as specified hereunder. If quoted price of few bidders is same then, Bidder who get more marks in Technical Bid will be considered.

Evaluation (IB 29.2(e))
The evaluation of Bids will be carried out according to criteria listed in IB 29.2 (a) - (d).
Technical Evaluation will be based on all the criteria given in succeeding paras regarding the Applicant's Financial Soundness, Experience Record, Personnel Capabilities and Equipment Capabilities as demonstrated by the Applicant's responses in the forms attached to this letter. The Employer reserves the right to waive minor deviations, if these don't materially affect the capability of an applicant to perform the contract. Details of the Mandatory and Other Qualification requirements with weightages are tabulated below:

MANDATORY REQUIREMENT	
PEC Registration Certificate	Based on the estimated cost of the project, the bidders must possess valid registration certificate of PEC in the category C–A, bearing relevant codes.
Project Experience	The bidder must have successfully completed at least 01 similar nature civil infrastructure development work *(as mentioned in the Scope of Work)* inclusive of Road, Water supply and Sewerage networks with a minimum project value of PKR 1 billion (or above) within the last 10 years.
Audited Financial Statements	Last 3 years (Audited accounts)
Tax Returns of Company	Copies of Income Tax Returns filed with the Federal Board of Revenue (FBR) for the last three (3) tax years must be provided.
Litigation History	An affidavit on non-judicial stamp paper of Rs. 100, declaring the firm's litigation history over the past five years must be submitted. The affidavit should include: 1. A declaration of any past or pending litigation with clients. 2. The current status and nature of each case, if any.
Blacklisting from any Agency	An affidavit on non-judicial stamp paper of Rs. 100 stating that the firm has never been blacklisted or barred by any Government, Semi-Government, Autonomous or International agency must be submitted.

Note:

- *If the above mandatory is not attended by the prospective firm, then they will not be considered for further evaluation.*
- *In the case of a Joint Venture, each partner must individually meet all the above mandatory criteria.*
- *The JV must submit a valid Joint Venture Agreement along with the bid.*
- *In case of JV with foreign firm, foreign firm must be registered with their relevant forums. The foreign firm also need to submit letter of consent in the name of PIDC, showing their interest of work along with local lead firm and foreign firm will get registered with relevant bodies in Pakistan if awarded a work by PIDC.*
- *In case of foreign experience, translation of experience should be done in English, the same should be signed and stamped by the client, or local JV partner should submit an undertaking that the "Translation of the document is genuine. In case of discrepancies or fraud, procuring agency has a right to cancel their bid and take legal action".*

OTHER QUALIFICATION REQUIREMENT	
CATEGORY	**WEIGHTAGE /MARKS**
GENERAL QUALIFICATION	05
GENERAL EXPERIENCE	40
PERSONNEL CAPABILITIES	20
EQUIPMENT CAPABILITIES	20
FINANCIAL SOUNDNESS	15
TOTAL:	**100**

Note:

- ***For the purpose of qualification, the applicant must score at least 50% in each category. The overall score must be 70% to be considered as technically qualified.***
- *In case of JV, cumulative marking will be done. However, General Qualification will be considered on individual basis.*

1. General Qualification

General Qualification signifies the years of establishment of the firm. Documentary evidence (like Memorandum of Association) must be provided for this purpose. Marks for years of establishment shall be awarded on the basis of the following:

S. No.	Category	Weightage / Marks
1	Firm's registration with PEC since last 10 years	05
	SUB-TOTAL:	**05**

2. General Experience

S. No.	Category	Weightage / Marks
i)	**Completion / Taking-Over Certificate from Client must be provided.** A project of similar nature civil infrastructure development work *(as mentioned in the Scope of Work)* of minimum project value of PKR 1 billion (or above) completed within the last 10 years in an industrial zone. • 1 Project = 10 marks	20
ii)	**Completion / Taking-Over Certificate from Client must be provided.** A project of similar nature civil infrastructure development work *(as mentioned in the Scope of Work)* of minimum project value of PKR 2 billion (or above) completed within the last 10 years other than industrial zone. • 1 Project = 5 marks	10
iii)	**Performance certificate or latest payment along with latest communication and contract must be provided.** Ongoing similar nature civil infrastructure development work *(as mentioned in the Scope of Work)* of minimum project value of PKR 1 billion (or above), awarded within the last 3 years in an industrial zone. OR, Ongoing similar nature civil infrastructure development work *(as mentioned in the Scope of Work)* of minimum project value of PKR 2 billion (or above), awarded within last 3 years other than industrial zone. • 1 Project = 5 marks	10
	SUB-TOTAL:	**40**

3. Personnel Capabilities

Marks will be awarded based on the qualification, experience, and current employment status of key technical personnel. Only individuals currently registered with Pakistan Engineering Council (PEC) or holding valid diplomas/ certifications will be considered. Valid CV, Employment contracts/ salary slips or HR certifications may be required for verification.

S. No.	Description	Maximum Marks
i)	**Graduate Engineers Registered with PEC. PEC details must be provided.** • **Professional Civil Engineers (2 No.):** ➢ 15 years or above experience ➢ 1 PE = 3 marks ➢ Maximum Marks = 6 • **Registered Engineers – 2 Civil, 1 Electrical, and 1 Mechanical (4 No.)** ➢ 10 years or above experience ➢ 1 RE = 1.5 mark ➢ Maximum Marks = 6	12
ii)	**Site Supervisors – 4 Civil, 1 Electrical, and 1 Mechanical. Degree/ PEC details must be provided (6 No.)** ➢ Minimum DAE with 15 years' experience/ BE or BS with minimum 8 years' experience ➢ 1 Supervisor = 1 mark ➢ Maximum Marks = 6	6
iii)	**Other Personnel** • **Quantity Surveyor (1 No. – 0.5 Marks)** ➢ Minimum DAE with 15 years' experience/ BE or BS with 8 years' experience • **HSE Officer (1 No. – 0.5 Marks)** ➢ Engr. or Certified/ Graduate and Registered with a recognized Health & Safety Institution/ Authority with 10 years' experience • **Land Surveyor (2 No. – 0.5 Marks each)** ➢ Minimum DAE Civil/ Surveying with 10 years' experience	2
	SUB-TOTAL:	**20**

4. Equipment Capabilities

Marks will be awarded based on the availability, ownership status, and condition of equipment required for the execution of the project. Bidders must provide documentary evidence such as ownership documents, leasing agreements, or affidavits of availability. Equipment must be in good operational condition, available for immediate deployment, and suitable for industrial infrastructure works.

S. No.	Equipment Type & Characteristics	Min. No. Required	Maximum Marks
1	Surveying Equipment (Including Total Station)	2	1
2	Earth Moving Machinery (Excavator, Loader) (2 No. each)	4	2
3	Steel Cutting & Bending Machine Electrical (02 No. each)	4	1
4	Bulldozer (200HP)	2	2
5	Motor Grader (140 HP)	2	2
6	Vibratory Roller (10 - 12 Ton)	2	1
7	Pneumatic Roller (18 - 21 Ton)	2	1
8	Dump Truck	4	2
9	Asphalt Paver (145 HP (3-6m wide)	1	1
10	Concrete Mixer Machine (6 Cum)	2	2
11	Generator (100KVA)	2	1
12	Crane (Capacity 18 tons)	1	2
13	Water Browser	2	1
14	Plate Compactors	2	1
		SUB-TOTAL:	**20**

5. Financial Position

Marks shall be awarded on the basis of the following criteria:

S. No.	Category	Weightage / Marks
i)	• Bank Credit Line ➢ Full marks for an available bank credit line of PKR 1,000 million or above. ➢ For values below PKR 1,000 million, marks will be awarded as: (Available Credit Line / 1,000) × 4	4
ii)	• Average Working Capital in last 3 years ➢ Full marks for an average working capital of PKR 3,000 million or above. ➢ For values below PKR 3,000 million, marks will be awarded as: (Average Working Capital / 3,000) × 4	4
iii)	• Average Annual Turnover in last 3 years ➢ Full marks for average turnover of PKR 5,000 million or above. ➢ For values below PKR 5,000 million, marks will be awarded as: (Average Turnover / 5,000) × 4	4
iv)	• Net Worth ➢ Full marks for positive net worth of PKR 1,000 million or more (as per latest audited balance sheet). ➢ For values below PKR 1,000 million, marks will be awarded as: (Net Worth / 1,000) × 3	3
	SUB-TOTAL:	**15**

Bidders Qualification Updating Forms

To establish its qualifications to perform the contract in accordance with Section (Evaluation Criteria 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
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 copies of original documents, in accordance withSub-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: _____

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

Page _____ of _____ pages

Pending Litigation, in accordance with Eligibility and Qualification Criteria			
☐ No pending litigation in accordance with Eligibility and Qualification Criteria, Sub-Factor 2.1.			
☐ Pending litigation in accordance with Eligibility and Qualification Criteria, Sub-Factor 2.1 as indicated 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: _____

Bid Reference No. (if any) and title: _____
Page _____ of _____ pages

1. Financial data

Type of Financial information in (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 Operating Activities	

*Refer to IB 14.2 for the exchange rate

2. Financial documents

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

(a) reflect the financial situation of the Bidder, and not an affiliatedentity (such as parent company or group member).

(b) be independently audited or certified in accordance with local legislation.

(c) be complete, including all notes to the financial statements.

(d) correspond to accounting periods already completed and audited.

Attached are copies of financial statements[1] for the last year required above; and complying with the requirements[1]
If the most recent set of financial statements is for a period earlier than 12 months from the date of bid, the reason 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 should provide information on their current commitments on all 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,

1. 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 of the above-named Works, we, the undersigned, offer to execute and complete such Works and 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.

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

3. 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.

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

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

6. 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.

7. 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.

8. 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 usand may be accepted at any time before the expiration of that period.

9. 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.

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

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

12. 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 particular Payment 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, unbalancedor 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.]

Index code	Index description	Source of index	Bidder's related currency amount	Weightages
(i)	**Fixed Portion**	**-**		0.30
(ii)	**Cement**	Federal Bureau of Statistics (FBS) Monthly Statistical Bulletin		0.05
(iii)	**Reinforcing Steel**			0.09
(iv)	**Local Labor**			0.19
(v)	**Aggregate**			0.05
(vi)	**Bitumen**	NRL		0.08
(vii)	**High Speed Diesel (HSD)**	PSO		0.20
(viii)	**Pipe (UPVC)**	Pak Arab		0.04
	TOTAL =			**1.00**

A-3
Schedule-A to Bid

SCHEDULE OF ADJUSTMENT DATA

Table II. Foreign Currency (FC) For Bill Nos.

[In the Table below, the Bidder shall (a) indicate amount of foreign currency payment, (b)indicate the source and base values of indices for the different foreign currency elements of cost,
(c) derive its proposed weightings of foreign currency payment, except the non-adjustable portion which will be filled in by the Employer.

If the Bidder wishes to incur in more than one foreign currency (up to two currencies permitted)then this table should be repeated for each foreign currency.]

Not Applicable

Index code	Index description	Source of index	Base value and date	Bidder's related source currency in type/amount	Equivalent in FC1	Bidder's proposed weighting
(i)	Non-adjustable	–	–	–		A: _____
(ii)						B: _____
(iii)						C: _____
(iv)						D: _____
(v)						E: _____
				Total		**1.00**

A-4
Schedule-A to Bid

SCHEDULE OF ADJUSTMENT DATA

Table III. Foreign Currency Requirements

[With reference to Sub Clause IB.14.1, the Bidder shall provide information below on the proportion of various currencies in which he requires payment to be made. The Bidders shall also indicate Factors (inputs) related to the requirement of respective currencies.]

Sr. No	Currency (name)	Percentage payable in currency	Factors (inputs) to which the Requirements Refer
1.	**LC** (Pak. Rs.)		* *General Expenses, Manpower, Local Staff, Expatriate Staff, Spare Parts, Fuel & Lubricants, Hydraulic Binder, Timber & Plywood, Additives & Protectives, Joints & Waterstops, Explosives-Fuses-Detonators, Re-Steel & Wire mesh, Metal Pipes & Fittings, Structural Steel, Miscellaneous Metals, Concrete Pipes, PVC Pipes, Build Materials, Sub-Contractor, Drilling & Grouting Sub-Contractor Third Party Supplies, Import Charges, General Expenses, Plants.*
2.	**FC1** *(US $ Dollar)*		* *Expatriate Staff, Spare Parts, Hydraulic Binder, Timber & Plywood, Additives & Protectives, Drilling Materials, Miscellaneous, Sub-Contractor, Import Charges, General Expenses, Plants.*
3.	**FC2** *(EUR € EURO)*		* *Expatriate Staff, Spare Parts, Additives & Protectives, Welding Materials, Miscellaneous, Electrical Sub-Contractor, Import Charges, General Expenses, Equipment, Plants.*
	TOTAL	**100.00**	

Not Applicable

*[*The above Factors (Inputs) related to the requirement of respective currencies, are for guidance only, and shall be indicated specific to the Contract.]*

A-5
Schedule-A to Bid

SCHEDULE OF ADJUSTMENT DATA

Table IV. Summary of Payment Currencies

[In the Table below, the Bidder shall list the exchange rates used in the currency conversion with reference to Sub Clause IB.14.2.]

Name of payment currency	a Amount of currency	b Rate of exchange (local currency per unit of foreign)	c Local currency equivalent c =a x b	d Percentage of Total Bid Price (TBP) 100xc / TBP
Local currency (Pak. Rs)		1.00		
FC1				
FC2				
Total Bid Price				100.00
Provisional sums expressed in local currency	*[To be entered by the Employer]*		*[To be entered by the Employer]*	
TOTAL BID PRICE (including provisional sum)				

Not Applicable

BILL OF QUANTITIES

A. Preamble:

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

2. The quantities given in the Bill of Quantities are estimated and provisional, and are given to provide a common basis for bidding. The basis of payment will be the actual quantities of work executed and measured by the Contractor and verified by the Engineer andvalued 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.

3. 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.

4. A rate or price shall be entered against each item in the priced Bill of Quantities, whether quantities are stated or not. The cost of items against which the Contractor will have failed to enter a rate or price shall be deemed to be covered by other rates and prices entered in the Bill of Quantities.

5. The whole cost of complying with the provisions of the Contract shall be included in the items provided in the priced Bill of Quantities, and where no items are provided, the cost shall be deemed to be distributed among the rates and prices entered for the related items of the Works, or the same shall be determined by the Engineer in accordance with Clause 13, General Conditions.

6. General directions and description of work and materials are not necessarily repeated nor summarized in the Bill of Quantities. References to the relevant sections of the Bidding Documents shall be made before entering prices against each item in the Bill of Quantities.

7. 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.

8. 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

B-2
Schedule-B to Bid

BILL OF QUANTITIES

(Refer Vol-III)

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) mentioned in Contract Data.

Description	Time for Completion
Whole Works: 1) Complete Road Network. 2) Sewerage and Strom Water drainage System. 3) Water Supply System. 4) Construction of Sub-Stations, UGWT and Pump Room. 5) Construction of Gate Offices, Boundary Wall & Watch Towers. 6) Street Lighting System: • Supply and installation of street lighting poles, luminaires, and mounting brackets • Placement of pole foundations, and junction boxes (where applicable). • Installation of earthing pits and earthing connections for street lighting poles. 7) Underground Conduits & Road Sleeves: • Installation of conduits and road crossing sleeves at predefined locations to facilitate future cable pulling for MV cables and security system and IT network. • Dedicated conduits with pulling rope from pole to pole (only) for street lighting cables to be pulled later. • CCTV Conduit Provisions: Underground conduit network with pulling rope from pole to pole (only) for the security surveillance system.	
TOTAL	**15 months**

THE BIDDER MUST CAREFULLY EVALUATE THE SCOPE AND QUANTUM OF WORK AND REALISTICALLY PREPARE THE MILESTONE COMPLETION SCHEDULE.

[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 the completion time for all Works stipulated in the Tender documents (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:

1. Organization Chart:

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

2. Mobilization:

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

3. Method of executing the Works:

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

LIST OF MAJOR EQUIPMENT

[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.

Not Applicable

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:

Month	Amounts (PKR)
1st	
2nd	
3rd	
4th	
5th	
6th	
7th	
8th	
9th	
10th	
11th	
12th	
13th	
14th	
15th	
Bid Price	

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:

1. *Site Preparation (clearing, land preparation, etc.).*

2. *Provision of Services.*

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

3. *Construction of Facilities*

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

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

5. *Other Items Proposed (Security services, etc.)]*

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 fee or otherwise, with the object of obtaining or inducing the procurement of a contract, right, interest, privilege or other obligation or benefit in whatsoever form from GoP, except that which has been expressly declared pursuant hereto.

[Name of 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 its corrupt business practices and further pay compensation to GoP in an amount equivalent to ten time the sum of any commission, gratification, bribe, finder's fee or kickback given by [name of 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: ……	Name of Bidder/Contractor: ……
Signature: ……	Signature: …….
[Seal]	[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 the request of the said Principal (Bidder) we, the Surety above named, are held and firmly bound unto_____
(hereinafter called the 'Employer') in the sum stated above for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

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

(1) 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., up to_____.

(2) 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;

(3) 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

(4) 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)

WITNESS:

Signature _____

1. _____

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 request of the said Principal we, the Guarantor above named, are held and firmly bound unto the _____ (hereinafter called the Employer) in the penal sum of the amount stated above for the payment of which sum well and truly to be made to the said Employer, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has accepted the Employer's above said Letter of Acceptance for_____

_____(*Name of Contract*) for the _____

_____(*Name of Project*).

NOW THEREFORE, if the Principal (Contractor) shall well and truly perform and fulfill all the undertakings, covenants, terms and conditions of the said Documents during the original terms of the said Documents and any extensions thereof that may be granted by the Employer, with or without notice to the Guarantor, which notice is, hereby, waived and shall also well and truly perform and fulfill all the undertakings, covenants terms and conditions of the Contract and of any and all modifications of said Documents that may hereafter be made, notice of which modifications to the Guarantor being hereby waived, then, this obligation to be void; otherwise to remain in full force and virtue till all requirements of 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 any liability attaching to us under this Guarantee that the claim for payment in writing shall be received by us within the validity period of this Guarantee, failing which we shall be discharged of our liability, if any, under this Guarantee.

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

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

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

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

Guarantor
(Schedule Bank)

WITNESS: Signature _____

1. _____ Name _____

_____ Title _____

Corporate Secretary (Seal) Corporate Guarantor (Seal)

2. _____

_____

Name, Title & Address

LOA-1

Letter of Acceptance

[Letter head 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 accepted a Bid by the Contractor for the execution and completion of such Works and the remedying of any defects therein.

NOW this Agreement witnessed as follows:

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

2. The following documents, 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 construed as part of this Agreement:

   a) This 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 Specifications Part A - Specific Provisions;
   h) The Specifications Part B - Technical Provisions;
   i) The Drawings;
   j) The Completed Schedules to Bid including Schedule of Prices;
   k) *[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".

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

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

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

Signature of 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-1

DAAB Agreement

[*All italicized 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:

A. the Employer and the Contractor have entered (or intend to enter) into the Contract;
B. 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;
C. the Employer and the Contractor desire jointly to appoint the above-named DAAB Member to act on the DAAB as:
    a. the sole member of the DAAB, and where this is the case, all references to the "Other Members" do not apply; or
    b. 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:

DAAB-2

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

the "**Other Members**"; and

D. the DAAB Member accepts this appointment.

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

1. The conditions of this DAAB Agreement comprise:

   (a) 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

   (b) 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.

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

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

3. The DAAB Member shall be paid in accordance with Clause 9 of the GCs. The currency of payment shall be_____.

   In respect of Sub-Clauses 9.1 and 9.2 of the GCs, the amounts of the DAAB Member's monthly 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).

4. 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.

5. 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.

6. 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 the Employer 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 the Interim Payment Certificates of the Contractor or until_____whichever is earlier.
(Date)

The Guarantor's liability under this Guarantee shall not in any case exceed the sum of 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 above mentioned date the advance payment is not fully adjusted.

Guarantor
(*Scheduled Bank*)

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:

(a) General Conditions
(b) Particular Conditions

General Conditions

These Conditions are the "General Conditions" which form part of the "FIDIC Conditions of Contract for Construction for Building and Engineering Works Designed by the Employer Second Edition (2017 Red book)" 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 two parts, 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:	Head of Technical, Pakistan Industrial Development Corporation (PIDC) 2nd Floor, PIDC House, Dr. Ziauddin Ahmed Road, Karachi. Telephone: 021-38266666-69, E-mail: wajid.ali@pidc.com.pk , faizan.khan@pidc.com.pk
1.1.35	Engineer's name and address:	The Engineer of project from Project Consultant will be notified later.
1.1.84	Time for Completion:	15 Months for whole of the Works
1.3(d)	address of Employer for communications:	Head of Technical, Pakistan Industrial Development Corporation (PIDC) 2nd Floor, PIDC House, Dr. Ziauddin Ahmed Road, Karachi. Telephone: 021-38266666-69, E-mail: wajid.ali@pidc.com.pk , faizan.khan@pidc.com.pk
	address of Engineer for communications:	Surbana Jurong Infrastructure Pte. Ltd. 49/D-1, Gulberg-III, Lahore-54660, Pakistan Tel: +92 4235754751 Email: sj-pakistan@surbanajurong.com
	address of Contractor for communications:	_____ *[insert Contractor's address at the time of signing of the Contract]*

Sub-Clause	Data to be Given	Data
1.4	Contract shall be governed by the law of:	Islamic Republic of Pakistan
	Ruling language:	English
	Language for communications:	English
1.8	Number of additional paper copies of Contractor's Documents:	*One complete set*
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 upon receipt of Notice to Commence.
2.4	Employer's financial arrangements	**PSDP**
3.2 (e)(ii)	Engineer's Duties and Authority	Variations leading to an increase exceeding one percent (1%) of the Accepted Contract Amount shall require prior approval from the Employer, subject to the condition that cumulative variations remain within five percent (5%) of the Accepted Contract Amount. Employer approval is mandatory in all instances.
4.2	Performance Security (as percentage of the Accepted Contract Amount in Currencies) percent: currency:	Ten percent (10%) of Accepted Contract Amount
4.2.1	Acceptable Performance Security	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) a Scheduled Bank in Pakistan or (b) an Insurance Company listed in the Contract Data and rated by PACRA/VIS of rating as provided in Table below: Accepted Contract Amount (In Eq. PKR million) Minimum Rating of Insurance Companies Up to 1000 A (+) 1001 to no limit AA 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.
4.7.2	Period for notification of errors in the items of reference	Twenty-Eight (28) days
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.
4.19	Period of payment for temporary utilities	On monthly basis
4.20	Number of additional paper copies of progress reports	*Four (04) copies*
5.1(a)	Maximum allowable accumulated value of work subcontracted (as a percentage of the Accepted Contract Amount)	Thirty Percent (30%) *[Employer may vary this percentage according to the nature and complexity of the Works]* Not Applicable

Sub-Clause	Data to be Given	Data
5.1(b)	Parts of the Works for which subcontracting is not permitted	Not Applicable *[Employer to provide his requirement according to the nature and complexity of the Works or state "None"]*
6.5	Normal working hours on the Site	*Eight (08) hours per day and 6 days in a week*
8.3	Number of additional paper copies of programmes	*Three (03) copies*
8.8 & 14.15(b)	Delay Damages payable for each day of delay	For each day of delay, delay damages shall be calculated as 10% of the Awarded Contract Amount, apportioned over the total number of days in the agreed contract duration of 15 months
8.8	Maximum amount of Delay Damages	Ten percent (10%) of the Accepted Contract Amount
8.14	Applicability of Incentives for Early Completion	No
12.2	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".
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	Ten percent (10%) of the Accepted Contract Amount excluding Provisional Sums payable in the currencies and proportions in which the Accepted Contract Amount is payable
14.2.1	Acceptable Advance 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.

Sub-Clause	Data to be Given	Data
14.2.3	Percentage deductions for the repayment of the Advance Payment	A deduction of fifteen percent (15%) shall be made from the amount of each Interim Payment Certificate (IPC) until the recovery of the Mobilization Advance
14.3	Period of Payment	*One month*
14.3(b)	Number of additional paper copies of Statements	*Original plus two hard copies plus one electronic copy*
14.3 (iii)	Percentage of retention	Five percent (5%)
14.3 (iii)	limit of Retention Money (as a percentage of the Contract Price)	Five percent (5%)
14.6.1	Issue of IPC	In the first line of the 1st paragraph the words "28 days" are substituted by "14 days"
14.6.2	Minimum amount of Interim Payment Certificate (IPC)	50 million
14.7	Mode of Payment	Through crossed cheque in favor 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
14.7(a)	Period of payment of Advance Payment to the Contractor	14 days
14.7b(i)	Period for the Employer to make interim payments to the Contractor under Sub-Clause 14.6 [Interim Payment]	28 days

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)	56 days
14.11.1(b)	Number of additional paper copies of draft Final Statements	*Three (03) copies*
14.15	Currencies of payment of Contract Price	Pak Rupees
14.15(a)(i)	Proportions or amounts of Local and Foreign currencies	as stated in the Table IV of Schedule A [*Schedule of Adjustment Data*]
14.15(c)	currencies and proportions for payment of Delay Damages	as stated in the Table IV of Schedule A [*Schedule of Adjustment Data*]
14.15(f)	rates of exchange	as stated in the Table IV of Schedule A [*Schedule of Adjustment Data*]
19.1	Permitted deductible limits: i) insurance required for the Works ii) insurance required for Goods iii) insurance required forliability for breach of professional duty iv) insurance required against liability for fitness forpurpose (if any is required) v) insurance required for injury to persons and damage to property vi) insurance required for injury to employees vii) other insurances required by Laws and by local practice	i) Ten percent (10%) of loss amount oneach & every loss ii) Nil iii) Nil iv) Nil v) Nil vi) Nil vii) Nil

Not Applicable

Sub-Clause	Data to be Given	Data
19.1	Periods for submission of insurance: a) evidence of insurance b) relevant policies	a) Not later than the Commencement Date b) 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)
19.2.3(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 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 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 (Dispute Avoidance and Adjudication Board)	Within 28 days from the Commencement Date.

Sub-Clause	Data to be Given	Data
21.1	the DAAB shall comprise	**3 Members**
21.1	List of proposed members of DAAB - Proposed by Employer - 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 Karachi, Pakistan

Summary of Sections of the Works

Section Name/Description of parts of the Works that shall be designated a Section for the purposes of the Contract (Sub-Clause 1.1.73)	Value: Percentage* of Accepted Contract Amount (Sub-Clause 14.9)	Time for Completion (Sub-Clause 1.1.84)	Delay Damages (Sub-Clause 8.8)
A			
B			
C			

* These percentages shall also be applied to each half of the Retention Money under Sub-Clause 14.9.

Section Name/Description (Sub-Clause 1.1.73)	Time for Completion (Sub-Clause 1.1.84)	Incentives for Early Completion (Sub-Clause 8.14)
A		
B		
C		

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].

(i) Sub-Clause_____*

(j) Sub-Clause_____*

**[insert Sub-Clause number (not Sub-Clause 3.7 [Agreement or Determination]*

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) a Scheduled Bank in Pakistan or (b) a foreignbank duly counter-guaranteed by a Scheduled Bank in Pakistan, or (c) an Insurance Company listed in the Contract Data and rated by PACRA/VIS of rating as provided in Table below:

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

In case of Joint Venture, the Performance Security shall be in the name of the Joint Venture or in the name of Lead 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 license 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 asbuilt. 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 endeavor to employ such contractors as Subcontractors."

Not Applicable

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 [*Paymentto 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 orcause 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 alsoprovide all other medical services and appoint a health and safetyofficer at Site if stated in the Specifications. In case of anyfatality 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 anyof 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 involuntaryor 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 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.

Not Applicable

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 andspare 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 valueof the Contractor's Equipment and spare parts remaining in the Country after completion of the Contract. Upon payment of suchdues 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."

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) a Scheduled Bank in Pakistan or (b) a foreign bank duly counter-guaranteed by a Scheduled Bank in

Pakistan.

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

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 theSub-Clause.

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 atime while the Contractor is responsible for its care, arising fromany 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

If the Contractor is the affected Party and suffers delay and/or incurs Cost by reason of the Exceptional Event of which he/she gave a Notice under Sub-Clause 18.2 [Notice of an Exceptional Event], the Contractor shall be entitled subject to Sub-Clause 20.2 [Claims For Payment and/or EOT] to:

(a) EOT; and/or

(b) If the Exceptional Event is of the kind described in sub-paragraphs (a) to (e) of 18.1 [Exceptional Events] and, in the case of sub-paragraphs (b) to (e) of that Sub-Clause, occurs in the Country, payment of such Cost.

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 fourth line of firstparagraph:

The Contractor shall effect and maintain insurance against liability for claims, damages, losses and expenses (including legal fees and expenses) arising out of the execution of the Works in respect of injury, ~~sickness, disease~~ or death of any person employed by the Contractor or any of the Contractor's other personnel.

The Employer and the Engineer shall also be indemnified under the policy of insurance, except that this insurance may exclude losses and claims to the extent that they arise from any act or neglect of the Employer or of the Employer's Personnel.

The insurance shall be maintained in full force and effect during the whole time that the Contractor's Personnel are assisting in the execution of the Works. For any person employed by a Subcontractor, the insurance may be effected by the Subcontractor, but the Contractor shall be responsible for the Subcontractor's compliance with this Sub-Clause.

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 either **M/s National Insurance Company Limited (NICL)** or with any of the following rated by PACRA/VIS of rating as provided in Table below:

1.	Jubilee Insurance
2.	Adamjee Insurance
3.	United Insurance
4.	EFU Insurance
5.	Alflah Insurance

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

The following Sub-Clause is added after Sub-Clause 19.2.7:

19.2.8 Workman Compensation Policy

The Contractor must secure a proper Workmen's Compensation Policy exclusively from above-mentioned insurance companies. This policy should enable the Contractor to compensate their employees for work-related injuries, as well as provide suitable compensation to the dependents in case of unfortunate death or permanent and total disablement of an employee. The Client bears no liability in this regard. For all publicly financed CAR/EAR projects, the Contractor must engage M/s NICL, ensuring compliance with Section-166 of the Insurance Ordinance, 2000. This applies specifically to Contractors

All Risk/Erection All Risk Policies related to the construction, renovation, or maintenance of 'public property'. Additionally, the Contractor is responsible for indemnifying the Client as well as the Consultant staff against any third-party claims arising from accidents or injuries that occur at the site during the execution of works.

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

23 Taxes

The Contractor, Subcontractors and their employees shall beliable 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.

SPECIFICATIONS
PART A - SPECIFIC PROVISIONS

TABLE OF CONTENTS OF SPECIFIC PROVISIONS

SP. No.	Description
SP-1	The Site
SP-2	Work Under the Contract
SP-3	Work by Others
SP-4	Project Features
SP-5	Care and Handling of Water
SP-6	Drawings
SP-7	Physical and Other Data Available to Contractor
SP-8	Layout of Work and Surveys
SP-9	Approval of Materials and Equipment
SP-10	Contractor's Quality Assurance Plan
SP-11	Construction Schedule
SP-12	Facilities Provided by the Employer
SP-13	Construction Camps and Colonies
SP-14	Other Facilities for Engineers and Employers Personnel
SP-15	Equipment Furnished by the Employer
SP-16	Cooperation with other Contractors
SP-17	Safety and Health
SP-18	Construction Utilities
SP-19	Traffic, Roads, Bridges
SP-20	Rock Quarries
SP-21	Flood Warning System
SP-22	Environmental Protection
SP-23	Standards of Countries other than those Specified
SP-24	Progress Reports and Photographs

Sp. No.	Description
SP-25	Unit Price Breakdown
SP-26	Transport and Handling of Cargo
SP-27	Directed and Required
SP-28	Communications to the Engineer
SP-29	Any Other Provision
SP-30	Measurement and Payment – General
SP-31	Measurement and Payment

*[**Note:***

The above Sections of Specifications, are for guidance only, and shall be indicatedappropriate to the work/project.

The Employer may adopt the above format. However, if any section is not applicable, it may be mentioned as "Not Used".]

1. THE SITE

Site of Works is the area for construction lying within the line of boundaries and limits shown on the Drawings and any such additional areas adjacent thereto as may be designated by "The Engineer" from time to time for the construction to be performed under the contract and all such areas and additional areas shall be comprised in the site defined in clause 1 Conditions of Contract.

The Employer will give to the contractor, possession of the area designated and defined as "the site" and shown on the drawings as may be required to implement as much of the works when The Engineer' Notice to Commence the Work is given.

2. WORK UNDER THE CONTRACT

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

The carrying out of all work included in the Contract is to be supervised by a sufficient number of qualified representatives of the Contractor and full facilities and assistance are to be afforded by the Contractor for the Engineer or his Representative to check and examine the execution of the work.

The Engineer reserves the right to inspect all parts of the works but may at his discretion waive inspection on certain items. This shall in no way absolve the Contractor from his responsibilities. This particularly applies to the checking of materials, the accurate setting out of foundations, and to the leveling, setting and aligning of the various parts, and to the proper fitting and adjustment of manufactured and finished materials and fixtures in position.

The Contractor shall submit to "The Engineer" in due time for approval and discussion, his proposals and plans as to the method and procedure to be adopted for the temporary and permanent works involved.

Submission of the proposals & plans, methodology and procedure for execution of works and approval thereof by the Engineer shall not relieve the Contractor of his responsibilities and duties under the Contract.

If the Engineer or his Representative find that the work progress is slow in such a way that the works or parts thereof will not be completed in the time specified, then he shall order the Contractor to work overtime or in shifts and the Contractor shall comply. These arrangements will be free of all financial encumbrances and at no additional costs to the Employer.

In the event of night work, the Contractor shall provide sufficient and adequate lighting to the satisfaction of the Engineer or his Representative and shall supply the necessary manpower for satisfactory continuation of the work after normal hours.

3. PROJECT FEATURES

Infrastructure Developments Works for 500 Acres Land Of Proposed Karachi Industrial Park (KIP) including:-

1) Complete Road Network for 500 Acres.
2) Sewerage and Strom Water drainage System for 500 Acres.
3) Water Supply System for 500 Acres.
4) Construction of UGWT and Pump Room.
5) Complete Sub-Stations Works including, Civil, Electrical and allied Works.
6) Routing of four feeders from BQIP Grid Station.

4. CARE AND HANDLING OF WATER

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

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

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

The Contractor shall keep all surfaces upon or against which concrete is to be deposited free from running water and no concrete shall be placed until such surfaces are properly drained. Suitable

precautions shall be taken to prevent running water from washing out cement or concrete while it is setting or from injuring the Works in any other way.

Notwithstanding the Approval by the Engineer of the Contractor's methods of dealing with water, the Contractor shall be responsible for and accept all the risks and liabilities of dealing with water from whatever source and of all effects thereof.

5. DRAWINGS

- **Tender Drawings**

  Tender Drawings issued with the Tender Documents called Tender Drawings; show scope of the work to be performed by the contractor. The Drawings are generally in sufficient details so as to be used as a basis for construction and fabrication.

- **Construction Drawings, Supplementary Drawings**

  After award of Contract, the Engineer will issue Construction Drawings to the Contractors.

  The Engineer shall have authority to issue the Contractor, from time to time, such supplementary Drawings and instructions as shall be necessary for the purpose of the proper and adequate execution and completion of the Works and the remedying of any defect therein. The Contractor shall follow these drawings.

  The Contractor shall give notice to the Engineer regarding the part of the Drawings which is in his opinion contains discrepancies or are not clear. The Engineer shall issue necessary clarification or supplementary Drawing in greater details as required to execute the works. These supplementary Drawings shall be reviewed by the Engineer for his determination of adjustment of the Contract Price under Clause 51 and 52 of Conditions of Contract.

- **Definition of Term Drawings**

  The term used in the specifications means the Drawings referred in Clause 5.1 and 5.2 hereof.

- **Checking of Drawings**

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

- **Copies of Drawings**

  Drawings will be issued to the contractor as described below.

- **Tender Drawings**

  Contractor shall receive one (1) set of the Tender Drawings along with the Tender Documents. Additional sets will be made available upon written request from the Contractor, with the cost of reproduction borne by the Contractor. The Employer shall be provided with two (3) sets of each Tender Drawing for official use

- **Construction Drawings/ Supplementary Drawings**

  The Contractor shall be provided, free of charge, with one (1) print of each Construction Drawing and any associated Supplementary Drawings. Four (4) copies of each of these drawings shall be issued to the Employer for their use and official records.

- **Drawings to be furnished by the Contractor/As-Built Drawings**

  The contractor shall submit to the Engineer for review of such drawings as required under the contract sufficient in advance of the work intended to be executed.

  The contractor shall, at all times, keep on site a separate set of prints on which all significant changes between the work shown on the drawings and the which is actually constructed, shall be noted neatly, accurately and promptly as the work progresses. The Sub-contractor(s) for plumbing, mechanical and electrical shall at all times, keep in site, a separate set of prints of the

drawings (showing their parts of the Works) on which all significant changes between the work shown on the Drawings and that which is actually constructed, shall be noted neatly, accurately and promptly as the work progress. Such drawings shall show the exact physical location and configuration of the works as actually installed.

The contractor shall within fourteen (14) days of issuance Taking-Over Certificate for whole of the Works furnished to the Engineer for his approval two (2) copies of such marked up drawings. One (1) copy of each of the marked-up drawings approved by the engineer shall be returned to the contractor by the Engineer and these shall be used for the preparation of the AS-BULIT Drawings.

The Contractor shall submit to the Engineer six (6) complete sets of all As-Built Drawings, along with a soft copy in AutoCAD format, within thirty (30) days of receiving the relevant drawings from the Engineer. Upon review and approval, the Engineer shall forward the complete set of As-Built Drawings to the Employer.

6. PHYSICAL AND OTHER DATA AVAILBLE TO CONTRACTOR

Drawings and information pertaining to existing project conditions are furnished for reference.

Neither the Employer nor the Engineer warrants the adequacy or correctness of these. The Contractors are encouraged to visit the project site to assess the existing site conditions.

7. LAYOUT OF WORKS AND SURVEY

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

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

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

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

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

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

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

The Contractor shall notify the Engineer at least 24 hours before performing a quantity survey and, unless specifically waived, quantity surveys shall be performed in the presence of an authorized representative of the Engineer. Degree of accuracy for the survey works shall satisfy the following specified tolerances:

a) Structure points shall be set within 0.01 foot accuracy from point to point, except where tighter tolerances are required.
b) Cross-section points shall be located within 0.10 foot, horizontally and 0.01 foot vertically.
c) Permissible closing error for a levelling line meant for establishing

Temporary Bench Mark (TBMs) shall not exceed 0.045 x √ M foot, where M is in miles. The permissible closing error shall be duly adjusted.

The Contractor shall provide all materials, equipment and labor required for surveying work, including, but not limited to, instruments, stakes, spikes, steel pins, templates, platforms, and tools, and except as required to be incorporated in the work or left in place, all such materials and equipment, shall remain the property of the Contractor. Surveying instruments shall be in perfect working condition and shall be subject to rigid inspection for proper operation at least after every two weeks of use. Defective instruments shall be promptly replaced or repaired and adjusted to the satisfaction of the Engineer.

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

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

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

8. APPROVAL OF MATERIALS AND EQUIPMENT

- **Quantity of Materials**

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

- **Submission of Samples and Data.**

  As soon as practicable after the award of Contract, the Contractor shall submit for the approval of the Engineer drawings, Catalogues diagrams and other descriptive data for all mechanical, electrical, architectural and such other materials and plant designated by the Engineer, which the contractor proposes for use under this Contract. For certain materials and plant, data may be required to be submitted in accordance with a detail form furnished by the Engineer. Samples of materials (2 Sets) shall be submitted by the Contractor to the Engineer at Contractor's Cost for approval sufficiently in advance of the materials intended to be incorporated in the Works. **Finally, The engineer shall consent from the employer before approval of material/samples**

etc.

- **Testing**

  Testing, except as otherwise specified herein shall be performed by a testing agency as proposed by the Contractor and approved by the Engineer at no extra cost to the Employer. The Engineer may require all testing to be carried out under his ~~and employer~~ supervision **and the Engineer shall inform/ brief time to time to the employer. Satisfaction of employer is necessary.**

  The quality control testing shall be performed by the contractor's competent personnel in accordance with a site testing as approved by the Engineer.

  The contractor shall keep a complete record of all quality tests programme performed on site.

- **Testing Laboratory Certificates.**

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

- **Inspection**

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

- **Approved Sample at Site.**

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

- **Site laboratory.**

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

  The laboratory shall also be equipped with new unused furniture, fittings and fixtures. If any equipment, furniture, fitting or fixture becomes unserviceable for any reason what so ever, the Contractor shall promptly replace the same as and when directed by the Engineer.

- **Bar Bending Schedule**

  Bar bending (reinforcement bars) schedule of all structural drawings shall be prepared by the Contractor and submitted in triplicate to the Engineer for approval. The Engineer shall brief the employer before the approval of BBS.

- **Submissions**

  Schedule submission at least thirty days before the dates when reviewed submittals will be needed.

  Shop drawings of activities, as deemed necessary by the Engineer, shall be submitted for review and approval by the Engineer as stipulated within the contract terms. Submit Shop Drawings and number of copies of Product Data which the Contractor requires for distribution plus four copies which will be retained by the Engineer.

  Submit three samples unless otherwise specified.

  Accompany submittals with transmittal letter, in duplicate, containing:
  - Data

- Project title and number
- Contractor's name and address
- The number of each Shop Drawing, Product Data and the Sample submitted.
- Notification of deviations from Contract Documents.
- Other pertinent data.

- **Re- Submissions Requirements**

  Shop Drawings:
  - Revise initial drawings as required and resubmit as specified for initial submittal.
  - Indicate on drawings any changes which have been made by the Engineer.
  - Product Data and Samples: Submit new data and samples as required for initial submittal.

9. CONTRACTOT'S QUALITY ASSURANCE PLAN/ SPECIFICATIONS

- **Specification or as specified**

  Specification or as specified refers to the specifications outlined in these Documents and where no specifications are available for any work or where the same are found not applicable then the relevant applicable ASTM or BSS specifications or equivalent standards shall apply in the same order. Any time for which no specifications are outlined but which are identified in drawings shall be completed accordingly to the standards as per ASTM/BSS these include items that may be added in the future. The Employer/ Employer's representative may supplement such specifications during the progress of work. All materials and processes used for these items shall be subject to standard testing and if found below the pertinent ASTM/BSS standards, shall be removed from the site immediately at the contractor's expense.

- **Standards and codes**

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

- **Material and process**

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

- **Equivalent Material, Process etc.**

  Where specific materials, processes etc. are specified and the same are not available other alternative material and processes which ensure an equal or higher quality than those specified will be accepted subject to the Employer prior review and written approval. Differences between the specified and the proposed alternatives must be fully described in writing by the contractor and submitted to the Employer's approval who may give such approval after determining that the alternative proposed ensures equal or higher quality.

- **Approved, Directed, Instructed**

  Approved, directed, instructed means the approval etc. of the Employer unless otherwise stated.

- **Alternatives**

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

- **Catalogues/Standards/Manufacturer's Instructions, etc.**

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

- **Applicability**

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

Suppliers of local and foreign products and installations specified shall have been regularly engaged in the business of manufacturing, fabricating, installing and / or servicing work required for a period not less than 5 years. In addition, the Engineer may request as appropriate a list of similar installations that describes project, scope and date of completion, complete literature, performance data, and technical data, list of services record within Pakistan and location of service office from which this installation could be maintained.

For the actual fabrication, installation and testing of the specified work use only thoroughly trained and experienced workmen completely familiar with the items required and with the manufacturers recommended methods of installation. In acceptance or rejection, no allowance will be made for the lack of skill on the part of workmen.

Use all means necessary to protect materials before, during and after installation and to protect the installed work and materials of all other trades. In the event of damage, immediately make all repairs and replacement necessary for approval and at no additional cost to the Employer.

Manufacture's standard schematic drawings shall be modified or deleted to indicate only information which is applicable to the project. Such standard information shall be supplemented to provide all additional applicable information.

Manufacturer's catalogue sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive literature shall be clearly marked to identify pertinent materials products or models. Dimensions and required clearances shall be indicated. Shop performance characteristics and capacities shall be noted.

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

- ASCE - American Society of Civil Engineers
- ASA- American Standard Association
- ACI- American Concrete Institute (USA)
- AISI- American Iron and Steel Institute (USA)
- AISC- American Institute of Steel Construction (USA)
- ANSI - American National Standard Institute (USA)
- ASTM - American Society for Testing and Materials (USA)
- AASHTO - American Association of State Highway & Transportation Officials
- AWS - American Welding Society (USA) BS - British Standards (UK)
- CP - Codes of Practice (UK)
- ICAO - International Civil Aviation Organization BSICP - British Standard Institute Code of Practice PS - Pakistan Standards (Pak)
- PCA - Portland Cement Association PSI - Pakistan Standard Institute
- SSPC - Steel Structures Painting Council (USA) UBC - Uniform Building Code (USA)
- USBR - United States Bureau of Reclamation (USA)

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

of the materials and equipment to the Engineer for approval.

10. CONSTRCUTION SCHEDULE

- **Submittal Date**

  The programme of works submitted by the Contractor, in accordance with the contract, in the form of a detailed schedule based on a computerized network analysis covering all construction activities indicating critical activities with critical patch resource scheduling for contractor's equipment material and labor within the period stated in the Appendix A to Tender. All the milestones shall be clearly identified.

- **Requirements**

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

  Each summary or detailed schedule shall consist of a bar chart and time scaled network. The schedule start and finish times for all activities on the bar charts shall agree with those in the network. All inter-relationships and inter-dependencies between structures shall be clearly indicated on the schedules. The network shall show the order and interdependences of activities planned by the contractor and shall be time – scaled accordingly to calendar dates.

- **Monthly Reports.**

  Each month the Contractor shall submit a report consisting of:

  - Copies if the bar charts for the current phase with both actual progress and scheduled progress shown.
  - Network analysis tabulations reflecting actual start date and finish dates where applicable.
  - A narrative report discussing any significant deviations from the schedule and, if necessary, explaining the steps proposed to be taken to maintain the approved schedule.

11. FACILITIES PROVIDED BY THE EMPLOYER

(Not Used)

12. CONSTRUCTION CAMPS AND COLONIES

Save insofar as the Contract otherwise provides, the Contractor shall provide and maintain such housing accommodation and amenities as he may consider necessary for all his supervisory staff and labor, employed for the purposes of or in connection with the Contract including all fencing, electricity supply, sanitation, cookhouses, fire prevention, water supply and other requirements in connection with such housing accommodation or amenities. On completion of the Contract, these facilities shall be handed over to the Employer or if the Employer so desires, the temporary camps or housing provided by the Contractor shall be removed and the Site reinstated to its original condition, all to the approval of the Engineer.

The Contractor shall erect and maintain at the site in location to be approved by the Engineer 3 Sign Boards 8' x 6' for painting the name of Work name of client, name of consultants, name of Contractor and Project Cost on Both side. The notice board shall comprise of the following; Frame of 3" dia GI pipe properly painted as per direction of the Engineer. 2 Nos. Posts of 3" Dia GI Pipe 4' above ground and 4' below ground embedded in 1:2:4 cc 2'x2'x4' with proper arrangement of anchorage and brasses. 5 Nos. MS / Polyvinyl sheets 9" wide and 1 No. 12" wide, 8' long each fixed with the pipe frame with 3" gap between each strip Background painted in white with synthetic enamel paint on both sides. Alphabets of appropriate size as approve by the Engineer in reflective paint.

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

13. OTHER FACILITIES FOR ENGINEER'S AND EMPLOYER'S PERSONNELS

The Contractor shall construct a Site Office as per design (Refer Annex-D) and / directions of the Employer on a land to be specified by the Employer. The said office shall be fully furnished / equipped with fittings and fixtures like fans, AC units, furniture, utilities (including backup power i.e Generator and or/Solar Plant) etc. The Contractor shall also be responsible for the maintenance of the said office till end of the Defect Liability Period.

The Contractor shall provide following facilities in the site offices of the Employer and the Engineer:

1. Six (06) workstation including Computer (latest generation Core I-7, minimum with 500 GB SSD, 16 Gb Ram, 17" Flat Color monitor, etc.), flash drive (at least 8 GB capacity) an A3 size color printer, stationery for exclusive use of Employer.

2. Setup a furnished meeting room, with seating capacity of 15 persons, with multimedia arrangements.

3. Five (05) workstations including Computer / Laptop (latest generation Core I-7, minimum with 500 GB SSD, 16 Gb Ram, a DVD writer, 17" Flat Color monitor, etc.), flash drive (at least 8 GB capacity) and stationery for the use of the Engineer and his/her staff.

4. A3 size color printers

5. UPS,

6. Stabilizers,

7. Air conditioners (as required by Employer and the Engineer)

8. 6 cubic feet refrigerators,

9. Installation of CCTV cameras network at project premises including office areas which must serve following purposes:

a) Time lapse

b) Site monitoring

c) Security of site and offices.

d) Video Recording and backup

These cameras must be connected via mobile apps to the Employer and the Engineer. etc.,

The site office shall be connected to the electrical system, potable water supply system and sewage disposal system. The Contractor shall provide replacement of the equipment(s), if any of the above-mentioned equipment(s) is temporarily or permanently rendered unserviceable for any reason(s) or declared to be beyond repair by the Engineer/Engineer's staff at no additional cost to the Employer.

The said offices shall be provided by the Contractor within twenty-eight (28) days of the receipt by the Contractor of Engineer's Notice to Commence or twenty-one (21) days of the payment of the first half of the Mobilization Advance, whichever earlier. The site office shall be maintained by the Contractor up to a period of three hundred sixty-five (365) days after the Issuance of Taking Over Certificate (DLP Period) by the Engineer. The site office along with all fittings, fixtures and gadgets shall become property of the Employer after the completion of the project and shall be handed over to the Employer along with list of all items given for the use of Engineer. The site office shall be removed /dismantled if directed by the Engineer/Employer. In such case, the area shall be developed in accordance with the drawings or to its natural state and as per the instructions of the Engineer.

The contractor shall also provide one latest Generation Core I-7 laptop of approved brand/make and 56 inch latest model LED for the exclusive use of the Employer.

The Contractor shall provide within one month to the issuance of Letter to Commence, operate and maintain following vehicles for the Employer and Consultant supervision team:

1. 01 No. Sedan (1600CC latest model) or equivalent for Employer with driver and fuel limit of 225 liter.

2. 01 No. Sedan (1000CC latest model) or equivalent for the Project supervision team of the Consultant, with driver and fuel limit of 200 liter.

3. 01 No. Van (AC latest model) for the Project supervision team of Consultant at Site, with driver and fuel limit of 200 liter.

4. 2 Nos. Motorcycle (125CC), for the use of staff of Employer and Consultant Team with fuel limit of 50 liter for each Motorcycle.

They shall furnish supply and provide, as may be necessary without specific direction of the Employer/Employer's staff, all fuels, lubricants, tyres and other supplies, all maintenance, repairs, comprehensive insurance cover and running costs and suitability qualified drivers at all times for running of vehicles and will provide a substitute vehicle in case of break down exceeding two days.

The Contractor shall provide replacement vehicle if the vehicle is temporarily or permanently rendered unserviceable for any reason(s) or declared to be beyond repair by the Employer/ Employer's representative at no additional cost to the Employer. The Contractor shall maintain the vehicles till the issuance of Defects Liability Certificate.

In case above facilities are not provided within stipulated time (within one month from the issuance of Letter to Commence), the Employer / Engineer may have the facilities developed/provisioned on their own and the actual expenditure will be deduct from the interim payment certificate submitted by the contractor.

No payment shall be made to the Contractor for the facilities involved under this clause. The cost thereof shall be deemed to have been included in the price quoted by the Contractor for the works.

14. EQUIPMENT FURNISHED BY THE EMPLOYER

(Not Used)

15. COOPERATION WITH OTHER CONTRACTORS

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

16. SAFETY AND HEALTH

Due precautions shall be taken by the Contractor, and at his own cost, to ensure the safety of his staff and labor at all times throughout the period of the Contract. The Contractor shall further ensure that suitable arrangements are made for the prevention of epidemics and for all necessary welfare and hygiene requirements

17. CONSTRUCTION UTILITIES

The Contractor shall search for, find, locate and protect any wiring, cable, duct, pipework, etc., within or immediately adjoining the site area.

The Contractor shall take full responsibly for safety of existing service lines, utilities and utility structures uncovered or encountered during excavation and construction operations. The Contractor shall take full responsibility for damaging any such service lines, utility/utility structure and any cost and/or expense that arises or issues from any such damage shall be borne directly by himself. Should any damage to any such service occur the Contractor shall forthwith take remedial action, initiate safety precautions, install temporary services and carryout repair all at his own cost and expense and inform the Engineer and notify all relevant authorities.

Existing utilities which are to remain in service for or after the works are to be determined by the Contractor. If any existing service lines, utilities and utility structures which are to remain in service are uncovered or encountered during these operations, they shall be safeguarded, protected from damage, and supported. The Contractor shall preserve, maintain and keep in perfect working conditions, any existing facilities required to be preserved by the Employer/the Engineer.

18. TRAFFIC, ROADS, BRIDGES

(Not Used)

19. ROCK QUARRIES

(Not Used)

20. FLOOD WARNING SYSTEM

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

Additionally, the Contractor shall be deemed to have taken all weather, flood, inundation, seismic, traffic, vibrations conditions, arising from any cause whatsoever, into account when preparing his Tender and he shall not be entitled to extra payment by reason of the occurrence or effect of excessive traffic vibrations, rain fall, floods, temperature or humidity, high winds, earthquakes or an, other heavier flood inundation, seismic or environmental conditions.

Without limiting his liabilities under the Contract, the Contractor shall make suitable arrangements to protect the works, Including temporary Works, and Constructional Plant against the effects of weather flood inundation seismic and traffic vibrations conditions.

No work shall be performed when; in the opinion of the Engineer such work is liable to be injuriously affected by the weather, flood, inundation seismic or traffic vibrations conditions. The Contractor shall not be entitled to extra payment on account of loss alleged to have been sustained directly or indirectly by reason of the Engineers declining to permit such work to start or continue or ordering any work damaged by the weather flood inundation seismic or traffic vibrations conditions to be made good or removed and re-executed.

The Contractor shall be responsible for obtaining and acting upon all relevant weather flood inundation and seismic information during the period of the Contract. The Contractor shall promptly supply copies of all-weather flood inundation and seismic forecasts to the Engineer

21. ENVIRONMENTAL PROTECTION

The Contractor shall exercise care to protect the natural landscape and shall conduct his construction operations so as to prevent any unnecessary destruction, scarring or defacing of the natural surroundings in the vicinity of works. Except where clearing is required for the Permanent works, approved construction roads and the Temporary Works, and for excavation operations, all trees and native vegetation shall be preserved and shall be protected from damage which may be caused by the Contractor's construction operations and equipment. On completion of the works, all work areas shall be smoothed and graded in a manner to confirm to the natural appearance of the landscape. Where unnecessary destruction, scarring, damage or defacing may occur as a result of the Contractor's operations, it shall be repaired, replanted, or otherwise.

22. STANDARDS OF COUNTRIES OTHER THAN ORIGION

(Not Used)

23. PROGRESS REPORTS AND PHOTOGRAPHS

During the continuance of the Contract, the Contractor shall submit weekly progress on forms as approved by the Engineer. Such weekly reports shall show the actual progress completed as of date of the report plotted against the schedule as given by the Contractor at the start of work and shall be broken down so as to indicate status of all activities associated with mobilization, design, material procurement, manufacture, surveys work, tests with regard to the agreed contract programme.

The Employer and the Engineer reserve the right to coordinate the schedules of this Contractor and other Contractors working at the Site, and to adjust and/or change any and all such schedules as required during the course of construction in order to achieve a coordinated project in harmony with the Employer's completion date.

Commencing after the first week of construction, and continuing every week until completion, the Contractor shall take and submit photographs to the Engineer's Representative, to show progress of his work and completion of each structure or major feature.

During the period of the Contract, the Contractor shall submit to the Engineer not later than the 8th day of the following month, 5 hard copies and soft editable format each of Monthly Progress Reports covering:

- A Construction Schedule indicating the monthly progress in percentage;
- Description of all work carried out since the last report;
- Description of the work planned for the next 56 days sufficiently detailed to enable the Engineer to determine his programme of inspection and testing;
- Monthly summary of daily job record;
- Photographs to illustrate progress; and
- Information about problems and difficulties encountered, if any, and proposals to overcome the same.

During the period of the Contract, the Contractor shall keep a daily record of the work progress, which shall be submitted to the Engineer at the end of each day. The daily record shall include particulars of weather conditions, number of men working, deliveries of materials, quantity, location and assignment of Contractor’s equipment

As soon as work commences on Site, the Contractor shall provide at least 10 to 12 photographs (along with soft copy) of the works from positions to be selected by the Engineer. Each photographic print shall not be less than 297mm x 210mm and shall bear a printed description, a serial number and the date when taken.

The negatives /soft copy of all photographs shall be held at the Contractor’s Site Office, numbered and handed over to the Employer at the completion of the Contract

24. UNIT PRICE BREAKDOWN

The FPS System of Units shall be used throughout the Project.

25. TRANPORT AND HANDLING OF CARGO

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

The Employer shall not be liable for any costs, charges or expenses in respect of any damage occurs to any bridge or road arising from the transport of Material or Plant by the Contractor. The Contractor

shall keep indemnified the Employer against all such claims. The Contractor shall negotiate the settlement of claim with the authority and pay all sums due in respect of all claims, proceeding, damages, costs, charges and expenses.

The Contractor shall notify the Engineer and Employer about the negotiations, in-respect of settlement of claim. In case of failure in payment of claimed amount by the Contractor, the Employer shall recover the amount of claim from the Contractor by making deduction from any monies due or to become due to the Contractor and shall notify the Contractor accordingly

26. DIRECTED AND REQUIRED

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

Upon completion of the works the Contractor shall restore all items covered by the Contract to the satisfaction of the Engineer.

The Contractor shall do regular cleaning and clear away all rubbish and excess materials that may accumulate from time to time on completion and before handing over.

Upon completion of the works, he shall obliterate all signs of temporary construction facilities such as work areas, structures, foundations of temporary structures, stock piles of excess or waste materials, or any other vestiges of construction, as directed by the Engineer. All buildings shall be cleaned; floors and paving scrubbed and the works and site shall be left in a clean and satisfactory state for immediate use and occupation. Care shall be taken not to use any cleaning materials, which may cause damage to the surface to be cleaned. The Contractor shall also take all necessary precautions to keep the works and site free from vermin during construction and he shall leave the works vermin free on completion. Application of pest control agents shall not commence until the specific product, name, method and extent of application have been submitted to and approved of by the Engineer.

27. COMMUNICATION TO THE ENGINEER

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

28. ANY OTHER PROVISION

(Not Used)

29. MEASUREMENTS AND PAYMENTS

The measurement of the Works shall be performed on the basis of the Specifications. All work completed under the Contract shall be measured according to the metric system for all items, unless otherwise provided herein or in the Special Provisions. All longitudinal measurements for area or volume will be made horizontally along the road center line, and no deduction will be made for individual fixtures in the pavement having an area of 1 sq. meter or less. All transverse measurements for area or volume of pavement courses will be made horizontally in accordance with the dimensions indicated on the plans, or the dimensions ordered by the Engineer. In computing volume of excavation, embankment and borrow material, the average end area method will be used. Where no items are provided in the Bill of Quantities for work required under the Contract, costs shall be deemed to be distributed among the quoted rates and prices entered for other items of work in the Bill of Quantities. The Works shall be measured net notwithstanding any general or local custom except where otherwise specifically described or prescribed in the Contract.

SPECIFICATIONS
PART B - TECHNICAL PROVISIONS

INFRASTRUCTURE DEVELOPMENT WORKS OF BLOCK-A ON 500 ACRES LAND OF PHASE-I (1500 ACRES) OF KARACHI INDUSTRIAL PARK

(PAC KAG E-I)

(Volume- II)

CLIENT:

TENDER SPECIFICATION

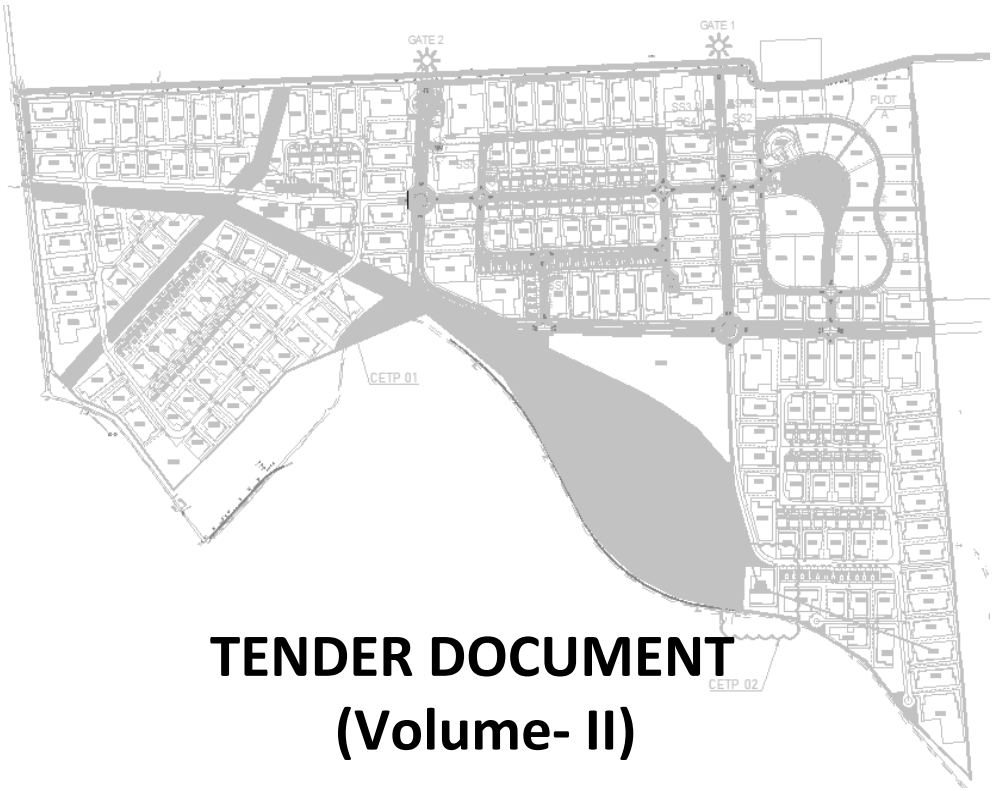
JUNE, 2025

Lead Firm

JURONG SURBANA

JV-Team

INFRASTRUCTURE DEVELOPMENT WORKS OF BLOCK-A ON 500 ACRES LAND OF PHASE-I (1500 ACRES) OF KARACHI INDUSTRIAL PARK (PACKAGE-I)



TENDER DOCUMENT
(Volume- II)

TECHNICAL SPECIFICATIONS

JUNE 2025

Lead Firm

SURBANA JURONG

JV-Team

Table of Contents

1 EXCAVATION 10

1.1 EXCAVATION – GENERAL 10

1.2 EXCAVATION – PIPELINES 10

1.3 DEWATERING 11

1.4 PROTECTION OF UTILITY SERVICE 11

1.4.1 DAMAGE TO SURFACE 11

1.4.2 MAINTENANCE OF TRAFFIC 11

1.4.3 CONTROL OF TRAFFIC ON ROADS 12

2 BACKFILLING 13

2.1 FILL, BACKFILLING AND RESTORING OF GROUND TO ORIGINAL CONDITION 13

2.2 COMPACTION 13

2.3 REMOVAL OF EXCESS AND UNDESIRABLE MATERIALS 14

2.4 EXECUTION 14

2.5 MATERIAL 14

3 PORTLAND CEMENT, AGGREGATES & WATER 16

3.1 PORTLAND CEMENT 16

3.1.1 GENERAL REQUIREMENTS 16

3.1.2 SPECIFICATION 16

3.1.3 PACKING AND MARKING 16

3.1.4 INSPECTION 17

3.1.5 REJECTION 17

3.1.6 METHOD OF SAMPLING AND TESTING 17

3.1.7 TRANSPORTATION OF CEMENT 17

3.1.8 STORAGE 18

3.1.9 USAGE 18

3.1.10 DELIVERY AND USAGE RECORD 18

3.2 AGGREGATE 18

3.2.1 GENERAL REQUIREMENTS 18

3.2.2 NATURE OF AGGREGATE 19

3.2.3 SOURCE 19

3.2.4 SAMPLING AND TESTING 19

3.2.5 AGGREGATE PROCESSING 19

3.2.6 GRADING REQUIREMENTS 20

3.2.6.1 FINE AGGREGATES 20

3.2.6.2 COARSE AGGREGATE: 21
Percent by Weight Finer than Each Laboratory Sieve 21
3.2.6.3 PARTICLE SHAPE 21
3.2.7 DELETERIOUS SUBSTANCES 22
3.2.7.1 FINE AGGREGATE 22
3.2.7.2 COARSE AGGREGATE 22
3.2.8 STORAGE 22
3.2.9 MOISTURE CONTROL 23
3.3 WATER 23
3.3.1 SOURCE 23
3.3.2 QUALITY 23
3.3.3 STORAGE 24
4 STEEL REINFORCEMENT 25
4.1 MATERIALS REQUIREMENT 25
4.1.1 SPECIFICATIONS 25
4.1.2 TESTING 25
4.2 CUTTING AND BENDING 25
4.3 PLACING AND POSITIONING 25
4.4 RELATION OF BARS TO CONSTRUCTION SURFACES 26
4.5 SPLICING 26
4.6 TOLERANCES 26
4.6.1 FABRICATING TOLERANCES 26
4.6.2 PLACING TOLERANCES 26
4.7 EMBEDMENT ITEMS 27
5 BEDDING AND PIPE LAYING 28
5.1 PIPE LAYING 28
5.2 BEDDING FOR PIPELINES 28
5.2.1 MATERIALS REQUIREMENTS 28
5.2.2 CONSTRUCTION REQUIREMENTS 28
6 CONCRETE SURROUND FOR PIPES 29
6.1 CONCRETE THRUST BLOCKS / ANCHORAGES 29
7 HYDROSTATIC TESTS (Water supply System) 30
7.1 TEST PROCEDURE 30

7.2 TEST PRESSURE 31
7.3 SECTIONAL HYDRAULIC TEST 31
7.4 HYDRAULIC TEST ON COMPLETION 32
7.5 DISINFECTION & CLEANING OF PIPE 32
7.5.1 DISINFECTING WATER MAINS 32
7.5.2 CLEANING 32
8 uPVC PIPE 33
8.1 STANDARDS AND SPECIFICATION 33
8.2 PHYSICAL PROPERTIES 33
8.3 ABBREVIATIONS 34
8.4 Nominal Pressure (PN) 34
8.5 THICKNESS AND DIAMETER 35
8.6 uPVC FITTINGS 35
8.7 JOINTING 35
8.7.1 SOLVENT CEMENT JOINT 35
8.7.2 GUIDE TO THE CONSUMPTION OF LUBRICANT, CLEANER AND SOLVENT CEMENT PER 100 JOINTS 36
8.7.3 Z-JOINT 36
8.7.4 FLANGED JOINT 36
8.8 INSTALLATION OF uPVC PRESSURE PIPES 36
8.8.1 INSTALLATION OF BURIED PIPE 36
8.8.2 Support Spacing 37
9 HDPE PIPES AND FITTINGS 38
9.1 HDPE PIPES FITTINGS AND ACCESSORIES 38
9.1.1 APPLICABLE STANDARDS AND CODES 38
9.2 TECHNICAL REQUIREMENTS 39
9.2.1 MATERIAL 39
9.2.2 PHYSICAL PROPERTIES 40
9.2.3 PIPE DIMENSIONS (GEOMETRICAL CHARACTERISTICS) 40
9.2.4 PIPE APPEARANCE 41
9.2.5 FITTINGS 41
9.2.5.1 FITTINGS APPEARANCE 41
9.2.5.2 FITTINGS DIMENSIONS 41
9.2.5.3 WALL THICKNESS OF FITTINGS 41

9.3 PIPE INSTALLATION 41
9.3.1 BUTT FUSION JOINTING 42
9.3.2 SADDLES/SIDEWALL JOINTING 43
9.3.3 ELECTRO FUSION JOINTING 43
9.3.4 MECHANICAL JOINTS AND FITTINGS 44
9.4 INSPECTION AND TESTING 44
9.4.1 CERTIFICATION AND DOCUMENTATION 44
9.4.2 TEST RESULTS AND FREQUENCIES 44
9.4.3 INSPECTION AND AUDIT REQUIREMENTS 44
9.4.4 ACCEPTANCE CRITERIA 45
9.4.5 DEFECTS 45
9.4.5.1 QUALITY ASSURANCE/QUALITY CONTROL 45
9.4.5.2 PACKING, MARKING AND VENDOR DOCUMENTATION 46
9.4.5.3 PIPE IDENTIFICATION AND PACKING 46
9.4.5.4 PACKAGING AND TRANSPORTATION 46
9.4.5.5 DELIVERY 47
9.4.5.6 WEATHERING 47
9.4.5.7 TIE-DOWNS 47
9.4.5.8 PALLETS 47
9.4.5.9 OVERHANG 47
9.4.5.10 STACKING 47
9.5 TRUCKING 47
9.6 SILO'S 47
10 MS PIPES AND SPECIALS 48
10.1 MILD STEEL SECTION SPECIFICATIONS 48
10.2 CHEMICAL PROPERTIES AND TESTS 48
10.3 MECHANICAL PROPERTIES AND TESTS 48
10.4 STANDARD SPECIFICATIONS 48
10.5 THICKNESS OF PLATES / COIL 48
10.6 PIPE 48
10.7 DIAMETER 48
10.8 LENGTHS 48
10.9 STRAIGHTNESS 49
10.10 ENDS 49
10.11 JOINTS 49

10.12 MANUFACTURE OF PIPES 49

10.13 INTERNAL PROTECTION OF PIPES – CEMENT MORTAR LINING 49

10.14 LINING MATERIAL 50

10.14.1 SAND 50
10.14.2 PORTLAND CEMENT 50
10.14.3 WATER 50
10.14.4 MIX FOR LINING 50
10.14.4.1 COMPOSITION 50
10.14.4.2 PROPORTIONS 51
10.14.4.3 WATER CONTENT 51
10.14.4.4 MIXING 51

10.15 THICKNESS OF LINING 51

10.16 CURING 51

10.17 CLEANING OF PIPE FOR LINING 51

10.18 MACHINE APPLICATION OF MORTAR LINING 51

10.19 GUARANTEE AND PERFORMANCE CRITERIA 52

10.20 MILD STEEL SPECIALS 52

10.20.1 GENERAL 52
10.20.2 QUALITY OF STEEL 52
10.20.3 DIAMETER 52
10.20.4 JOINTS 52
10.20.5 LENGTH / WIDTH 53
10.20.6 COATING 53

11 GRP PIPES 54

11.1 MANUFACTURER'S PRE-QUALIFICATION 54

11.1.1 MANUFACTURER'S SCOPE OF WORK 54

11.2 APPLICABLE CODES AND STANDARDS 55

11.3 PRODUCT DESCRIPTION 57

11.3.1 General 57
11.3.2 Raw Materials 58

11.4 REQUIREMENTS 58

11.4.1 Wall Thickness 58
11.4.2 Length 59
11.4.3 Diameters 59
11.4.4 Stiffness 59
11.4.5 Longitudinal Tensile Strength 59

11.4.6 Hoop Tensile strength 59
11.4.7 Hardness - Barcol (ASTM D 2583) 59
11.4.8 Joints 59
11.4.9 Workmanship 60
11.4.10 Fittings 61
11.5 DESIGN PARAMETERS 61
11.6 INSPECTION & TESTING 62
11.7 PIPE INSTALLATION 65
11.8 INSTALLATION (GENERAL REQUIREMENTS) 66
11.9 ONSHORE BUOYANCY CONSIDERATIONS 67
11.10 HYDROSTATIC TESTING OF PIPELINES 67
11.11 HYDROSTATIC TESTING OF PRESSURE PIPELINES 68
11.12 HYDROSTATIC TESTING OF NON PRESSURE PIPELINES 69
11.13 DEFLECTION MEASUREMENT OF PIPELINES (GRP Pipes) 70
11.14 MARKING 71
11.15 STORAGE & PACKING FOR SHIPMENT 71
11.16 SUBMITTALS 71
11.17 GUARANTEE 72
12 VALVES 74
12.1 VALVES 74
12.1.1 GENERAL 74
12.1.2 BUTTERFLY VALVES 74
12.1.3 GATE VALVES 75
12.1.4 AIR VALVES 76
12.1.5 FLOW METER 77
12.1.6 CHECK VALVES 77
12.1.7 DISMANTLING PIECES 78
12.2 PENSTOCKS 80
12.2.1 GENERAL 80
12.2.2 PRESSURE SEALS 80
12.2.3 DRIVE SPINDLE AND NUT 81
12.2.4 FIXING BOLTS 81
12.2.5 HEADSTOCK PILLAR 81
12.3 VALVE CHAMBERS 81

12.4 PRESSURE RELIEF VALVES 82
12.5 PRESSURE REDUCING /SUSTAINING VALVES 82
12.6 BALL FLOAT VALVES 83
12.7 PRESSURE GAUGES 83
12.8 EXPANSION JOINTS 83
12.9 OVERHEAD BRIDGE CRANE 83
13 CAST IRON COVERS WITH FRAMES 85
13.1 STEEL LADDER 85
14 PUMPING MACHINERY 86
14.1.1.1 PRESSURE GAUGE 97
14.1.1.2 BRASS STRAINER 97
14.1.1.3 PRESSURE SWITCH 97
14.1.1.4 WATER LEVEL INDICATOR 97
14.1.2 CHAIN AND PULLY BLOCK ARRANGEMENT 97
14.1.3 MAINTENANCE MANUALS AND TOOLS 98
14.1.4 PUMPING MACHINERY 98
14.1.4.1 MEASUREMENT 98
14.1.4.2 PAYMENT 98
14.1.5 CHAIN PULLEY BLOCK 99
14.1.5.1 MEASUREMENT 99
14.1.6 LEVEL INDICATOR 99
14.1.6.1 MEASUREMENT 99
15 POLYVINYLCHLORIDE WATER STOPPER 99
15.1 MATERIAL REQUIREMENTS 99
15.2 CONSTRUCTION REQUIREMENTS 100
16 BITUMEN COATING 101
16.1 MATERIALS 101
16.2 DELIVERY STORAGE AND HANDLING 101
16.3 PREPARATORY WORK 101
16.4 WATER PROOFING TREATMENT IN FOUNDATION / SUB-STRUCTURES 101
17 EXTERNAL FIRE FIGHTING SYSTEM 102
..... 109

..... 110

18 QUALITY ASSURANCE & QUALITY CONTROL REGIMEN 113

18.1 GENERAL..... 113

18.2 TOOLS OF QA AND QC..... 113

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 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 or 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.

1.2 EXCAVATION – PIPELINES

2.1 The excavation shall be carried out to the required alignment, levels, slopes or gradients 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

2.2 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.

2.3 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.

2.4 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. The method employed in all cases shall be approved and agreed by the Engineer or his Representative.

The Contractor shall provide such drainage outlet ditches or canals as may be necessary to affect proper drainage before rain is expected. 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.

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.

2 BACKFILLING

2.1 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.

2.2 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.

2.3 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.

2.4 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.

2.5 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.

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, 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, 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.

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 MATERIALS REQUIREMENT

4.1.1 SPECIFICATIONS

Concrete reinforcement bars shall be of following specifications,

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

4.1.2 TESTING

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

4.2 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.

4.3 PLACING AND POSITIONING

- Reinforcement shall be placed and maintained, within the specified tolerance of its position
- 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.

4.4 RELATION OF BARS TO CONSTRUCTION SURFACES

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).

4.5 SPLICING

Except 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

4.6 TOLERANCES

Following tolerances shall be observed:

4.6.1 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")

4.6.2 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.

4.7 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 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.

5 BEDDING AND PIPE LAYING

5.1 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, 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 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.

5.2 BEDDING FOR PIPELINES

5.2.1 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.

5.2.2 CONSTRUCTION REQUIREMENTS

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

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 6".
- 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 "Concrete". The reinforcement steel has confirmed to the requirements given to Section 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.

7 HYDROSTATIC TESTS (Water supply System)

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

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.

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 I0 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, 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. Pipe work shall be tested according to PN rating of pipe 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 0.75 m/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.

8 uPVC PIPE

8.1 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.

8.2 PHYSICAL PROPERTIES

The physical properties of UPVC pipes shall fall within 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
In flammability	Will not support combustion	-
Water absorption (24 hrs at ambient temp.)	0.07	%

8.3 ABBREVIATIONS

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

8.4 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)

8.5 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

8.6 uPVC FITTINGS

uPVC fittings shall be approved manufacture .For sampling testing and tolerance limit, BS and PS specification 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.

8.7 JOINTING

8.7.1 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.

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

Range of pipe and fittings diameter (mm)

	32 – 40	**50 – 63**	**75 - 90**	**110 – 125**	**140 - 160**
Approx.	**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 (litre)	0.35 –0.50	0.65 – 0.90	1.00 – 2.00	3.00 – 5.00	6.5 – 9.0
Solvent Cement (litre)	0.78 –1.00	1.30 – 1.800	2.00 – 4.00	6.00 – 10.00	13.0 – 18.0

8.7.3 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.

8.7.4 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.

8.8 INSTALLATION OF uPVC PRESSURE PIPES

8.8.1 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. 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.

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.

8.8.2 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 HDPE PIPES AND FITTINGS

9.1 HDPE PIPES FITTINGS AND ACCESSORIES

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. The minimum pressure rating shall be decided as per design requirement, but shall not be less PN10 for distribution & 12.5 for transmission pipes.

9.1.1 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

9.2 TECHNICAL REQUIREMENTS

9.2.1 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.

9.2.2 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

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.

9.2.3 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.

9.2.4 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.

9.2.5 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.

9.2.5.1 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.

9.2.5.2 FITTINGS DIMENSIONS

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

9.2.5.3 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.

9.3 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.

9.3.1 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.

9.3.2 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.

9.3.3 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.

9.3.4 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. 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.

9.4 INSPECTION AND TESTING

9.4.1 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.

9.4.2 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

9.4.3 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.

9.4.4 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.

9.4.5 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.

9.4.5.1 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

9.4.5.2 PACKING, MARKING AND VENDOR DOCUMENTATION

9.4.5.3 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.

9.4.5.4 PACKAGING AND TRANSPORTATION

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

9.4.5.5 DELIVERY

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

9.4.5.6 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.

9.4.5.7 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.

9.4.5.8 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.

9.4.5.9 OVERHANG

Pipe shall not overhang at either end of the trailer.

9.4.5.10 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.

9.5 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.

9.6 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.)

10 MS PIPES AND SPECIALS

10.1 MILD STEEL SECTION SPECIFICATIONS

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

10.2 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.

10.3 MECHANICAL PROPERTIES AND TESTS

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

10.4 STANDARD SPECIFICATIONS

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

10.5 THICKNESS OF PLATES / COIL

Thickness of plate / coil shall be as per design requirement. All plates used shall be free of surface defects.

10.6 PIPE

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

10.7 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.

10.8 LENGTHS

Pipes shall be finished in uniform lengths.

10.9 STRAIGHTNESS

The pipe shall be straight.

10.10 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.

10.11 JOINTS

Joints shall be welded as per AWWA specifications.

10.12 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.

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.

10.13 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.

10.14 LINING MATERIAL

10.14.1 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.

10.14.2 PORTLAND CEMENT

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

10.14.3 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.

10.14.4 MIX FOR LINING

10.14.4.1 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.

10.14.4.2 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.

10.14.4.3 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.

10.14.4.4 MIXING

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

10.15 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.

10.16 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.

10.17 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.

10.18 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.

10.19 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.

10.20 MILD STEEL SPECIALS

10.20.1 GENERAL

The specials like bends; tees etc. to be used shall be manufactured with MS plates of specified thickness. Internal diameters shall be as directed by the Engineer. The Contractor shall submit shop drawing for all special before the manufacturing of special

10.20.2 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.

10.20.3 DIAMETER

The internal diameter of the specials and collars shall be as specified for pipes or as approved and directed by the Engineer.

10.20.4 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.

10.20.5 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.

10.20.6 COATING

The internal and external coating for specials for rising main shall be same as provided for M.S. Pipes.

11 GRP PIPES

This specification covers the minimum requirements for the GRP piping for aboveground and underground installations, intended to be used for raw water applications for above and underground applications.

The Manufacturer's design shall satisfy the minimum requirements set herein. This specification includes the minimum requirements for design, manufacture, workmanship, testing, inspection and installation of standard GRP pipe systems.

11.1 MANUFACTURER'S PRE-QUALIFICATION

The manufacturer should have at least 10 years of experience of manufacturing record of pipes and fittings (tees, elbows, flanges, special spooling's etc.). Manufacturer should have in house testing facilities for conducting all necessary tests. The manufacturer should have ISO 9001 / ISO 14001 Certifications coupled with other independent international certifications body e.g. B.S.I

11.1.1 MANUFACTURER'S SCOPE OF WORK

The GRP pipe system Manufacturer will be responsible for the following:

a) Inspection and testing at the Manufacturer's works in accordance with specified requirements herein.

b) The manufacturer should have the capacity to provide technical assistance to end users and consultants as well as capable of providing site services to its Clients from the manufacturers trained personnel's.

c) Contractor shall provide guarantee for GRP pipes for 3 years including any repair, providing laying, jointing, replacement and transportation etc. complete in all respects

d) Manufactured shall provide to the Clients complete information, Technical Specifications and Broacher regarding GRP pipes and fittings.

e) Manufacturer shall provide training facilities to staff of the Client regarding the laying, jointing repair and maintenance of GRP pipes and fittings.

f) Marking of pipe for identification

g) Provision of a Site Staff (s) to assist during erection.

11.2 APPLICABLE CODES AND STANDARDS

ASTM D3517, AWWA C950, BS 14364, BS 1796 Standard Specification for "Fiberglass" (Glass-Fiber Reinforced Thermosetting Resin) Sewer and Industrial Pressure Pipe. The following internationally accepted standards are the minimum requirements for the manufacture of GRP Pipe Systems and should be referenced throughout the Project Specification where appropriate.

AWWAC950	Glass Fiber Reinforced Thermosetting Resin Pressure (Latest Edition).
AWWA M45	Fiberglass Pipe Design
ASTM D 3517	Specification for Glass Reinforced Thermosetting Pressure Pipe.
EN 1796	Piping system for pressure and non-pressure water supply - Glass Reinforced thermosetting plastics (GRP) systems based on unsaturated polyester (UP) resin.
BS 4504	Circular Flanges For Pipes, Valves and Fittings (PN Designated)
BS 5480	Glass Reinforced Plastics (GRP) Pipes, Joints and Fittings for Use for Water Supply or Sewerage
ISO 7685	Plastics Piping Systems-Glass-Reinforced Thermosetting Plastics (GRP) Pipes - Determination of Initial Specific Ring Stiffness
ISO 8513	Plastics Piping Systems-Glass-Reinforced Thermosetting Plastics (GRP) Pipes - Determination of Longitudinal Tensile Properties
ISO 10468	Glass-Reinforced Thermosetting Plastics (GRP) Pipes -Determination of the Long-Term Specific Ring Creep Stiffness under Wet Conditions and Calculation of the Wet Creep Factor
ISO 10467	Plastics Piping Systems for Pressure and Non-Pressure drainage and Sewerage-Glass- Reinforced Thermosetting Plastics (GRP) Systems Based On Unsaturated Polyester (UP) Resin
ISO 10471	Glass-Reinforced Thermosetting Plastics (GRP) Pipes -Determination of the Long-Term Ultimate Bending Strain and the Long-Term Ultimate Relative Ring Deflection under Wet Conditions
EN 681-1	Elastomeric Seals-Materials Requirements for Pipe Joint Seals Used In Water and Drainage Applications

EN 1225	Plastics Piping Systems - Glass-Reinforced Thermosetting Plastics (GRP) Pipes-Determination of the Creep Factor under Wet Conditions and Calculation of the Long-Term Specific Ring Stiffness
EN 1227	Plastics Piping Systems - Glass-Reinforced Thermosetting Plastics (GRP) Pipes Determination of the Long-Term Ultimate Relative Ring Deflection under Wet Conditions
EN 1228	Plastics Piping Systems Glass Reinforced Thermosetting Plastics (GRP) Pipes Determination of Initial Specific Ring Stiffness
EN 1393	Glass Fiber Reinforced Thermosetting Plastics (GRP) Pipes-Determination of Initial Longitudinal Properties
EN 1394	Plastics Piping Systems-Glass-Reinforced Thermosetting Plastics (GRP) Pipes Determination of the Apparent Initial Circumferential Tensile Strength
EN 1447	Plastics Piping Systems-Glass-Reinforced Thermosetting Plastics (GRP) Pipes - Determination of Long-Term Resistance to Internal Pressure
EN 14364	Plastics Piping Systems for Drainage and Sewerage with or Without Pressure – Glass Reinforced Thermosetting Plastics (GRP) Based on Unsaturated Polyester Resin (UP) Specifications for Pipes, Fittings and Joints
ASTM D 2992	Obtaining Hydrostatic or Pressure Design Basis for “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe and Fittings
ASTM D 3262	“Fiberglass” (Glass-Fiber-Reinforced Thermosetting - Resin) Sewer Pipe
ASTM D 3567	Determining Dimensions of "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe and Fittings
ASTM D 3681	Chemical Resistance of “Fiberglass” (Glass-Fiber-Reinforced Thermosetting -Resin) Pipe In a Deflected Condition
ASTM D 3754	Standard Specification for GRP Sewer and Industrial Pressure Pipe.
ASTM D 4161	“Fiberglass” (Glass-Fiber-Reinforced Thermosetting -Resin) Pipe Joints Using Flexible Elastomeric Seal.
ASTM D 2412	Standard test method for determination of external loading characteristics of plastic pipe by parallel plate loading.

ASTM C 581	Standard practice for determining chemical resistance of thermosetting resins used in glass fiber reinforced structures intended for liquid service.
ASTM D 1598	Standard test method for time to failure of plastic pipe under constant internal pressure.
ASTM D 2143	Standard test method for cyclic pressure strength of reinforced thermosetting plastic pipe.

11.3 PRODUCT DESCRIPTION

11.3.1 General

All GRP pipes shall be manufactured by continuous filament winding process. Filament winding process is used to manufacture pipes by feeding raw materials onto the outside of a rotating mandrel.

The pipe shall be constructed so as to include internal and external corrosion barriers of a composition suitable to resist the corrosive effects of the contained and surrounding environments.

The inside diameter (ID) of the finished pipe is fixed by the mandrel outside diameter. The outside diameter (OD) of the finished pipe is determined by the amount of material that is wound on the mandrel.

The pipe shall be produced in one continuous piece with no joints.

The type of resin used for particular application will be unsaturated thermosetting polyester resin which is cured by heat and chemical additives.

The pipe shall be a composite laminate consisting of a corrosion resistance internal liner, a structural layer and an external layer.

a. **Internal Liner**

The liner shall consist of two layers, a surface layer and a barrier layer and reinforced with E glass fiber with minimum thickness of 1 mm.

The surface layer shall be resin rich and reinforced with ECR glass or suitable synthetic type surface tissue. The barrier layer shall have resin with fiber reinforcement and without aggregate.

b. **Structural Wall**

The structural wall of the pipe shall be reinforced with closely spaced continuous fiberglass filament winding, chopped roving, all impregnated in thermosetting resin. No dark pigments or resin fillers such as calcium carbonate shall be used.

For underground applications, where stiffness is a critical factor for the GRP pipe system, fine silica sand, complying with BS 5480 requirements, may be included.

c. **External Layer**

The exterior resin rich layer of the pipe shall have a minimum thickness of 0,2mm reinforced with ECR glass or suitable synthetic type surface tissue.

No dark pigments or resin fillers such as calcium carbonate shall be used.

11.3.2 Raw Materials

All materials and the manner and degree to which they are used during the construction of all components required for the GRP pipe system described by this specification shall be selected so they will resist the corrosive effects of both the contained and surrounding environments.

All structural materials shall be new and free from all deleterious defects and imperfections and only be used for production after having been controlled and approved by the Manufacturer's Quality Department.

Testing and controlling shall be done according to the relevant methods, as described in Section 8 (Inspection and Testing) of this specification.

5.2.1 Glass Reinforcements shall be compatible with the impregnating resin used and should be suitable for the service intended.

5.2.2 Resins used shall be a commercial high grade resin e.g. isophtahlic, orthophthalic or terephthalic, as specified under Section 5.1.

5.2.3 No dark pigments shall be used in the GRP pipe or joints. No additives shall be used except when required for viscosity control.

5.2.4 Aggregates are inert granular material of a size range between 0.05mm and 1mm such as graded silica sand. They shall be incorporated where they are a designed part of the composite structure. The purity of silica sand shall be minimum 97%.

11.4 REQUIREMENTS

11.4.1 Wall Thickness

The average wall thickness of the pipe shall not be less than the nominal wall thickness declared by the manufacturer, and the minimum wall thickness at any point shall not be less than 87.5% of the nominal wall thickness.

11.4.2 Length

GRP pipe shall be manufactured in standard laying lengths of not greater than 12 meters. Random short lengths, if supplied, shall not exceed 5% of the quantity supplied of each size. The tolerance on the Manufacturer's declared laying length shall not exceed ± 25 mm.

11.4.3 Diameters

- Pipes shall be designated by nominal size (DN). Outside diameter of the pipes shall be in accordance with ISO 10639 and EN 1796 Table 5 for DN > 600mm, and Table 6 for DN $\leq$600mm.

- 15% of the pipe shall be produced as 'adjustment pipe' where on site there will not be needed any calibration operation.

11.4.4 Stiffness

The pipe stiffness shall be determined by the Manufacturer to meet the design requirement with particular regard to installation method, burial depths, deflection limits, buckling and vacuum requirements, in accordance with AWWA M45. The pipe specific stiffness class shall be SN 5000 and/or SN 10000 N/m^2 in accordance with AWWA C950 or BS 5480.

11.4.5 Longitudinal Tensile Strength

GRP pipe shall meet the minimum longitudinal tensile strength requirements specified in AWWA C950 for the appropriate operating pressure class.

The above requirements are intended to provide adequate strength for normal handling and underground conditions. Pipe intended to withstand the end load resulting from internal pressure at changes of direction or the beam load resulting from above ground installation shall require higher longitudinal strengths and a suitably designed, fully restrained, jointing system.

11.4.6 Hoop Tensile strength

GRP pipe systems shall meet the minimum hoop tensile strength requirements specified in A WWA C950 for the appropriate operating pressure class.

11.4.7 Hardness - Barcol (ASTM D 2583)

The laminated surface shall have Barcol hardness of minimum 40 Barcol.

11.4.8 Joints

a. Flexible Joints (Couplings)

Couplings shall be manufactured by a fully automated process in which the pre-impregnated fiber fabric is wound on to a heated mould. Any type of filler like sand shall not be used in coupling production. Couplings shall have full face EPDM (Ethylene Propylene Diene Monomer) rubber inside and shall meet the performance requirements of ASTM D 4161. Third party approved test report should be prepared in accordance with ASTM D 4161for the couplings. Couplings shall allow the angular deflections as follows:

Nominal Angular Deflection (degree)	**Nominal Pipe Diameter (mm)**
3°	DN = 500
2°	500 < DN =800
1°	1000 < DN =1800
0.5°	DN = 1800

EPDM rubber used inside the couplings shall have a shore hardness of 60 ±5 and shall be in compliance with EN 681-1 Type WA, WC. The full-face EPDM rubber shall be positioned and bonded during the production. The rubber profile shall have one sealing lip at each side which provides leak-tightness in pressure and non-pressure applications. The use of asymmetric type rubber profile is not permitted.

Center of the GRP full faced coupling should have appropriate stopper that covers whole circumferential area of the coupling to assure the pipe ends should not be damaged during mounting in coupling.

In order to eliminate improper placement of sealing rubber in GRP coupling, all sealing rubbers should be mounted in manufacturers place.

b. Rigid Joints Flanges

Flanges shall be manufactured by hand lamination technique and shall be drilled according to ISO 7005, BS 4504.

11.4.9 Workmanship

a. GRP pipe, fittings and joints shall be free from de-laminations, cracks, bubbles, pinholes, pits, blisters, foreign inclusions and resin-starved areas that due to their nature, degree or extent detrimentally affects the strength and serviceability of the pipe. No glass fiber reinforcements shall penetrate the interior surface of the pipe wall.

b. Joint sealing surfaces shall be free of dents, gouges, de-laminations, or other surface irregularities that will affect the integrity of the joints.

c. GRP pipe, fittings and joints shall be as uniform as commercially practicable in color, capacity, density and other physical properties.

11.4.10 Fittings

a. GRP fittings such as bends, tees, junctions and reducers shall be equal or superior in performance to the GRP pipe of the same diameter and pressure. All fittings shall be having a smooth internal surface with similar wall construction.

Standard fittings shall be made by mitered construction from continuous filament winding GRP pipes.

All GRP flanges and blind flanges up to 1800 mm diameter shall be machine filament wound.

b. For GRP fittings, the deviation from the stated value of the angle of change of direction of a bend, tee, junction etc. shall not exceed ± 1 degree.

c. The tolerance on the Manufacturer's declared length of fitting shall be ± 10 mm taken from the point of intersection to the end of the fitting or ± 10 mm on a straight fitting.

d. All GRP fittings shall be fabricated in the factory, by the pipe manufacturer, to ensure Quality Control (Under no circumstance shall fabrication of fittings be allowed on site by Contractor). Complex fittings arrangements may be pre-assembled by the pipe Manufacturer in the factory such that field joints are kept to a minimum.

11.5 DESIGN PARAMETERS

Pipe shall meet the following minimum design requirements:

Operating Pressure (Pw)	as per design	
Surge Pressure (Ps)	40% of I Pw, unless otherwise specified.	
Minimum Earth Cover	as per design	
Initial Installed Deflection for Buried Pipe	2.0% Min.	
Long Term Installed Deflection for Buried Pipe	5.0% Max.	
Safety Factors		
Pressure Rating	>=	1.8
Ring Bending Strain (stress)	>=	1.5
Combined Strain (stress)	>=	1.5
Buckling	>=	2.5

The Contractor shall be responsible for implementing / installing the correct design for each GRP pipe system. Buried GRP pipe design shall be established in accordance with AWWA M45.Design calculations shall be submitted to the Engineer for review and approval.

11.6 INSPECTION & TESTING

a. The Manufacturer shall take adequate measures in the production of the products covered by this specification to assure compliance with the requirements herein. An Inspection and Testing Plan (ITP) should be forwarded to the Contractor for approval in the Pre-Award phase. Plant inspection by the Contractor's qualified personnel or the omission of such inspections shall not relieve the Manufacturer of the responsibility to furnish products complying with the requirements of the minimum manufacturing requirements given herein.

b. All raw materials used for the production of pipes, joints and fittings shall be subjected to a series of tests to ensure that they are in compliance with the required specifications. All deliveries of resin shall be checked for consistency of viscosity, reactivity and solid content. All deliveries of glass fiber shall be checked for weight per unit area, moisture content and binder content. All deliveries of silica sand shall be checked for consistency of density, grading, moisture content and purity. EPDM rubber used for couplings shall be checked for consistency of appearance, weight, hardness and dimension. If the test results do not conform to the requirements, the lot shall be rejected.

c. Initial tests shall be carried out during production to monitor the quality of pipes. The manufacturer shall have an internationally accredited laboratory to perform stiffness, hoop tensile and longitudinal tensile tests. Long term tests (type tests) shall be performed to prove the suitability and performance of the raw materials used and method of construction and the design of GRP products. Long term tests shall be performed whenever a change is made in any of these characteristics.

d. Production and Testing Notice - When plant inspection is required by the Contractor or Client the Manufacturer shall provide adequate advance notice of when and where production and testing of ordered products will commence.

e. The Contractor and / or Client Inspector (s) shall have free access with reasonable advance notice to the Manufacturer's plant areas that are necessary to assure that products comply with all requirements herein.

f. As a minimum the following tests shall be performed at the indicated intervals unless otherwise agreed-upon, and shall form a part of the Manufacturers overall quality control program.

g. Initial Tests

The pipes shall meet the minimum requirements specified in the tables below:

<table>
<tr><td colspan="3">Hydrostatic-Pressure Test
100% of pipes shall be hydrostatically tested at 2xPN
at 5 minutes</td><td>Test Method
AWWA C 950</td><td>Minimum Requirements Pipes shall not allow any water to pass through the pipe wall and appear on the outside surface.</td></tr>
<tr><td>PN</td><td>TEST PRESSURE (bar)</td><td>Test Time (min)</td><td></td><td></td></tr>
<tr><td>10</td><td>20</td><td>5</td><td></td><td></td></tr>
<tr><td>16</td><td>32</td><td>5</td><td></td><td></td></tr>
<tr><td>20</td><td>40</td><td>5</td><td></td><td></td></tr>
<tr><td colspan="3">Burst Test1% of pipes shall be pressurized to be burst. The sample of pipe shall be 1.5 m and tested to be burst while both two ends of the pipe sample are sealed with GRP coupling.</td><td>ISO 10639 Appendix B1</td><td>Pipes shall not burst or allow any water to pass through the pipe wall and appear on the outside surface.</td></tr>
<tr><td colspan="3">Stiffness 1 in every 100 pipes manufactured At 3% deflection</td><td>ISO 7685</td><td>Test results shall be higher than nominal stiffness of the pipe.</td></tr>
<tr><td colspan="3">Level A 1 in every 100 pipes manufactured</td><td>ISO 10639</td><td>There shall not be any interior surface cracks or crazes. The test ring shall not have any delamination.</td></tr>
<tr><td colspan="3"></td><td></td><td></td></tr>
<tr><td colspan="3"></td><td>Test Method</td><td>Minimum Requirements</td></tr>
<tr><td colspan="3">Level B 1 in every 100 pipes manufactured</td><td>ISO 10639</td><td>There shall not be any structural damage as evidenced by inter-laminar separation, tensile failure of the glass fiber reinforcement, and fracture or buckling of the</td></tr>
</table>

		pipe wall. Cracks at the surface may appear at Level B deflection
Hoop Tensile Strength 1 in every 100 pipes manufactured	ISO 8521 B/D/E	Average circumferential tensile strength shall be higher than the values given in AWWA C 950 Table 10.
Longitudinal Tensile Strength 1 in every 100 pipes manufactured	ISO 8513	Average longitudinal tensile strength shall be higher than the values given in ISO 10639 Table 14.
Wall thickness 100% of pipes	ASTM D3567	Average wall thickness of the pipe shall not be less than the nominal wall thickness declared by the manufacturer, and the minimum wall thickness at any point shall not be less than 87.5% of the nominal wall thickness.
Dimension Length: 100% of pipes	ASTM D3567	The tolerance on the laying length shall be ± 60mm. Outside diameter of the pipes shall be in accordance with ISO 10639 and EN 1796 Table 5 for DN > 600mm, and Table 6 for DN ≤ 600mm.

h. Long Term Tests

The pipes shall meet the minimum requirements specified below:

	Test Method	**Minimum Requirements**
Long term chemical resistance under deflected condition	ASTM D 3681	Calculated long term strain at 50 years shall not be less than 0,5% according to BS 5480

Long term hydrostatic pressure design basis	ASTM D 2992 Method B	Calculated long term failure pressure at 50 years, shall not be less than 2 times the nominal pressure (PN), expressed in bars.
Long term specific ring stiffness (creep factor) under wet conditions	ISO 10468	50 years extrapolated stiffness value shall not be lower than 50% of the initial stiffness
Long term ultimate ring bending deflection	ISO 10471	Relative ultimate ring deflection under wet conditions shall be higher than the values given in ISO 10639 Table 12.
Joint water tightness	ASTM D 4161	There should not be any sign of damage, leakage or weeping.

11.7 PIPE INSTALLATION

Install pipe, fittings, and accessories in accordance with BS 8010 / AWWA M 45 and manufacturer's instructions.

a. 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 and installation of pipes as appropriate.

b. The technical expert shall provide comprehensive technical assistance to the Contractor throughout the Contract and regularly monitor the Contractor's activities and report on shortcomings.

The pipeline shall be within 20mm of the specified line and the invert level shall be within 6mm of the specified value.

Obtain satisfactory initial deflection test results for sections of pipeline laid between consecutive manholes or chambers prior to commencement of pipe laying in further sections.

When cut pipe is required, adjustment pipe shall be used since calibration is not required.

Excavation for lying of GRP shall not proceed until an approved device for gauging pipe deflections is on site.

a. Use a suitable mechanized device to the approval of the Engineer for gauging pipe deflections. Maintain devices for gauging pipe deflections in good working order. Submit calibration certificates before every period of use.

    i. For pipes of 600mm diameter and greater. Measure deflection by physical entry into the pipes. Use a regularly calibrated telescopic spring loaded graduated rod to measure percentage deflections in each diameter. Provide a suitable trolley to facilitate access into the pipe. Record all measurements.

11.8 INSTALLATION (GENERAL REQUIREMENTS)

The Contractor shall submit the pipe Manufacturer's Installation Manual and associated Data for Client review upon Contract Award. A site meeting to include Client, the Contractor and Manufacturer is to occur within two weeks from Contract Award to clarify any outstanding issues / questions on the given installation procedures.

GRP pipe shall be handled, stored, transported and installed in strict accordance to the Manufacturer written instructions.

The pipe installation procedures and practices chosen shall meet the design requirements specified.

No stacking of pipe larger than 1.8 m in diameter shall be allowed on site or during transport.

Reinforced Concrete Thrust Blocks shall be used at all changes in direction, size reduction / expansion, and other thrust locations underground for unrestrained pressure systems. Thrust blocks shall encase the entire GRP fitting at the directional change and should be constructed to fully absorb all thrust loads.

Pipe Deflection readings shall be taken and recorded on all buried pipe at two-meter intervals. Initial deflections shall not show a reduction in internal vertical diameter for over 2.0 percent of the pipe ID.

The Contractor shall employ on a full-time basis the services of field representatives from the pipe Manufacturer throughout the pipe off- loading, storage, installation and testing period.

For standard buried unrestrained pipeline sections, a flexibly jointed short pipe shall be incorporated outside rigid structures to provide pipeline flexibility against differential settlement. A minimum of two (2) flexible joints on either side of a rigid structure is required. The length of the short pipe shall be in accordance with the Manufacturers recommendation.

11.9 ONSHORE BUOYANCY CONSIDERATIONS

Where the pipe is to be installed on-shore within water table level, proper considerations have to be taken to prevent pipe flotation. In general, a minimum soil cover equal to one pipe diameter should be kept above the pipe crown to prevent flotation.

11.10 HYDROSTATIC TESTING OF PIPELINES

Hydrostatic Testing of Pipelines General

a. Submit for the Engineer's approval details of the proposed methods and program for testing, including details of test equipment. Arrange for all tests to be witnessed by the Engineer or other person appointed by the Engineer. Provide everything necessary for carrying out testing and cleaning including water, pumps, gauges, piped connections, stop ends and all other temporary works. Ensure that pipelines are properly completed and supported before being put under test except as hereinafter detailed.
    i. No testing will be permitted until seven days after thrust blocks and other holding down works have been completed.
    ii. In addition to any tests of individual joints or other interim tests, which may be specified elsewhere, submit all parts of the pipelines to a final test.
    iii. Notwithstanding the foregoing, carry out at any stage of construction other tests that the Engineer considers desirable to check materials and workmanship on the pipeline. Ensure that the obligations to perform successful tests under the Contract are achieved.
b. Use potable water for hydrostatic testing and pipeline cleaning.
c. Test the pipeline in lengths between manholes or valve pits or such shorter lengths as the Engineer may direct or permit.
d. Use properly designed fittings for the purpose of temporarily closing the openings in pipelines to be tested. Use fittings adequately strutted to withstand the pressure specified.
e. Ensure that the arrangement for testing a pipeline includes provision for the purging of air from the pipeline prior to a water test.
f. Where multiple pipelines are laid in common trench, test only one line at any one time.
g. Ensure that gauges used for testing pipelines have a dial diameter of not less than 100mm and a full scale reading not greater than twice the specified test pressure. Before any gauge is used, arrange for independent laboratory to check the accuracy of the gauge. Provide a dated certificate of its accuracy to the Engineer.

h. The Contractor must make his own arrangement for the supply and disposal of water used for testing which must be obtained from a source accepted by the Engineer.

i. The Contractor must complete the pipelines between the ends of laid and tested lengths of pipeline by tie-in sections of the shortest practical length.

11.11 HYDROSTATIC TESTING OF PRESSURE PIPELINES

a. Divide pressure pipelines into sections not exceeding 500m in length or as directed by Engineer. Test each section separately.

b. Before pressure testing is started, re-check the pipes and the valves for cleanliness, and re-check the operation of all valves. Cap off the open ends of the pipeline (or sections thereof) with blank flanges or cap ends additionally secured where necessary with temporary struts and wedges. Complete all anchor and thrust blocks and fasten securely all pipe straps and other devices intended to prevent the movement of pipes.

c. Apply test pressure to the entire pipeline or section being tested to either the design test pressure is 1.5 times the working pressure, 1.5 times the surge pressure or 1.5 times the pump closed valve pressure, whichever is the greatest.

   i. Fill each pipeline or section with water and displace all free air from the pipeline.

   ii. Raise the pressure in the pipeline by pumping water until the highest of the working pressure/surge pressure/pump closed valve pressure is attained in the lowest part of the section.

   iii. Maintain at this level by further pumping until it is steady for a period of not less than 24 hours.

   iv. Monitor the pipeline over a period of 24 hours without further pressurization.

   v. At the end of this period, measure the reduced pressure in the pipeline, the original test pressure restored by pumping and the loss measured by drawing off water or air from the pipeline until the pressure has fallen to match the reduced pressure previously noted.

   vi. Ensure that the loss does not exceed 0.02 litre per millimetre of pipe diameter per kilometre of pipe per day for each bar of head applied.

   vii. If the pipeline fails the test, locate the faults, repair and retest the pipeline until it passes.

   viii. Visually inspect all exposed pipe, fittings, valves and joints during the tests.

   ix. After satisfactory completion of the 24 hour period test, bring the pipeline to test pressure and maintain it at this pressure, by pumping if necessary, for one hour. Disconnect the pumping and no water is allowed to enter the pipeline for a further period of two hours.

x. At the end of the two hours period, restore the original test pressure by pumping water into the pipeline. Determine the volume of make up water required to achieve the test pressure specified and deemed to represent the cumulative loss during the two hour period of test.

xi. Ensure the loss does not exceed the limit stated in 'vi' above. If the pipeline fails the test, locate and repair the faults and repeat the test.

d. Ensure that all valves in the pipeline are satisfactorily operating under working pressure and that the pipelines have been finally cleaned out as specified hereafter.

e. Do not test pipes against closed valves.

11.12 HYDROSTATIC TESTING OF NON PRESSURE PIPELINES

a. Test all non-pressure pipelines up to 1000mm diameter after completion of concrete or granular bedding up to the soffit of the pipeline. Clear the bedding around pipe joints to allow for visual inspection for leaks. Ensure that the trench is kept dry. Apply water head for testing of either depth to invert plus 1.0m, or 5.0m, whichever is the greater. Measure the head at the lower end of the pipeline.

b. Maintain the water head over a period of 30 minutes and if necessary, add water from a measuring vessel at 10 minute intervals. Record the quantity of water added from the measuring vessel.

   i. The leakage, quantity of water added, shall not exceed 0.5 X pipe diameter (m) X length of pipe under test (m) litres.

c. For non-pressure pipes greater than 1000mm diameter, inspection for water tightness, workmanship and compliance to this specification shall be carried out by man entry.

d. Not more than 7 days prior to handover all pipelines shall be subject to an infiltration test as follows:

   i. Test the pipeline in lengths between manholes or such shorter lengths as the Engineer may direct or permit. Maximum length to be tested shall be 1 kilometre.

   ii. Dewatering shall have been discontinued for at least 3 days prior to test.

   iii. Volume of water infiltrating into the pipe shall be accurately measured for a minimum period of 1 hour.

   iv. Maximum infiltration shall not exceed 1 litre per millimetre of pipe diameter per kilometre of pipe per day.

e. Keep a record of all tests and make them available for inspection. Hand over test records to the Engineer for approval.

f. Pipes or joints shall not be accepted if any leakage or damage is visible during an internal inspection.

g. If the result of any test or inspection does not comply with the requirements of the specification, the Contractor shall investigate the reason and carry out remedial work to the approval of the Engineer. The pipeline shall then be re-tested. This process shall be repeated until the requirements of the specification are satisfied.

11.13 DEFLECTION MEASUREMENT OF PIPELINES (GRP Pipes)

13.1 For pipe length greater than 3.0m measure the horizontal and vertical deflections for all GRP pipes at each end, at points 100mm away from the joint, 1.5m away from the joint and at 3.0m intervals thereafter. For pipe lengths of less than 3.0m, measure these deflections at each end, at a point 100mm away from the joint, and at the mid-point. For GRP pipes installed with granular bed and surround, take measurements on at least three separate occasions as follows.

i. After the pipe surround material has been placed and compacted to 150mm above the pipe crown. Do not proceed with further pipe laying until this test has been satisfactorily completed.

ii. On completion of all backfill material up to ground level but before the dewatering is removed. Take this measurement within one day of the completion of backfilling.

iii. Immediately prior to the issue of a Provisional Acceptance Certificate.

13.2 For GRP pipes with concrete surround, carry out the deflection testing as in stages (i) and (ii) above. For proving the pipes immediately prior to the issue of the Provisional Acceptance Certificate, draw a pig or ball through the pipeline, sized so that it will not pass any point in the pipeline which has been deflected to a greater degree than that permitted in the long term.

13.3 For pipes exhibiting any negative deflection in the vertical in (i) above and pipes exhibiting any deflection in excess of 2% in (ii) above or 4% in (iii) above, expose the pipe and replace and recompact the surrounding bedding material. Replace the pipe should the deflection exceed 5%. Any pipe to be replaced must be taken away from site and not be incorporated into the permanent works.

13.4 Subject pipes exposed for recompaction and pipes replaced for other reasons, to the three deflection checks listed in clause 11.1 a. above. Carry out deflection checks on adjacent pipes for 50m either side of the recompacted or replacement pipes.

13.5 Tabulate the results of the deflection measurements. Submit copies of the results to the Engineer immediately after each set of measurements has been taken.

11.14 MARKING

Each pipe and fitting shall be indelibly marked with the following information.

- Manufacturers Name or trademark
- Manufacturing date
- Manufacturing number
- Nominal diameter in mm
- Operating pressure in Bars
- Nominal laying length in meter (for pipe only)
- Manufacturers Inspection mark

11.15 STORAGE & PACKING FOR SHIPMENT

Pipes shall be stored on a flat surface and protected against mechanical damage. Packing, shipment and storage shall be carried out in a manner to ensure the original performance, quality and integrity during arrival at destination or during its storage. GRP pipes shall be packed and shipped as nested in each other.

11.16 SUBMITTALS

The following information shall be submitted with the Manufacturers

1. GRP Pipe Data Sheet (s) (as per Attachment I)
2. Detailed Resin Data
3. Detailed Glass Reinforcement Data
4. Detailed Pipe Aggregate Data
5. Detailed Joint & Gasket Data
6. GRP Pipe Manufacturer's Pre-Qualification
7. Manufacturer's ISO 9001, ISO 14001, OHSAS 18001 Certification
8. International Accreditation certificate of laboratory

In addition to the above information, the following shall be submitted during the mobilization period:

1. Detailed manufacturing process for pipe, joints and fittings.
2. Detailed drawings for pipe ends, joints and fittings.
3. Complete pipe design calculations for each Diameter/Pressure.
4. Frictions loss factors pipes and fittings
5. Manufacturers Quality Control and Assurance Manual.
6. Proposed Inspection and Testing Program (ITP).
7. Pipe Manufacturers written handling, storage and installation instructions.
8. Proposed Hydro test method statement

9. Proposed pipe transport procedures.
10. Qualification (Type) Test results and report for:
    - Long term stiffness (Aging factors); for buried pipe only
    - Long term hydrostatic Design Basis (HOB); for pressure pipe only

11.17 GUARANTEE

Contractor shall provide guarantee for GRP pipes for 3 years including any repair, providing laying, jointing, replacement and transportation etc. complete in all respects.

Manufactured shall provide to the Clients complete information, Technical Specifications and Broacher regarding GRP pipes and fittings.

Manufacturer shall provide training facilities to staff of the Client regarding the repair and maintenance of GRP pipes and fittings

Manufacturer/Supplier shall provide guarantee in the name of the Client. Also Client shall ensure that the guarantee will still be valid and abided by the Manufacturer's successors in case of sale, transfer of ownership or any other condition. Contractor shall also ensure to abide by the work mentioned above within the guarantee period without claiming any amount of money incurred.

Manufacturer/supplier of the pipe shall provide guarantee of supplying whole lot of pipe length at the project site, and at its designated location on the site, within three (3) months staring from commencement of the project as agreed upon by the Engineer.

GRP PIPE DATA SHEET (FOR EACH DIAMETER/PRESSURE/SERVICE)

(TO BE PROVIDED PRIOR TO START PIPE MANUFACTURING)

Design Parameters		**Unit**
Nominal Diameter	:	mm
Pipe Manufacturing Process	:	
Service	:	
Rated Working Pressure	:	
Joint Type	:	
Maximum Allowable Vacuum	:	
Laying Length	:	m

Pipe Wall structure

Nominal Wall Thickness

Inner Layer Thickness	:	mm
Resin Type	:	
Glass Type		
Structural Wall Thickness	:	mm
Resin Type		
Glass Type		
Outer Liner Thickness	:	mm
Resin Type		
Glass Type		

Mechanical Properties

Design Specific Tangential Initial Stiffness	:	Pa
Design Initial Longitudinal Tensile Strength	:	MPa
Design Initial Hoop Tensile Strength	:	MPa

12 VALVES

12.1 VALVES

12.1.1 GENERAL

This specification outlines the minimum requirements for the design, manufacturing, testing, and acceptance of all valves. The term "Valve" encompasses gate valves, butterfly valves, check valves, control valves, air valves, plunger valves, pressure relief valves, and pressure reducing valves.

Valves must adhere to the specification requirements and align with the drawings concerning their location and dimensions. All valve materials must be carefully selected to prevent any instances of electrolytic corrosion. Bidders are required to submit a comprehensive set of technical catalogues for the project valves along with their bids.

The latest editions of the following standards shall be applied:

ISO 2531, 5210, 5211, 5752 & 9001

Relevant SASO Standards for Ductile Iron Pipes and Fittings EN 593

DIN 1691, 1693, 1709, 1714, 3202, 3223, 3352, 3354, 4056, 17440

Valve manufacturers must be approved and certified in accordance with ISO 9001 standards.

The material used for the valves must be carefully chosen and approved by the Engineer to ensure its suitability for the water quality and maximum working pressures. All materials must be free from defects, and any repairs or replacements must receive prior authorization from the Engineer.

Certificates for the materials used in fabrication shall be provided to the Engineer by the Contractor for verification.

Hand wheels, used for manual operation of the valves, must be made of forged steel or ductile cast iron, while levers should be forged steel.

12.1.2 BUTTERFLY VALVES

Butterfly valves must adhere to EN 593 standards. These valves, characterized by their double offset disk design, double flanged structure, and face-to-face Series 14 configuration as per ISO 5752, are engineered to close in a clockwise direction.

Equipped with a T-section rubber seal on the disk, these valves ensure complete drop tightness in both directions of operation. The valve body, crafted from ductile cast iron in accordance with DIN 1693 GGG 40, features an interior lining of EPDM rubber. Meanwhile, the valve disk is constructed from duplex stainless steel 9, as specified by DIN 17440.

The clamping ring, an integral component of the disk, must be a single-piece construction made from stainless steel 1.4571, compliant with DIN 17440 regulations. The valve shaft, also subject to DIN 17440 standards, is forged from stainless steel 1.4462.

Connection between the shaft and the disk is achieved using a parallel key along with an additional taper pin, with parallel pins strictly prohibited. To ensure seamless operation, the valve disk is designed sans external ribs up to DIN 1200, featuring hubs for shaft stubs.

The rubber seal on the disk is not only easily replaceable but also crafted from EPDM rubber free from harmful components, capable of withstanding storage in dry climates. For ease of maintenance, additional adjusting screws are included on the clamping ring.

Bolts and nuts required for maintaining the clamping ring and valve body must meet stringent standards, made from stainless steel 1.4571 as specified by DIN 17440 (A4 or SS316).

The worm gearbox device must exert a maximum input force of no more than 250 mN pull on the hand wheel to generate the required operator torque for a working pressure of 10 bar. It should be equipped with an opening indicator to signify the valve position. Constructed with a ductile cast iron housing conforming to DIN 1693 GGG 40, the gearbox must feature end stops in both directions to ensure a minimum 90-degree rotation. Its input shaft should be cylindrical with a parallel key.

Furthermore, the gearbox mounting flange for attachment to the butterfly valve must comply with ISO 5211 standards, with provisions for fixing a connection flange according to ISO 5210 for future electric actuator installations. The worm gearbox should be capable of operating within an ambient temperature range of -20°C up to 80°C and should possess a water and dust tight rating of IP 67.

During installation, the valve shaft should be positioned horizontally. Butterfly valves are to be supplied with a hand wheel and must meet minimum of PN 10 specifications or as specified in the BOQ. Additionally, both the interior and exterior surfaces of the butterfly valves should be coated with fusion-bonded pure epoxy resin, ensuring a minimum dry film thickness of 300 microns.

12.1.3 GATE VALVES

The gate valves specified must adhere to the double flanged type as per DIN 3352, part 4, with a face-to-face length according to ISO 5752 Series 14. They should feature fully enclosed gearing and operating mechanisms, with bolts and nuts constructed of stainless steel 1.4571 in compliance with DIN 17440 standards (A4 or SS 316).

To safeguard the bolts, they must be shielded by caps or equivalent protective measures.

These valves should be of the pocketless, soft-sealing gate type with a straight-through port. The wedge must be low clearance guided within the body, fully rubber coated both internally and externally. Additionally, the spindle thread must be of the rolled type, and spindle sealing should incorporate at least two O-rings made of synthetic rubber.

Constructed of ductile cast iron GGG 40 according to DIN 1693, the body, bonnet, and wedge of the gate valves must meet stringent standards. The valve spindle can be fabricated from stainless steel 1.4571 or 1.4462, following DIN 17440 specifications.

Both the bolts and nuts should be composed of stainless steel 1.4571 in adherence to DIN 17440 standards (A4 or SS316). The rubber components on the wedge and sealing rings must possess qualities enabling them to withstand storage in dry or humid climates.

Furthermore, the gate valves must feature fusion-bonded pure epoxy resin coating inside and outside, ensuring a minimum dry film thickness of 300 microns.

For washout gate valves, the extension spindle and brackets should be fabricated from stainless steel 1.4571 in accordance with DIN 17440, with couplings and square heads made of ductile cast iron GGG 40 as per DIN 1693 and hot-dip galvanized.

The washout gate valve size must have stainless steel 1.4571 pins/bolts should be utilized for fixing the coupling and square head, following DIN 17440 standards.

An opening indicator should be mounted atop the extension spindle to indicate the valve's position. The square head must measure 27 x 27 mm for operation using a T-key as per DIN 3223.

Extension spindles for buried gate valves are to be made of stainless steel 1.4571 according to DIN 17440, with couplings and square heads of ductile cast iron GGG 40 according to DIN 1693, hot-dip galvanized. The square head should also measure 27 x 27 mm for T-key operation, as per DIN 3223, and the extension spindles must be protected with plastic tubing.

Surface boxes should be constructed of cast iron GG 25 according to DIN 4056, with the cover connected to the body via a stainless-steel chain. The cover must be inscribed with "Water Valve" in English.

12.1.4 AIR VALVES

Air valves must be Combination (admission, venting and release) and adhere to the double orifice double chamber design, featuring both small and large orifices. Additionally, a single air release valve measuring 75 mm in size with a small orifice of 4 mm must be installed on each discharge header in the pumping station, subject to confirmation by the Transient Analysis conducted by the Execution Contractor. The valve should eet the following requirements

- Min. air discharge capacity during pipe filling with 0.5 bar. diff. pressure = 250 m3/hour
- Min. air entrance capacity during pipe draining with 0.5 bar. diff. pressure = 2000 m3/hour

The double orifice air valves should be equipped with floats made of stainless steel 1.4571 in accordance with DIN 17440 and guided by bronze pins. Constructed of ductile cast iron GGG 40

following DIN 1693 standards, the body and covers of the air valves must be designed to mitigate water hammer effects. EPDM rubber sealing is required for potable water applications.

Bolts and nuts utilized for assembly must meet the standards of stainless steel 1.4571 as per DIN 17440 (A4 or SS316).

The air valve's internal and external surfaces should be coated with fusion-bonded pure epoxy resin, ensuring a minimum dry film thickness of 300 microns. Each air valve should also be equipped with an isolation gate valve operated by a hand wheel.

For the MS rising main, two air valves measuring 150 mm each should be installed, with each valve chamber welded onto the 900 mm branch. The sizes of the large and small orifices must be confirmed through the Transient Analysis conducted by the Execution Contractor.

12.1.5 FLOW METER

The flow meters for the transmission pipelines shall be Magnetic flowmeter type flow meter and housed inside a RCC chamber on the discharge header immediately outside the pump house or within the pump room as per the manufacturer’s directions.

The flow meter shall be with single-line sensor, double flanged, made of mild steel and supplied complete with digital recorder and totalizer for switchboard installation.

The flow meter shall be complete with transducers, single line signal converter and output signal of 4-20 mA and galvanically isolated. The required length of the cable shall be included with the flow meter. Flanges shall be minimum of PN 10 or as specified in the BOQ.

The accuracy of the flow meter shall be +/- 1%, power supply 220V/1/60 HZ

The coating inside and outside of the flow meter shall be fusion bonded pure epoxy resin with dry film thickness of minimum 300 microns.

12.1.6 CHECK VALVES

The following listed materials or equivalent materials shall be used for the check valves as minimum requirement.

Valve body materials include:

- ASTM A 105
- ASTM A 216 Gr. WCB
- ASTM A 351 Gr. CF8M

Trim materials for the disc and piston include:

- ASTM A 182 Gr. F316L or Gr. F316LN
- ASTM A 351 Gr. CF 8M

For swing check valves with large diameters, carbon steel with FBE coating may be utilized as disc material. However, the contact surface must be made of stainless steel.

Seats (seat rings) are composed of Stellite 6 or ASTM A 182 Gr. F316L or F316LN

Check valves operate by opening with fluid flow and closing when fluid flow stops or reverses direction. They must feature flanged ends for secure installation.

All internal fixing devices within the check valves must be crafted from stainless steel or bronze. Additionally, nuts and studs susceptible to vibration should be equipped with spring washers or locking tabs to prevent loosening.

In cases where higher abrasion is anticipated due to moving parts in direct contact with water, these components must be constructed from stainless steel or similar non-corrosive materials, subject to approval by the Engineer.

Two types of check valves are required:

Non-slam nozzle type: These are suitable for applications where non-slam requirements are essential, such as discharge lines of pumps and control valves. Generally, long-pattern nozzle check valves are preferred, with short-pattern types considered only if space constraints dictate.

Swing check or duo-check type: These valves must be designed to allow the disc to respond swiftly to any changes in flow, ensuring closure under "no-flow" conditions. Metal-to-metal sealing is necessary to achieve tight shut-off.

Both the seat and disc of the check valves must be made from stainless steel to ensure durability and corrosion resistance.

Swing type check valves or duo-check valves are designated for use in auxiliary systems and locations where non-slam check valves are not necessary.

Swing check type valves will be equipped with limit stops to ensure the disc does not remain in the open position, along with damping devices to prevent slamming. Additionally, hand operators will be provided where necessary, allowing the valve to be locked in either the open or closed position, with clear indication of its current state.

12.1.7 DISMANTLING PIECES

Dismantling pieces serve to simplify the installation and removal of various pipeline components such as flow meters, valves, and pump equipment. Simple flange adaptors are utilized in situations where no axial forces are anticipated or where there are limited deflections in the pipeline.

These components are designed to meet the operational conditions outlined in the relevant project specifications. Dismantling pieces are self-contained flanged restrained joint fittings, comprising two flanged pipe components and harness bars capable of withstanding thrust from design pressure and temperature fluctuations. They are supplied as complete assemblies, including a spigot piece, flange adaptor, tie bars, and gasket. The spigot piece may consist of existing pipe with a plain calibrated end and a slip-on flange welded on. Importantly, the design ensures that no part of the restraint system extends beyond the flange diameter.

The flanged ends of dismantling pieces and flange adaptors feature raised-face flanges, with a pressure rating matching that of the connected pipe flanges. Dismantling pieces allow for longitudinal adjustment of at least ±1" (±25 mm), achieved through the telescopic action of the flanged spigot within the flange adaptor. Flange adaptors, on the other hand, can accommodate at least ±0.1" (±2.5 mm) of longitudinal deflection and ±1° of angular deflection. The telescopic action of the pipe within the flange adaptor provides this adjustability, with spigot pipe tolerances defined by the Contractor.

Both dismantling pieces and flange adaptors are constructed from carbon steel per the Contractor's design standard. The sealing rings are made of EPDM (Ethylene Propylene Diene Monomer) rubber, while bolts, tie bars, nuts, and washers are of carbon steel with hot-dip galvanization.

.**Material & Coating**	**Material**	**Standard**
Body	EN GJS 500-7or S235/S275	EN 1563EN 10025
Seals / Liner	Elastomer EPDM	EN 681-1
Bolts / Nuts	C.S.8.8-tZN (hot dip galv.) or S.S.A2-70	tZN in acc. ISO1461S.S in acc. ISO 3506
Tie-bars	C.S.8.8-tZN (hot dip galv.) or S.S.A2-70	tZN in acc. ISO1461S.S in acc. ISO 3506
Minimum coating thickness	Non-toxic epoxy for drinkable water, internal and external 200 microns thickness	EN 1490
Coating ext. colour code	RAL 5017 (blue) or similar	RAL

12.2 PENSTOCKS

12.2.1 GENERAL

a) Penstocks shall be of robust design, suitable for their application, and their construction shall be capable of resisting deflection under the worst operating head conditions. Each penstock shall be provided with a suitable hand wheel of adequate diameter for the duty required. To be confirming to BS 7775: 2005.
b) Penstocks shall carry identification marks and/or brass plates to identify the penstock number and function.
c) Penstocks shall be clockwise closing.
d) Gearing shall be supplied where necessary to ensure that the required operating force applied by hand to the rim of the wheel does not exceed 25kgf. If the hand wheel cannot be readily accessed, extension spindles, headstocks and foot brackets shall be provided where specified.
e) Penstocks shall be fabricated with cast iron. Where applicable the penstock shall be electrically actuated. The hand wheel shall have the direction of closing cast thereon. Bituminous paints shall not be applied to the hand wheel.
f) Penstocks spindles specified to be key operated shall be fitted with stem caps. The caps shall be drilled and each provided with nut and bolt for securing to the spindle, which shall likewise be drilled to accept the bolt. Where caps are fitted, they shall be supplied complete with operating tee key. The extended spindle shall be such that the tee key will be operated at 0.9-1.2 meters above floor level.
g) The penstocks shall be supplied complete with all accessories, fittings, fixing bolts, nuts and washers ready for installation. Fixing nuts and bolts shall be supplied by the manufacturer and shall be of cast iron.
h) The penstocks shall be wall or channel-mounted full frame "Flush Invert" type suitable for extended operation.
i) They shall offer excellent corrosion resistance, be lightweight in operation and require minimum maintenance.
j) The doors shall be designed for ON or OFF seating pressures, suitable for an off-seating head of 8.5m. The seals shall be watertight under these conditions for head and direction of flow.
k) Thrust tubes shall be provided between the penstock frame and headstock in order to absorb the thrust in both directions of operation. Thrust tubes shall incorporate all necessary fixing brackets and spindle guide plates.
l) Penstock welding to be in accordance with BS EN ISO 15614.

12.2.2 PRESSURE SEALS

The unseating sides of the frames shall be fitted with adjustable pressure seals. Frame seals shall be EPDM and shall be fitted with corrosion resisting retaining strips and cast iron fixing bolts. The seals

shall be readily adjustable in situ using adjustable fasteners, which shall be replaceable. The seals shall not project into the flow through the penstock aperture.

The invert seal shall be EPDM.

12.2.3 DRIVE SPINDLE AND NUT

a) Penstocks shall be of the rising spindle type with the lifting bracket securely bolted to the top of the door with cast iron fasteners. The spindles shall be manufactured from stainless steel, machined all over, with a machine cut robust trapezoidal or square form thread, operating in a gunmetal nut. Polyethylene or similar materials are not permitted
b) All spindles shall be protected by a protection tube complete with position indicator end cap and grease nipple. Where the spindle length exceeds 2.5m, guide brackets shall be provided for the drive spindle and shall be bushed with aluminium bronze or similar non-ferrous material. These shall be of the split bearing type.

12.2.4 FIXING BOLTS

The penstock frame shall be fixed by cast iron anchor bolts or encapsulated epoxy resin bonded type. The design of anchor bolts shall be such that a minimum of civil preparation will be necessary for satisfactory erection of the penstock.

12.2.5 HEADSTOCK PILLAR

a) Fabricated mild steel or cast iron pillars shall be provided for the mounting of the drive gear on the penstock.
b) The penstock frame shall be fabricated from cast iron sections. All welds shall be continuous and adequate drainage of hollow sections shall be provided where applicable. Any strengthening of doors by the provision of ribs and gussets shall be carried out by welding and not by bolting.
c) The penstock door shall be cast iron sandwich construction. The door shall be stiffened by a steel matrix in a chemically bonded filler of rigid cellular polymer. The matrix shall be grit-blasted before polymer filling.
d) The door shall have sufficient strength to withstand the working pressures without significant deflection or distortion.
e) The side sealing faces may consist of simple metal-to-metal contact between the door and frames or of synthetic rubber seals and plastic guides as necessary to withstand the required working pressure without leakages.

12.3 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 as directed and approved by the Engineer. All Chamber covers and frames in the slab of chambers of appropriate sizes shall be of cast iron of robust construction and suitable for heavy duties and provided with locking arrangements.

12.4 PRESSURE RELIEF VALVES

Pressure relief/safety valves shall be installed wherever damages due to excess pressure by malfunction or wrong operation can be expected. They shall be full lift type, spring loaded, angle pattern, factory adjusted pressure blow out set point secured and sealed, and discharge pipe shall be provided where necessary in order to avoid any accident due to unexpected blow out. The discharge pipe shall be as short as possible and with a size double to the valve outlet.

The pressure relief valve shall be spring loaded angle pattern type and shall be suitably rated for all working pressure and test delivery pressure.

The valve shall be located on the main discharge header and shall modulate to relief access set point pressure back to the sump, it shall maintain constant pressure in the system regardless of demand changes

The valve material shall be as follows

Valve body : Ductile cast iron GGG50

Seat : Stainless steel 316

Stem : Stainless steel 316

Bonnet : Stainless steel GGG 40

12.5 PRESSURE REDUCING /SUSTAINING VALVES

The pressure reducing valve shall be spring loaded type and shall be suitable rated for all working and test delivery pressures.

The pressure drop through valve shall ne exceed 0.15 bar under full flow.

The spring loading should be adjustable from 0.00 to operating pressure

The valve material shall be as flows

Valve body : Ductile cast iron GGG50

Seat : Stainless steel 316

Stem : Stainless steel 316

Bonnet : Stainless steel GGG 40

12.6 BALL FLOAT VALVES

The float valve shall be flanged type and should be fixed at tank inlet with extended lever.

The valve shall be able to close and open when the reservoir levels to an adjustable set point (to be decided as per design requirement) below the invert level.

The valve material shall be Stainless Steel 316 L.

The ball valve shall be provided with position indicator open/close and shall be connected to RTU and SCADA.

12.7 PRESSURE GAUGES

Pressure gauge shall be installed at the suction and at the discharge side of pumps, at strainer in- and outlet, and at other places where pressure control/reading is necessary for proper plant control. The gauges shall be provided with a pressure cock with "T" passage to allow pressure vent and pressure reading. The dials shall be concentric 150mm diameter and graduated in (bar). Gauge graduation shall be such that the gauge is not used continuously beyond 70 % of the maximum graduation. The gauge shall be sealed from treated effluent water by means of diaphragm or capsule and shall be filled with silicon oil or similar and approved. All gauges shall be calibrated and test certificated of an independent institute for each individual gauge shall be provided by the contractor.

12.8 EXPANSION JOINTS

Expansion joints shall be installed where every necessary or required by the engineer in order to eliminate stress and vibration transfer from rotating/oscillating or otherwise vibrating equipment and /or thermal stress to the pipe work or vice versa. The expansion joints shall be of single sphere bellow type with tie bars and flanges.

Material

Bellow : Natural rubber or neoprene

Flanges : Stainless steel Stainless steel 1.4571 to DIN 17006

Tie Bar : Stainless steel 1.4571 to DIN 17006

12.9 OVERHEAD BRIDGE CRANE

Over Head bridge crane shall be provided for the pumping station as per design including motorized lifting hoist quipped with manually lifting device for manual lifting and down loading, manual by chain operated longitudinal and transversal travelling gear and trolley, rails, single type girder, remote control box for hoist operation from pump installation floor warning light and audible signal when the hoist is in operation.

The crane bridge shall be equipped with catwalk bridge to be used for maintenance and repair of devices located at ceiling height and for crane, maintenance, including fixed ladder.

Crane safety working load shall be as described above, but not less than 3000 kg.

Catwalk safety load shall be 100 kg/m2.

13 CAST IRON COVERS WITH FRAMES

Cast iron cover and frame shall be of the sizes and duty as per requirement. 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.

13.1 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 directed by Engineer.

14 PUMPING MACHINERY

PART 1 GENERAL

SECTION INCLUDES

Vertical turbine pump and motor

REFERENCE

AWWA Standard E103 – Horizontal and Vertical Line Shaft Pumps

AWWA Standard C110 – Ductile Iron and Gray-Iron Fittings for Water

ANME/ANSI B16.5 – Pipe Flanges and Flanged Fittings

NEMA MG-1 Motor and Generators

ANSI/HI 9.6.4 Rotodynamic Pumps for Vibration Measurements and AllowableValues

ANSI/HI 9.8 Pump Intake Design

ANSI/HI 14.6 Rotodynamic Pumps for Hydraulic Performance Acceptance Tests

SUBMITTALS

1. Manufacturer's Certificate: Certify that products meet or exceed specified requirements and are suitable for the intended use.
2. Submit pump and motor performance and nameplate data, pump curves showing operating points with impeller trim, NPSH curve, submergence requirements, bhp, efficiencies, gravitational weight of the rotating parts, hydraulic down thrust during normal operation and at shut-off head, type and size of motor, size and dimensions of suction intake, line shaft sizing calculations, and bearing life calculations.
3. Submit pump and motor manufacturer and model number, number of pump stages, pump and motor size and dimensioning data, and motor protection and efficiency.
4. Submit certified pump curve associated with a factory non-witness performance test showing that performance requirements are satisfied. Curves shall include flow, head, efficiency, net positive suction head (NPSH) required and brake horsepower. The curve from the performance test shall be approved by the Engineer prior to shipment. Certify that pump will perform in accordance with the submitted curve and data. The pump test acceptance grade shall be 1E as described in Table 14.6.3.4 of ANSI/HI 14.6 Rotodynamic Pumps for Hydraulic Performance Acceptance Tests.
5. Manufacturer's literature, illustrations and applicable data for the pumps.
6. The shop drawings shall include details of pump assembly; installation layout and procedures; piping and electrical connections and requirements; types of materials used in pump construction; details on all pump accessories, such as couplings, line shaft, discharge head, etc.; dimensions of major components; weights, structural and

operating features, space required, clearances, type of finish or shop coat, and other pertinent data.

7. A list of manufacturer's recommended spare parts to be supplied, with the manufacturer's current price for each item. List bearings by the bearing manufacturer's numbers only.
8. The following data shall be provided on the drive motor: materials of construction, dimensions, rpm at full load, frequency, voltage, full load current, code and design letter, efficiency, horsepower, number of phases, time rating, temperature rise, service factor and bearing life rating. The submittal shall include motor manufacturer's recommended lubrication requirements.
9. Operating and Maintenance Instructions: Submit three sets of operation and maintenance manuals. The operation and maintenance manuals shall have been prepared specifically for the model and type of pump furnished and shall not refer to other models and types of similar equipment. Disk copies of material submitted shall be provided in MS Word and ACAD 2013 version or later. The operation and maintenance manuals shall include but not be limited to the following:
    a. Equipment function and description.
    b. Normal and limiting operating characteristics.
    c. Installation instructions (assembly, alignment and adjustment x procedures).
    d. Operation instructions (normal start-up and shutdown procedures, normal operating conditions and emergency situations, troubleshooting guide).
    e. Lubrication and maintenance instructions.
    f. Parts list with catalog numbers and predicted life of parts subject to wear.
    g. Drawings - cross sectional view, assembly and wiring diagrams.
    h. Performance curves.
10. Submit a copy of this specification section, with addendum updates included, with each paragraph clearly marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. If deviations from the specifications are indicated and, therefore requested by the Contractor, the submittal shall be accompanied by a detailed, written justification for each deviation. Failure to include a copy of the marked-up specification sections, along with justification for any requested deviations to the specification requirements, with the submittal shall be cause for rejection of the entire submittal with no further consideration. The Client/Engineer retains the right to reject any proposed deviations in favor of this specification as written.

QUALITY ASSURANCE

1. Manufacturer: Company specializing in the manufacturing of the pumps and motors specified in this section, with a minimum of ten (10) years documented experience.

2. Manufacturer will provide a factory trained representative to inspect and certify the installation and oversee the startup of the pumping equipment.
3. Material Service Requirements: The pumps, motors and all related equipment shall be suitably constructed of materials to withstand the operating conditions which shall be experienced during the pump's performance and outside environment.
4. Balancing: Pump units shall be statically and dynamically balanced. The vibration allowance in the units shall not exceed the upper limits as established by the Hydraulic Institute Standards.
5. Tests: Each pump with its own drive motor shall be fully tested on water at the pump manufacturer's plant before shipment. Tests shall consist of checking the unit at its rated speed, head, capacity, required NPSH, available suction lift, efficiency and brake horsepower, and at such other conditions of head and capacity to properly establish the performance curve. Certified copies of test reports shall be submitted. The Standards of the Hydraulic Institute shall govern the procedures and calculations for these tests. During these tests the pumps with drive motors shall be checked for balance.

MANUFACTURER: Refer List of Approved manufacturers

WARRANTY

Warranty: Include coverage of all pump and motor system including but not limited to pump, motor, impellers, bearings, seals, wear plates, wear rings, and pump and motor shafts or a period of two (2) years from the date of the final pay request. Warranty shall cover any problems created from vibration, manufacturing defects, improper installation, or other defective work.

Certifications: Furnish the Engineer with a written certification signed by the manufacturer's representative, that the installed equipment:

a. Has been installed per manufacturer's requirements.
b. Has been lubricated per manufacturer's instructions.
c. Has been accurately aligned and proper running clearances set.
d. Is free from undue stress imposed by piping or mounting bolts.
e. Is ready to be operated on a continuous basis, and is free from any known defects.

PERFORMANCE REQUIREMENTS

Vertical Turbine Deep Well and Booster Pumps and Motors.

Primary Duty Point or Guarantee Point	**Pump**
Design flow capacity, Imp gpm	2778
Total Dynamic Head (TDH), ft	56 ft
Minimum shut off head, ft	*
Maximum NPSH (absolute) required atdesign point, ft	*
Minimum pump efficiency	80%
Maximum nominal pump speed, rpm	1450
Number of pump stages	*
Maximum motor size, BHP	56 KW

Pump Dimensions

Approximate Setting Depth (from centerline of discharge head to end of column assembly)	
Minimum column diameter	*
Min. wall thickness of steel column pipe	*
Discharge flange size	*
Discharge flange rating ANSI	150#
Minimum shaft diameter	*
Maximum bowl diameter	*

* To be provided by the manufacturer

Operating Conditions

Duty	Premium EfficiencyInverter
Drive	VFD
Ambient environment	Indoors, ventilated andheated (40°F – 104°F)
Fluid service	Canal Raw water
Fluid temperature, degrees C	45 to 75
Project site elevation	As per drawings

EQUIPMENT GENERAL REQUIREMENTS

1. All vertical turbine pumps and motors supplied for this project shall be by the same manufacturers (high service pumps and supply well pumps).
2. Pump curves shall have no more than one specific flow rate corresponding to one specific head condition except for shut-off head.
3. Material Service Requirements: Pumps and all related equipment shall be constructed of materials suitable for the intended applications.
4. Data Plates:
   - All data plates shall be of stainless steel suitably attached to the pump with stainless steel screws. Pump data plates shall contain the manufacturer's name, serial number, pump size and type, serial number, speed, impeller diameter, design capacity and head and other pertinent data.
   - Motor data plates shall contain the manufacturer's name and model number, rpm, Hp, frequency, voltage, phase, efficiency, and service factor.
5. Hardware: All machine bolts, nuts and cap screws shall be hex head type, stainless steel. Hardware requiring special tools or wrenches shall not be used.
6. Parts Numbering: Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. Each part shall be properly identified by a separate number. Identical parts for separate units shall have the same number.
7. Miscellaneous Parts: The equipment shall be furnished with shims, stainless steel anchor bolts, couplings, sheaves, belts, motor flanges, drive and belt guards and any other miscellaneous materials necessary to properly mount and install pump and motor.

VERTICAL TURBINE DEEP WELL AND BOOSTER PUMPS AND

MOTORS

Vertical Turbine Pump: Vertical water lubricated open line shaft turbine pump with multistage bowl assembly, column, lineshaft, top shaft, suction screen, and driver as specified. Unless otherwise stated herein, the pump shall in all respects conform to AWWA Standard E103 – Horizontal and Vertical Line Shaft Pumps and shall comply with all local and state safety regulations.

1. Manufacturers of pumps suitable for municipal, drinking water deep well applications must meet the performance requirements stated above and are also subject to the requirements listed below. Manufacturers and models meeting the requirements of this specification may be considered with proper documentation.
2. Discharge head

Constructed of fabricated steel and be of the high-profile type to allowthe shaft to be coupled above the stuffing box and be suitable for mounting the motor and supporting the column and bowl assemblies.

Capable of containing the greater of 150% of the maximum pressuredeveloped by the pump as described below, and of sufficient design to support the entire weight of the pump components and driver.

Shall have a 1/2" NPT connection for a pressure gauge.

Outside and inside surfaces of the discharge head shall be coated withan NSF 61 approved epoxy coating to 16 mills

A soleplate shall be provided with proper thickness to load and thrust, but no less than 1-1/2” with a bolt hole pattern matching the dischargehead.

Equipped with integral lifting lugs to facilitate installation and removal. Capable of withstanding the weight of the discharge head and pump assembly.

A tapped drain line shall be provided to convey packing discharge tothe floor drain. Access ports shall be provided/

Top line shaft

The top line shaft (head shaft) shall be of ASTM A582 Type 416 stainless steel and have a surface finish not to exceed RMS 40 (ANSIB46.1) and shall not exceed 10 feet in length.

The diameter of the shaft and coupling shall be designed in accordance with AWWA E103 Section 4.4.2.2 with a shaft speed of one half of the nominal pump speed. For this application, see Section

1.7 Paragraph C for minimum line shaft diameter. To ensure accuratealignment of the shafts, they shall be straight within 0.005 in. total indicator reading for a 10 ft section; the butting faces shall be machined square to the axis of the shaft.

The top shaft adjusting nut shall be bronze of ASTM B584 and shall bepositively locked in position with a steel lock screw or washer of ASTM A108 Grade 1018. Each joint shall be equipped with a Type 304 stainless steel sleeve placed between the bearing and the shafting.

Column line shaft

Shall be of carbon steel A108 Gr 1045 ground and polished to asurface finish not to exceed RMS 40 (ANSI B46.1).

Sections shall be furnished in interchangeable sections not over 10feet in length.

The butting faces shall be machined square to the axis of the shaft, with maximum permissible axial misalignment of the thread axis withthe shaft axis of 0.002" in 6".

Diameter shall be no less than that determined by AWWA E103 Section 4.4.2.2 with a shaft speed of one half of the nominal pump speed. The pump supplier shall confirmthat this diameter is such that elongation due to hydraulic thrust will notexceed the axial clearance of the impellers in the pump bowls and meets the AWWA E103 and reduced speed requirements above.

Shall be straight within 0.005 in. total indicator reading for a 10 ft.section.

The line shaft bearings shall be fluted rubber retained in the centeringspider by a shoulder on each end of the bearing.

Discharge column pipe

Shall be of threaded ASTM A53 grade B steel pipe in interchangeablesections not over 10' in length and shall conform to AWWA E103 Section 4.4.2.

Shall be coated with an NSF 61 approved epoxy coating to a minimum16 mills

Sections shall be connected by threaded sleeve couplings.

Bowl assembly

The pump bowls shall be of close grain, cast ASTM A48 Class 30 orductile iron ASTM A536, free from blow holes, sand holes and all faults, accurately machined and fitted to close dimensions.

The pump bowls shall be capable of withstanding the greater of a hydrostatic pressure equal to twice the pressure at rated flow or 1.5times the shut-off head.

The pump bowls interior shall be epoxy coated with an NSF 61 approved epoxy with a minimum thickness of 16 mills

The pump bowls exterior shall be epoxy coated with an NSF 61 approved epoxy with a minimum thickness of 16 mills

The pump bowls shall be equipped with replaceable bronze wear rings.

Suction bowl

Suction bowl or suction bell shall be provided with a non-soluble grease packed bronze bearing. A bronze sand collar shall be providedto protect this bearing from abrasives in the pumping fluids. The bearing housing shall have sufficient opening at the bottom for easy removal of the bearing.

Impellers

Shall be cast bronze and shall be the enclosed type with bronze wearrings and 416 stainless steel collets.

The impellers shall be accurately fitted and balanced both staticallyand dynamically.

Factory trimmed to match the performance conditions indicated.

Impellers to be keyed on drive shaft.

Bowl assembly shaft

Shall be of A582 Type 416 stainless steel, turned, ground and polishedto a surface finish not to exceed RMS 40 (ANSI B46.1).

Supported by steel backed rubber bearings above and below eachimpeller.

The suction case bearing shall be grease lubricated and protected by abronze sand collar of ASTM B584.

The size of the shaft shall be no less than that determined by AWWAE103 Section 4.4.2.2.

Deep well pump suction strainer

Constructed of 416 stainless steel and shall have a net inlet area equal to at least three times the impeller inlet area. The maximumunit opening shall not be more than 75 percent of the minimum opening of the water passage through the bowl or impeller.

Pressure transducer

The pump column shall be provided with a slotted or perforated 1.5 inch diameter PVC or HDPE pipe of sufficient length to extend from the well casing sole plate to the top of the bowl assembly to serve asa water level sounding tube.

The pressure transducer shall be as specified in the drawings.

MOTOR

WP-1 weather protected, vertical hollow shaft, with all materials, workmanship, and tests conforming with the applicable specifications of the National Electric Manufacturer's Association (NEMA), the Institute ofElectrical and Electronic Engineers (IEEE), the American Standards Association (ASA), the Anti-Friction Bearing Manufacturing Association (AFBMA). The pump shall meet the requirements of NSF/ANSI 61.

The following requirements as defined by NEMA MG-1

Premium Efficiency – minimum nominal full load efficiency shall be95.0%

Design B

Code F or G

Inverter Duty

Name plated for 60 hertz operation. The motor shall be capable of operating a variable torque load over a 2:1 speed range. The motorshall be capable of operating continuously at 30 hertz without overheating.

Performance data for adjustable speed operation shall be stamped on a steel data plate permanently attached to the motor frame. The minimumamount of adjustable speed data shall include

Application type: constant torque, variable torque, or constant hp

Maximum approved continuous torque

Approved rpm and frequency operating ranges

Load amps at peak load on inverter power

Service factors

Horsepower: The motor shall not exceed rated horsepower at any point on the pump curve.

Time rating: Inverter

Maximum ambient temperature: 40°C,

Temperature rise: Class B

Insulation system designation: Class F, H,

Synchronous speed: 1800 rpm

Frequency: 60 hz

Phases: 3

Voltage: 480

Service Factor: 1.15

Backspin protection: non-reverse ratchet (ball bearing type)

Motor bearings

Shall be antifriction and designed to carry the weight of all rotating parts plus the maximum hydraulic thrust load under all conditions ofoperation.

L-10 life at the operating point shall be a minimum of 44,000 hours.

Factory Testing: A Certified Non-Witness Factory Performance Test will be performed on each unit, the performance will include measuring flow and headat rated design condition, testing may be at a reduced speed measuring flow and head corresponding to the rated condition when adjusting for speed using the appropriate affinity laws. Use of a test diver is permitted for factory tests. Record measured Flow, Suction Pressure, Discharge Pressure and make observations on bearing temperatures and noise level

Spare Parts:

Furnish for each pump, the recommendedspare parts, properly boxed and labeled for each pump, which are to include, as a minimum, the following:

Two (2) sets of gaskets and O-rings.

Two (2) mechanical seals.

Two (2) sets of shaft sleeves, keys, and accessories.

One (1) year supply of each type of lubricant required.

PART 3 EXECUTION

EXAMINATION

Verify all pumps, motors, and materials are present and meet the requirements of the Specifications.

STARTUP SERVICES

The Contractor shall start the system to ensure that all aspects of the system areoperating according to manufacturer's recommendations. The Contractor shall check the volume and pressure capacities of the pumping equipment and submitto Engineer.

Provide a factory-trained representative to inspect and to certify the installation ofpump and motor. Prior to operator training, demonstrate to the Engineer that the equipment is ready for operation.

Provide a factory-trained representative to oversee start-up and demonstrate operation and maintenance of the pump and motor for a minimum of 8 hours at the project site and make necessary adjustments to pump setting, lateral impellerclearances, etc. to provide proper system operation.

After pump has been completely installed, the Contractor shall conduct, in the presence of the Engineer, testing of all mechanical equipment and piping as in operation to demonstrate capacity, correct alignment, smooth operation, proper adjustment, and freedom from noise, vibration, over-heating and leaking, and to ensure satisfactory compliance with the specifications. All defects shall be corrected. The Contractor shall supply all oil, grease, electric power, water and all other material necessary to complete the field tests.

If the pump performance does not meet the Specifications, corrective measures shall be taken by the Contractor, or pump shall be removed and replaced with a pump which satisfies the conditions specified.

Motor Field Testing: Motor shall be disconnected from the pump and run for four (4) hours. Following the run-in test, reconnect the motor to the pumping equipment and reinstall all coupling guards.

Pump Field Testing:

Upon completion of all the mechanical work, the Contractor shall conduct testing as specified herein to demonstrate that theequipment performs in accordance with all specifications.

The Contractor shall perform initial testing of the equipment to insure himself that the tests listed in the Demonstration Test paragraph below can be completed.

The Demonstration Test shall demonstrate thatall items of these Specifications have been met by the equipment, as installed, and shallinclude the following tests:

That the pump can deliver the specified pressure and discharge flow at rated efficiency.

That the pump controls perform satisfactorily.

In the event that the equipment does not meet the Demonstration Test, the Contractor shall, at his own expense, make sure changes and adjustments in the equipment which he deems necessary and shall conduct further tests until written certification is received from the Engineer.

A **vibration test** shall be conducted upon completion of the pump and motor installation. The test shall indicate amplitude, velocity, and peak to peak parameters. Each reading will be taken at a minimum of five different points oneach piece of equipment. Each point must fall within values published in HI 9.6.4. It will be the pump supplier's responsibility to replace the appropriate piece of equipment and/or eliminate the cause of excessive vibration to achieve acceptable vibration readings before final acceptance is issued.

Field Harmonics: During star-up the pump manufacture will perform a Reed Critical Frequency (RCF) analysis commonly referred to as a "bump test". The bump test will be done through the full operating range of the pump speed, frommin speed to max speed. If there are any reflections of harmonics through the operating range of the pump it will be the pump manufactures responsibility to either correct the problem or inform the owner of the speeds that will need to beavoided through the Variable Frequency Drive Settings. A full report of these findings will be provided to the owner before final acceptance of the equipment.

14.1.1.1 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.

14.1.1.2 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.

14.1.1.3 PRESSURE SWITCH

Pressure switch shall be electric actuating device, which will close/open the circuit at pre-set 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.

14.1.1.4 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.

14.1.2 CHAIN AND PULLY BLOCK ARRANGEMENT

Manual chain and pulley block arrangement shall be installed by the Contractor in Pump Room.

The chain and pulley block arrangement shall be capable to lift the specified load and shall be provided and installed as shown to serve as lifting arrangement for pumps and accessories.

The I-Beam shall be a standard AISI girder of required size and specific weight. The travel wheels of the pulley block shall be made of dia-forged steel and supported on ball or roller bearings, which are lubricated for life. The bolts wherever used shall be of high tensile steel. Rubber buffers shall be provided at the end of travel of pulley block in either direction.

The chain block shall be capable to provide a standard clearance/lift as shown. After installation, the lifting arrangement shall be subject to no load and full load tests for satisfactory operation. Before putting into operation, the arrangement shall be properly cleaned, greased and painted.

14.1.3 MAINTENANCE MANUALS AND TOOLS

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.

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.

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.

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.

14.1.4 PUMPING MACHINERY

14.1.4.1 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.

14.1.4.2 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.

14.1.5 CHAIN PULLEY BLOCK

14.1.5.1 MEASUREMENT

Measurement of acceptably completed works of providing, installing and testing of chain and pulley block arrangement will be made on the basis of actual number provided and installed in position as shown in the drawing.

14.1.6 LEVEL INDICATOR

14.1.6.1 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 POLYVINYLCHLORIDE WATER STOPPER

15.1 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° F	570
Stiffness in flexure, 1/2" span	28 kg/cm^2 (400 psi)	571

15.2 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 required 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 BITUMEN COATING

16.1 MATERIALS

Bitumen 10/20 grade.

16.2 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.

16.3 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.

16.4 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 EXTERNAL FIRE FIGHTING SYSTEM

1.0 GENERAL

Conform to General requirements for mechanical services.

1.1 Description of work

1.1.1 The work Includes supply, installation, testing and commissioning Wet Riser and external hydrant system as an integral part of the complete Fire Services Installation.

1.1.2 All works shall be carried out as shown on drawings in full compliance with NFPA standards and Local Civil Defense Authority and consultant's approval.

1.2 Standards and Codes:

All applicable local authority regulations and codes

NFPA14. Standard for the installation of stand pipe and hose systems

NFPA24. Standard for the installation of External Fire Hydrants

NFPA 25. Standard for commissioning of fire suppression systems.

BSI - British Standard Institute.

1. BS 5041 - Fire Hydrant Systems Equipment.
2. BS 5274 - Specification for Fire Hose Reels

D. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

1. AWWA C502 - Dry-Barrel Fire Hydrants
2. AWWA C503 - Wet-Barrel Fire Hydrants
3. AWWA C550 - Protective Epoxy Interior Coatings For Valves and Hydrants

E. UL - Underwriters Laboratory, Inc. USA.

F. FM - Factory Mutual Testing Laboratories, USA

G. FOC - Fire Offices Committee of UK.

H. DIN - Deutches Institute for Normung e. V. West Germany

I. JIS - Japanese Industrial Standards

J. AWS - American Welding Society

K. ASME - American Society of Mechanical Engineers

L. ISO - International Standards Organization Switzerland

M. AISI - American Iron and Steel Institute

N. American Society for Testing and Materials

1.3 Design Criteria

1.3.1 Fire suppression system shall be selected to meet the required duties stated in the drawings and schedules.

1.3.2 The entire Fire Protection System shall be hydraulically analyzed and installed by a specialist contractor only.

1.4 Submissions

1.4.1 Submit the complete fire protection system data sheets. List piping material types, ASTM number, schedule or pressure class, joint type, manufacturer and model number where appropriate. List valves, specialties and equipment with manufacturer and model number.

1.4.2 Shop drawings shall indicate water supply location and size, piping layout and size, locations and type, hanger locations and type, equipment locations and type, valve locations and type, occupancy classes, hydraulic calculations reference points, node references of remote area and discharge densities.

1.4.3 Together with Shop Drawings and Product Data, Plans and Specifications shall be submitted in conformance with NFPA. Contractor shall be responsible for obtaining approvals from Civil Defence Authority.

1.4.4 Test Reports shall be submitted in accordance with the approved format giving all required test details.

1.5 Quality Assurance and Control

1.5.1 Any installed material not meeting the specification requirements must be replaced with material that meets these specifications.

1.6 Product delivery, storage and handling

1.6.1 Handle equipment and components carefully to prevent damage, breaking, denting and scoring. Do not install damaged components, replace with new.

1.6.2 Store equipment and components in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.

1.7 Manufacturers

Refer Approved list of manufacturers

2.0 PRODUCTS

2.1 Materials General

Piping

2.1.1 Firefighting pipe work above grade (For Buildings Works)

A. Refer Internal Works Fire Fighting specifications

B. All pipe work and fittings shall conform to the relevant clauses in this specification.

C. Where weld fittings or mechanical grooved fittings are used, use only long radius elbows having a centre line radius of 1.5 pipe diameters.

D. No elbows will be allowed on fire service systems where all changes of direction shall be by means of standard bend springs or long radius bends.

E. Where pipes cross fire rated walls and slabs, beams and waterproof membranes, galvanized steel sleeves shall be used and the penetrations shall be fireproofed (using flexible materials) to the same rating as the wall. The fire proofing materials shall be applied strictly as per the manufacturer's recommendations.

2.1.2 Firefighting pipe work Below Grade.

F. All External Fire Water Supply pipes shall be high density polyethylene pipes (HDPE) and shall comply with the requirements of DIN 8074/8075 or ISO 4427 type PE 100 SDR 11 -(standard dimension ratio) PN-16 and tests are made in accordance with American Standards ASTM D1248/D3035/F714 or Equivalent ISO Standards.

G. Molded PE Fittings: ASTM D 3350, PE resin, socket- or butt-fusion type, made to match PE pipe dimensions and class.

H. The pipes shall be suitable for underground installation for drinking water at a working pressure up to 12 bar at 20°C or 9 bars at 35°C.

I. The pipe nominal size and wall thickness shall be to the following dimensions.

Mean Outside Diameter OD (mm)	Monomial Thickness(mm)	Internal Diameter ID(mm) SD R11, PN-16
50	4.6	40.8
75	6.8	61.4
90	8.2	73.6
110	10	90
125	11.4	102.2
160	14.6	130.8
200	18.2	163.6
225	20.5	184
250	22.7	204.6
315	28.6	257.8
355	32.2	290.6
400	36.3	327.4

The minimum required strength (MRS) of the polyethylene pipe shall be 8 MPa at 20°C and 50 years life time. The design stress shall be 6.3 MPa.

The polyethylene pipe shall meet the following specification:

Property	Test Method	Units	PE 100
Density (Compound)	ISO 1183	Kg/m³	959
Melt Flow Rate(190ºC/5kg)	ISO 1133	g/10 min	0.25
Tensile Stress at Yield(50mm/min)	ISO 527-2	MPa	25
Elongation at Break	ISO 527-2	%	> 600
Charpy Impact Strength, notched	ISO 179/1eA	kJ/m²	16
Vicat Softening Point	ASTM D 1525	ºC	122
Brittleness Temperature	ASTM D 746	ºC	< -70

ESCR (10% Igepal), F50	ASTM D 1693A	Hrs.	>10,000
Thermal Conductivity	DIN 52612	W/mºK	0.4
Linear Thermal Expansion	ASTM D 696	K^{-1}	$1.5x10^{-}4$

The pipes shall be manufactured from polyethylene containing only those antioxidants, UV stabilisers and pigments necessary for the manufacturing of the pipes.

Polyethylene pipes shall be black colour. 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.

The thermal stability of polyethylene material shall meet the requirements of ISO 4427.

If rework material is added or used, it shall be clean, derived from the same resin and reground under the supervision of the same manufacturer and shall be compatible with the material to which it is added.

The material of the polyethylene pipe which is in contact with or likely to come in contact with drinking water shall not constitute a toxic hazard, shall not support mlcrobial growth and shall not give rise to unpleasant test 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 organoletpic / 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.

Polyethylene pipes shall be clearly marked at intervals of one meter indicating the manufacturer name, nominal diameter, standard number, pipe class, pressure rating and date of pipe manufacturing. The word "WATER" shall also be marked every one meter. The marking shall be by means of paint or engraved marks. All markings shall be in blue colour.

The pipes shall kept shaded at all times. The coils shall be wrapped and shall not be exposed to direct sunlight.

2.2 Valves

2.2.1 All valves shall be rated for at least 1.5 times the system working pressure. All isolating valves shall be lock shield type. All Valves shall be UL listed FM- approved and shall have a minimum test pressure of 16 bars (PN-16)

2.2.2 Gate valves:

50mm and smaller: Outside screw and yoke gate valves, bronze body, bronze mounted, screwed bonnet, rising stem, solid wedge

65mm and larger: Outside screw and yoke gate valves, Ductile Iron, rising stem, solid wedge, UL listed as indicated on the drawings.

2.2.3 Check valves:

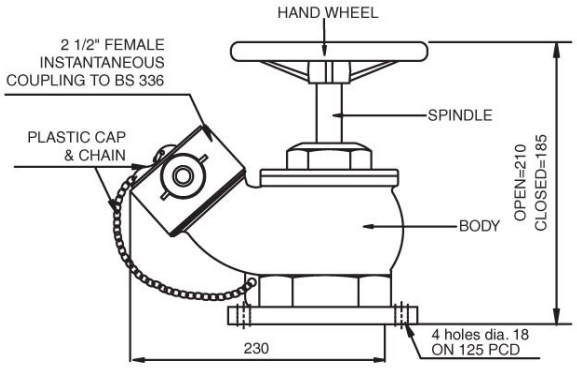
50mm and smaller: Bronze body, threaded end, renewable bronze disc, suitable for installation in a horizontal or vertical line with flow upward.

65mm and larger: Ductile iron body, flanged or grooved ends, bronze trim, bolted cap, renewable bronze seat and disc, suitable for installation in a horizontal or vertical line with flow upward.

2.3 Landing Valves

Copper Alloy to BS EN 12163: 1998 with Spheroidal Graphite Cast Iron Hand wheel. Hydrant outlets should be of a type acceptable to the public fire brigade and should comprise a valve outlet, screwed or flanged for attachment to the riser and fitted with a 65 mm instantaneous female coupling and a blank cap secured by a suitable length of chain. The whole fitting should be of sound construction and shall be suitable for a working pressure of 27 bar. Valve shall comply with BS 4504.

The hydrant outlet valves used shall be of the type incorporating a device to limit the outlet pressure to a maximum of 6.9 bar



EXTERNAL FIRE HYDRANTS

A. Fire hydrant shall be of the UL/FM Certified pillar type with protecting shell and shall as per AWWA C503-88 or equivalent British Standard Manufacturer shall be approved by the Local Civil Defense Authority.

B. Fire hydrants and appurtenances shall be selected from the Approved Materials List

C. Dry-barrel fire hydrants shall comply with AWWA C502 and these specifications unless otherwise indicated on the Approved Drawings

D. Wet-barrel fire hydrants shall comply with AWWA C503 and these specifications unless otherwise indicated on the Approved Drawings

E. Upper barrel shall be of best quality ductile iron. Lower barrel shall be of cast iron. All barrel castings shall be painted inside and outside with 300 micron thick non toxic fusion bonded epoxy. Aluminum shell shall be painted with 60 micron thick polyester paint to color as approved by the local Civil Defence Authority.

F. The interior of ductile-iron hydrants shall be fusion-epoxy lined per AWWA C55

G. All outlets shall be provided with National Standard Fire-Hose Threads. Outlets shall be equipped with brass or ductile iron caps with chain

H. Hydrant rod shall be of steel, zinc electroplated in two part construction held together by a rod connector made of hot dip galvanized ductile iron

I. A cast bronze nut shall directly actuate the hydrant rod. Grease groove shall ensure complete lubrication and long life `O' rings shall seal the lubrication chamber and prevent water entering the operating mechanism.

J. Hydrant shall be with one front outlet size 100mm diameter and two side outlets each 65mm diameter. Outlets shall be provided with quick connect couplings, protective caps held in place by chains. Fire hydrants shall be with enclosed outlets in an aluminium casing as approved by the local Civil Defence Authority and shall be suitable for a maximum working pressure of 16 Bars. Hydrants outlets shall be provided with quick connect couplings to the approval of the Local Civil Defence Authority.

K. Hydrant outlet sizes and configuration shall be as shown on the Approved Plans or as directed by the fire department of jurisdiction.



2.6 FIRE Hose Cabinets

A. Fire cabinets shall be Single Compartment MS with 1.2mm thickness as minimum. Fire hose cabinets shall be coated with 70 microns red oxide pain for corrosion protection. Hinges shall be solid, pin type machined from steel rods and welded to cabinet and door. Door edges shall be boxed and shall have recessed handle in stainless steel.

B. The dimensions and details shall be (H=1600 W=800 D=300) as per drawings. Incase required by the consultant and client cabinets shall be given two (2) coats of red oxide primer and finished with two (2) coats of fire red enamel but this shall only to subject to consultants approval.

Design Features

A. Upper compartment specially designed for mounting swinging pipe type hose reels (size - 1" x 30 mtr long).

B. Lower compartment can accommodate the following: 2.5" x 30 mtr. lay flat fire hose + 2 portable extinguishers + 2.5" landing valve + nozzle as detailed in the drawings.

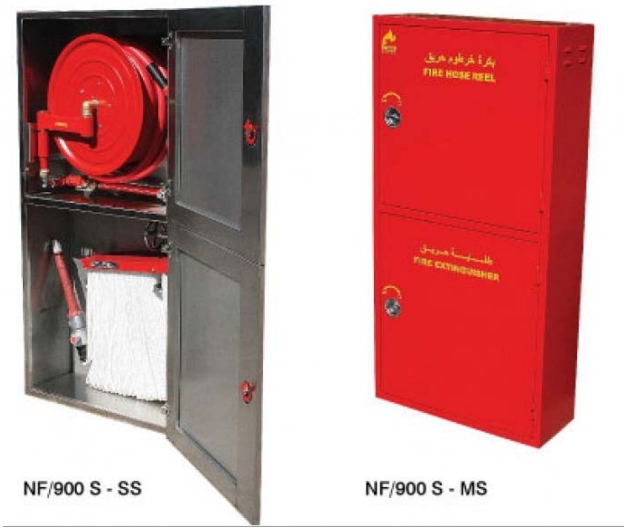
C. Special hose reel mounting bracket with minimal cabinet depth.

D. Swinging pipe type hose reel can be mounted on either side of the cabinet based on the site condition/ riser access.

E. Inlet lock shield control valve, pressure reducing valve are fixed.

F. Cabinet can be with Door Made of Full Stainless Steel sheet Brush Finish.

G. Cabinet painted with Red (RAL 3000) electrostatic powder coating. (only if requested by the client)



2.5 PORTABLE FIRE EXTINGUISHERS

A. Fire extinguishers shall be to the approval of the local authorities.

B. Fire extinguishers shall be as indicated on the drawings.

C. The pressure test on the extinguishers shall remain valid for 5 years.

D. All portable extinguishers shall have welded steel / light alloy shells

E. All extinguishers shall have labels attached, which states the date of last inspection, next due date and the name and address of the inspection agency.

1. Dry Powder - 6 KG capacity with flexible discharge hose and nozzle/fixed nozzle, trigger type operating lever, and safety locking pin.
2. CO2 – 5 kg capacity with flexible discharge hose and long, plastic horn, trigger type operating level and safety locking pin.

2.7 WHEELED FIRE EXTINGUISHERS

A. Carbon Dioxide: Large extinguishers with 30 Kg CO2 cylinder with screw-down valve, high pressure hose with extinguishing shower/snow pipe. All mounted on trolley with solid rubber tyred disc wheels.

B. Carbon Dioxide: Small extinguishers with 10 Kg CO2 cylinder with screw-down valve, high pressure hose with extinguishing shower/snow pipe. All mounted on trolley with solid rubber tyred disc wheels.

2.8 FIRE BREECHING CONNECTIONS

A. 4 ways breeching connections for use as alternative water supply entries by the Local Fire Department shall be of 65 mm male inlet type in accordance with BS 5041 Part 3: 1975 (1987) and local civil defense requirement.

B. UL 405, 175-psig (1200-kPa) minimum pressure rating; with corrosion-resistant-metal body with brass inlets, brass wall escutcheon plate, brass lugged caps with gaskets and brass chains, and brass lugged swivel connections.

C. Breeching connections shall be in glass fronted boxes to BS 5041: Part 5: 1974 (1987) marked "Wet Riser Inlet" in English and Urdu.

1. Type: Flush, with four inlets and square or rectangular escutcheon plate.
2. Type: Exposed, projecting, with two inlets and round escutcheon plate.

2.9 PRESSURE GAGES

A. Coordinate first paragraph and list below with Part 2 "Manufacturers" Article. Retain "Available" for nonproprietary and delete for semiproprietary specifications.

B. Description: UL 393, 3-1/2- to 4-1/2-inch (90- to 115-mm-) diameter, dial pressure gage with range of 0 to 250 psig (0 to 1725 kPa) minimum

C. Water System Piping: Include caption "WATER" or "AIR/WATER" on dial face.

2.10 PRESSURE REDUCING VALVES

A. Where required for installation in the Fire Protection Systems, the PRV shall be UL/FM direct acting, site adjustable type, of bronze (up to 50mm) or cast iron (65mm and larger) construction

B. The pressure reducing valves shall be suitable for maximum working pressure that exist within the system and downstream pressure should be site adjustable between 5 and 8 bar. Refer to Schematic drawings for the minimum locations at which PRV's shall be required.

C. All PRVs shall be equipped with built in pressure gauge and Gate Valves on Both Sides / PRVs shall be installed as working & standby arrangement weather shown or not shown on drawings.

3.0 EXECUTION

3.1 Preparation

Piping and Fittings. Ream all pipe to full inside diameter after cutting and thoroughly clean before erection. All material shall have proper identification marks that can be verified prior installation.

3.2 Installation

Install fire protection systems in accordance with NFPA rulings, listings and manufacturers recommendations. Locate where accessible for servicing and replacement.

Run all piping as direct as possible, avoiding unnecessary offsets. Conceal piping in finished rooms unless shown or specified otherwise.
Valves: Properly align piping before installation of valves. Do not support weight of piping system on valve ends. Mount valves in locations where access for operation are available for servicing and replacement.

3.3 Painting

All exposed firefighting pipe work (whether exposed or concealed) shall be given one coat of approved primer (should be an primer suitable for Steel pipes) and two coats of approved post office enamel paint to NFPA requirements.

3.5 Testing and Commissioning

The fire protection piping system shall be tested hydrostatically for not less than 6 hours at 1 ½ times the system pressure without leak.

Testing of pipe networks in sections or entire system shall be carried out as required by sequence of construction program. Do not conceal any pipework unless and until it has been successfully tested and certified. If required for the additional pressure load under test, provide temporary restraints at fittings or expansion joints.

Use clean water and remove air from the piping being tested where possible. Measure and record test pressure at the high point in the system.

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 Client, 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.

TABLE OF CONTENTS – ELECTRICAL SPECIFICATION

S. No.	Section	Description
1	E-1	General Electrical Requirements
2	E-2	Electrical Identification
3	E-3	Testing and Commissioning
4	E-4	Conductors and Cables
5	E-5	Conduits and Pipes
6	E-6	Medium Voltage Switchgear
7	E-7	Ring Main Units (RMU)
8	E-8	Sub-Stations
9	E-9	Street Lighting Fixtures
10	E-10	Lighting Poles
11	E-11	ICT Communications (GPON)
12	E-12	Earthing System
13	E-13	Indoor Lighting Fixtures
14	E-14	Pad Mounted Units (PMU)
15	E-15	Oil Type Transformer
16	E-16	Power Factor Correction
17	E-17	Security System
18	E-18	List of Approved Manufacturers

SECTION E-1:
GENERAL ELECTRICAL REQUIREMENTS

1.0 FOREWORD:

This document is to describe the minimum requirements for the equipment and installations and to ensure that the Contractor is fully aware of his duties to perform the required works, in accordance with the terms of the Contract.

2.0 SCOPE OF WORK:

The works related to the electrical system which are included in the scope of this Contract are shown on the Drawings, stated in the Particular Specifications, Bill of Quantities and explained in these specifications. The works shall broadly include but not limited to the following:

1. Low Voltage Switch Boards / Distribution Boards (Section - E - 2)
2. Low Voltage Cable and Wires (Section – E - 3)
3. Conduits and Pipes (Section – E - 4)
4. Wiring Accessories (Section – E - 5)
5. Interior Lighting Fixtures (Section – E - 6)
6. Earthing System (Section – E - 7)
7. Cable Tray, Ladder and Trunking (Section – E - 8)
8. Lightning Protection System (Section – E - 9)
9. UPS (Section – E - 10)
10. Telecommunication Systems (Section – E - 11)
11. Close Circuit Television (CCTV) System (Section – E - 12)
12. Public Address and Voice Evacuation System (Section – E – 13)
13. Addressable Fire Alarm System (Section – E – 14)
14. Self-Contained Emergency Lights (Section – E – 15)
15. Diesel Generator (Section – E – 16)

All material and equipment supplied by the Contractor shall be new and, in all respects, conform to the high standards of Engineering design, workmanship, performance and function as here in specified and fully meet the quality level and rugged requirements of the specifications.

The Contractor shall also be responsible to supply any other equipment not specifically mentioned in these documents but which is necessary for proper operation of the works / system, shall be considered to have been so specified and accordingly shall be provided by the Contractor as part of the Contract.

The Contractor shall be solely responsible for ensuring proper functional requirements of various equipment and shall also be responsible for furnishing any additional piece of equipment and for making modification in the equipment as desired and / or approved by the Owner or his representative, to achieve proper coordination with various equipment offered in the bid and also those installed by others.

Approval of the Contractor's supplied equipment / installation works shall not relieve the Contractor of any of his obligations or liabilities under the Contract, except insofar as provided under the conditions of the Contract.

3.0 RULES AND REGULATIONS:

The entire electrical installation / work shall be carried out by licensed contractor, authorized to undertake such work under the provisions of Electricity Act 1910 and The Electricity Rules 1937 as adopted and modified up to date by the Government of Pakistan.

All works shall be carried out in accordance with the latest edition of the Regulations of the Electrical Equipment of Buildings issued by the Institute of Electrical Engineers - London, the Contract documents, the Electricity Rules 1937 and bye-laws that are in force from time to time. Any discrepancy between these specifications and any other rules and regulations shall be brought to the notice of Owner or his representative, and his decision shall be final and conclusive.

The Contractor shall be responsible for completing all formalities and submitting the test certificates as per prevailing rules and regulations and shall have the installation passed by the Government Electric Inspector of that region. All requirements of the Electric Inspector and the Electric Company shall be complied with.

4.0 STANDARDS:

The specification recommended practices, official standards and codes the non - restrictive list of which is given below:

- International Electro-technical Commission (IEC)
- British Standards (BS)
- National Electric Code (NEC)
- National Standards
- Local Electric / Utility Supply Company standards
- EN Standards for PAVA System
- NFPA 72
- EIA/TIA Standards for ICT System

In the event of conflict between standards, the most stringent shall prevail.

Whenever the electrical equipment to be installed, does not hold national standards, the Contractor shall take into account the specific standards chosen by the Owner and make sure that the equipment he has to install, meets these standards.

In addition, even if no mention is stipulated in this specification, it is implied that the equipment be tropicalized, if required, by the conditions of the site of installation.

In any case, the standards and codes to be taken into consideration are those in force at the date of delivery.

5.0 INSTALLATION AND SERVICE CONDITIONS:

5.1 Site Conditions:

All material and equipment supplied and installed shall be designed, manufactured and tested to meet the following ambient conditions unless specifically stated otherwise for any material / equipment:

a. Maximum outdoor ambient temperature : 45 degree C

b. Minimum Indoor ambient temperature : 0 degree C

c. Maximum relative humidity : 90 %

d. Minimum relative humidity : 26 %

5.2 Service Conditions:

Equipment shall be designed and built for continuous service with a minimum of supervision and maintenance.

6.0 DOCUMENTS TO BE SUBMITTED:

The contractor shall submit following documents at the time of biding or as per instruction of the Engineer:

1. Documents and certificate to be submitted for approval, including:
   - Information to be provided with the bid.
   - Document to be provided by the owner.
   - Documentation.
2. Warranty
3. Packing and delivery
4. Marking
5. Testing, including**:**
   - Type tests.
   - Routine Tests.
   - Special test.
6. Technical data sheet
7. Maintenance and operation manual
8. Training Program

- END OF SECTION -

SECTION E2 - ELECTRICAL IDENTIFICATION

1.0 SUMMARY

A. Electrical Identification Materials and Devices:

1. Identification for raceway and metal-clad / armored cable.
2. Identification for conductors and communication and control cable.
3. Underground-line warning tape.
4. Warning labels and signs.
5. Instruction signs.
6. Equipment identification labels.
7. Miscellaneous identification products.

2.0 QUALITY ASSURANCE`

A. Comply with ANSI A13.1 and ANSI C2.

3.0 PRODUCTS

A. Raceway and Metal-Clad Cable Identification: Adhesive labels, wraparound plastic sleeves, colored adhesive tape and underground-line warning tape.

B. Conductor and Cable Identification: Colored adhesive tape, marker tape, write-on tags and brass or aluminum tags.

C. Equipment Labels: Printed adhesive film, printed adhesive film with clear protective overlay, engraved plastic and stenciled legend.

D. Warning Signs: Baked enamel or metal backed butyrate.

E. Instruction Signs: Engraved, laminated acrylic or melamine plastic.

END OF SECTION

SECTION E3 - TESTING AND COMMISSIONING

1.0 DESCRIPTION OF WORK

Prior to acceptance, inspect, operate and test all electrical equipment, materials and components, whether such tests are detailed in this specification or not. Tests will be witnessed by THE CONSULTANT/ PROJECT MANAGER, to ensure that the operation of the systems and components satisfies the requirements of the Contract Documents.

Include any specific testing required by the Authorities, or any other body having jurisdiction over the installation, and as directed by THE CONSULTANT/ PROJECT MANAGER.

Provide all tools, equipment, labour and materials required to perform the electrical testing. Provide three copies of the test reports to THE CONSULTANT/ PROJECT MANAGER.

2.0 GENERAL

The testing and commissioning shall be carried out in accordance with contract requirements, by a firm specializing in this work, under no circumstances shall the Contractor be allowed to use his own staff or affiliated companies for the Capital plant such as switchboards, power factor correction equipment, fire alarm system, lighting control and dimming system, central emergency lighting system and lifts.

The contractor shall submit for approval, a detailed method statement for each testing and commissioning activity.

The contractor shall maintain written records of all tests.

Successful test records shall be counter signed by the consultant and bound into the operation and maintenance manual. upon completion of the testing and commissioning the contractor shall demonstrate to the consultant the following:

A. Voltage within correct tolerances in accordance with the contract documents.

B. Power factor and harmonics in accordance with the Contract Documents.

C. Earthing in accordance with the contract Documents.

D. Illumination levels in accordance with the Contract Documents.

E. Correct control of all plant.

F. Structured cabling of telephone and data communication system

G. Fire alarm system.

H. Correct functioning of all the specialist systems and their integration.

An audit inspection at factory before dispatch and at site after receipt of the switchgear for any manufacturing / transit defects.

3.0 PRECOMMISSIONING AND COMMISSIONING CHECKS

Pre-commissioning and Commissioning check sheets for the following shall be submitted for the CONSULTANT review:

A. DB / Final Light & Power Points

B. Specified Lighting Controls

C. Power And Control Cables

D. Fire Alarm System

E. Emergency Lighting System

F. Programmable lighting control system

Once the procedures are agreed up on, the Inspection and testing reports for the above systems shall be submitted for CONSULTANT review/approval.

The following inspections have to be carried out for any manufacturing defects/transit damages and inform the supplier immediately if found any defects.

4.0 TESTING AND COMMISSIONING

Upon completion of the installation the Contractor shall perform field tests on all equipment, material and systems all tests shall be conducted in the presence of the Consultant/client's Engineer for the purpose of demonstrating equipment or system compliance with specifications. The contractor shall submit test protocol for approval at least two weeks before conducting the test.

The Contractor shall furnish, install and maintain all tools, instruments, test equipment, material, connections, etc. and furnish all personnel including supervision and "Standby" labour required for the testing, setting and adjustment of all electrical facilities and their component parts, including putting the same into operation.

All tests shall be made with the proper regard for the protection of the equipment and the Contractor shall be responsible for adequate protection to all personnel during such tests.

The Contractor shall record all test values of the tests made by him on all equipment, giving both "as found" and "as left" conditions. Three (3) copies of all test result shall be given to the Engineer In charge for record purposes.

The witnessing of any test by the Engineer In charge does not relieve the Contractor of his guarantees for materials, equipment and workmanship as specified in the Conditions of Contract.

4.1 Insulation Resistance Tests

Insulation resistance tests shall be made on all electrical equipment, using a self-contained instrument such as the direct indicating ohm-meter of the generator type Direct current potentials shall be used in these tests and shall be as follows:

- Circuit under 230 volts – 500 volts test
- Circuit 230 volts to 400 volts – 1000 volts test

The minimum acceptable insulation resistance value will be 5 Mega ohms.

The test equipment for insulation testing will be furnished by Contractor.

Before making connections at the ends of each cable run, the insulation resistance test of each cable shall be made. Each conductor of a multicore cable shall be tested individually to each other conductor of the group and also to earth. If insulation resistance test readings are found to be less than the specified minimum in any conductor, the entire cable shall be replaced and the new cable shall installed/laid.

All switchgear shall be given an insulation resistance measurement test to ground after installation but before any wiring is energized Insulation tests shall be made between open contacts of circuit breakers, switches and between each phase and earth.

If the insulation resistance of the circuit under test is less than that specified above the cause of the low reading shall be determined and removed. Corrective measures shall include dry out procedure by means of heaters of equipment is found to contained measure. Where corrective measures have been necessary and the insulation resistance reading taken after the correction has been made it should satisfy the requirements specified herein. Repeated insulation resistance test shall be made twice and at least 12 hours apart. The maximum range for each reading on the 3 successive tests shall not exceed 12 hours apart and 20% of the average value. After all tests have been made successfully, the equipment shall be reconnected.

4.2 Earth Resistance Tests

Earth resistance tests shall be made by the Contractor on the earthing system, separating and reconnecting each earth connection as may be required by the Engineer In charge. If it is indicated that soil treatment or other corrective measures are required to lower the ground resistance values, the Engineer In charge will determine the extent of such corrective measures.

The electrical resistance of the ECC together with the resistance of the earthing lead measured from the connection with earth electrode to any other position in the completed installation shall not exceed one ohm.

Earth resistance test shall be performed as per Electrical Inspector's requirements. Where more than one earthing sets are installed, the earth resistance test between two sets shall be measured by means of Resistance Bridge Instrument. The earth resistance between two sets shall not exceed one ohm.

4.3 Operating Tests

Current load measurement shall be made on all electrical equipment.

The current reading shall be taken in each wire and in each neutral wire while the circuit or equipment is operating under actual load conditions Clip-on ammeters may be used to take current readings.

All light fittings shall be tested electrically and mechanically to check whether they comply with the standard of specifications. Light fittings shall be tested so that when functioning properly no flickering is observed or choke noise is heard.

After any equipment has been tested, checked for operation etc., and is accepted by the Project Engineer's representative the Contractor shall be responsible for the proper protection of such equipment for assurance that subsequent testing of other equipment of systems do not disturb the completed work.

4.4 Visual Inspections

Carry out Visual Inspections to verify that the Electrical equipment has been correctly installed in accordance with the design with correctly rated protection devices and bonding that no visible damage exists.

END OF SECTION

SECTION E4 – LV CONDUCTORS AND CABLES

1.0 SUMMARY

A. The scope of works include Main LV Feeders, building wires, cables, connectors, splices, and terminations for wiring systems rated 600/1000 V and less. Also include sleeves and sealing of all openings and sleeve for the cables.

2.0 CODES & STANDARDS

A. Latest editions and amendments of the below mentioned standards and codes:

- IEC 227 : Power and Lighting PVC insulated cable.
- IEC 228 : Conductors of insulated cables
- IEC 502 : Extruded solid dielectric insulated power cables for rated voltages from 1 kV up to 30 kV.
- IEC 331 : Fire resisting characteristics of electrical cables (where specified)
- IEC 332 : Tests on electric cables under fire conditions.
- IEC 811 : Common test methods for insulating and sheathing of electrical cable.
- IEC 287 : Calculation of the continuous current rating of cables.
- BS 4066 : Test on electric cables under fire conditions.
- BS 6346 : PVC insulated cables for electricity supply.
- BS 6004 : PVC insulated cables (non armoured) for electric power and lighting.
- BS 801 : Composition of lead and lead alloy sheaths of electric cables.
- EEMUA 133 : Underground cable protected against solvent penetration and corrosive attack.
- BS 5467 : XLPE insulated armoured cables for electrical supply.
- BS 6724 : XLPE insulated armoured Single Core PVC Insulated Copper Conductor sheathed cables.
- BS 7211 : Single Core PVC Insulated Copper Conductor non armoured cables / wires.

3.0 MATERIAL

A. Conductors and Cables:

1. Conductors: Copper (or Aluminium - only when specifically mentioned on drawings and BoQ).
2. Conductor Insulation:
   - Multi-core cables – XLPE
   - Single-core cables – XLPE (PVC – only when specifically mentioned on the drawings and BoQ).

- Single-core building wires up to 6 sq. mm - PVC

3. Single and Multi conductor Cable: Armoured/ Unarmoured cable, Type AC, Metal-clad cable, Type MC, Mineral-insulated, metal-sheathed cable, Type MI, Nonmetallic-sheathed cable, Type NM, Type SO and Type USE with ground wire.

B. Connectors and Splices: Factory fabricated.

C. Sleeves for Raceways and Cables:

1. Steel pipe sleeves.
2. Cast-iron pipe sleeves.
3. PVC and uPVC sleeves
4. Sleeves for rectangular openings.

D. Sleeve Seals: EPDM, NBR sealing elements, plastic, carbon-steel, stainless/steel pressure plates, and carbon, stainless/steel connecting bolts and nuts.

4.0 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper, Solid for 4.0 sq. mm and smaller; stranded for 6.0 sq. mm and larger.

B. Branch Circuits: Copper, Solid for 4.0 sq. mm and smaller; stranded for 6.0 sq. mm and larger.

5.0 CONDUCTOR AND INSULATION APPLICATIONS

A. Service Entrance: Single conductors in raceway, Mineral-insulated, metal-sheathed cable, multi-conductor cable in raceway.

B. Exposed Feeders: Single conductors in raceway, Unarmored cable, Metal-clad cable, Mineral-insulated, metal-sheathed cable, Nonmetallic-sheathed cable.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Single conductors in raceway, Unarmored cable, Metal-clad cable, Mineral-insulated, metal-sheathed cable, Nonmetallic-sheathed cable.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Single conductors in raceway, Underground feeder cable.

E. Feeders in Cable Tray: Single conductors in raceway, Armored/Unarmored cable, Metal-clad cable, Mineral-insulated, metal-sheathed cable, Nonmetallic-sheathed cable.

F. Exposed Branch Circuits, Including in Crawlspaces: Single conductors in raceway, Unarmored cable, Metal-clad cable, Mineral-insulated, metal-sheathed cable, Nonmetallic-sheathed cable

G. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Single conductors in raceway, Unarmored cable, Metal-clad cable, Mineral-insulated, metal-sheathed cable, Nonmetallic-sheathed cable.

H. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and underground: Single conductors in raceway, Underground branch-circuit cable.

I. Branch Circuits in Cable Tray: Single conductors in raceway, Unarmored cable, Metal-clad cable, Mineral-insulated, metal-sheathed cable.

J. Cord Drops and Portable Appliance Connections: Hard service cord with strain relief device at terminations to suit application.

K. Class 1 Control Circuits: In raceway.

L. Class 2 Control Circuits: In raceway, Power-limited cable, concealed in building finishes and in raceway/cable tray.

6.0 FIELD QUALITY CONTROL

A. Testing: Contractor is responsible to perform all testing as per applicable standards, mentioned in Testing and Commissioning or required by the Engineer or utility company (K-Electric).

END OF SECTION

SECTION E5 – CONDUITS AND PIPES

1.0 SUMMARY

A. The extent of works shown on the drawing does not indicate the exact position of conduit and pipes. The Contractor shall ensure exact location and route of conduit and pipes in coordination with other services drawings, as per site requirements and as directed by the Engineer.

B. The quality and material for the accessories of conduits and pipes such as sockets, elbows, bushings, bends, inspection / pull boxes, round boxes, etc., necessary for the completion shall be similar to that of conduit or pipes. All the accessories shall be supplied by the Contractor without any extra cost and deemed to have been included in the price of conduits / pipes.

2.0 CODES & STANDARDS

A. Pipes and Conduits shall comply with following codes and standards:

- BS 31 Steel Conduit and accessories
- BS 1378 Galvanized Iron Pipes and accessories.
- BS 3595 PVC Pipes and accessories.
- BS 4607 PVC Conduits and accessories.
- Any other standard referred to in above standards or Contract Documents.

END OF SECTION

SECTION E6 – MEDIUM VOLTAGE SWITCHGEAR

1.0 SUMMARY

A. Metal-enclosed, metal-clad, Medium Voltage (MV) switchgear with circuit-breakers, disconnector switches, earth switches, protection relays, instrument transformers, measuring instruments and all other components as per various parts of IEC 62271 and other applicable standards, K-Electric requirements and as shown on the drawings.

2.0 APPLICABLE STANDARDS

A. The MV switchgear and its components shall fully comply with all applicable National and International standards as well as the requirements of the utility company (K-Electric). The list of standards mentioned below is for reference only and the Contractor is responsible to comply with all applicable standards whether included below or not. The associated verifications must be submitted with the offer.

B. The manufacturer of MV switchgear has to run and furnish evidence of a certified quality management system according to EN/ISO 9001 and a certified environmental management system according to EN/ISO 14001.

C. The MV switchgear shall comply with the following standards:

Component	IEC / EN standard	VDE standard
Switchgear	62271 62271-101 62271-200 62271-304	0671-1 0671-200 0671-304
Switching devices	62271-100 62271-102 62271-103 62271-105	0671-100 0671-102 0671-103 0671-105
Voltage detecting System	62271-213 62271-206	0671-213 (Draft)
HV HRC fuses	60282 60787	0670-4 0670-402
Surge arresters	60099	0675
Degree of protection	60529 62262	0470-1 0470-100
Insulation	60071	0111

Instrument transformers	61869-1 61869-2 61869-3	0414-9-1 0414-9-2 0414-9-3
Installation	61936-1	0101
Operation	EN 50110	0105-100

3.0 MANUFACTURED UNITS

A. System Parameters:

1. Rated voltage Ur: 17.5 kV, 3-phase
2. Nominal Operating voltage UB: 11 kV, 3-phase
3. Rated frequency fr: 50 Hz
4. Rated short-duration power-frequency withstand voltage Ud: 38 kV
5. Rated lightning impulse withstand voltage Up: 95 kV
6. Rated short-time withstand current Ik: 25 kA
7. Rated continuous current of the bus-bars Ir: 630 A
8. Rated continuous current of Ring-main Dis-connector Switches Ir: 630 A
9. Rated continuous current of Vacuum Circuit Breakers Ir: 630 A
10. Rated continuous current of Transformer feeders (if required) Ir: Depends on HV HRC fuse link
11. Selectable auxiliary and control voltages: 24/48/60/110/220 V DC, 110/230 V AC

B. Metal-Enclosed Interrupter Switchgear:

1. Arc resistant, Internal arc classification: IAC A FLR 21 kA/1 s.
2. Main-Bus Continuous Rating: 630A.
3. Interrupter Switches, Duty-Cycle, Fault Closing: 25 kA asymmetrical.
4. Mechanical interlock to prevent opening door unless switchblades are open.
5. Window to permit viewing switchblade position.
6. Power fuses.

C. Metal-Clad, MV Circuit Breaker Switchgear:

1. 3-pole Vacuum Circuit Breakers (VCB), fully withdrawable (Provide SF6 type circuit breakers when specifically shown on drawings or mentioned in BoQ).
2. The MV Circuit Breakers shall be designed as a three-position switch for "CLOSED" - "OPEN" - "EARTHED", according to IEC 62271-100.
3. Mechanical interlocks to move the shutters before the draw-out and draw-in operations of circuit breaker.
4. Possible to operate and lock individually the shutter plates in both closed and opened positions.
5. Independent manual operation of shutters shall be possible.

6. Provide Interlocking device such that the MV circuit breaker can be closed only when it is in fully plugged-in or fully withdrawn position. Withdrawal of circuit breaker shall only be possible in the open or isolated position.
7. Voltage monitoring / indicators
8. Provide MV Circuit breaker as Cable feeder with make-proof earthing switch when shown on the drawings or mentioned in the BoQ.
9. Each circuit breaker shall have a device to register the number of closing operations.
10. MV circuit breakers shall be provided with ON-OFF push buttons fitted with hinged covers to prevent accidental operation
11. Provide Earth switch with all accessories with each MV circuit breaker.
12. Provide suitably rated long life low burden LED type indication lamps to indicate the status of each circuit breaker and earth switch as follows:
    a. Green lamp: Circuit breaker “OFF”.
    b. Red lamp: Circuit breaker “ON”.
    c. Yellow Lamp: Circuit breaker “TRIPPED”.
    d. Orange Lamp: Earth Switch “ON”.
13. Provide required number of 10 Amps, 230V AC normally closed and normally open potential free auxiliary contacts for various functions with sufficient spare contacts in each MV circuit breaker.
14. A test position to facilitate testing operation of MV circuit breakers manually and by protective relays. Test sockets with plugs shall be provided for testing the relays.
15. Provide a three position, trip/normal/close switch for local tripping and closing of each MV circuit breaker.
16. Each MV circuit breakers complete with necessary secondary control wiring using ferrules to indicate the circuit. Protection MCBs shall also be provided for all control circuits
17. MV Circuit breakers shall have automatic discharging of spring charged mechanism while withdrawing or inserting the circuit breaker in the compartment.
18. Arc resistant.
19. Main-Bus Continuous Rating: 630 A.
20. Designed to operate within three cycles of trip initiation
21. Operating Mechanism Control Power: 48 V dc for closing and tripping.
22. Operating Mechanism Control Power: 120 or 240 V AC for closing and tripping.
23. Test accessories.
24. Low DC voltage alarm.
25. Grounding and testing device system.
26. Circuit-breaker test cabinet.
27. Smart control, suitable for remote tripping device.
28. Test accessories.
29. Low DC voltage alarm.

30. Grounding and testing device system.
31. Circuit-breaker test cabinet.

D. Indoor Enclosure: Steel.

E. Outdoor Enclosure: Galvanized steel.

F. Components:

The MV switchgear shall be provided with all required components and accessories including protections and instruments as per these specifications, applicable standards as well as in accordance with the requirements of utility company (K-Electric). Details of major components are given below:

1. Main Bus: Copper, tin plated
2. Ground bus.
3. Bus insulation.
4. Suitably rated, high quality instrument transformers (CTs and PTs) as required for the satisfactory operation of the MV switchgear
5. Exchangeable ring-core type Current Transformers (CTs) with 5A secondary, suitable burden and 5P20 accuracy for protection and 1.0 for measuring circuits with security factor 5.
6. Dry type cast encapsulated epoxy resin Potential transformers (PTs) with primary and secondary voltage as per the system characteristics and accuracy class 1.0.
7. Inverse Definite Minimum Time (IDMT) directional or non-directional over-current relays for phase and earth fault protection and differential protection relays. The relays shall preferably be triple pole type and have positive action without chatter.
8. Multifunction digital metering monitor.
9. All required Voltmeters, Ammeters, kWh and kVARh meters suitable for 3-phase, 3-wire, 50 Hz, balanced and un-balanced loads. All meters and instruments shall be flush mounted
10. Digital Voltmeters with selector switches to measure phase-to-phase and phase-to-neutral voltages.
11. Other protective and auxiliary relays.
12. Surge arresters.
13. Provision for future devices.
14. Fungus proofing.
15. Control Power Supply
16. DC battery with charger
17. Control wiring.
18. Rubber insulation mat 600 mm wide and covering full length of the MV switchgear rated for 17.5 kV.
19. Rubber gloves, Voltage indicating stick, etc.

4.0 SOURCE QUALITY CONTROL

A. Circuit Breakers: Type tested according to IEC.

B. Switchgear Assembly: Type tested according to IEC.

5.0 FIELD QUALITY CONTROL

A. Testing: As per IEE regulations and IEC standards by Contractor.

END OF SECTION

SECTION E7 – RING MAIN UNITS (RMU)

1.0 MAIN FEATURES

A. The Ring Main Units (RMUs) shall have the following design features:

1. The RMU shall be a factory-assembled, type-tested, 3-pole metal-enclosed, medium voltage RMU according to IEC 62271 various parts.
2.
   2.1 RMU-A: The RMU shall have 2 nos. 3-pole, MV Load Break Switches (LBS) or Disconnecting Isolators as incoming ring-main panels and one or two 3-pole, MV Vacuum type Circuit Breakers (VCB) as outgoing as shown on the drawings and BoQ (Provide SF6 type circuit breakers when specifically shown on drawings or mentioned in the BoQ).
   2.2 RMU-B: The RMU shall have 4 nos. 3-pole, MV Vacuum type Circuit Breakers (VCB) as incoming ring-main panels and two 3-pole, MV Vacuum type Circuit Breakers (VCB) as outgoing as shown on the drawings and BoQ (Provide SF6 type circuit breakers when specifically shown on drawings or mentioned in the BoQ).
3. Earthing Switches
4. The medium-voltage part must be maintenance-free for the guaranteed life time
5. Internal arc tested design having Internal Arc Classification of IAC A FLR
6. Suitable for outdoor duty and weatherproof from environmental influences
7. Metal enclosure, hermetic panel by panel
8. Sealed primary enclosure
9. All switching devices are operated at the panel front
10. The Vacuum circuit breakers shall be with the possibility of remote control
11. Use of ring-core current transformers outside the enclosure (free of dielectric stress)
12. Voltage transformers in metal-coated and plug-in design
13. Operating mechanisms for switching devices shall be located outside the high-voltage compartments
14. Must provide maximum reliability and personal safety
15. Capacitive voltage taps (capacitive voltage dividers) in the bushing to the cable feeder shall enable the verification of safe isolation from supply at the panel front without danger. The degree of protection of the switchgear must not be reduced thereby
16. The complete RMU has to be designed according to the IEC standards and shall meet all the stipulated requirements of the local power supply company (K-Electric)
17. The RMU shall be prepared for smart control and protection system. All signals, switch positions, current and voltage values have to be wired to a terminal strip, or connected to the control and protection system via the multifunction protection relay

with RS485 interface and/or Ethernet interface.

18. The incoming and outgoing cable connections of the 3 phases for MV circuit breakers or Disconnector switches shall be arranged at the same level, horizontally side-by-side, and be easily accessible from the front.
19. The RMU panels have to be equipped with cable fixing brackets adjustable in height and depth, e.g. made of C-profiles.
20. Partition class: PM
21. Loss of service continuity category shall be as under:
    a. Feeder panels with HV HRC fuses: LSC 2
    b. Feeder panels without HV HRC fuses: LSC 2
    c. Panels without isolating distance: LSC 1

2.0 SUSTAINABILITY REQUIREMENTS

A. The MV Ring Main Units shall comply with all the sustainability requirements with high quality products as per applicable standards and the details given below:

1. All materials used in the manufacture and installation of MV ring main units shall be of high quality and of proven suitability for the functions they will perform and the conditions they will meet in service
2. Compact design with efficient use of space
3. Highest supply security due to maintenance free equipment design
4. Ensuring personal safety through encapsulation, earthing, interlocking, etc.
5. Service life of at least 30 years
6. Possibility of proper and environmentally friendly disposal
7. Environmental product declaration according to ISO 14021, based on a full-scale lifecycle assessment (LCA) study according to ISO 14040/44.

3.0 APPLICABLE STANDARDS

A. The RMUs and the associated components shall fully comply with all applicable National and International standards as well as the requirements of the utility company (K-Electric). The list of standards mentioned below is for reference only and the Contractor is responsible to comply with all applicable standards whether included below or not. The associated verifications must be submitted with the offer.

B. The RMU manufacturer has to run and furnish evidence of a certified quality management system according to EN/ISO 9001 and a certified environmental management system according to EN/ISO 14001.

Component	**IEC / EN standard**	**VDE standard**

Switchgear	62271 62271-101 62271-200 62271-304	0671-1 0671-200 0671-304
Switching devices	62271-100 62271-102 62271-103 62271-105	0671-100 0671-102 0671-103 0671-105
Voltage detecting System	62271-213 62271-206	0671-213 (Draft)
HV HRC fuses	60282 60787	0670-4 0670-402
Surge arresters	60099	0675
Degree of protection	60529 62262	0470-1 0470-100
Insulation	60071	0111
Instrument transformers	61869-1 61869-2 61869-3	0414-9-1 0414-9-2 0414-9-3
Installation	61936-1	0101
Operation	EN 50110	0105-100

4.0 TECHNICAL DATA

A. The RMU must at least meet the following technical data:

1. Rated voltage Ur: 17.5 kV, 3-phase
2. Nominal Operating voltage UB: 11 kV, 3-phase
3. Rated frequency fr: 50 Hz
4. Rated short-duration power-frequency withstand voltage Ud: 38 kV
5. Rated lightning impulse withstand voltage Up: 95 kV
6. Rated short-time withstand current Ik: 21 kA

7. Rated continuous current of the bus-bars Ir: 630 A
8. Rated continuous current of Ring-main Dis-connector Switches Ir: 630 A
9. Rated continuous current of Vacuum Circuit Breakers Ir: 630 A
10. Rated continuous current of Transformer feeders (if required) Ir: Depends on HV HRC fuse link
11. Internal arc classification: IAC A FLR 21 kA/1 s
12. Color: RAL 7035 (light gray or as approved by the Engineer)
13. Ambient air temperature: 50°C
14. Type of installation: Pad mounted
15. Selectable auxiliary and control voltages: 24/48/60/110/220 V DC, 110/230 V AC

B. If the offer is based on another type than stipulated, the "technical inquiries" must be completely filled in upon submission of the offer in order to evaluate the equivalency of the offered make.

5.0 MV CIRCUIT BREAKERS

A. The MV Circuit Breakers must fulfill the following technical requirements as a minimum:

1. 3-pole Vacuum Circuit Breakers (VCB), fully withdrawable (Provide SF6 type circuit breakers when specifically shown on drawings or mentioned in BoQ).
2. The MV Circuit Breakers shall be designed as a three-position switch for "CLOSED" - "OPEN" - "EARTHED", according to IEC 62271-100.
3. Mechanical interlocks to move the shutters before the draw-out and draw-in operations of circuit breaker.
4. Possible to operate and lock individually the shutter plates in both closed and opened positions.
5. Independent manual operation of shutters shall be possible.
6. Provide Interlocking device such that the MV circuit breaker can be closed only when it is in fully plugged-in or fully withdrawn position. Withdrawal of circuit breaker shall only be possible in the open or isolated position.
7. Voltage monitoring / indicators
8. Provide MV Circuit breaker as Cable feeder with make-proof earthing switch when shown on the drawings or mentioned in the BoQ.
9. Each circuit breaker shall have a device to register the number of closing operations.
10. MV circuit breakers shall be provided with ON-OFF push buttons fitted with hinged covers to prevent accidental operation
11. Provide Earth switch with all accessories with each MV circuit breaker.
12. Provide suitably rated long life low burden LED type indication lamps to indicate the status of each circuit breaker and earth switch as follows:
    a. Green lamp: Circuit breaker “OFF”.

b. Red lamp: Circuit breaker “ON”.

c. Yellow Lamp: Circuit breaker “TRIPPED”.

d. Orange Lamp: Earth Switch “ON”.

13. Provide required number of 10 Amps, 230V AC normally closed and normally open potential free auxiliary contacts for various functions with sufficient spare contacts in each MV circuit breaker.

14. A test position to facilitate testing operation of MV circuit breakers manually and by protective relays. Test sockets with plugs shall be provided for testing the relays.

15. Provide a three position, trip/normal/close switch for local tripping and closing of each MV circuit breaker.

16. Each MV circuit breakers complete with necessary secondary control wiring using ferrules to indicate the circuit. Protection MCBs shall also be provided for all control circuits

17. MV Circuit breakers shall have automatic discharging of spring charged mechanism while withdrawing or inserting the circuit breaker in the compartment.

6.0 INSTRUMENT TRANSFORMERS, PROTECTION AND MEASUREMENTS

A. The RMUs shall be provided with all required protections and instruments as per these specification, applicable standards as well as in accordance with the requirements of utility company (K-Electric). It shall meet following minimum requirements:

1. Provide suitably rated, high quality instrument transformers (CTs and PTs) as required for the satisfactory operation of the MV switchgear and in accordance with applicable IEC standards and K-Electric requirements.

2. Provide exchangeable ring-core type Current Transformers (CTs) with 5A secondary, suitable burden and 5P20 accuracy for protection and 1.0 for measuring circuits with security factor 5.

3. Provide dry type cast encapsulated epoxy resin Potential transformers (PTs) with primary and secondary voltage as per the system characteristics and accuracy class 1.0.

4. Each MV circuit breaker shall be provided with Inverse Definite Minimum Time (IDMT) directional or non-directional over-current relays for phase and earth fault protection and differential protection relays.

5. The relays shall preferably be triple pole type and have positive action without chatter.

6. Provide all required Voltmeters, Ammeters, kWh and kVARh meters suitable for 3-phase, 3-wire, 50 Hz, balanced and un-balanced loads. All meters and instruments shall be flush mounted.

END OF SECTION

SECTION E8 - SUB-STATION

1.0 SCOPE OF WORK

A. The works related to the electrical system, which are included in the scope of this Contract, are shown on the Drawings, stated in these specifications. The works shall broadly include but not limited to the following:

- MV Switchgear
- Oil Type Power Transformers
- Power Cables
- LV Switchgear

B. The Contractor shall also be responsible to supply any other equipment not specifically mentioned in these documents but which is necessary for proper operation of the works / system, shall be considered to have been so specified and accordingly shall be provided by the Contractor as part of the Contract.

C. The Contractor shall be solely responsible for ensuring proper functional requirements of various equipment and shall also be responsible for furnishing any additional piece of equipment and for making modification in the equipment as desired and / or approved by the Manager Contract or his representative, to achieve proper coordination with various equipment offered in the bid and also those installed by others.

D. Approval of the Contractor's supplied equipment / installation works shall not relieve the Contractor of any of his obligations or liabilities under the Contract, except insofar as provided under the conditions of the Contract.

2.0 MV SWITCHGEAR

2.1- Material Specifications

A. The MV switchboard shall be sheet steel fabricated, cubicle type, totally enclosed, dust tight and vermin proof to IP 4X classification. It shall be floor mounting, free standing of 3mm sheet steel, de-rusted, degreased, primed with two coats of zinc-chromate and painted with two coats of enamel. It shall be of draw-out trolley design and have anti-condensate heaters thermostatically controlled in each cubicle. Provision for manual operation of the heater shall be provided. The switchboard shall be one panel incoming / outgoing with cable box for termination of both incoming and outgoing cables.

B. The circuit breakers shall be triple pole, withdraw able, vacuum type. They shall have manually operated drive mechanism. For manual operation a handle shall be provided. Interlocking device shall be provided such that the breaker can be closed only when it is in fully plugged in or fully withdrawn position, and withdrawal of circuit breaker is only possible in the open or isolated position, Safety shutters shall be provided to automatically cover the live contacts as the circuit breaker is withdrawn. A triple pole grounding switch shall be provided for cable and bus bars earthing. The circuit breakers shall be provided with ON-OFF push buttons. Luminous indications shall be provided for 'ON, 'OFF' 'TRIPPED' positions.

C. The circuit breaker shall have anti pumping capabilities to prevent immediate closing of breaker after opening due to any reason.

D. Each 11 KV circuit breaker shall comply with IEC 56 and shall comprise of the following accessories and meet the following requirements.

1.	Rated current	:	630A or as shown in drawing
2.	Rated nominal voltage	:	11 KV
3.	Rated maximum voltage	:	12 KV
4.	Withstand voltage	:	27 KV for 1 minute.
5.	Rated short circuit capacity	:	350 MVA at 11 KV for one second.
6.	High tension CTs class	:	0.5 for metering and protection of appropriate ratings to IEC 185
7.	High tension PTs class	:	0.5 rating 11 KV/1 110V to IEC/86
8.	kWh meter class	:	1.0 with maximum demand indicator.

9. High conductivity electrolytic copper tin plated bus bars completely isolated and mechanically braced to withstand stresses under fault conditions and colour coded to BS 3245.
10. KVARh meter.
11. Protective relays for over current protection
12. Protective relay for earth fault protection.
13. Ammeters
14. Voltmeter
15. Voltmeter selector switch
16. Indicating lamps
17. Cable box of appropriate size for termination of both incoming and outgoing cables.
18. Buchholz / temperature alarm/trip circuits with alarm hooter.
19. Earth bar

E. Insulation mat shall be placed in front of the MV Panels all along the length. It shall be 200mm wide and 6mm thick and suitable for providing insulation for 11 KV working.

F. Danger Boards / Signs and Shock / First Aid charts shall be provided as per the requirements of the local Electricity Rules.

G. Contractor shall be responsible to ensure the size of cubicle can be accommodated as per site conditions, with adequate clearances available for physical inspection of the panel from all sides.

H. The design of panel should be such that it does not create any objection / hindrance in getting NOC / Approval from the electrical inspector.

2.2- Installation

A. The contractor shall provide all labor and materials, tools and equipment required to install, connection, test and commission the switchgear. All installation materials such as foundation bolts leveling, clamps, cable sockets, lugs, solder, wall plugs, steel raw bolts, washer units etc, are to be supplied by the Contractor.

B. Manufacturer's recommendations for installations are to be followed and therefore the shop drawings are to be approved by the Engineer before installation. The contractor shall work out in advance the position of holes, channels. For any departure from the working drawing that are deemed necessary by the Contractor due to the site condition, he shall submit the details of such departure and obtain the Engineer's instructions in writing before starting such work.

2.3- Testing and Commissioning

A. Upon complete installation of the switchgear in its position the Contractor shall perform tests, in the presence of the Engineer, to show the effectiveness and correctness of its components. The Contractor shall provide all labor, materials, equipment, instruments and power needed to perform the test required.

B. The complete assembled panels shall be checked for proper clearance, alignment fitness of all joints and earthing system. All protective relay functions shall be checked by means of primary injection tests and functional tests shall be carried out for protective alarm and interlock functions. The Contractor shall record all test values obtained during the tests on the switchgear. Triplicate copies of such test data shall be submitted by the Engineer.

3.0 OIL TYPE POWER TRANSFORMERS

3.1- Material Specifications

A. The capacity of oil type power transformers shall be as shown on the drawings and mentioned in the BOQ. The transformers shall be oil-immersed type naturally cooled 3-phase indoor type to BS 171 / IEC 76 specifications in all respects.

B. The oil type power transformers shall at least meet the following specifications.

1.	Type	:	ONAN
2.	Voltage ratio at no-load	:	11000 / 415 Volts
3.	Frequency	:	50 Hz
4.	Vector Group	:	DYn 11
5.	Off load tap changer (HT)	:	0, $\pm$2.5%, $\pm$5%
6.	HT connection	:	11 KV Delta
7.	LT connection	:	415 V with grounded star point
8.	Neutral on LT side	:	Solidly earthed
9.	Ambient temperature	:	50 °C
10.	Temperature rise of oil	:	40 °C over ambient temperature
11.	Temperature rises of winding	:	50 °C over ambient temperature
12.	Impedance voltage	:	4.5% to 6%
13.	Rated max. voltage HT/LT	:	15 KV / 0.6 kV
14.	Voltage regulation	:	Not to exceed 2.5% of no-load operating condition at 0.85 P.F. secondary voltage.

C. The oil type power transformers shall be provided with the following accessories.

1. Double float Buchholz relay for alarm and tripping with testing facility.

2. Oil conservator.
3. Silica gel breather, with oil bath
4. Lifting Jugs
5. Bi-directional rollers.
6. Pressure release safety valve.
7. Oil filling valve
8. Oil drain valve
9. Earth terminal
10. Dial level gauge
11. Dial type thermometer with maximum temperature indicator pointer and tripping facility.
12. Diagram and name plate
13. Pressure Release safety valve
14. Off-load tap changer fitted with position indicator and pad-locking arrangement.
15. HT porcelain bushings with protective spark gaps.
16. LT and neutral porcelain bushings.
17. Cable Termination Box on LT and HT side
18. Marshalling box

D. The transformer tank shall be constructed of welded boiler plates and provided with external radiating tubes. The steel cover plate shall be bolted to the tank using gasket for perfect oil seal. The tank shall be anticorrosive painted and finished in grey colour.

E. The transformer core shall be built of non-aging, cold rolled, electrical silicon steel lamination and each lamination insulated to reduce eddy current losses. The core laminations shall be clamped and bolted effectively to reduce humming. The winding, coils shall be of high grade electrolytic copper conductor, flat or round, paper insulated thoroughly dried and impregnated as required.

F. The filling of oil shall be carried out at such a temperature that the pressure in the tank is at a minimum. The space above the oil shall be evacuated and filled with dry clean nitrogen. The pressure of nitrogen inside the top cover shall not exceed 0.35 kg/sq.cm.

G. Tank and terminal box joints shall be fitted with gaskets to prevent entry of water. Gaskets shall be of a suitable non-absorbent material. Joint faces shall fit properly and no additional thickness or jointing shall be used to make good irregularities.

H. The top cover shall have a substantial flange and adequate number of bolts fixing the cover to a similar substantial flange on the transformer tank. The gasket provided at this joint shall be of synthetic rubber bonded cork. Conservator tank shall be provided with Silica gel breather to allow for expansion of oil.

3.2- Transformer Installation

A. Transformers shall be installed at location shown on the drawings. It is responsibility of the Contractor to check the provisions in civil works, related to transformer installation.

B. The installation of the transformer shall be carried out in accordance with specifications and the manufacturer's recommendations. The accessories shall be assembled, installed and connected in place so as to form a complete transformer assembly. The transformers roller wheels shall be locked after placing it in position so that the wheels do not move on the channel due to vibrations.

C. The HV cable connections shall be made on the HV terminal, provided on the transformer, by the Contractor as per manufacturer's recommendations. The cable compound and all other jointing / termination materials shall be provided by the Contractor without any additional cost. The neutral on the LV side shall be effectively connected to earth.

D. The control wires for Buchholz relay connections to alarm and trip contacts of the HT circuit breaker as distribution stations shall be installed in a heavy gauge steel conduit with transformer station and also it shall be run along the cable trench.

3.3- Testing and Commissioning

A. The contractor shall submit a detailed list of manufacturers recommended tests along with test procedures and intended results, for approval by the Consultant. Any additional test recommended by the Consultant shall be made part of the list of tests to be carried out on the transformers. The manufacturers recommend test list shall be submitted at least 2 weeks prior to the planned testing activities.

B. Testing of the transformer shall be carried out at the manufacturer's facility as well as at the client substation. All test procedures shall comply with the manufacturer's specified procedures and as per IEC standards. All testing procedures shall be carried out in the presence of the Consultant / Client. All expenses for witnessing the test procedures shall be deemed to have been included in the quoted prices. The quoted prices shall be inclusive of transportation of the transformer to and from the manufacturer's / approved testing agent's facility.

C. In case any test fails to comply with standards, manufacturers recommendations, the cause of failure shall be determined and removed. The equipment shall then be retested for compliance. Any material (transformer oil, silica gel etc.) found to be inadequate or failing the required test procedures shall be replaced within the cost quoted

D. Upon complete installation of the transformer in its position, a thorough check shall be made for the proper fixing of accessories, protective relays, neutral connection, oil quality and level etc. The transformer shall be tested before energizing as per the Engineer's instruction. The transformer will be commissioned in the presence of the Engineer to satisfy its complete effectiveness and compliance with specifications. After installation, all tests as recommended by the manufacturer including connectivity of control equipment shall be carried out. In addition, the following shall be adjusted prior and subsequent to connection with the load;

3.4- Transformer Tapping

A. Transformer tapping shall be adjusted for no load and full load operation providing the desired output at any tapping. Adequate protection shall be ensured to prevent risk of damage from short circuits and having all contact surfaces of ample area for satisfactory operation during overloads.

B. The mechanism shall be manually operated and shall come to rest only when the switch is making full contact. At all times, clear indication shall be given of the ratio at which the transformer is operating. Means shall be provided for locking the tapping switch mechanism in the position corresponding to each voltage ratio.

C. All test values obtained during the test on the transformer shall be recorded. Triplicate copies of all such test datasheet (for both passed and failed tests) shall be submitted to the Engineer for necessary approval.

4.0 POWER CABLES

4.1- Material Specifications

A. The MV Cable shall be XLPE insulated, 15 KV grade to IEC 502. The Conductors shall be of high conductivity stranded electrolytic copper. The insulation shall be cross-linked polyethylene extruded over the conductor. Each core shall be shielded by a semi-conducting material applied directly over the insulation. The semi-conducting material shall be covered by bare copper tape applied with suitable overlapping. Phase identification tape of red, yellow and blue shall be wrapped over the copper shield. The three insulated conductors shall be assembled with PVC filler and bound with tape. The tape binder shall then be covered with extruded PVC jacket. The PVC jacket shall be padded with a suitable material before application of armour. Armouring shall be provided with single layer of galvanized steel wire. The armouring shall be covered with binder tape. The armour shall be of appropriate size to carry the system fault current.

B. The entire cable assembly shall be covered with a PVC jacket of thickness not less than 2.5mm. The size of cable and voltage grade shall be given on the over-sheath at every 3 metres interval.

C. System voltage and rated voltage shall be 15 KV (phase to phase). Continuous operating temperature of conductor shall be 90 degrees C.

D. Cable terminator kits shall be used for termination of HT cables as per manufacturer's recommendations. Cable joints where required are to be as per IEC/BS standards. Cable termination kits and cable joints are deemed to be included in the contractor's price.

4.2- Cables Installation - Laid Direct in Ground

A. Cables of 1,000 volts grade and up to 15,000 volts grad laid direct in the ground shall be at a minimum depth of 800 mm measured from the top of the cables to the general ground level. For this purpose a trench shall be excavated, cleaned and the floor of the trench shall be covered with a minimum of 100 mm of clean sand or sifted soil before laying the cable.

B. After laying the cables they shall be covered with additional clean sand or sifted soil, well punned over and around the cables to a level of 100 mm above the uppermost cable. Protective cable tiles shall be carefully placed over each cable. As per requirements of site conditions the buried depth may be changed with due approval of the Engineer.

C. In addition to the protective cable tiles all cables buried direct shall be marked throughout their length by polyethylene cable warning tape colored yellow. Such tape shall be laid 300 mm above the cable tiles during the backfilling of the trenches and where required two or more tapes shall be laid side by side to ensure full width cover.

D. The warning tapes shall read "Danger – 400 volts or Danger – 11,000 volts" as the case may be.

5.0 LV SWITCHGEAR

5.1- Material Specifications

A. Main, Sub-main Distribution Boards and DBs shall be of the totally enclosed type, dust proof, damp proof and be suitable for floor/surface/flush mounting, and comply with IEC 157, IEC 158, IEC 439, BS 4752.

B. They shall be suitable for 400/230 volts 3 phase, 4 wires, 50 Hz system and shall have all components rated for insulation class 600 volts minimum.

C. All main, sub main and MCB distribution boards shall be factory assembled. Main and Sub-main distribution boards shall be fabricated with 14SWG and MCB DBs with 16 SWG sheet steel, de-rusted, degreased, primed with two base coats of anti-corrosive paint and painted with two coats of heavy enamel paint in approved colour or powder coated. Indoor distribution boards shall have enclosures of IP-54 grade. Where powder coated switchboards have been specified, all metal work of the distribution board shall be cleaned down to bare shining metal, phosphate and the surfaces chemically prepared for powder coating. Then these shall be coated with powder of colour RAL 7032 and then baked in oven. The thickness of powder coating shall not be less than 120 microns. Indoor distribution boards shall have enclosures of IP-42 grade.

D. All distribution boards shall be complete with adequately rated electrolytic tinned copper phase, neutral and earth bus bars and be complete with incoming and outgoing cable terminations arrangement, terminal block/line up terminals and shall be suitable for flush mounting of all instruments. The cabling inside the panels shall be suitably numbered and harnessed by means of straps or cords.

E. All components shall be installed on mounting brackets inside the enclosure and protected from the front with, screwed sheet steel safety plate. The enclosure shall be provided with rubber gasketting and a lockable hinged door with cam fastener. All distribution boards shall be front access type.

F. The front side of the distribution boards shall be provided with a name plate designating the board. The inside of the door shall have a chart clearly indicating the circuits with their designations. The door is to be grounded by flexible copper cable. This also applies to the common and front plate.

G. Suitably rated CTs shall be provided as required CTs shall be of class 0.5 for metering and 1.5 for protection.

H. Miniature circuit breakers (MCBs) and moulded case circuit breakers (MCCBs) shall be of the moulded pattern and their switching levers shall be such that they are accessible through the safety plate for operation. The short circuit rating of the circuit breakers shall be as indicated on the drawing. They shall comply with IEC Standards 947-2 and 898.

I. Load Break Switches and contractors shall be of AC3 type for motor loads. Air circuit breakers above 630A shall be housed in separate cubicles. Aluminum plate shall be provided for cable entry to ACBs / MCCBs cubicles of 630A and above rating.

J. Outdoor feeder pillar shall be housed in weather proof sheet steel cabinets to 1P54 grade fabricated with 14 SWG sheet steel, de-rusted, degreased, rust-proofed with two coats of anticorrosive paint or powder coated. They shall be floor mounted on concrete bases of required dimensions.

K. All components of feeder pillars shall be on mounting brackets inside the enclosure. They shall be equipped with adequately rated electrolytic copper

phase, neutral and earth bus bars and be complete with cable terminations arrangement, terminal block/line up terminals.

5.2- Power Factor Improvement Plant

A. The power factor improvement plant shall be used for improving the power factor of the system. The plant shall have automatic as well as manual operation capability.

B. The power factor improvement plant shall be aligned with main LT switch board and it shall be a part of that LT switchboard as shown on the drawing. The capacitors shall be suitable for three phases, 415 volts, 50 Hz system and shall be self-cooled, designed for indoor use in tropical climate for maximum ambient temperature of 45 degrees centigrade and relative humidity 90%. The capacitors shall be in the form of banks divided for 12, 8, 6 and 4 stages. Each capacitor bank unit shall be either 50 KVAR or 25 KVAR. The total KVAR capacity shall be as indicated on the drawings. Each capacitor unit shall be complete with discharge resistors and internal fuses and shall be connected with control panel with proper size of single core PVC insulated cables.

C. The panels shall be supplied complete with a set of 3-phase, full capacity, isolated tinned copper bus bars, interconnections, risers, designation labels, cable sockets, holding down bolts, wiring with cleats and ferrules, earthing sockets and studs, etc. Each control panel shall comprise:

1. 1 No. Multi stage power factor correction relay for automatic/manual control.
2. 1 No. 3-phase, 4 wire, 415 volts, unbalanced load power factor indicator.
3. 1 No. Auto-off-Manual selector switch
4. 1 No. Current transformer with 5 amps secondary current, having suitable output burden and accuracy.
5. 3 Nos. Instrument protection fuses.

D. Following equipment shall be provided for every 50 KVAR capacitor bank:

1. 1 No. 125 amps, triple pole 415 volts air break contactor with auxiliary contacts (2 N0 + 2 NC). Contractor shall be suitable for AC 3 duty.
2. 1 Set of 2 Nos 125 Amps H RC back-up fuses with base and carrier.
3. 1 Set of ON and OFF push buttons.
4. 1 No. Red lamp for “On” indication of the contractor.

E. The capacitors used for PFIP shall at least comply with the following minimum requirements:

1. According to IEC-83 1 -1 and 831-2.
2. Fully insulated, terminals to be shielded by a cover.
3. Dielectric: Plastic poly-propylene, impregnated.
4. Electrodes: Aluminium coating vacuum metalized.
5. Safety features: Self healing. Over pressure tear-off fuse.
6. Withstand switching operations safely.
7. Maximum in rush current 200 times rated current.
8. Loading capacity: 1.1 times rated voltage. 1.3 times rated current at delta max.

9. Overloading capacity 1.5 times rated output at delta max.
10. Acceptable tolerances - 5/+ 10% of rated output at rated frequency.
11. Static life expectancy > 100,000 operating hours.
12. Test Specifications: Terminal versus terminal with an AC voltage 2.15 times rated voltage for 10 seconds duration. Terminals to casing with an AC voltage of 3 KV for 10 seconds duration.

6.0 SHOP DRAWINGS

A. The Contractor shall submit the shop drawings to the Engineer showing the detailed scheme of installation, explaining the method of installation, proposed position of termination etc., for approved before commencement of installation.

END OF SECTION

SECTION E9 - STREET LIGHTING FIXTURES

1.0 GENERAL

The work under this section consists of supply, storage, installation, testing & commissioning of road lighting system read together with drawings & bill of quantity. The Contractor shall furnish all labour, materials, services, and skilled supervision necessary for the construction, erection, installation, and connection of all equipment. The extent of work specified herein and/or shown on the drawings represents the minimum requirements.

Electrical Work Generally is to be in accordance with the requirements of the Specification Road lighting including luminaries, columns, related power distribution and control, protective earthing and related works including column foundations, cables, etc.

2.0 STANDARDS

Luminaries generally are to comply with IEC 60598 standards and recommendations. Manufacturer is to verify compliance with these standards and the applicable local regulations and design standards.

3.0 TECHNICAL REQUIREMENTS

Minor deviations from the Drawings may be considered for improvement in construction details, but no changes are to be made without the written approval of the client/Engineer.

4.0 AMBIENT CONDITIONS

Unless otherwise specified, equipment is to be designed and de-rated for continuous and trouble-free service at 50 ^{0}C ambient temperature and 100% relative humidity, with temperature reaching 70 ^{0}C in direct sunlight and with high content of ultra-violet rays. Equipment is to withstand full load operation whilst exposed to sun.

5.0 EQUIPMENT DATA

Contractor shall submit complete data for approval including, but not limited to, the following:

a) Detailed literature, in English, for each type of luminaire or fixture, lamp and control gear including manufacturer's name, catalogue number, rating, material specification, overall dimensions, operating characteristics and principles, and any modification to a standard product if applicable

b) Detailed specification and drawings for each column type including shape, base/mounting flanges, bolts, nuts etc, cross-sections, design criteria and calculations, brackets, finishes, provisions for cabling, cut-out or circuit-breaker etc.

c) Photometric data for lighting calculations including polar curves, coefficients of utilization efficiency and depreciation factors.

6.0 SHOP AND CONSTRUCTION DRAWINGS

Contractor shall submit drawings for approval including, but not limited to, the following:

a) Layout of equipment in exact positions.

b) Cabling and wiring diagrams, single line drawings, loads, phase distribution, protection and control, earthing.

7.0 SAMPLES

Submit fully equipped sample of luminaire or other materials or components if required by the Engineer.

8.0 WARRANTY

The supplier shall provide the full warranty on all equipment supplied during the period specified below. The warranty shall cover all parts and all costs, which are directly attributable to the supplier. Warranty coverage shall begin on the date that the equipment is received. The warranty period shall be 3 years.

9.0 O & M DOCUMENTATION

An Operation, Instruction and Maintenance Manual, in English and in the local language, shall be provided by the Supplier/Contractor .The following minimum details must be provided in the Manual:

a) About Photovoltaic

b) About White LED lighting system - its components and expected performance

c) About White LED Lights. The make, model number, country of origin and technical characteristics of LEDs should be stated in the product data sheet and furnished to the test centres.

d) DO's and DONT's

e) Name and address of the person or service centre to be contacted in case of failure or complaint.

10.0 PRODUCTS AND MATERIALS

10.1 LED Street Lighting System

The Road light operates from **Dusk to Dawn** i.e., the lamp automatically switches ON after the sunset and switches OFF after sunrise. The LED light should have programmable driver.

The light fixture shall be posted on single or double arm pole as shown in drawings. The luminaire shall be fixed on to the Pole and are interconnected through the cables. The street light operates in the stand alone mode.

The Street Lighting system components consist of:

a) LED Luminaire

b) Pole

c) Interconnecting cables

d) Terminal box & Circuit Breaker

10.2 LED Luminaire

Luminaire with transparent acrylic cover, housing a high efficiency LED lamp shall be fitted with gasket and accessories for weather and insect proof operation. The light fixture shall be posted on single or double arm pole as shown in drawings. The light fixture should be fully comply with safety norms according to:

- IEC 62471 photo biological safety of lamps and lamp systems including luminaires.
- EN 61347-2-13:2006; Safety testing for LEDs.
- EN 60598-1 and EN 60598-2; Luminaries safety testing.

a) **Body Construction:** The Road light LED Luminaire shall be as per international standard and made of non-corrosive high pressure moulded die cast aluminium housing and Tempered Flat glass with minimal glare. The surface must be finished with powder coating paint. The body should be aerodynamic profiled to give least air resistance. The Luminaire shall be consist of Heat Sink, One-piece cast, low-copper (<0.4% Cu) aluminium alloy. Which shall be effectively spreads heat to ensure long component life of LEDs and electronic components and provides precise alignment of LEDs and lenses. The Lamp compartment must be IP 66 with lens replaceable possibility.

b) **Source of Light Output:** The light source shall be of white LED type. Single lamp or multiple lamps can be used. View angles of a minimum of 120 or above. The luminous performance of individual LED used should not be less than 120 lumen / watt, when measured luminaire as a whole. The colour temperature of white LEDs used in the system should be in the range of 40,000K – 50,000K. Use of LEDs which emit ultraviolet light will not permitted.

The light output from the white LED light source should be constant throughout the duty cycle. The guaranteed life expectancy and performance of all LED lighting fixtures shall conform to L70B20 requirements at 50,000 hours or better. The Colour Rendering Index (CRI) shall be Ra >80 or better.

The make, model number, country of origin and technical characteristics of white LEDs used in the lighting system must be furnished by the supplier/manufacturer. In absence of this data, the Road lighting fixture will not be accepted by the Engineer.

c) **LED Modules:** The LED modules utilize an aluminium metal-clad board for maximum heat transfer, leading to longer life. The product shall be enabling Pending Aimed Optics, which allows the direction and intensity of the light to be tightly controlled. This control of the LEDs allow fixtures to maintain light levels equal to or greater than that of MH and HPS fixtures at a much lower energy consumption levels.

d) **Lens:** The LED's Lens shall be High impact moulded, UV-stabilized, Profile Acrylic lens, for maximum efficiency of light transmission.

e) **LED Driver:** The LED driver, with high output current accuracy of ± 1.5%, with a high power factor correction to maximize power utilization shall be required. The driver should be comply UL 1310 / UL48 Class 2 with a built-in over-temperature protection.

f) **Finish / Colour:** Thermally set polyester powder-coated for durability with 3 mils nominal paint thickness and corrosion resistant rated 500 hours salt spray endurance.

g) **Full Cut-Off:** The Luminaire should meet IEC standards for full cut-off luminaires.

11.0 TECHNICAL DATA SHEET OF STREET LIGHTING FIXTURE

DESCRIPTION	SPECIFICATION
Road light :	
Light Source	LED light
lamp for LED light	As per BOQ
Heat dissipater	Air Convection radiator
LED luminous efficiency	>120 lm/w
LED Illumination flux	As per BOQ
Working Temperature	55 ° C
Lamp's Output Ratio/ Efficiency	>= 90%
P.F of LED Street/Flood Lighting	>= 0.99
Colour Temperature(CCT)	As per engineers / consultant approval
Surge Protection	Min surge protection 15kV
Colour Index(CRI)	As per consultant / engineer approval
Beam Angle	Vertical Axis:70º, Horizontal Axis: 140º
Lifespan	50,000 hrs (L70B20), 3yrs warranty minimum
IP Rating	IP66
Illumination time	8~10 hours per day,

12.0 CERTIFICATIONS

The Contractor shall provide following certificates with LED Light Fixture Sample for the approval from Consultant/Client:

a. LM 80 certificate for Chips

b. LM 79

c. LM 82 -12

d. ENEC Certificate @ 50 C

13.0 MANUFACTURER'S DECLARATIONS AND SUBMISSIONS

Following manufacturer's declarations and submissions should be provided with the Tender submission.

S. No.	Parameters	Technical Specifications	Documents to be provided
1	System Voltage	220V to 240V 50 Hz	Laboratory Test Report
2	Power Factor	Not less than 0.90	Laboratory Test Report
3	Surge Protection.	11 kV	Laboratory Test Report
4	LED Driver	Programmable for Dimming with: - 1-10V DC - DALI - On board standalone prog (or as shown on the drawings)	Manufacturer's Declaration
5	Lumen Maintenance	L70B20 at 50,000 hours or better	LM80 test report & TM21 Projection
6	Colour Temperature	Neutral White ~ 4,000K ±275K or as approved	Manufacturer's Declaration LM 79 Test report
7	Colour Rendering index	70 + / - 10	Manufacturer's Declaration LM 79 Test report
8	Ambient Temperature	50 Degrees Celsius	Manufacturer's Declaration with Thermal report
9	IP Rating	≥ IP66 without glue (or as shown on the drawings, whichever is better)	IEC 60596-1 Test report
10	IK Rating	≥ IK08	IEC 60598-1 or IEC 62262 Test report
11	Cover	Transparent & weather resistant grade polycarbonate or glass optical cover (or as shown on the drawings)	Manufacturer's Declaration Material Datasheet Material UL94 rating of V2 (Minimum).
12	Housing	High Pressure Die Cast Aluminium with heat management system	Manufacturer's Declaration
13	Maintenance	Tool-less Driver cavity opening & Tool-less Gear tray change	Manufacturer's Declaration

S. No.	Parameters	Technical Specifications	Documents to be provided
14	Tel. management Controls	Integrated Antenna or communication equipment in to luminaire housing	Manufacturer's Declaration and Evidence to show capability.
15	3rd Party Test Report	Laboratory facility must be accredited according to ISO 17025 & recognized by ILAC /APLAC for testing of LED products.	- IEC60598 Report (IEC 60598-2-3) - EMC Test Report (EN55015, EN61547, EN61000-3-2) - Photo biological Safety Test Report (IEC62471) - EMF Test Report (IEC 62493) - SPD Test (IEC 61643-1-2005 & IEC 61347-2-11) - Factory Certificates (ISO 14001, ISO9001, OHSAS18001) - Certificates for Test Laboratory (ISO 17025)
16	3rd Party Driver Test Report	Laboratory facility must be accredited according to ISO 17025	- IEC 61347-1,-2-13 Test Report - IEC 62384 Test Report
17	Additional Test Report	Manufacturer's Test Report or from accredited lab.	- Salt Spray Test Report (Minimum 500 hours Natural Salt Spray) as per ISO 9227 & ISO 10289 - Vibration Test Report - Road Lighting simulations based on given configurations.

END OF SECTION

SECTION E10 - LIGHTING POLES

1. GENERAL

The work covered under this section of the specifications consist of furnishing all labour, equipment, appliances and materials and in performing of all operations in connection with providing, installing, connecting, testing the Street light poles in accordance Hot dip galvanized with 100 microns weather proof. These will be located as directed by the Engineer.

Material:	steel, Q235,Q345,S235,S355,SS400
Yield strength of Material:	Minimum yield strength>=235n/mm2 for Q235, S235 and SS400 Minimum yield strength>=345n/mm2 for Q345 S355 and Gr 50
Pole height:	8m
Length of one part	without joint
Wall thickness:	4mm
Pole's Shape:	Polygonal, Round, Taper Octagonal, Taper round, Round conical, Taper Square, Square.
Arm type can be made:	Single arm, Double arm, Tri-arm, Four-arm
Arm Diameter:	Diameter as 42mm, 48mm, 60mm, 76mm, etc. can fit to any diameter's lamps.
Welding	Advanced CNC welding equipment. Flaw testing, internal and external double welding makes the welding beautiful in shape. The international welding standards are applied.
Galvanization:	Hot dip galvanization with thickness of 80-100μm average in accordance with Turkish TSE standards or European standards.
Manufacturing Capacity Per Day:	250
Wall thickness Tolerance:	+- 0.1mm from 2.3mm to 4mm. +- 0.2mm from 5mm to 20mm. +- 0.5mm from 22mm to 30mm
Painting colour:	(RAL) Colour card or Refer to client's requirement
Surface treatment 1:	Rough pole
Surface treatment 2:	Hot dip Galvanizing antirust.
Surface treatment 3:	Hot dip galvanizing with powder coating
Temperature range	-35 °C~+65 °C
Wind Speed:	Against wind pressure of 120Km/h to 180Km/h, or according to client design.
Base plate mounted	Base plate is square, octagonal or round in shape with slotted holes for anchor bolt and dimension as per customer's requirement.
Ground mounted:	The length buried underground as per customer's requirement.
Quality Control	According to ISO9001-2020 requirements.
Certificates	ISO9001-2020, Audited Supplier

Other	Less land occupation & easy maintenance.

2. MATERIAL SPECIFICATION

a. **CONSTRUCTION:** Columns shall have octagonal section, tapered, formed sheet steel, electrically welded, and of height specified in the drawing. Columns height are to be one piece section. Columns are to have minimum wall thickness of 4 mm at base. Sheet steel is to have minimum rupturing resistance of 490 to 610 N/mm^2 and minimum yield strength of 355 N/mm2. The Columns shall be hot dipped galvanized with min 80 microns. The manufacturer shall provide quality assurance certificate.

Contactor should submit the Shop drawing / design details of Poles.

b. **TOP OF COLUMN:** It shall be designed to receive single or double arm brackets or other arrangement required, to support number of luminaires shown on the Drawings. Bracket arrangement is to be designed to ensure that failure, due to wind induced oscillations, does not occur and that rotation from desired alignment is not possible.

c. **COLUMN DESIGN:** Column cross-section, thickness of steel, joints, welds, bolts etc. are to be designed to withstand gust wind velocity of 160 km/hr blowing in the most unfavourable direction at a height 20 m above ground level, with column fully equipped. Fatigue of steel is in no case to exceed half elasticity limit, taking into account dynamic stresses due to vibrations. Steel flange plate, of adequate thickness, is to be solidly welded onto lower edge of column as shown on the drawings, and is to have specified number of holes for holding down bolts together with central cable access hole not less than 150 mm diameter.

d. **ACCESS DOOR:** of weatherproof construction is to be positioned hinged at column base and is to be suitably sized to insert and service the supply cable terminations and protective device. Door is to be flush fitting with retaining mechanism and positive locking arrangement with removable hexagonal key. Column is to be reinforced at door opening. Opposite each door, a non-hygroscopic baseboard of suitable size to accept appropriate equipment is to be fixed to inside of column by purpose-made brackets. Stainless steel earthing stud with washers and nuts is to be welded inside the column near the access door.

e. **LIGHT BRACKET:** The road light bracket shall be made of Galvanized M.S pipe bent to shape as shown on the drawing. The light fixture bracket shall be fixed on pole, by means of bolt. The dimensions of the bracket shall be as shown on the drawing.

f. **FINISH:** Welds are to be smooth with spatter removed, inside and outside surfaces of column are to be cleaned by pickling or blasting and are to be free of grease. Steel components of columns are to be hot-dip galvanized after fabrication. Minimum thickness of zinc coating is to be 500 g/m^2 on both inside and outside surfaces of column. Galvanizing is to be to NFA 91121 and NFA 91 122 (June 1958) or BS 729. Any damage to galvanizing is to be rectified during erection by wire brushing affected area and treating with approved rust converter to the satisfaction of the Engineer. Flange plate and inside and outside of column base are to be galvanized.

END OF SECTION

SECTION E11 - ICT COMMUNICATIONS (GPON)

1.0 GENERAL

The scope shall cover the complete Gigabit capable Passive Optical Network (GPON) system including all kind of components and accessories for the satisfactory installation, operation and maintenance of the ICT Communications system required for the complete project on site. The system shall adhere to the standard ITU G.984.1. It describes a flexible optical fiber access network capable of supporting the bandwidth requirements of infrastructure services and covers systems.

2.0 STANDARDS

Following ITU standards shall be used as recommendation for the system:

[ITU-T G.652] Recommendation ITU-T G.652 (2003), Characteristics of a single mode optical fiber cable.

[ITU-T G.808.1] Recommendation ITU-T G.808.1 (2006), Generic protection switching – Linear trail and subnetwork protection.

[ITU-T G.902] Recommendation ITU-T G.902 (1995), Framework Recommendation on functional access networks (AN) – Architecture and functions, access types, management and service node aspects.

[ITU-T G.982] Recommendation ITU-T G.982 (1996), Optical access networks to support services up to the ISDN primary rate or equivalent bit rates.

[ITU-T G.983.1] Recommendation ITU-T G.983.1 (1998), Broadband optical access systems based on Passive Optical Networks (PON).

[ITU-T G.983.2] Recommendation ITU-T G.983.2 (2002), ONT management and control interface specification for B-PON.

[ITU-T G.983.3] Recommendation ITU-T G.983.3 (2001), a broadband optical access system with increased service capability by wavelength allocation.

[ITU-T G.984.2] Recommendation ITU-T G.984.2 (2003), Gigabit-capable Passive Optical Networks (GPON): Physical Media Dependent (PMD) layer specification.

[ITU-T G.984.3] Recommendation ITU-T G.984.3 (2008), Gigabit-capable Passive Optical Networks (GPON): Transmission convergence layer specification.

[ITU-T G.984.4] Recommendation ITU-T G.984.4 (2008), Gigabit-capable Passive Optical Networks (GPON): ONT management and control interface specification.

[ITU-T G.984.5] Recommendation ITU-T G.984.5 (2007), Gigabit-capable Passive Optical Networks (GPON): Enhancement band.

[ITU-T I.112] Recommendation ITU-T I.112 (1993), Vocabulary of terms for ISDNs.

3.0 DEFINITIONS, ABBREVIATIONS AND ACRONYMS

A. **Differential fiber distance**: An OLT is connected to several ONU/ONTs. The differential fiber distance is the difference in the distance between the nearest and farthest ONU/ONT from the OLT.

B. **Optical line termination (OLT)**: A device that terminates the common (root) endpoint of an ODN, implements a PON protocol, such as that defined by [ITU-T G.984], and adapts PON PDUs for uplink communications over the provider service interface. The OLT provides management and maintenance functions for the subtended ODN and ONUs.

C. **Optical network termination (ONT)**: A single subscriber device that terminates any one of the distributed (leaf) endpoints of an ODN, implements a PON protocol, and adapts PON PDUs to subscriber service interfaces. An ONT is a special case of an ONU.

D. **Optical network unit (ONU)**: A generic term denoting a device that terminates any one of the distributed (leaf) endpoints of an ODN, implements a PON protocol, and adapts PON PDUs to subscriber service interfaces. In some contexts, an ONU implies a multiple-subscriber device.

E. **Physical reach**: Physical reach is defined as the maximum physical distance that can be achieved for a particular transmission system.

F. **Service**: Service is defined as a network service required by operators. Service is described by a name that is clearly recognized by everyone, regardless of whether it is a frame structure name or a general name.

G. **Configuration:** The interface at reference points S/R and R/S is defined as IFPON. This is a PON-specific interface that supports all the protocol elements necessary to allow transmission between OLT and ONUs.

H. **Logical Reach:** Logical reach is the maximum distance between ONU/ONT and OLT except for the limitation of the physical layer. In GPON, the maximum logical reach is defined as TCC area.

I. **Physical Reach:** Physical reach is the maximum physical distance between the ONU/ONT and the OLT. In GPON, two options are defined for the physical reach: area define for TCC. It is assumed that maximum distance over which FP-LD can be used in the ONU for high bit rates such as 1.25 Gbit/s or above.

J. **Differential Fiber Distance:** In GPON, the maximum differential fiber distance is 20 km. This affects the size of the ranging window and provides compliance with [ITU-T G.983.1].

K. **Split Ratio:** the larger the split ratio is for GPON, the more attractive it is for operators. However, a larger split ratio implies greater optical splitting which creates the need for an increased power budget to support the physical reach. Split ratios of up to 1:64 are realistic for the physical layer, given current technology. However, anticipating the continued evolution of optical modules, the TC layer must consider split ratios up to 1:128.

L. **Service Overlay:** An overlay wavelength may be used to provide enhanced services to the subscriber. Accordingly, GPON must vacate the Enhancement Band defined in [ITU-T G.983.3].

M. **Abbreviations and Acronyms**

BRI	Basic Rate Interface
DSL	Digital Subscriber line

FTTB	Fiber to the Building
FTTH	Fiber to the Home
FTTC	Fiber to the Curb
FTTCab	Fiber to the Cabinet
ONT	Optical Network Termination
OLT	Optical Line Termination
ONU	Optical Network Unit
OpS	Operation Systems
PDH	Plesiochronous Digital Hierarchy
PRI	Primary Rate Interface
PON	Passive Optical Network

4.0 NETWORK ARCHITECTURE

The optical section of a local access network system can be either active or passive and its architecture can be either point-to-point or point-to-multipoint. The optical access network (OAN) is common to all architectures, hence the commonality of this system has the potential to generate large worldwide volumes.

5.0 FTTB SCHEME

The FTTB scheme can be divided into two scenarios, one for multi-dwelling units (MDUs) and the other for businesses. Each scenario may have the service categories as defined under FTTH below.

6.0 FTTH

Within this scenario, the following service categories may be considered:

1. Asymmetric broadband services (e.g., digital broadcast services, VOD, file download, etc.).
2. Symmetric broadband services (e.g., content broadcast, e-mail, file exchange, distance learning, telemedicine, online-gaming, etc.).
3. POTS and ISDN. The access network must be able to provide, in a flexible way, narrow-band telephone services with the appropriate timing for the introduction.

7.0 SERVICES, USER NETWORK INTERFACE AND SERVICE NODE INTERFACE

7.1 Services:

GPON is required to support all currently known services and new services being discussed for TCC subscribers and business customers, because of such a broadband capability.

What specific services should be provided is clearer to some operators than to others and depends heavily on the particular regulatory conditions of each operator's markets, as well as on the market's own potential. How these services are delivered in a cost-effective way is a function not only of legal conditions, but

also of factors including existing telecommunication infrastructure, dwelling distribution and business customer's mix.

7.2 User Network Interface And Service Node Interface:

ONU/ONT has UNI, as well as OLT, has an SNI. UNI/SNI depends on which services are provided by the service operator.

8.0 BIT RATE

Basically, GPON aims at transmission speeds greater than or equal to 1.2 Gbit/s. Accordingly, GPON identifies two transmission speed combinations as follows:

- 1.2 Gbit/s up, 2.4 Gbit/s down;
- 2.4 Gbit/s up, 2.4 Gbit/s down.

The most important bit rate is 1.2 Gbit/s up, 2.4 Gbit/s down, constituting nearly all of the deployed and planned deployment of the GPON systems.

9.0 MAXIMUM MEAN SIGNAL TRANSFER DELAY

GPON must accommodate services that require a maximum mean signal transfer delay of 1.5 ms.

Specifically, GPON system must have a maximum mean signal transfer delay time of less than 1.5 ms between T-V (or (a)-V, depending on the operator's preference). See clause 12 of [ITU-T G.982]. Delays introduced by the adaptation functions such as circuit emulation are not included in this value.

Although a section of the delay measurement is T-V for FTTH system, or (a)-V for the other application in [ITU-T G.982], in a GPON system the reference points are not restricted by the system configuration.

10.0 PROTECTION ON THE PON SECTION

From the viewpoint of administration of the access network, the protection architecture of GPON is considered to enhance the reliability of the access networks. However, protection shall be considered as an optional mechanism because its implementation depends on the realization of economical systems. Further information on protection switching can be found in [ITU-T G.808.1].

10.1 Possible Protection Switching Types

There are two types of protection switching, both of which are analogous to those of SDH systems:

i) Automatic switching.

ii) Forced switching.

The first type is triggered by fault detection, such as loss of signal, loss of frame, signal degrade (BER becomes worse than the predetermined threshold), and so on. The second type is activated by administrative events, such as fiber rerouting, fiber replacement, etc. Both types should be possible in a GPON system, if required, even though they are optional functions. The switching mechanism is generally realized by the OAM function, therefore, the required OAM information field should be reserved in the OAM frame.

The relevant part of the protection in the GPON system in this scheme should be

a part of the protection between the ODN interface in the OLT and the ODN interface in the ONU via the ODN, excluding the SNI redundancy in the OLT. The relevant part of the protection in the GPON system should be a part of the protection between the ODN interface in the ONU and each ODN interface in the two OLTs via the ODN, plus the signaling required to implement protection functions upstream from the SNI.

10.2 Possible Duplex GPON Configuration Examples

The control protocols for each configuration should be specified independently from one another. No switching protocol is required since the switching is carried out only in the OLT. The possible configuration examples are detailed below:

Type A: A deprecated configuration that duplicated only the optical fibers.

Type B: The second configuration doubles the OLTs and the optical fibers between the OLTs and the optical splitter, and the splitter has two input/output ports on the OLT side. This configuration reduces the cost of duplexing the ONUs, although only the OLT side can be recovered.

Type C: The third configuration doubles not only the OLT side facilities but also the ONU side. In this configuration, recovery from failure at any point is possible by switching to the standby facilities. Therefore, the full duplex cost enables high reliability.

Type D: A deprecated configuration that allowed the mixing of duplicated and non-duplicated ONUs, essentially providing a combination of types B and C protection.

It shall be noted that in both of these types of protection schemes, the PON line terminations do not need to reside in a single OLT equipment. In fact, they may be located in physically diverse locations (dual parenting).

10.3 Possible Duplex GPON Characteristics

Type B: This configuration requires cold standby of the spare circuit in the OLT side. In this case, signal loss or even frame loss is, in general, inevitable in the switching period. However, all the connections supported between the service node and the terminal equipment should be held after this switching.

Type C: In this case, the hot standby of the spare receiver circuits is possible in both ONU and OLT sides. In addition, hitless switching (without frame loss) is also possible in this configuration.

10.4 Requirements

1. The protection switching function should be optional.
2. Both automatic protection switching and forced switching are possible in the GPON system, if required, even though they are optional functions.
3. All the configuration examples of clause 14.2 will be possible, even though they are optional functions.
4. The switching mechanism is generally realized by the OAM function, therefore, the required OAM information field must be reserved in the OAM frame.
5. All the connections supported between the service node and the terminal equipment should be held after switching.

Regarding the last requirement, one implementation of the POTS service node

(exchange) requires the frame loss period to be less than 120 ms. if the frame loss period becomes longer than that, the service node disconnects the call, and the call set-up is required again after the protection switching. Since GPON supports the emulation of conventional services, such as POTS and ISDN, this value should be taken into consideration.

T1 and E1 services require 50 ms protection times, so for these services to be provided as protected, the GPON should support 50 ms protection times.

10.5 Required Information Fields for OAM Frame

Protection switching requires less than ten codes to be used for both upstream and downstream, which will be realized by the field of the OAM frame. The field mapping of the OAM frame for the protection will be required to be defined.

11.0 SECURITY

Due to the multicast nature of the PON, GPON needs a security mechanism adapting the following requirements:

1. To prevent other users from easily decoding the downstream data.
2. To prevent other users from masquerading as another ONU/ONT or user.
3. To allow cost-effective implementation.

12.0 QUALITY ASSURANCE

Manufacturer's Qualifications: Firms regularly engaged in manufacture of signal transmission media and accessories of types required, whose products have been in satisfactory use in similar service for not less than 25 years.

Installer's Qualifications: Firms with at least 25 years of successful installation experience with projects utilizing systems and equipment similar to that required for this project.

Co-ordinate with other electrical work including wires/cables, electrical boxes and fittings, and raceways, to properly interface installation of data system with other work.

Sequence installation of system with other work to minimize possibility of damage and soiling during remainder of construction.

13.0 SUBMITTALS

Product Data: Submit manufacturer's data on signal transmission media and components.

Shop Drawings: Submit layout drawings of telephone cable distribution system and accessories.

Wiring Diagrams: Submit data transmission wiring diagrams for overall system.

END OF SECTION

SECTION E12 - EARTHING SYSTEM

1.0 GENERAL

The work covered under this section of the specifications consist of furnishing all labour, equipment, appliances and materials and in performing of all operations in connection with providing, installing, connecting, testing the earthing system complete in accordance with this section of specifications and drawings. The earth pits on the drawings are only indicative and these will be located as directed by the Engineer.

2.0 APPLICABLE STANDARDS AND CODES

- BS 951 - EARTHING CLAMPS
- BS 7430 - EARTHING
- BS 2874 - NUTS,BOLT,WASHER,SCREW & RIVETS FOR USE ON COPPER
- BS 1433 - HARD DRAWN BARE COPPER CONDUCTOR FOR EATHING.
- BS 6346 - PVC INSULATED CABLES.

The maximum values of resistance of equipment earthing systems to the body of earth shall be as follow**:**

- General Electrical Earthing : 1 Ώ
- Earthing For Static Discharge : 1000 Ώ
- Earthing For Lightning Protection : 10 Ώ
- Instrument Clean Earth : 1 Ώ

3.0 EARTHING ACCESSORIES

The Earthing system shall be consist of Earth electrodes, Earthing leads, Earth connecting point, Earth continuity conductor and all accessories necessary for the satisfactory operation of the associated electrical system.

3.1- Earthing by Copper Plates

The earth electrode Copper plate shall consist of 600mm x 600mm x 3mm thick 99.9% high conductivity electrolytic tinned copper plate. The plate shall have four terminals for connecting the earthing leads as shown on the drawings.

3.2- Earthing by Copper Rods

The earth copper rod shall be installed for lighting poles as indicated in drawings. The copper rods shall be of 3m length and 20mm dia with high conductivity electrolytic copper. This shall be driven into the ground to the full length as shown in drawing.

3.3- Double Flange Earth Electrode Seal

Provide waterproof Double Flange Earth Electrode Seals for use in constructions where internal earths are specified to be installed in concrete slabs in basements or any other location where ingress of water specifically sub-soil water is expected. These double flange seals shall at least comply with following specification:

- Nominal thickness: 300mm (Provide extended seal tubes if concrete slab thickness is more).
- Withstand maximum pressure: 80 psi (5.5 bars).
- Material: High Density Plastic unless otherwise approved by the Engineer.
- Standard: BSEN 62561-5 (2011) and an extended 5 day test following BSEN 62561-5 test conditions.

3.4- Earthing Lead

The earthing lead shall connect the earth electrode to earth connecting point or equipment. It shall be round hard drawn bare electrolytic copper of size shown on the drawings. The cost of earthing leads deemed to have been included in the price of earth electrode & no separate pavement shall be made for it.

3.5- Earth Continuity Conductor

Earth continuity conductor (E.C.C) shall be hard drawn bare copper wire or single core PVC insulated copper conductor cable of sizes indicated on the drawings or BOQ. All thimbles, lugs, sockets, nuts, washers and other accessories necessary for the complete installation of ECC shall be provided by the Contractor without any extra cost. PVC insulated cables when used as E.C.C. shall be green or green yellow.

3.6- Earth Connecting Points

When copper plates or copper rods are used as earth electrodes, the earthing leads from the plate or rod shall terminate at the earth connecting points which shall be of tinned copper bar, rectangular in shape, having dimensional 500mm x 50mm x 10mm, installed in the wall of the inspection chamber at the ground level. Further connections to respective locations shall be made from this bar by earth conductors of various sizes as shown on the drawings.

3.7- Inspection Chamber

At the ground level an inspection chamber shall be provided size shown on the drawing. The inspection chamber shall have 50mm x 50mm angle iron frame at the top to accommodate an approved quality heavy duty cast iron or concrete cover with handle. The cover shall have “EARTH BELOW” inscribed on its top. The Contractor shall provide and install the cover flush with the ground level.

4.0 EARTHING INSTALLATIONS

Complete earthing systems as shown on the drawing shall be installed by the Contractor. The earthing system shall give earth resistance, including resistance of soil, earth leads and E.C.C. equal to less than one ohm, this without ground pits water spraying.

The earthing system shall be loop connected with earthing cables at least 300 mm away from telephone cables. The concept of the main loops and the way they are connected shall be such that equipment / apparatus can be easily removed without requiring a complex disconnection operation nor risking interruption of / or damage to the loop itself. The fastening of the earthing conductors shall be made on a sufficient length so as to prevent crushing or cross section weakening. The parts on which they are connected shall be conveniently cleansed and surface.

Leads sheaths or steel tape armours are not permitted as grounding conductors. The earthing system shall be installed to ensure that when any part of the earthing system is disconnected for the purpose of carrying out periodic testing an alternative path to earth is available.

At all connections of earth continuity conductor to MV/LV Switchboard, LV Distribution Board or any other metallic body, proper size or brass sockets, thimbles or lugs shall be used to which the copper wire shall be connected by copper brazing. The soldering of copper wire at joints or termination shall not be allowed. All tee-off connections shall be by copper brazing using suitable socket and clamps. After brazing, the jointed surface shall be protected by oxide inhibiting compound of low electrical resistance. For connections to metallic body, the surface shall be thoroughly cleaned before bolting the lug or socket.

The earth continuity conductor shall be in general run in cable trench or in conduits / pipes as shown on the drawings. Where laid along underground cables these shall be laid directly under ground in unpaved areas and in pipes under paved areas.

The earth connecting point shall be installed at locations shown on the drawings. It shall be fixed on wall surface by means of brass screws with nuts, washers and other insulating material as instructed by the Engineer.

The earth continuity conductor of sizes shown on the drawing shall be installed all along the cable runs and connected to the earthing bar / terminals provided in the equipment. The body of all Switchboards shall be connected to earth by specified size of E.C.C. All metal work shall also be connected to earth by specified size of E.C.C.

At any joint or termination, the E.C.C. shall be connected using proper accessories. No connection shall be made by twisting of earth conductors.

4.1- Installation of Earth Electrodes (Copper Plate)

The installation of earth electrode (copper plate), a pit of appropriate diameter and up to the depth of 4 m or (as directed at site) shall be first excavated in the bare ground. The earth electrode shall be installed upright in the pit and shall be surrounded by **mixture of lime and charcoal** around the electrode as shown on the drawings and packed hard. From the plate earthing leads of 2x70mm² bare Cu. Conductor shall be taken to the bus bar in the inspection chamber through 50mm G.I pipe for watering purpose.

4.2- Installation of Earth Electrode (Copper Rod)

The earthing system by copper rod shall consist of 20mm dia and 3 meter long copper rods. These shall be of 99.9% purity copper. These shall have screw able head to accommodate other rods in series with the help of dowel as is shown in the drawings. The driven head shall consist of a hardened tip. These rods shall be connected to the earthing lead whose other end shall be connected to the earth connecting points to be provided in the inspection chamber. From the earth connecting point’s earth connection shall be made to individual point as marked in drawing.

4.3- Installation of Double Flange Earth Electrode Seals

The Double Flange Earth Electrode Seals must be installed fully in accordance with the manufacturer’s instructions and under the supervision of manufacturer’s trained and certified staff. Earth electrode seal flange and components must be free from dust/ debris/ grease/ paint before pouring the concrete to achieve highest quality and fully compacted to ensure full sealing from water. It shall be possible that additional Earth Rods can be driven at a later date, with no additional parts or causing damage to the Earth Rod Seal. The main concrete slab must not be shuttered out and the Earth Rod Seal fitted later.

4.4- Installation of Earth Electrode where condition not suitable for Earthing

Where the rock lie just below the surface or water table are very deep then earth electrode shall be installed through drilling or digging method. Due to certain

ground conditions make it difficult to obtain a reliable earth resistance, whilst particular installations may require a very low resistance. In such cases, **Marconite concrete** shall be used as backfill for a conventional earth rod achieve a lower earth electrode resistance.

5.0 EQUIPMENT GROUNDING

5.1- Non-current carrying metal parts

Bond and ground non-current carrying metal parts of electrical apparatus and equipment provided under work of any section of specifications.

5.2- Grounding of Fence

All metallic fences shall be grounded by driving earth rods at a distance of 50 meter.

6.0 INSPECTION AND TESTS

Earth resistance tests shall be made by the Contractor on the complete earthing system in the presence of the Engineer. The test result shall conform to BS 7430 (formerly CP 1013) and BS 6651 (Formerly CP 326). To obtain the desired result more earth rods shall be provided.

END OF SECTION

SECTION E13 - INDOOR LIGHTING FIXTURES

1.0 SCOPE OF WORK

The work under this section consists of supplying, installation and commissioning of all material and services of the complete light fixtures as specified herein and / or shown on the Tender Drawings and given in the Bill of Quantities.

The Contractor shall discuss the electrical layout with the Engineer and coordinate at site with other services for exact route, location and positions of light fixtures.

2.0 GENERAL

The description of light fixtures in given Bill of Quantities, and stated on the drawings, and relevant material are described in this section. The determination of quality is based on certified photo-metric data covering the coefficient of utilization, light distribution curves, construction material, shape, finish, operation, etc.

The Contractor shall submit two samples of each and every light fixture specified and obtain approval of the Owner before purchasing. The quality and finishes of local make light fixtures (if mentioned in BOQ) shall be same as that of standard manufacturer. The accessories such as ballast, lamp / starter holders, starters, lamps, igniters, etc., for all type of light fixtures shall be of Philips make.

All fixtures shall be finished in standard colour schemes as mentioned in the manufacturer's catalogue for respective fixtures, unless specifically stated in the Specifications, Drawings or Bill of Quantities or directed by the Engineer.

3.0 STANDARDS

Particular reference shall be made to:

- IEC 60598 Luminaries.
- IEC 62031 LED modules for general lighting-Safety requirements.
- IEC 62384 DC or AC supplied electronic control gear for LED modules performance requirements.
- BSEN 1838 Emergency Lighting

Any other standard referred in this specification.

4.0 LED Light Fixtures

The light fixture shall be as stated on drawings and bill of quantities. The light fixture shall be finished in standard colours unless otherwise stated on drawings or directed by Engineer. All LED light fixtures shall be of international standard and quality. The type of fixtures with manufacturer catalogue reference is given on the fixture schedule and in Bill of Quantities. Equivalent fixture may be acceptable provided that the Contractor submits for review all necessary data indicating photo-metric curves to show that the fixture proposed are of the same type, construction and quality.

The lamps for light fixtures shall be Light Emitting Diodes with driver and shall be supplied and installed according to the wattage as indicated on drawings. The guaranteed life expectancy and performance of all LED lighting fixtures shall conform

to L70B20 requirements at 50,000 hours or better. The Colour Rendering Index (CRI) shall be Ra >80 or better.

Weather proof light fixture shall comprise of cast aluminium body and gasketed clear glass cover secured to the body by means of galvanized nuts / screws to give a weather proof and water tight fit. The gasket shall be weather resistance type.

The LED light fixtures shall be supplied complete with driver and all accessories as per light fixture schedule and shall be installed in accordance with manufacturer's recommendations and sound engineering practice.

5.0 INSTALLATION

5.1 General

The mounting heights of light fixtures are indicated on the drawings, and position of fixtures according to the mentioned scale.

The Contractor must ensure that the light fixtures are installed uniformly with respect to the dimensions of the area. Any modifications due to site conditions may be made with the approval of Engineer. All fixtures shall be carefully aligned before fixing in position. All fixing accessories such as ceiling rose, flexible cord, lamp holder, suspension rod; pipe or chain with suitable canopy, etc., shall be provided and installed.

The wiring between terminal box and the fixture shall be carried out with 3 core 0.75 sq. mm and I sq. mm copper conductor, PVC / PVC cable respectively for circuits protected by 10 amps and 15 / 20 amps MCBs. The wiring inside light fixture body shall be done with heat resistant cables or PVC insulated cable in heat resistant sleeves as approved by the Engineer.

Glasses, shades, reflectors, diffuses, etc., must be in a clear condition after installation.

All light fixtures shall be earthed by an earth wire connected to the earth terminal in the fitting.

5.2 Indoor Light Fixtures

The indoor light fixture shall be installed on the surface of ceiling or wall by means of nylon plugs and galvanized steel screws, such that their back finish flush with the surface for exposed conduits and flush with outlet box for concealed conduit system. Wherever convenient, screws for fixing light fixtures shall be screwed into the holes of the outlet box. The light on false ceiling shall be installed in accordance with manufacturer's recommendations and in coordination with ceiling installation.

5.3 Outdoor Lighting

For illumination around buildings during dark hours, light fittings in various arrangements shall be provided in accordance with these specifications. The items not shown on drawings or called for, but which are necessary for a complete working system as required, these shall also be provided and deemed to have been considered as such.

The Contractor shall essentially use the standard products of a manufacturer, regularly engaged in the manufacturer of the product and shall meet the requirement of the specifications.

6.0 CERTIFICATIONS

The Contractor shall provide following certificates with LED Light Fixture Sample for the approval from Consultant/Client:

a. LM 80 certificate for Chips

b. LM 79

c. LM 82 -12

d. ENEC Certificate @ 50 C

7.0 MANUFACTURER'S DECLARATIONS AND SUBMISSION

Following manufacturer declaration and submission should be provided with the Tender submission.

S. No.	Parameters	Technical Specifications	Documents to be provided
1	System Voltage	220V to 240V 50 Hz	Laboratory Test Report
2	Power Factor	Not less than 0.90	Laboratory Test Report
3	Surge Protection.	15 kV	Laboratory Test Report
4	LED Driver	Programmable for Dimming with: - 1-10V DC - DALI - On board standalone prog (or as shown on the drawings)	Manufacturer's Declaration
5	Lumen Maintenance	L70B20 at 50,000 hours or better	LM80 test report & TM21 Projection
6	Colour Temperature	Neutral White ~ 4,000K ±275K or as approved	Manufacturer's Declaration LM 79 Test report
7	Colour Rendering index	70 + / - 10	Manufacturer's Declaration LM 79 Test report
8	Ambient Temperature	50 Degrees Celsius	Manufacturer's Declaration with Thermal report
9	IP Rating	- IP31 (or > as shown on drawings, whichever is better) - Weatherproof for moist areas (min. IP-54)	IEC 60596-1 Test report
10	IK Rating	≥ IK08	IEC 60598-1 or IEC 62262 Test report

S. No.	Parameters.	Technical Specifications	Documents to be provided
11	Cover	Transparent or diffused, polycarbonate or glass (or as shown on the drawings)	Manufacturer's Declaration Material Datasheet
12	Housing	Die Cast Aluminium or sheet steel with heat management system	Manufacturer's Declaration
13	Maintenance	Tool-less accessibility for driver & other components	Manufacturer's Declaration
14	3rd Party Test Report	Laboratory facility must be accredited according to ISO 17025 & recognized by ILAC /APLAC for testing of LED products.	- IEC60598 Report (IEC 60598-2-3) - EMC Test Report (EN55015, EN61547, EN61000-3-2) - Photo biological Safety Test Report (IEC62471) - EMF Test Report (IEC 62493) - SPD Test (IEC 61643-1-2005 & IEC 61347-2-11) - Factory Certificates (ISO 14001, ISO9001, OHSAS18001) - Certificates for Test Laboratory (ISO 17025)
15	3rd Party Driver Test Report	Laboratory facility must be accredited according to ISO 17025.	- IEC 61347-1,-2-13 Test Report - IEC 62384 Test Report

END OF SECTION

SECTION E14 – PAD MOUNTED UNITS (PMU)

1. Main Features:

The Pad Mounted Units (PMU) shall be designed according to IEC and shall meet all the requirements of the local power supply authority (i.e. K-Electric). It shall have at least following design features:

- Two separated and isolated compartments viz-a-viz MV Compartment, LV Compartment and oil type transformer.
- The PMU shall be metal enclosed, with separate door and lock for each compartment.
- The complete enclosure shall be weatherproof, made of corrosion-resistant metal with canopy. Designed for outdoor installations in harsh environmental conditions and should be independent of environmental influences.
- Protection Class shall be minimum IP54.
- Cooling fans with high quality sand filters mounted on louvers.
- Environmental product declaration according to ISO 14021, based on a full-scale lifecycle assessment (LCA) study according to ISO 14040/44.
- Internal Arc Classification shall be IAC A FLR 50 kA/1 sec. as per IEC 62271-200 standard.
- Service life of at least 35 years.
- Ensure personal safety through earthing, interlocking, and other means.
- Stainless Steel rating plate with embossed writing.
- The Pad Mounted Unit shall be suitable for installation in the three phase underground 11kV distribution system of the following rated characteristics:
  - i. Nominal system voltage 11 kV
  - ii. System highest voltage 12 kV
  - iii. Frequency 50 Hz
- The Pad Mounted Unit shall be designed and built to give efficient and reliable performance continuously at its full rated capacity in the climatic and atmospheric conditions prevailing at the sites, which are specified below:
  - i. Peak ambient air temperature 50 °C
  - ii. Minimum temperature 0 °C
  - iii. Maximum relative humidity 95% at dry bulb temperature of 43 °C
  - iv. Altitude 100 m above Mean Sea Level
  - v. Location Sea-coast (interior in semi-desert)
  - vi. Wind speed 140 km/hr.
- The depth of the compartments shall be such that all equipment can be accommodated with adequate Clearances
- Pad lockable doors for secure access to MV and LV compartments.
- The auxiliary materials to be supplied with the equipment include a danger plate, a rating plate/name plate, and loose materials such as a switch stick, fuse puller, and foundation bolts for proper operation, safety, and installation.
- The complete PMU shall be suitable to install on a concrete pad.

2. MV Compartment:

- The enclosures for MV Coupling compartment for linking the PMU to the Distribution Transformer shall be through insulated Flexible Tin coated pure Copper high conductivity Bus Bar arrangement connected between LBS and the Transformer MV Bushing, and shall be tested for following insulation levels.
  i. Lightning impulse withstand voltage 95 kV
  ii. One minute Power Frequency withstand voltage 34 kV
- The Vertical insulation barriers of minimum 6 mm thickness shall be provided between each phase in the coupling compartment.
- The barriers shall be rigidly fixed so that no inadvertent displacement or swinging is possible and can also be removed in case of any fault occurring on the MV side.
- The barriers shall be made of a durable, rigid and non-hygroscopic insulating material. The detail of which shall be supplied by the manufacturer for Engineer's approval.
- The interconnection between the LBS and transformer bushing shall be through insulated flexible Tin coated pure Copper high conductivity bus bar strips to withstand the effect of short circuit.
- **Load Break Switch:**
  - 2 Nos. Three Pole (TP) Load Break Switches, rated for 15 kV, 200 A
  - Designed according to IEC 62271-103
- **Fuse Protection:**
  - 12 kV HRC Fuses
  - Fuse Link ratings as follows:
    - 250 kVA PMU: 20 A
    - 300 kVA PMU: 25 A
    - 400 kVA PMU: 32.5 A
    - 500 kVA PMU: 40 A
  - Fuse clamps for easy installation and replacement

3. Transformer Compartment:

The transformer compartment shall consist of 01 number required ratings 11/0.420 kV transformer as per KE specifications which shall be self-contained and made as complete unit. It shall be possible to detach the transformer from the assembly without completely dismantling the enclosure and equipment or draining the oil from the transformer. Transformer designed and tested according to IEC 60076 standards.

- **Transformer Capacity:** As shown on Drawings (250, 300, 400, 500 kVA)
- **Transformer Type:** Oil-immersed, hermetically sealed
- **Primary Voltage:** 11,000 Volts
- **Secondary Voltage:** 420 Volts
- **Off-load Tap Changer:** +5%, +2.5%, 0, -2.5%, -5%
- **Vector Group:** Dyn11
- **Frequency:** 50 Hz
- **Cooling Type:** ONAN (Oil Natural Air Natural)
- **Limit of Temperature Rise:** 50 °C Oil, 55 °C winding temperature
- **Basic Insulation Level (BIL)**: 95 kV

4. LV Compartment:

- Provide LV 3-pole MCCBs designed as per IEC 60947-2 standards.
- Provide required number and current ratings of MCCBs as per the load of each feeder pillar fed from the PMU with at least one spare MCCB of similar rating and one space.
- Provide Ammeter and Voltmeter for monitoring the operating voltage and current at LV compartment.
- The dry type CTs for Ammeters shall be Class 0.5, Burden 5 VA with 400/5 A ratio for 250 / 300 kVA PMUs and 800/5 A ratio for 400 / 500 kVA PMUs.
- Provide sufficient space in LV compartment for future mounting of 3-phase, 4-wire kWH (energy) meter, rated for 420 VAC, 50Hz, suitable for 5A CT Secondary, Class 1.0
- Necessary brackets and mounting rails shall be provided for LV compartment. The rails shall have holes and slots in them for mounting of equipment for a range of dimensions. No equipment is to be directly mounted on the enclosure walls.
- The minimum clearances shall be maintained 50 mm for Phase to Phase and 25 mm clearances for Phase to Earth in the air for LV compartment of the enclosure.
- The current ratings of incoming and outgoing LV TP MCCBs for LV Compartment can be varied as per the need and requirements of load. The LV Circuit Breakers shall be MCCB type complying with the requirement of K-Electric Standard Specification.
- Provision shall be made for insertion of required sizes and types of Lugs as per LV cables used. For incoming and outgoing of each PMU, Bimetallic Lugs must be provided at termination of Aluminum conductor cables to copper bus bars or vice versa.
- All the equipment should be fixed in such way that no live parts are exposed. The bus bars shall be insulated except at the connection point for Lugs. Whenever necessary insulating PVC cover may be provided.
- The rating plate shall be made of stainless steel sheet fixed inside the door. All data shall be embossed on the rating plate as per IEC standards (only printing is not acceptable).
- Access through the compartment shall be through water tight hinged door with a handle and built-in locks.
- A pocket shall be provided inside the LT compartment door for keeping maintenance log book and drawings.
- The LV Bus-bars shall he made of high conductivity Tin coated Copper and of rectangular Cross section. The bus bars shall be mounted on insulators placed at suitable intervals so that these are rigidly mounted and able to withstand the effects of short circuits.
- All Auxiliary Material should be included.
- Provide space for installation of kWh (Energy) meter for rated capacity of the transformer, so that the owner can install it in future, when required.

5. Paint:

- The metal enclosure shall be painted with special polyurethane paint, steel gray in color to withstand the atmospheric conditions prevailing at site which tends to have corrosion inducting effect. Before applying paint, sheet metal surface should be treated through the process of degreasing and phosphating to ensure clean printed surface, which is free from dust, grease or other contamination.
- Three coats of paints shall be applied; the first coat shall be primer of Zinc Chromate (Phosphate) and red oxide, having weather resistant and rust inhibiting properties.
- The second coat shall he based on synthetic resin alkyd type, with weather resisting pigments and necessary additives.
- The paint should be excellent weather resistant properties with smooth, glossy finish.
- The third finish coat shall also be based on a synthetic resin and shall have hard durable surface and excellent weathering resisting properties
- The total paint thickness shall not be less then 0.12mm (120 micron)
- Alternatively oven baked painting having durable weather resistant properties or powder coating paint may also be acceptable with all the properties & qualities as mentioned above.
- The paint used shall be in according to ASTM B 117 & D 2794 Standards.

6. Grounding:

- All equipment's and individual compartments grounding shall be through flexible earthing bus-bar in the Pad Mounted Unit for onward termination to the earthing pit.

7. Tests:

- **Type Tests:** Bidder shall submit the Type Tests report for individual components (i.e. LBS, LT Circuit Breaker, Relay, Transformer etc.) as per requirements of relevant KE standard specifications (Latest applicable) and shall be carried out in an independent internationally reputable third party laboratory.
- **Routine Tests:** Routine tests shall be carried out as per requirement of relevant IEC and KE Standard Specification (Latest applicable) for individual components (i.e. LBS, LT Circuit Breaker, Relay, Transformer etc.) and shall be carried out in presence of Engineers representatives.

8. Data Sheet and Documentations:

- The following documents along with manufacturing standards are to be submitted with the bid
  a) Report of type tests of all individual components
  b) Detailed dimensional drawings
  c) Technical literature / original brochures

9. Training and Operating / User Manual:

- Successful bidder shall arrange comprehensive training program intended for guidance of concerned Owner/K-Electric field staff for proper installation, maintenance and repair of offered Pad Mounted Unit.
- User manual for proper handling instruction shall be provided with each Pad Mounted Unit.

10. Warranty:

- The supplier shall provide full warranty for replacement of any fault/ damage part and all costs solely due to transportation to the site. The Pad Mounted Unit shall be under full warranty for three (02) years after handing over the project. Manufacturer is responsible to replace any damage part and provide Services without any extra cost during the warranty period.

11. Standards and Compliance:

The various equipment in Pad mounted units shall at least comply with the following standards (Latest applicable):

- **Transformer:** IEC 60076
- **Switchgear:** IEC 62271
- **HRC Fuse Links:** IEC 60282
- **MCCB:** IEC 60947-2
- **Instrument Transformers (CTs):** IEC 61869

END OF SECTION

E15- OIL TYPE TRANSFORMER

Distribution transformer, oil immersed, naturally cooled, double wound, core type in sealed design, suitable for outdoor installation.

- **Service** : Outdoor
- **Phases** : 3
- **Frequency** : 50 Hz
- **Double wound** : yes
- **No load voltage ratio :** 11000 / 415 v
- **Tapping (at no load) :** +2.5 %, 0, -5 %, -7.5%
- **Vector group :** dyn 11
- **Impedance at 75° C at nominal tap** : 4%
- **Ambient temperature :** 50° c
- **Temp. Rise in oil / copper**: 40/50° C
- **Type of cooling**: ONAN
- **No of bushings**: 3/4
- **Iron losses at 100% voltage** : 265 watts
- **Copper losses** : 2020 watts
- **Short circuit current withstand duration** : 2 sec
- **Basic impulse level (peak)** : 95kv
- **Power frequency test voltage**: 34/ 2.5 KV
- **Type of tank** : sealed
- **Type of winding** : layer/layer
- **Neutral brought out** : yes
- **Voltage regulation at unity/0.85/0.6 p.f** : 2.1 / 3.67 / 4.13
- **Efficiency at100% / 75% /50% /25% load** : 98.4 / 98.16 / 98.48 / 98.45
- **Insulation (hv/lv)** : Enameled

All values are subject to IEC tolerances

END OF SECTION

E16- POWER FACTOR CORRECTION

1.1 SUMMARY

A. Automatic power factor correction equipment rated 600 V and less.

1.2 CODES AND STANDARDS

Capacitors	IEEE 519, IEC 831-1,2
Series Reactors	IEC 76
Contactors	IEC 947-4-1
Fuses	IEC 269
Circuit Breakers	IEC 947 – 1,2
Degree of Protection	IEC 144

All such equipment shall be manufactured only by manufacturer having ISO 9001 certificates.

1.3 PRODUCTS

A. Capacitor Cells: Dry, metallized-dielectric, encapsulated type.

B. Capacitor-Bank Fuses: Current-limiting, non-interchangeable type.

C. Discharge resistors.

D. Fixed Capacitors: Integrally fused.

E. Automatic Power Correction Factor Units: Capacitor banks, contactors, and solidstate, Microprocessor-based controls installed in independent enclosures.

1. Adjustable Target Power Factor: 0.95 lagging to unity.
2. Local Display: LED or LCD in door of enclosure.
3. Alarm indication.
4. Current transformer.
5. Main circuit breaker.
6. Remote monitoring components.

1.4 FIELD QUALITY CONTROL

A. Testing Agency: Contractor engaged.

END OF SECTION

SECTION E17 – SECURITY SYSTEM

PART-1 GENERAL

1.1 SUMMARY

A. This Section includes IP Based CCTV system and Access Control System for the building.

1.1.1.1.1 IP CCTV System includes the following:
- 1.1.1.1.1.1 Network Video Recorder (NVR)
- 1.1.1.1.1.2 IP CCTV Cameras
- 1.1.1.1.1.3 CCTV LED Display
- 1.1.1.1.1.4 Gigabit Switch
- 1.1.1.1.1.5 Associated Cabling

1.1.1.1.2 IP Access Control System includes the following:
- 1.1.1.1.2.1 Card Readers (BIO/proximity type)
- 1.1.1.1.2.2 Push Button
- 1.1.1.1.2.3 Door Controllers
- 1.1.1.1.2.4 Master Control Panel/work Station
- 1.1.1.1.2.5 Associated Wiring

1.2 QUALITY ASSURANCE

A. Comply with relevant standards of BS, NEMA and NEC.

PART-2 PRODUCTS

2.01 IP CCTV SYSTEM:

The system shall provide IP CCTV surveillance system for specified area by means of IP color CCD cameras. The Control Room shall house the surveillance through LED display and workstation through Network video recorder placed in Main IT room first floor.

2.02 FIXED TYPE IP CAMERA:

The camera shall be compact rugged, 2 MP IR 1/3 image format digital color CCD having the horizontal resolution of 1280x960 TVL or above with outstanding picture quality. The camera shall provide easy installation, digital signal processing, on screen displays, superior picture quality reliability. The camera shall accept AC or DC and POE. The camera shall provide auto-detection of lens type with lens wizard.

2.03 NETWROK VIDEO RECORDER:

- NVR shall support minimum 100 channel and the direct analog cameras.
- NVR shall provide 6 to 10 Mbps for recording of IP video stream, play back and export.

- NVR shall support recording of H.264, JPEG, and MPEG-4 IP Stream.
- NVR shall support third party H.264 Megapixel video stream up to 10Mps resolution with total system throughout recording of all IP & analog streams, playback and export.
- The NVR shall have fully open architecture with support for both IP Specific Cameras and as well as ONVIF Compliance.
- The NVR shall support 0.264 compression, CIF 4CIF resolution at maximum 100 IPS, 16 audio input and RS422/485 PT2 Control with supplied system/ third party compatible protocol.

2.04 CCTV LED:

Color LED is multi standard compatibility 32 inch with a built-in loud speaker and in puts able to accept NTSC, PAL and S-video standard in 1280P TV line or above of horizontal resolution is housed in a compact, space- saving metal cabinet for rugged reliability.

2.05 VIDEO CABLE:

Ethernet cat 6 cable is to be used for all IP based CCTV cameras.

2.06 TESTING & COMMISIONING:

The entire normal test as recommended by the manufacturer shall be carried out on the system. The system shall be commissioning by the authorized personnel only.

PART-3 IP BASED ACCESS CONTROL SYSTEM

0.1 STANDARDS

Materials and workmanship shall conform to the latest issue of all industry standards, publications, or regulations referenced in this section and with the following references as applicable.

NFPA 70 – National Electrical Code
UL294 – Standard for Access Control Systems
NFPA 101 - Life Safety Code.

1.1.1.2 SYSTEM DESCRIPTION

The System shall be a modular and network capable access control system. The System shall have the ability of handling controlled access with various reader technologies supported simultaneously, alarm monitoring with text and graphics based annunciation.

SUBMITTALS

A. Manufacturer's Data:

1. Submit three (3) copies of:

    a. Product Data Sheets
    b. Installation Instructions

2. Authorized Dealer Certificate and Certified Training Certificates of installers who will be working on this project.

B. Shop Drawings

1. Submit three (3) copies and digitally in Auto-Cad 14 or later format on a CD (3 copies), shop drawings, including:

    a. Layout of equipment on supplied Auto-Cad drawings.
    b. Security Console elevation drawings.
    c. Field Controller equipment location wall layouts, including size requirements.

C. As-Built Drawings

1. Update Shop Drawings to create final As-Built Drawings. Submit 3 copies and digitally in AutoCAD or later format on a CD (3 copies).

D. Stand Alone Operation

1. All database information required for stand-alone operation shall be stored at the main workstation of the system.
2. Proprietary software programs and control logic information used to coordinate and drive system hardware shall be stored in Flash Downloadable Read Only Memory.
3. Relay for lock control, and one input for monitoring a status switch, a request-to-exit device, and a tamper switch. There shall be status indicator lights for active relays, as well as diagnostic indicator lights to aid in system troubleshooting. There shall be dedicated alarm output relay/s for external reporting of the following conditions: Alarm; Duress; Tamper; and Trouble.

END OF SECTION

SECTION E18 - LIST OF APPROVED MANUFACTURERS

1. GENERAL

All Equipment shall be procured from Principal Authorized agents / distributors / resellers

The Bidder shall fill name of only one manufacturer for each equipment/material on which the tender is based. He shall be bound to supply the equipment from the same manufacturer. In case, the Bidder gives names of more than one manufacturer against any equipment, the Engineer / Owner can ask the Bidder supply the equipment from any one of them.

At the evaluation stage if it is noted that any material offered by the bidder does not meet the specification requirements, the Engineer / Owner reserves the right to ask the bidder to replace his choice of equipment supplier meeting the required quality and specification requirement.

During the execution stage if the material from any supplier is found defective / substandard the Engineer / Owner reserves the right to ask the successful bidder to replace his choice of manufacturer / supplier for that particular equipment.

Any change in manufacturer / supplier shall only be entertained if there is sufficient reason that adhering to the original choice of manufacturer / supplier shall be detrimental to either the project quality or project timeline. Proper approval shall have to be sought for change in the choice manufacturer / supplier at least 1 month before the equipment is to be procured.

Samples of all equipment shall have to be got approved prior to their procurement. Any deviation from the BoQ / Specification shall be listed in a separate sheet to be labeled as Annexure-1 containing the details of the deviation including the deviating BoQ item number.

2. LIST OF APPROVED MANUFACTURERS

A standard list of approved manufacturers for the project is given below for the guidance of the bidder. Any additional manufacturer(s) or products mentioned here, which are found irrelevant to the project can be ignored. In case, if any manufacturer for a specified products is missed from this list, the bidder shall raise the query during bidding stage and get it clarified from the client/consultant.

S.No.	Manufacturer / Supplier	Country of Origin	Vendors Details
MEDIUM VOLTAGE (MV) PRODUCTS			
MV Switchgear / RMUs / PMUs			
a.	Pak Electron Limited (PEL)	Pakistan	Mr. Ahmed Hassan Ph: 021-32200951-4, Mob: 0300-2140257
b.	Siemens	Pakistan	Mr. M. Yasir Arshad Siddiqui Ph: 021-32592705, Mob: 0322-2224588
c.	Schneider Electric	Pakistan	Mr. Ali Asghar, Sh. Wilayat Ahmed & Sons. Ph: 021-32624011, 32624012 Mob: 0309-8298294
d.	ABB	Pakistan	
LOW VOLTAGE (LV) PRODUCTS			
LV Switchboards / LV Distribution Boards / PFI Panels			
a.	Pak Electron Limited (PEL)	Pakistan	Mr. Ahmed Hassan Ph: 021-32200951-4, Mob: 0300-2140257
b.	Siemens	Pakistan	Mr. M. Yasir Arshad Siddiqui Ph: 021-32592705, Mob: 0322-2224588
c.	Schneider Electric	Pakistan	Mr. Ali Asghar, Sh. Wilayat Ahmed & Sons. Ph: 021-32624011, 32624012 Mob: 0309-8298294
d.	Hussain & Co.	Pakistan	Mr. Raza Ph: 021- 36341930, 36367002, Mob: 0333-2315658
e.	Green T&D	Pakistan	
LV Load Break Switches, Changeover Switches &			
a.	Gewiss	Italy	Global Lighting Technologies, Mr. Sheraz Shahzad Ph: 042-38935216, Mob: 0322-8064747
b.	Kraus & Naimer	New Zealand	Global Lighting Technologies, Mr. Sheraz Shahzad Ph: 042-38935216, Mob: 0322-8064747
c.	Legrand	Italy	Mega Plus, Mr. Mukhtar Ahmed Ph: 021-111-003-355, Mob: 0303-
d.	Breter	Italy	Mr. Ali Asghar, Sh. Wilayat Ahmed & Sons Ph: 021-32624011, 32624012 Mob: 0309-8298294
e.	Clipsal	Australia	Mr. Jahanzaib Inam Ph: 021-111-081-081 Ext 115, Mob: 0308-2229597
Power Factor Improvement Capacitors &			
a.	Nokian	Finland	Jubilee Corporation, Mr. Abuzar Ph: 021-111-000-520 / 021-32602200-7, Mob: 0300-2390577

S.No.	Manufacturer / Supplier	Country of Origin	Vendors Details
b.	Schneider	France	Mr. Ali Asghar, Sh. Wilayat Ahmed & Sons. Ph: 021-32624011, 32624012 Mob: 0309-8298294
c.	ABB	Italy	Mr. Raheel Ahmed ABB Power and Automation Pvt. Ltd. Ph: 021-37130702, Mob: 0316-4777076
d.	Siemens	Germany	Mr. M. Yasir Arshad Siddiqui Ph: 021-32592705, Mob: 0322-2224588
Contactors			
a.	Telemechanique (Schneider) Electric)	France	Mr. Ali Asghar, Sh. Wilayat Ahmed & Sons. Ph: 021-32624011, 32624012 Mob: 0309-8298294
b.	Legrand	France	Mega Plus, Mr. Mukhtar Ahmed Ph: 021-111-003-355, Mob: 0303-
c.	ABB	Italy	Mr. Raheel Ahmed ABB Power and Automation Pvt. Ltd. Ph: 021-37130702, Mob: 0316-4777076
Push Buttons, Switches, etc.			
a.	Schneider Electric	France / Italy	Mr. Ali Asghar, Sh. Wilayat Ahmed & Sons. Ph: 021-32624011, 32624012 Mob: 0309-8298294
b.	Maruyasa	Japan / Malaysia / Indonesia	Jubilee Corporation, Mr. Abuzar Ph: 021-111-000-520 / 021-32602200-7, Mob: 0300-2390577
MV/LV Cables & Wires			
a.	Pakistan Cables	Pakistan	Mr. Aurangzeb Ubaid Ph: 021-111-222-537, Mob: 0300-8953394
b.	Newage Cables	Pakistan	Mr. Adnan Ph: 021-35837577, Mob: 0300-8230970
c.	FAST Cables	Pakistan	Mr. Awais Hassan Mob: 0321-6698976
Cable Glands, Lugs, Terminals and Accessories			
a.	Cembre	UK	
b.	Hubbell / Hawke	UK	
c.	Hensel	Germany	Mr. Shahzad Mob: 0301-8472264
PVC/UPVC Conduits and Accessories			
a.	Jeddah Polymer	Pakistan	Ph: 021-3634-3666
b.	Dadex	Pakistan	Ph: 021-111-000-789, 021-3431-3881
c.	Galco	Pakistan	Galaxy Corporation, Ph: 36934660, 36958826, 36991789,

S.No.	Manufacturer / Supplier	Country of Origin	Vendors Details
d.	Civic	Pakistan	S. Mohsin H. Naqvi, Pelikan Pipe Industries (Pvt) Ltd. Ph: 021-3257-1593, 3258-1390 Mob: 0300-3945580
e.	Beta	Pakistan	Mr. Dilawaiz Ahmed Ph: 042-35172409-44, Mob: 0301-
GI Conduits			
a.	IIL	Pakistan	International Industries Ltd. Ph: 021-111-019-019
b.	Steelex	Pakistan	Steelex (Pvt.) Ltd. Ph: 021-111-019-019, 36880620
Back Boxes / Pull Boxes / Junction boxes / Floor			
a.	Hensel	Germany	Mr. Shahzad Mob: 0301-8472264
b.	Clipsal (Schneider)	Australia	Clipsal Pakistan, Mr. Jahanzaib Inam Ph: 021-111-081-081 Ext 115, Mob: 0308-2229597
c.	Davis	Malaysia	Clipsal Pakistan, Mr. Jahanzaib Inam Ph: 021-111-081-081 Ext 115, Mob: 0308-2229597
Switches & Socket Outlets			
a.	Clipsal (Schneider Electric)	Australia	Clipsal Pakistan, Mr. Jahanzaib Inam Ph: 021-111-081-081 Ext 115, Mob: 0308-2229597
b.	MK Electric	UK	Leiamra Engineering, Mr. M. Shoaib Khan Ph: 021-34558611-12, Mob: 0300-2318227, 0311-8972136
c.	Legrand	Italy	Mega Plus, Mr. Mukhtar Ahmed Ph: 021-111-003-355, Mob: 0303-2480739
d.	ABB	Italy	Dynamic Engineering, Mr. Aown Muhammad Ph: 051-5514707, 051-5513470, Mob: 315-5291248
Lighting Fixtures			
a.	Philips	Netherland	Signify Pakistan Ltd., Mr. Firdous Mob: 0336-2122296
b.	Gewiss	Germany	Global Lighting Technologies, Mr. Sheraz Shahzad Ph: 042-38935216, Mob: 0322-8064747

S.No.	Manufacturer / Supplier	Country of Origin	Vendors Details
c.	COARTS	China	
Lightning Protection & Earthing Systems			
a.	Erico	USA	Equipment Supplies & Workshop (ESW), Mr. Hammad Ph: 021-34322716, Mob: 0334-3638481
b.	Furse	UK	Britlite Engineering, Mr. Rizwan Mirza Ph: 021-35341732-6, Mob: 0300-2090702
c.	Dhen	Germany	Jubilee Corporation, Mr. Abuzar Ph: 021-111-000-520 / 021-32602200-7, Mob: 0300-2390577
d.	Thomas & Bett	UK	
Cable Trays / Trunking			
a.	M-tech	Pakistan	Mr. Waseem Ph: +92-42-111-333-105, Mob: 0300-8484463, 0333-1702690
b.	MAK	Pakistan	
c.	Hussain & Co.	Pakistan	Mr. Raza Ph: 021- 36341930, 36367002, Mob: 0333-2315658
d.	Ashraf Industries	Pakistan	Ph: +92-42-35745901-2
EXTRA LOW VOLTAGE (ELV) PRODUCTS			
Data Communication Systems & IPTV			
a.	Vivanco	UK	
b.	Clipsal (Schneider Electric)	Australia	Schneider Electric, Mr. Jahanzaib Inam Ph: 021-111-081-081 Ext 115, Mob: 0308-2229597
c.	Panduit	USA	Valued Engineering Solutions, Mr. Anwer Ellahi Mob: 0320-1315709

S.No.	Manufacturer / Supplier	Country of Origin	Vendors Details
d.	Norden	UK / China	
Telephone Cables			
a.	Vivanco	UK	
b.	Clipsal (Schneider Electric)	Australia	Schneider Electric, Mr. Jahanzaib Inam Ph: 021-111-081-081 Ext 115, Mob: 0308-2229597
c.	Panduit	USA	Valued Engineering Solutions, Mr. Anwer Ellahi Mob: 0320-1315709
Communication Racks & PDUs			
a.	Schneider	France	Clipsal Pakistan, Mr. Jahanzaib Inam Ph: 021-111-081-081 Ext 115, Mob: 0308-2229597
b.	Panduit	USA	MB Communication, Ph: 021-32270926-7
c.	Vivanco	UK	
d.	Norden	UK / China	

END OF SECTION

GAS DISTRIBUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

1.2 SUMMARY

A. This Section includes the following for natural gas distribution outside the building:

1. Piping.
2. Valves.
3. Service regulators.
4. Service meters.

B. Related Sections include the following:

1. Division 15 Section "Fuel Gas Piping" of CSI (Construction Specification Institution) format, for natural gas piping inside the building.

1.3 DEFINITIONS

A. Gas Main: Utility's natural gas piping.

B. Gas Distribution: Piping from gas main to individual service-meter assemblies.

C. Service-Meter Assembly: Piping, valves, service regulator, service meter, and specialties.

D. Point of Delivery: Piping outlet from service-meter assembly.

E. Natural Gas Piping: Piping that conveys natural gas from point of delivery to natural gas utilization devices inside the building.

F. PE: Polyethylene plastic.

1.4 PERFORMANCE REQUIREMENTS

A. Minimum Working-Pressure Ratings:

1. Piping and Valves: [100 psig (690 kPa)] minimum, as per SSGC requirement.
2. Service Regulators: 100 psig (690 kPa)] minimum, as per SSGC requirement.
3. Service Meters: AS per SSGC requirements

1.5 SUBMITTALS

A. Product Data: For the following:

1. PE pipe and fittings.
2. Valves.
3. Service regulators. Indicate pressure ratings and capacities.

B. Shop Drawings: For natural gas service piping and service meter assembly. Include plans, elevations, sections, details, and attachments to other work.

C. Welding certificates.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For the following natural gas distribution equipment and accessories to include in emergency, operation, and maintenance manuals.

1. Service regulators.
2. Service meters.
3. Earthquake valves.

1.6 QUALITY ASSURANCE

A. NOTE: all work to be carried out as per SSGC rules and regulations.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of earthquake valves and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

C. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

D. Comply with requirements of utility supplying natural gas and with authorities having jurisdiction for natural gas systems.

E. Comply with [ANSI Z223.1 or NFPA 54] for materials, installation, testing, inspection, and purging.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and legally dispose of liquids from drips in existing gas piping. Handle liquids to avoid spillage and ignition. Notify gas supplier. Do not leave flammable liquids on premises overnight.

B. Store PE pipes and valves protected from direct sunlight.

1.8 PROJECT CONDITIONS

A. NOTE: all work to be carried out as per SSGC rules and regulations.

B. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.

C. Interruption of Existing Natural Gas Service: Do not interrupt natural gas service to facilities occupied by Owner or others unless permitted by SSGC :

1.9 COORDINATION

A. Coordinate connection to gas main with utility.

B. Coordinate natural gas distribution with other utility Work.

PART 2 - PRODUCTS

2.1 PIPES AND FITTINGS

A. PE Pipe: ASTM D 2513, SDR 11.

1. PE Fittings: ASTM D 2683, socket type or ASTM D 3261, butt type with dimensions matching ASTM D 2513, SDR 11, PE pipe.

B. Transition Fittings: Manufactured pipe fitting with one PE pipe end for heat-fusion connection to PE pipe and with one ASTM A 53/A 53M, Schedule 40, steel pipe end for threaded connection to steel pipe.

2.2 JOINING MATERIALS

A. Components, Tapes, Gaskets, and Bolts and Nuts: Suitable for natural gas and as recommended by piping manufacturer.

2.3 SHUTOFF VALVES

A. Shutoff Valves, General: Manual operation, suitable for natural gas service, and with 300-psig minimum working-pressure rating (WOG type)_.

B. Threaded Valves, NPS 1 (DN 25) and Smaller: Include listing by agency acceptable to authorities having jurisdiction.

C. Ball Valves: Bronze body, with chrome-plated brass ball; lever handle; and complying with ASME B16.33, MSS SP-110, UL 842

D. Flanged valves, 50mm diameter and above: Include listing by agency acceptable to authorities having jurisdiction.

E. steel body Gate valve valve with flanged ends in accordance with ASME B16.38. Provide PTFE seats. nonlubricated, wedge-mechanism or tapered lift plug, and flanged ends.

F. Service Mark: Initials "WOG" shall be permanently marked on valve body

1. Seat: Coated with thermoplastic.

2. Stem Seal: Compatible with natural gas.

3. Ends: Flanged

4. Pressure Class: 300 psig

2.4 SERVICE REGULATORS

A. Description: Natural gas service regulator complying with ANSI B109.4 or DIR 006.3-listed for service regulators.

1. Construction: Single-stage, steel-jacketed, corrosion-resistant diaphragm type. Include atmospheric vent and elevation compensator.
2. Pipe Connections:

a. NPS 2 (DN 50) and Smaller: Threaded.
b. NPS 2-1/2 (DN 65) and Larger: Flanged.

2.5 SERVICE METERS

A. Service Meters, General: Gas meters and Pressure regulators as approved by SSGC.

2.6 CONCRETE BASES

A. Description: Precast concrete made of 3000-psi- (20.7-MPa-) minimum, 28-day compressive strength reinforced concrete; at least 4 inches (100 mm) thick and 4 inches (100 mm) larger in each dimension than supported item, unless otherwise indicated.

2.7 VALVE BOXES

A. Provide each valve on buried piping with a RCC Cast in Place valve box of a size suitable for the valve.

B. Valve box shall have a round cover with the word "Gas" cast on it. The Cover shall be Cast Iron or HDPE.

C. metal tag or label shall be installed on top or inside of each valve box lid. The tag shall designate the appropriate location number, valve size, and other pertinent information. Each Cover shall be given a heavy coat of bituminous paint. Provide adjustable box extensions of length required for depth of buried valve.

2.8 STRAINERS

A. Provide on high pressure side of pressure-reducing valves, on the inlet side of indicating and control instruments and equipment subject to sediment damage and where shown on drawings. The strainer element shall be removable without disconnection of piping.

B. The strainer shall be installed on the Main Gas connection and Metering station.

C. Gas Lines: basket type with removable mesh lined brass strainer sleeve.

D. Body: Smaller than 75 mm (3 inches), brass or bronze; 75 mm (3 inches) and larger, cast iron or semi-steel.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Refer to Division 2 Section "Earthwork" of CSI (Construction Specification Institution) format, for excavating, trenching, and backfilling.

3.2 PREPARATION

A. Close equipment shutoff valves before turning off gas to premises or piping section.

B. Inspect natural gas piping according to fuel gas code to determine that natural gas utilization devices are turned off in piping section affected.

C. Comply with fuel gas code requirements for prevention of accidental ignition.

3.3 PIPING APPLICATIONS

A. Flanges, unions, and transition and special fittings with pressure ratings same as or higher than system pressure rating may be used, unless otherwise indicated.

B. Aboveground Piping:

1. NPS 2 (DN 50) and Smaller: Steel pipe, butt-welding-type fittings, and welded joints. Joints for connection to threaded service regulators, service meters, and valves may be threaded.

2. NPS 2 (DN 50) and Smaller: Steel pipe, malleable-iron fittings, and threaded joints.
3. NPS 2-1/2 (DN 65) and Larger: Steel pipe, butt-welding-type fittings, and welded joints. Joints for connection to service regulators, service meters, and valves with flanged connections may be flanged. Joints for connection to service regulators, service meters, and valves with threaded connections NPS 2-1/2 to NPS 4 (DN 65 to DN 100) may be threaded.

C. Underground Piping: PE pipe, PE fittings, and heat-fusion joints.

D. Protective Conduit for Underground Piping: Steel pipe and threaded- or welding-type fittings.

E. Underground-to-Aboveground Piping Connections: Service-line riser.

F. PE-to-Steel Piping Connections: Transition fitting.

3.4 VALVE APPLICATIONS

A. Drawings indicate types of shutoff valves to be used. If specific types are not indicated, the following requirements apply:

1. Connections to Existing Gas Piping: Use valve and fitting assemblies made for tapping gas mains.
2. Underground: Use PE valves or as approved by SSGC.

3.5 PIPING INSTALLATION

A. Install underground, natural gas distribution piping buried at least [36 inches (900 mm)] below finished grade.

B. Install underground, PE, natural gas distribution piping according to ASTM D 2774.

C. Install underground, PE, natural gas distribution piping at entrance to and under part of building in steel piping protective conduit that is vented to outside.

D. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where readily accessible to permit cleaning and emptying. Do not install where condensate would be subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches (75 mm) long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

E. Terminate service-regulator horizontal vents or horizontal vent piping with reducing-elbow fittings with large end as outlet. Install fitting outlet turned down with corrosion-resistant insect screen in outlet.

3.6 SERVICE-METER ASSEMBLY INSTALLATION

A. Install service-meter assemblies aboveground on concrete bases.

B. Install metal shutoff valves upstream from service regulators. Shutoff valves are not required at second regulators if two regulators are installed in series.

C. Install service regulators with vent outlet horizontal or facing down. Install screen in outlet if not integral with service regulator.

D. Install metal shutoff valves upstream from service meters. Install dielectric fittings downstream from service meters. Refer to Division 2 Section "Piped Utilities -- Basic Materials and Methods" for dielectric fittings.

E. Install service meters downstream from pressure regulators.

F. Install pressure-relief or pressure-limiting devices so they can be readily operated to determine if devices are free of debris, tested to determine pressure at which they will operate, and examined for leakage if closed.

3.7 VALVE INSTALLATION

A. Install PE shutoff valves on branch connections to existing underground, natural gas distribution piping. Install valves with valve boxes.

B. Install metal shutoff valves on aboveground, natural gas distribution piping.

C. Install earthquake valves aboveground, outside building, and according to listing applications.

3.8 JOINT CONSTRUCTION

A. Refer to Division 2 Section "Piped Utilities -- Basic Materials and Methods" for basic piping joint construction.

3.9 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect gas distribution piping to natural gas source and extend to service-meter assemblies and points indicated. Connect to building's natural gas piping if it is installed; otherwise, terminate piping with caps, plugs, or flanges, as required for piping material. Refer to Division 15 Section "Fuel Gas Piping" for natural gas piping inside the building.

C. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment having threaded pipe connection.

D. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection.

E. Connect to utility gas main according to utility's procedures and requirements.

F. Install aboveground, natural gas distribution piping upstream from equipment shutoff valves, electrically continuous, and bonded to grounding electrode according to NFPA 70.

G. Do not use natural gas distribution piping as grounding electrode.

3.10 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplates and signs on or near each service regulator, service meter, and earthquake valve.

1. Text: In addition to identifying unit, distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

B. Refer to Division 2 Section "Piped Utilities -- Basic Materials and Methods" for equipment nameplates and signs.

C. Warning Tapes: Arrange for installation of continuous, underground, detectable warning tape over natural gas distribution piping during backfilling of trenches for piping.

D. Refer to Division 2 Section "Earthwork" for warning tapes.

3.11 FIELD QUALITY CONTROL

A. Test, inspect, and purge natural gas distribution according to requirements of fuel gas code and utility.

B. Repair leaks and defective valves and specialties and retest system until no leaks exist.

C. Report results in writing.

D. Verify correct pressure settings for service regulators.

ROADS AND RUNWAYS

Code 127

ROAD AND RUN WAY (S.H.-127)

Brief Specification

(1) Solid Measure:

Materials in their natural state before excavation etc.

(2) Packed Measure

Materials which have been spread, leveled and / or filled, watered and rammed or equally consolidated.

(3) Loose Measure:

As packed measure but not rammed or equally consolidated.

(4) Borrow Pits:

Are to be made only in the areas and of the size and shape approved by the Engineer in charge.

(5) Profiles:

All excavations, embankments, revetments etc are to be properly set out to the true line curre, level or slopes required.

(6) Embankments:

Earth for formation of embankment shall be taken from cut material, in preference to take it from borrow pits. The height is to be based on the average lift from the average ground level for the embankment. The depth of the borrow pits is not to be included in calculating the lift.

(7) Compaction:

Compaction where ever specified will be according to modified AASHTO density as follow:-

(i) Non Cohesive soil upto 100% of modified AASHTO density.

(ii) Cohesive soil upto 95% of modified AASHTO density.

Note: Decision with reference to cohesive, non cohesive soil will be made by Engineer-in-charge through site inspection and tests where necessary. The type of equipment to be used for compaction at various Sub-grades shall be determined by the field staff as a result of field tests. Prior to and during the entire operation of compaction soil tests shall be carried out both in the field and the laboratory. The contractor shall bound to make corrections where found necessary as a result of the tests.

(8) Final Checking of Sub-grade:

After compaction the surface shall be checked by means of a scratch template. The template should be designed as to enable check of sub-grade after placing forms on which the template handles can slide smoothly and should be of such strength and the rigidity that under a test made by supporting it at the centre, the ends will not show a deflection of more than one inch / 25 mm.

The template should be provided with adjusting rods projecting downwards towards the Sub-grade at a spacing of not more than one foot / 300 mm.

The longitudinal and cross-section should also be checked by means of line and grade stakes.

After the final checking the sub-grade must be protected till the sub-base is laid.

Only pneumatic wheel traffic should be allowed on the compacted sub-grade, crawler wheel or steel tyred traffic must not be allowed.

(9) SUB-BASE COURSE

(i) Prior to place sub-base materials, the sub-grade in the area to be covered should be set right with adequate compaction.

(ii) Any error in the sub-grade should be corrected & by adding material, loosening and compacting or cutting off peaks etc.

(iii) The entire surface of sub-grade should be cleaned of all foreign matter by brooming.

(iv) The contractor will produce sample from various sources to be tested for gradation, Atterberg limits, and AASHO density,

(v) Material for the sub base should be free from lumps or balls of clay organic or other objectionable matter.

(vi) The portion of the selected material passing No.40 shall have a liquid limit less than 35 and plastic index less them 12 The loose thickness of material should be such that the compacted depth is not less than 3 inches / 75m.m and not more than 6 inch/ 150 m.m.

(vii) Actual loose depth of material will perhaps be 20% to 25% more than the compacted depth.

(viii) The moisture contents of the material should be checked and corrected.

(ix) The moisture contracts slightly, in excess of the optimum will be necessary for obtaining the desired density.

(x) The contractor shall however, be required to increase or reduce the moisture contents at the desire of Engineer-in-charge, after the test in Laboratory in the following manner.

(a) When the field moisture contents exceed the specified percentage, these should be reduced by blading and aeration. The use of disc followed by blade will accelerate drying. The process should be continued till uniformity of moisture content is obtained through out the mass.

If the field moisture contents are in-sufficient, moisture should be added to the material as it is being moved into the windows by water truck which should follow immediately behind the blade. The addition of water also prevents segregation. As soon as windrowing is completed, the contractor should arrange to get it inspected by

the field staff to determine the uniformity of moisture contents before compaction is started.

(xi) During the entire operation of laying and compaction of the sub-base course, the following tests shall be carried out both in the field and Laboratory and the contractor shall be bound to make correction where found necessary.

(a) Moisture tests:

Moisture contents shall be regularly checked by the quick field method and in speedy moisture tester by the field staff and the samples also sent frequently to the Laboratory for testing.

(b) Grading Tests:

Mechanical analysis test will be carried out frequently to know any major change in the grading of the material necessitating change in the moisture contents, compaction equipment or the necessity of rejecting the material brought at site.

(c) Field Density test:

The field density of the compacted sub-base course shall be frequently tested at the rate not less than one per 2400 Sft/ 223 Sqm area or predetermined location. At random tests shall also be carried twice a day.

(xiii) Soil aggregates (Ghera) available as such in nature consists of pebbles, shingle and sand. The size of pebbles should not exceed 75 mm. It can be a mixture of natural and crushed stone if approved by Engineer in charge. The minimum CBR for sub base material shall be 30%.

(10) Base Course (Water Bound Macadam)

(1) Use approved suitable hard, tough and durable stone.

(2) Road metal to be graded, produced from broken or crushed quarried stone or large boulders of the least dimension not less than 6 inches / 150 mm.

(3) Lay to gradient camber and super-elevation required and dry roll, fill in depression, which may appear during rolling.

(4) Roll wet and add screenings ½ inch / 13 m.m or below and roll on, leaving the finished surface solid smooth and conforming to the required falls, levels, etc.

(5) Cover surface with ½ inch / 13 mm layer of approved grit (river sand gravel, or shingle or stone screenings) and open road to traffic.

(6) Keep the road wet / moist under traffic for 14 days and make good damages.

(7) Roller to be 8 to 12 ton power roller.

(8) When AASHTO specifications are required to be followed, in sub base and base, the material used shall be of the quality and grading conforming to standard AASHTO grading / specifications. The recommended gradation for sub-base and base is given in table 1 and table II respectively.

GRADING FOR SOIL AGGREGATES USED AS SUB BASE MATERIAL

Sieve Designation	Percentage by weight passing square mesh sieve	
	Grading "A"	Grading "B"
2 in (50mm)	100	100
1 in (25mm)	-	75-95
3/8 in (9.5mm)	30-65	40-75
No.4(4-75 mm)	25-55	30-60
No.10(2.00mm)	15-40	20-45
No.40(0.425mm)	8-20	15-30
No.200(0.075mm)	2-8	5-20

Note:- (1) The lab soaked CBR should not be les than 30%.

(2) The material passing No.40 shall have liquid limit not greater than 25 and plastic index (P1) not greater than 6.

GRADING REQUIREMENT FOR CRUSHEDED STONE 'BASE COURSE'

Sieve Designation	Percentage by weight passing square mesh sieve			
	Grading 'A' Size 50mm To 25mm (2in to 1 in)	Grading 'B' size 63 mm to 37.5 mm (2/1-2 into 1/1-2 in)	Grading 'C' Size 90mm To 37.5 mm (3/1-2 into 1/1-2)	Screening size 4.75mm to 0.15 mm (No.4 to No.100)
Passing 100 mm (4in) sieve	-	-	100	-
Passing 90 mm (3 ½ in) Sieve	-	-	90-100	-
passing 75 mm (3 in) Sieve	-	100	-	-
passing 63 mm (2 ½ in) sieve	100	90-100	25-60	-
passing 50mm (2 in) Sieve	90-100	35-70	-	-
passing 37.50 mm (1½ in) Sieve	37-50	0-15	0-15	-
passing 25 mm	0-15	-	-	-

(I in) Sieve passing 19mm	-	0-5	0-5	-
(3/4 in) Sieve passing 12.50 mm	0-5	-	-	-
(½ in) Sieve passing 9.50 mm	-	-	-	100
(3/8 in) Sieve passing 4.75 mm	-	-	-	85-100
(No.4) Sieve passing 0.15 mm (No.100) Sieve.	-	-	-	10-30

Note:- (1) The maximum size of largest stone particle in selected gradation of material should be less than ½ of the thickness of compacted layer.

(2) Percentage of wear not greater than 45 at 500 revolution as per AASHTO-T96.

(10) The material as specified will be laid to the required profile and camber and hand packed. The surface will be then rolled by plain roller followed by vibratory roller. Choking material will continue tobe added while being rolled with vibratory roller, till saturation of the voids is achieved. Water will then be added and surface rolled with plain roller till well finished compacted surface is attained. Dry density of the base/sub base will be determined by field method and process of rolling further continued till a dry density to the extent of required modified AASHTO is achieved.

(11) PRIMING COAT:

(1) The prime coat will be applied only when the existing surface is dry or contain only such amount of moisture as will not hamper uniform distribution of the bituminous material.

(2) No work is done when the atmospheric temperature is below 60 F or when the weather is foggy or rainy.

(3) The various limits of the quantity of bitumen varying between 0.2 to 0.8 gallon per Sq yard / 0.84 Sqm to be used after making trail patches or 10kg / 10 Sqm/108 Sft on base course.

(4) One should be very careful to ensure uniformity of application, prevention of leak drops etc, other wise the entire priming work will be rejected.

(12) SURFACE DRESSING (Single Coat 80/100 Grade Bitumen)

(a) Allow the water bound macadam base course surface to dry to a depth of at least 2inch/50mm.

(b) Rack all caked mud, dust dirt or other deleterious matter with wire brushes and brooms and finally dust the surface with gunny bags so as to leave the voids perfectly clean.

(c) Apply tack/prime coat of bitumen 60/70 or 80/100 heated to 150C.

Spray hot dressing at the rate of 12.20 kg per 10 Sqm. The hot dressing shall be heated in a proper heating plant to the temperature ranging between the minimum and Maximum

(a) temperature specified by the manufacturer and shall be applied to the road surface by means of pressure sprayer at temperature not less than the minimum temperature specified. The sprayer shall be operated in such a way as shall ensure an even and uniform distribution of the hot dressing on the road surface. Excessive deposit of hot dressing on the road shall not be allowed. Spraying shall in all cases be carried out parallel to the centre line of the road. The edges of the surface tobe treated with hot dressing shall be defined by wire, binder twine or other cord lines stretched and pegged in position.

(b) Immediately following the application of hot dressing spread ¼ inch /6 mm gauge aggregate consisting of broken or crushed stone or gravel or shingle The aggregate shall be perfectly dry, free from foreign matter and shall be spread uniformly and evenly at the rate of 0.12cum /10 Sqm. of the bituminous surface. Precaution shall be taken to ensure that whole of the surface is covered with uniform layer of aggregate with out any of accumulation of surplus aggregate at any point. The aggregate to use shall preferably by gravel.

(c) Immediately following the application of the aggregate and the complection of brooming, roll the whole area with appropriate compaction equipment/roller. The rolling shall continue till the aggregate is thoroughly embedded in the bituminous surface.

(d) Open the road to traffic soon after the completion of rolling unless otherwise specified by the manufacturer of the hot dressing used.

(13) SURFACE DRESSING TWO COAT (80/100 bitumen)

Two coat work as on water bound macadam surface not previously treated with hot or cold dressing.

First Coat:

All as single coat work described in para 12(c) to 12 (g) except that.

(i) Spray hot dressing at a rate of 22 kg / 10 Sqm / 108 Sft.

(ii) Spread ½ inch / 13 mm gauge aggregate (graded screened bajri/ crushed stone) at a rate of 6.35 Cft/0.18 cum per 108Sft/ 10 Sqm

Second coat:

This shall be applied immediately after the first coat. The work shall be done in all respect as described in para 12 (c) to 12 (g) above except that (i) Spray hot dressing at the rate of 12.20kg/108 Sft / 10 Sqm. (ii) Spread ¼ inch/ 6 mm gauge aggregate at the rate of 5.3 Cft / 0.15 cum per 108 Sft/ 10 Sqm.

(14) RENEWAL COAT WITH BITUMEN 80/100 ON BLACK TOP SURFACE

i) All pots holes shall be cut as nearly square or rectangular as possible, the sides being cut vertical.

ii) The side of the trench should be painted with "Hot Bitumen" and filled with metal previously coated with hot bitumen.

iii) The pre-coated metal should be rammed in layers of one inch 725 mm.

iv) After repairs to a patch it shall be slightly dusted with sand or stone dust before opening it to traffic so that the coated material may not be pricked up by traffic.

v) Patch repairs to pot holes should proceed very much in advance of seal coat work.

vi) The old surface should then be thoroughly cleaned of dust mud etc with wire brushes and brooms and finally swept with gunny bags. The surface should be perfectly dry.

vii) All as paras 12 (c) to 12 (g) above, except that:

viii) Spray hot dressing at rate of 12.20 kg / 108 sft / 10 sqm.

(15) PRE-MIXED 3" INCHES / 75 MM ASPHALT MACADAM

i) The base coat and seal coat shall have the thickness of 2-1/2 inches / 63 mm and 1/2 inch / 13 mm respectively.

ii) The aggregates used shall be clean dry and hard obtained from approved quarries and shall consist of the following sizes and quantities.

a) BASE COAT;-

i) 1-1/2 inch / 38 mm standard size @ 22 cft / 0.62 cum per 100 sft / 9.3 cum one inch / 25 mm standard size @ 8 cft / 0.23 cum per 100 sft / 9.3 cum.

b. Pre-Coated Seal:-

ii) 1/4 inch / 6 mm standard size @ 8 cft / 0.23 cum per 100 sft / 9.3 cum.

iii) The bitumen shall be heated at per manufacturer's specifications and shall be maintained at that temperature.

iv) The aggregate shall be measured and fed into mixer in the correct proportions. The quantity of bitumen will be 3-1/2 lbs per cft. of the aggregates.

v) A small quantity of the fine river sand may be added to the mix as a filler at 4 Ibs / 1.8 kg per cft / 0.0283 cum of the aggregates.

vi) The mixed material shall be conveyed by suitable means to the road surface and shall be raked to the correct thickness.

vii) The surface shall be rolled with 8 to 10 ton power roller and the rolling should continue as long as proper consolidation is obtained.

viii) The wheels of the roller should be kept moistened so as to prevent the wheels from picking up the coated material.

ix) The base course and the seal coat shall be rolled separately.

x) The surface should be tested by a camber board and straight edge for depressions which should be filled in with more mix and well rolled.

(16) PREMIXED 2"INCHES/50 MM ASPHALT MACADAM

i) The base coat and pre-coated seal coat shall have the thickness of 1-1/2 inch / 38 mm and 1/2 inch / 13 mm respectively

ii) The aggregates shall be clean dry, hard and of the best quality consist of the following size and quantity

a) BASE COAT:-

1 inch / 25 mm standard size @ 15 cft / 0.42 cum per 100 sft / 9.3 cum. 3/4 inch / 19 mm standard size @ 5 cft / 0.14 cum per 100 sft / 9.3 cum.

b) SEAL COAT:-

i) 1/4 inch / 6 mm standard size @ 6 cft / 0.17 cum per 100 sft / 9.3 cum.

ii) The aggregate shall be measured and fed into mixture in the correct proportions. The quantity of bitumen shall be 3-1/2 Ibs / 1.58 kg per cft/ o . 02832 cum of the aggregates.

iii) A small quantity of fine river sand may be added to the mix as filler at 4 Ibs / 1.8 kg per cft / 0.02832 cum of the aggregates.

iv) Pre-coated seal coat consist of 1/4 inch / 6 mm standard size stone chips or bajri as specified, pre-coated with bitumen of the grade specified, the bitumen required to coat the chips or screened bajri shall be 4 Ibs / 1.8 kg per cft / 0.02832 cum of chips or bajri. The mix will be laid at 6 cft / 0.17 cum per 100 sft / 9.3 cum

(17) PRE-MIXES 1 INCH /25 MM AS ASPHALT MACADAM (CHIPPING CARPET)

i) The surface on which the carpet is to be laid should thoroughly cleaned of all dirt and dust etc.

ii) Apply tack coat of hot bitumen of specified grade and temperature @ 15 Ibs / 6.8 kg per 100 sft / 9.3 cum.

iii) A layer of pre-mixed chips or bajri 1/2 inch / 13 mm standard size coated with hot bitumen of specified grade and temperature @ 4 Ibs / 1.8 kg per cft shall be spread uniformly over the tack coat at 10 cft per 100 sft.

iv) The surface should then rolled with a power roller of 8-tons to 10-tons to full consolidation.

v) The surface should then be given a seal of pre-mixed sand at 2-1/2 cft / 0.07 cum per 100 sft / 9.3 cum. The sand of approved quality shall be mixed with bitumen at specified temperature at 8 Ibs / 3.6 kg per cft / 0.0283 cum of sand and carefully spread over pre-mixed bajri so as to fill the voids.

vi) Keep the traffic off the finished surface for 24 hours.

Note: For more details regarding Grouted Macadam: Full Grout 3" inches /75 mm, 2" inches / 50 mm with 30/40 bitumen. Grouted Macadam, Semi Grout with 30/40 grade, a seal coat with 80/100 grade bitumen and Hot Mix Asphalt Concrete Pavements, please consult specifications for Building and Road Works, Pakistan Public Works Department.

(18) CEMENT CONCRETE PAVEMENT

a) Cement:-

The cement shall be ordinary Portland, normal setting cement of any brand, complying in all respect with B.S. 12.
Cement unless otherwise specified to be of any particular quality, shall means ordinary setting time.

b) Coarse Aggregate:-

Aggregate must be clean, inert, hard, nonporous and free from dust, laminated particles, loam clay, organic or other impurities and silt. Coarse aggregates shall be hard and durable / broken / crushed stone, gravel or single.

c) Sand:-

Sand shall be sharp, cubical, hard, dense and whole of which pass through 3/16 inches / 5 mm sieve and 2 to 10% through sieve No.ioo. It should be free organic impurities and clay lumps.

d) Water:-

Water shall be free from earth, vegetable, organic and inorganic impurities particularly the sulphate / salts. Water should generally be fit for drinking P.H. value of water shall range between 6 and 8.

e) Cement Concrete:-

i) No mixer shall be used which has rated capacity of less than one bag batch.
ii) The water measuring equipment shall be capable of accurate measurement, by volume and by weight.
iii) Vibrates shall be placed at such places so as to ensure thorough vibration of the concrete at all parts. Vibrations shall not be secured to the reinforcement. At least, one stand-by-vibrator shall be held ready for immediate use in the event of breakdown.
iv) The concrete shall be mixed in such quantity as is required for immediate use and any concrete which has developed initial set shall not be used.
v) Concrete not in place within 45 minutes after the introduction of the mixing water to the cement, shall not be used.
vi) Hand mixing shall not be done except in case of emergency and under written approval of Engineer-In-Charge.
vii) The base on which the concrete pavement is laid shall have been prepared smooth, compacted and true to the grades and cross-sections.
viii) Forms shall be made of steel of an approved section and shall beset to the required lines and grades. Forms shall be thoroughly cleaned and oiled each time they are used.
ix) The slump of the pavement concrete shall be from one to 3 inches: The slump shall not be varying more than one inch form batch to batch.
x) All joints shall be constructed true to alignment and grade. Form expansion joints between the slabs to the full depth of concrete. The expansion joints shall be 1/2 inch / 13 mm.
xi) The concrete shall be spread uniformly between the forms. Vibrators shall be used adjacent to the longitudinal edge of the pavement. The rate of vibration shall not be less than 3500 vibrations per minutes.
xii) The concrete shall be spread full depth and compacted so that the surface will conform to the finished grade and cross-sections. The concrete along the forms shall be thoroughly spaded or vibrated in a manner that will ensure maximum compaction.
xiii) Immediately following final floating, the entire area of the pavement shall be tested with a 10 feet straight edge. Any depression found shall be immediately filled with fresh concrete which shall than be compacted and finished.

xiv) Placing of concrete should be discontinued during the heavy rain which causes serious damage to the finished surface.

xv) Curing shall be started immediately after 24 hours when the concrete is still green but in summer and in the presence of hot dry winds curing may be required to be started earlier depending upon the condition. Curing shall not be delayed as once concrete gets dry it will affect adversely toward completion of chemical action. For normal Portland cement, under normal temperature conditions, a seen days curing in summer is satisfactory.

TECHNICAL SPECIFICATIONS – AIR CONDITIONING WORKS

1.	TABLE OF CONTENT	1
2.	GENERAL	2
3.	DX SPLIT AIR CONDITIONING UNITS	5
4.	FANS	9
5.	ELECTRICAL WORKS	10
6.	LIST OF APPROVED MANUFACTURERS	11

1.0 GENERAL:

The contract drawings indicate the extent and general arrangement of the Air Conditioning and Mechanical Ventilation System. Equipment and piping shall fit into the space allotted and shall allow adequate and acceptable clearance for entry, servicing and maintenance. Where component parts of equipment or system cannot be serviced without distributing adjacent work resulting from original installation of other work, corrective action satisfactory to the Client / Project Managers / Consultant shall be taken, without any additional cost to the Owner.

(a) Capacities of equipment and materials shall not be less than those indicated.

(b) Conformance with Agency requirements: Where materials or equipment are specified to conform to requirements of Underwriter's laboratory, Inc., Air-conditioning and Refrigeration Institute of Heating, Refrigeration and Air-conditioning Engineers, etc., the Contractor shall submit proof of conformance. The label or listing of the specified agency will be acceptable evidence.

(c) Nameplates: Each major item of equipment shall have the manufacturer's name, address serial and model numbers on a plate securely attached to the item.

(d) Protective and Access requirements: Belts, pulleys, chains, gears, coupling, projecting set-screws, keys and other rotating parts are so located that any person in close proximity shall be fully enclosed or properly guarded. High temperature equipment and piping so located as to endanger personnel or create a fire hazard shall be properly guarded or covered with insulation of a type as specified by the manufacturer. Items such as catwalk ladders and quad rails shall be provided where indicated for safe operation and maintenance of equipment.

(e) Verification of dimensions: The Contractor shall visit the premises to thoroughly familiarize himself with all details of the work and working conditions and verify all dimensions in the field, and shall advise the Client / Project Managers / Consultant of any discrepancy before performing any work. The Contractor shall be specifically responsible for the co-ordination and proper relation of his work to the building structure and to the work of all trades.

(f) Pipes crossing fire rated wall, the gap between wall and pipes shall be filled with soft packing like mineral wool, the ends shall be closed with approved sealant shall be deemed to have been included in the relevant items.

1.1 Equipment and Material:

(a) General:

These shall conform to the respective publications and other requirements specified herein, and as shown on the drawings and shall be the products of the manufacturers regularly engaged in the manufacture of such products. Items of equipment shall essentially be duplicate of equipment that has been in satisfactory use at least 10 years prior to bid opening and shall be supported by a service organization that is, in the opinion of the Client / Project Managers / Consultant, reasonably convenient to the site. It shall be solely the Contractor's responsibility to ensure that the equipment / material supplied by him shall fit into the space allotted for the purpose. If at any stage it is detected that the equipment supplied by him cannot fit into the space provided for the equipment, then the Contractor shall be responsible for supplying other equipment of suitable size, without incurring any additional cost to the Owner.

(b) Approval of Equipment and Material:

Before starting installation of any material or equipment, the Contractor shall submit for approval, working drawings of all areas and lists of materials and equipment's to be incorporated in the work. The layout drawings shall include a plan and elevations of the proposed work, piping and equipment to establish that the equipment will fit in the allotted space with clearances for installation and maintenance. The drawings shall show proposed details for attachment anchoring, and hanging to structural framing of the building; vibration isolation units; foundation and support; location and size of sleeves and prepared openings for passage of pipes. If departures from the contract drawings are deemed necessary by the Contractor, details of such departures including changes in related portions of the project and the reasons thereof shall be submitted with the drawings. Approved departures shall be made at no additional cost to the Owner. A complete electrical connection diagram, for each electrically controlled component having automatic or manual control device, shall be submitted for approval. Wiring diagrams shall identify each component and one diagram shall show all interconnected or interlocked components. The lists of materials and equipment shall be supported by sufficient descriptive material, such as catalogs, diagrams, performance curves, charts,
Layout drawings and other data published by the manufacturer, to demonstrate conformance to the specifications requirements; model numbers alone will not be acceptable. The data shall also include the name and address of the nearest service and maintenance organization that regularly stock repair parts. Listings of items that function as parts of an integrated system shall be furnished at one time. One copy of the layout drawings, wiring diagrams and lists will be returned, marked to indicate approval.

All material / equipment shall be submitted for approval and only approved material / equipment shall be supplied to the site.

1.2 Equipment and Material:

The contract shall provide at his cost, samples of material, equipment for approval by the Engineer before order is placed for the same. Engineer may waive this requirement, if detailed published catalogues submitted by the contractor provide sufficient information for approval. These samples shall include but not limited to:

(a) Pipe Insulation and Covering
(b) Adhesive and Tapes
(c) Electrical Items (Power and Control Cables, Conduit, Circuit Breakers)
(d) Hangers and supports
(e) Copper Piping and fittings
(f) Condensate Drain Piping and fittings

2.0 DX SPLIT AIR CONDITIONING UNITS:

2.1 General:

DX Split system air-conditioning Units, to be in two parts indoor & outdoor units, including filters, evaporator coils, compressors, condenser coils, and fan section, connection to electric power point, refrigerant piping, remote sensors, control wiring, complete in all respect.

Provide units pre-piped, pre-wired, pre-charged refrigerant gas factory assembled and factory tested, with all controls pretested prior to shipping. Provide a terminal strip with each electrical component individually and separately wired to strip. Provide a separate fuse, internally mounted, for each electrical component. A single fuse for multiple compressors or fan motors will not be accepted.

2.2 Indoor Unit:

2.2.1 Cabinet, Casing and Frame:

Unit framework to be formed of structural steel members of 12 to 14 gauge mild steel. After assembly paint the framework for maximum protection against rust. Exterior panels to be fabricated of 18 gauge galvanized steel finished with a baked acrylic enamel over an epoxy primer. Provide neoprene gasketing between panels and frame members; panels to be attached to the frame with quick release latches (no sheet metal screws). Insulate sections including compressor compartment with 1" thick, 3-lb. /cu. ft. density fiberglass having an R value of 4.16.

Arrange units for full front, side and rear service access to all mechanical, electrical and refrigeration controls, check out of electrical control panel, without disrupting or interfering with air flow.

2.2.2 Supply Fan and Motor:

Provide single width, forward curved Class I & II supply fans secured to a machined, ground and polished solid steel shaft. Coat shaft with a rust inhibitor and support by two outboard bearings selected for a minimum 200,000 hours average life.

Provide three-phase NEMA design 'B', 40qC continuously rated fan motor with energy-saving design, .85 power factor, NEMA 'T' frame, open drip-proof, operating at 1750 rpm and supplied with grease-lubricated ball bearings.

2.2.3 Direct Expansion Coil:

Provide direct expansion coil with ½" OD seamless copper tubes
Expanded into copper fins, not less than 3 rows deep or more than 12 fins per inch. Provide evaporator coil with a distributor with side port for hot gas bypass and thermostatic expansion valve with adjustable superheat and external equalizer. Test coil at 300 PSIG air pressure under water, completely dehydrate and pressure test with refrigerant. Provide coils with heavy gauge, insulated, galvanized steel drain pans complete with mastic coating for corrosion protection.

2.2.4 Filters:

Provide filters having a 40% ASHRAE dust spot efficiency, U.L. Class I pleated media type 2-inch deep.

2.2.5 Evaporator Defrost Thermostat:

Provide defrost thermostat package with enclosure, wiring and hardware for field installation.

2.3 Condensing Unit:

2.3.1 General:

Provide units pre-piped and pre-wired, pre-charged refrigerant gas, factory assembled and factory tested, with all controls pre-tested prior to shipping.

Assemble all condenser components on a common base in a weatherproof housing. Provide condenser coil, condenser fans and motors, refrigerant reservoir, charging valve, all controls and holding charge of Refrigerant.

2.3.2 Condenser Coil:

Construct condenser coil of copper plate fins, mechanically bonded to seamless copper tubes. Circuit coil for sub-cooling. Test coils to 425 psi.

2.3.3 Condenser Fans and Motors:

Furnish direct driven, propeller type belt driven, centrifugal fans arranged for vertical horizontal discharge. Provide condenser fan motors of the permanently lubricated type, resiliently mounted. Provide a safety guard for each fan. Include controls for cycling fans for intermediate season operation and low ambient control. Balance each fan statically and dynamically.

2.3.4 Controls:

Locate factory wired controls in a separate enclosure. Provide high and Low pressure switches and compressor overload devices. Incorporate a positive acting timer to prevent short cycling of compressor if power is interrupted. Timer to prevent compressor from restarting for approximately 5 minutes after shutdown.

2.3.5 Refrigerant Circuits:

Each refrigerant circuit is to be an independent circuit completely piped, tested, dehydrated and fully charged with oil and Gas Refrigerant. The Refrigerant circuits are to include compressor, condenser coil with integral liquid sub-cooler, liquid line service and charging valve, filter drier, and sight glass. Compressor units to include suction and discharge line braided-wire isolators.

2.3.6 Casing:

Make unit casing fully weatherproof for outdoor installation. Construct

casing of galvanized steel, zinc phosphatized and finished with baked enamel. Provide openings for power and refrigerant connections. Make panels removable for servicing. Provide heavy duty coil guards, unit mounting rails and drain holes.

2.4 Execution:

Provide refrigerant piping and accessories to connect condensing unit's condensers to indoor air conditioning units according to manufacturer's instructions.

Copper pipes shall be insulated with 3/4" (20 mm) thick closed cells synthetic elastomeric foam insulation and wrapped with self-adhesive waterproofing tape. Condensate drain pipe shall be uPVC class E ASTM D1785 or BS3505 with solvent welded fitting for installation not expose and GI pipe class B (medium) BS 1387 with threaded fittings for installation on roof or expose. Condensate drain shall be insulated with 3/8" (10mm) thick closed cell synthetic elastomeric foam insulation. Contractor to provide minimum 25 mm diameter Condensate Drain and terminate to nearest drain point. All piping shall run inside pipe enclosure or all expose pipe shall be covered.

No insulation shall be applied to any system of piping until all pipe work has been tested, cleaned out and made tight. All insulation shall be applied in a manner consistent with good practice and methods. All longitudinal joints of pipe shall be at the top and bottom. Insulation shall be continuous through walls, floors, ceiling and partitions etc.

All insulated refrigerant pipes exposed to atmosphere shall be provided with a cladding of 26 gauge (0.55 mm) thick G.I. sheet metal with proper support system for cladding works. Cladding works shall be painted with one coat of primer and two coats of finish paint, as approved by the Engineer and as direct by Engineer in charge.

2.4.1 Startup and Testing:

a. Manufacturer's service technician to check alignment of bearings, drives and motors after installation to ensure that no misalignment exists, or make any necessary alignment adjustments prior to startup.

b. The manufacturer shall furnish a start up check list to the Owner at least two months prior to start up. The list must be explicit as to the various items to be checked prior to start up.

c. Before units are started up, manufacturer to pump new grease into bearing housings to force out old grease and provide adequate lubrication.

d. Before acceptance of the equipment by the Owner, conduct all tests as required to demonstrate that the equipment operates mechanically, electrically and acoustically as specified.

e. Conduct a satisfactory performance test in the presence of the Owner / Engineer incharge. Any units found to vibrate beyond acceptable levels must be rebalanced in the field at the Contractor's expense.

2.5 Foundation

Condensing units shall be installed on 150 mm (6" thick), high concrete pads. Pads shall be constructed of 1:2:4 concrete with nominal enforcement. Pad shall be finished with 3/16" (5 mm) cement plaster; edges shall be chamfered and finally painted with two coats of oil paint. Drawings shall be submitted to the Consultants for approval. Condensing units shall be placed on the pads using ribbed neoprene isolators.

3.0 EXHAUST FANS:

3.1 GENERAL:

The contractor shall supply and install fans of the type and capacity specified in Schedule Sheet and conforming to the specifications given herein. The contractor shall be responsible for the proper selection of the fans so that the specified operating conditions are obtained. Connection to the electric power point is in contractor scope. Motor shall be sized to provide the required BHP for meeting the specified conditions without overloading. The Fans shall be provided as per List of Approved Manufacturer's.

External static pressure given in the schedule are indicative and for guidance only. The Contractor shall calculate the external and total static pressure for all fans and shall submit the same for Engineer's review and approval before ordering the fans. Required fan and motor shall be provided without any additional cost and no variation or claim shall be entertained in this regard.

3.2 PROPELLER FANS:

Shall be supplied of the quality indicated on the drawings. Propeller fans shall operate on 220V/1 phase/50 Hertz A.C. current. Fans shall be directly mounted on the motor, and shall operate without disturbing noise, during normal operation. The discharge side of the fan shall be provided with self-closing shutters. Propeller fans shall be as manufactured by National Japan or approved equal local brand.

3.3 INSTALLATION:

3.3.1 General: Fans as shown on drawings shall be installed by the Contractor, complete in all respects and as per satisfaction of the Consultants. Fans shall be rigidly secured so that they operate without vibration and transmission of vibration to the structure shall be through isolated. Connection to ducting shall be through flexible connectors. Ducting connection to fan shall ensure lowest turbulence and smooth transition of sizes. All supporting arrangements of the

fans shall be drawn up by the Contractor and submitted to the Engineer for approval.

Floor mounted fans shall be installed on concrete housekeeping pad at minimum of 100 mm above the floor, fan shall be mounted on vibration isolator. Structural suspended fans shall be installed using threaded rods and vibration isolator.

3.3.2 Commission & Testing: The fans shall be commissioned and tested by the Contractor.

4.0 ELECTRICAL WORKS:

4.1 General:

The Contractor shall be responsible for the complete power and control electric wiring required for Air Conditioning System. The Owner shall provide electric supply at point (Contractor to verify this point). Wiring onwards from this supply point to all motors, equipment's and controls, etc., shall be the responsibility of the Air Conditioning Contractor. The electrification work shall be carried out by a licensed workman, authorized to undertake such a work under the provision of Pakistan Electricity Act and Rules and the latest edition of I.E.E. Wiring Regulations. Any special requirements of the local Electric Supply Company shall be complied with.

4.2 Cables and Conduit:

All the cables listed, except otherwise specified in Electrical Drawings, are four cores PVC insulated PVC sheathed cables 600/1000 volts grade as per British Standard B.S. 6004:1969. The conductors shall be of high conductivity annealed copper wires of 99.97% purity heavily insulate with PVC compound and sheathed overall with PVC compound. The insulation color identification will be as red, yellow, blue and black for neutral. In general all the cables, except otherwise specified in the cable schedule will be non-armored types. All cables shall be selected at 45 °C.

All conduits shall be of heavy gauge 16 SWG G.I, manufactured and tested in accordance with latest relevant standards. The minimum size of conduit shall be 20 mm.

The conduit shall be protected by two base coats of red oxide anti-rust paint and finished in first quality black enamel paint. The coating shall be of heavy enamel, which shall not flake or crack during installation and handling. Each conduit length shall be furnished with threaded ends and a threaded coupling at one end. Soft metal bushes shall be provided at conduit termination to prevent damage to cable during pulling operation. Flexible steel conduits shall be installed at all points' locations where flexible connection is required, as directed by the Engineer in charge. The flexible conduits when used, shall be protected by external PVC sheath, resistant to oil damages. All conduits shall be cut square and reamed at the end.

All conduit ends and the inside of conduits shall be clean and free from burrs.

The Contractor shall coordinate with Electrical Drawings for detailing.

5.0 LIST OF APPROVED MANUFACTURERS:

S.NO.	EQUIPMENT / MATERIAL	RECOMMENDED MANUFACTURERS
1	DX SPLIT AIR CONDITIONING UNITS	a) HITACHI b) GREE c) HAIER
2	COPPER PIPING	a) MUELLER USA b) YORKSHIRE c) CRANE ENFIELD
3	HANGERS & SUPPORTS	a) HILTI, GERMANY b) FISHER, GERMANY c) SIKLA, UK d) MUNGO, SWITZERLAND
4	HVAC FANS	a) SASA. b) AEROTECH c) AIR GUIDE
5	UPVC PIPING	a) DADEX b) VESBO c) COSMOPLAST
6	ELECTRIC CABLES	a) PAKISTAN CABLES b) NEW AGE CABLES c) POINEER CABLES
7	STEEL CONDUIT FOR ELECTRICAL WORKS	a) HILAL, PAKISTAN b) PREMIER, PAKISTAN
8	AIR DISTRIBUTION OUTLETS	a) THERMEC, PAKISTN b) STEEL CRAFT, PAKISTAN c) AIR GUIDE COMPANY,PAKISTAN
9	CLOSED CELL FOAM INSULATION	a) AEROFLEX, THAILAND b) SUPERLON, MALAYSIA c) ARMACELL, THAILAND

Table of Contents

(Sect. 15140)	-	DOMESTIC WATER PIPING
(Sect. 15145)	-	DOMESTIC WATER PIPING SPECIALTIES
(Sect. 15150)	-	SANITARY WASTE, VENT AND STORM PIPING
(Sect. 15155)	-	DRAINAGE PIPING SPECIALTIES
		LIST OF APPROVED MANUFACTURERS

Sect.15140 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

1.02 SUMMARY

A. This Section includes domestic water piping inside the building.

1.03 DEFINITIONS

A. CPVC: Chlorinated polyvinyl chloride plastic.

B. PEX: Crosslinked polyethylene plastic.

C. PVC: Polyvinyl chloride plastic.

D. PPR: Poly propylene Random

1.04 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing domestic water piping systems with 125 psig (860 kPa) unless otherwise indicated.

1.05 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

B. Water Samples:

C. Field quality-control test reports.

1.06 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14, "Plastics Piping System Components and Related Materials," for plastic, potable domestic water piping and components

C. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for potable domestic water piping and components.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Manufacturers: Refer Approved List of Manufacturers.

2.02 PIPING MATERIALS

A. The pipe materials shall as stated below.

2.03 DOMESTIC COLD WATER BELOW AND ABOVE GRADE

1. Polypropylene pipes and pipe fitting PN20 to DIN 8077 for pipe size upto 110mm dia.

2. uPVC pipes to BS 3505 with Class E with solvent welded fittings to BS 4346 for pipe sizes above 110mm dia.

2.04 DOMESTIC HOT WATER PIPING

1. Polypropylene pipes and pipe fitting PN20 to DIN 8077 for pipe size upto 110mm dia.

2. cPVC Sch 80 pipes with solvent welded fittings for pipe sizes above 110mm dia.

2.05 IRRIGATION PIPES

1. uPVC pipes to BS 3505 with Class D with solvent welded fittings to BS 4346 for all pipe sizes.

2.06 Gas Piping:

A. Natural Gas Piping Above Grade

1. LPG Liquid fill line (if Applicable) shall be seamless steel to ASTM A53/A106 schedule 80.

2. High Pressure (Above 5 Psi) Gas pipes shall be seamless black steel to ASTM A53/A106 schedule 40.

3. Natural Gas Low pressure Gas pipes shall be GI Medium as per as per BS EN 10255.

4. Pipe in Pipe Sleeve Pipe (if indicated on the drawings) should be seamless Pipe.

5. The Pipe selection should match the natural gas service in future.

B. Natural Gas Piping Below Grade

1. All buried Gas piping shall be Polyethylene PE-100 PN-16 as per DIN 8075, ASTM D2513, ISO 4437:1996, DIN 8075, ASTM D2513 with Fusion Weld fitting.

2.07 Fuel oil Piping:

1. Fuel Oil piping shall be in black mild steel to BS 1387 – heavy weight, with screwed malleable iron fittings for pipes up to 50 mm to BS 143 & 1256 and to BS EN 10242 and for pipe of 65 mm and above, Butt welded fittings to BS 1965 part 1.

2.08 VALVES

A. Generally, all valves of the same type shall be of the same manufacturer. All gate, globe, angle, and swing check valves as a group shall be of the same manufacturer. All valves 50 mm and smaller shall be threaded and have bronze bodies.

B. All valves 65 mm and larger shall be Cast iron type and shall be flanged (or grooved for grooved coupling joints).

C. For PPR piping use PPR Coated valves of the same piping material and manufacturer.

D. Each valve shall be marked (engraved, stamped, or cast on each valve or metal tag, permanently attached to the valve) at the factory with the following minimum information
   1. Manufacturer's Name.
   2. Catalogue or Figure No.
   3. Size and Pressure Class.

E. Arrows to indicate direction of flow on check, globe, angle, non-return, and eccentric plug valves.

2.09 GATE VALVES

A. [Size 50 mm and Smaller]. Furnish bronze valves with screwed-in bonnet, non-rising stem, solid wedge disc, and threaded ends. Pressure rating PN20.

B. [Size 65 mm and Larger]. Furnish Iron Body Bronze Mounted (IBBM) valves, i.e. cast iron body bronze trim valves, with bolted bonnet, non-rising stem, solid wedge disc, flanged ends, and renewable seat rings.

2.010 GLOBE VALVES.

A. [Size 50mm and Smaller]. Furnish valves designed for minimum PN20 working pressures.

B. [Size 65 mm and Larger]. Furnish valves designed for minimum PN16 working pressure.

2.011 CHECK VALVES

A. [50 mm and smaller]. Furnish swing valves designed for minimum PN20 non-shock working pressures. Valves shall have renewable discs and side plugs, integral seats.

B. [Size 65 mm and Larger Water Check Valves]. Valves shall be silent type spring loaded of the double door or wafer style. Valves shall be designed for minimum PN16 non shock water working pressure.

2.012 RELIEF VALVES.

Domestic Water Temperature and Pressure Relief Valve.

A. On hot water storage tanks provide an ASME rated thermostatic, self-closing, temperature and pressure relief valve, located in the relief valve openings of tanks. Valve shall have a minimum thermal discharge capacity equal to the input capacity of the heater standard pressure setting of 600 kPa and standard temperature setting of 100 - 140 degrees C. Relief valve pipe to discharge to floor drain.

2.013 BALL VALVES.

A. [Size 50 mm and Smaller]. Valves shall be standard port, 2-piece construction with screwed ends. Valves shall be designed for minimum PN25. Valves shall have bronze or brass body, stainless steel ball, steel handle with vinyl grip.

B. [Size 65 mm and Larger].Valves shall be standard port, BS 5159 with flanged ends. Valves shall be designed for minimum PN16 working pressure. Valves shall have steel body, chrome or nickel plated steel or stainless steel ball.

2.014 Float Valves

A. Float valves shall be installed as indicated in the drawings to provide consistent level control in reserve supply water storage tanks. The valve shall meet the requirements of the Water Byelaws for air gaps and shall be constructed throughout in approved materials and shall prevent back siphoning. Bronze equilibrium float valves 80 and above shall be flanged end, flat faced and drilled to suit BS4504 PN16.

B. Bronze equilibrium float valves upto 50 shall be screwed end BS2779 parallel and shall be provided complete with back nut.

C. Floats for valve sizes 80mm and above shall be of copper.

2.015 Solenoid Valves

A. Electrically operated solenoid valves shall be single phase 220V and shall be rated for the system pressure

2.016 Bib Taps

A. Bib-cocks shall be in accordance with BS 1010: 1973. They shall be provided with hose union nosepiece and hand wheel operated.

2.017 Automatic Air Valves

A. Automatic air valves shall have a bronze body with bolted cover and a 9mm top outlet.

2.018 Strainers

A. Up to and including DN50 strainers shall be manufactured from bronze and shall be of the 'Y' type with bolted cap, PN25 temperature/pressure rating.

B. Strainers above DN50 shall be manufactured from cast iron and shall be of the 'Y' type with bolted cap, PN16 temperature/pressure rating and shall be complete with drilled and tapped caps complete with drain cocks.

C. Strainers shall be provided with a medium grade screen sized such that in their clean condition the maximum pressure drop at the design flow rate shall not exceed 6kPa.

PART 3 - EXECUTION

3.01 EXCAVATION

A. Excavating, trenching, and backfilling are specified in Section "Earthwork."

3.02 PIPE AND FITTING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.

B. Flanges may be used on aboveground piping, unless otherwise indicated.

C. Grooved joints may be used on aboveground grooved-end piping.

3.03 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use bronze ball or gate valves for piping NPS 2 (DN 50) and smaller. Use cast-iron butterfly or gate valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.
2. Hot-Water-Piping, Balancing Duty: Calibrated balancing valves.
3. Drain Duty: Hose-end drain valves.

B. PPR Coated PN-25 rated ball, butterfly, and check valves may be used in matching piping materials.

3.04 PIPING INSTALLATION

A. Install domestic water piping level without pitch and plumb.

B. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

3.05 HANGER AND SUPPORT INSTALLATION

A. Install supports according to Division 15 Section "Hangers and Supports."

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced 1 size for double-rod hangers, to a minimum of 3/8 inch (10 mm).

D. Install hangers for PVC/cPVC/PPR and PE piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 2 (DN 50) and Smaller: 48 inches (1200 mm) with 3/8-inch (10-mm) rod.
2. NPS 2-1/2 to NPS 3-1/2 (DN 65 to DN 90): 48 inches (1200 mm) with 1/2-inch (13-mm) rod.
3. NPS 4 and NPS 5 (DN 100 and DN 125): 48 inches (1200 mm) with 5/8-inch (16-mm) rod.
4. NPS 6 (DN 150): 48 inches (1200 mm) with 3/4-inch (19-mm) rod.
5. NPS 8 (DN 200): 48 inches (1200 mm) with 7/8-inch (22-mm) rod.

E. Install supports for vertical PVC/cPVC/PPR piping every 48 inches (1200 mm).

3.06 FIELD QUALITY CONTROL

A. Inspect domestic water piping as follows:

1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

    a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
    b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
3. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

B. Test domestic water piping as follows:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to water pressure of 150 psi or 50 psi above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

END OF SECTION 15140

Sect.15145 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following domestic water piping specialties:

1. Balancing valves.
2. Strainers.
3. Outlet boxes.
4. Hose stations.
5. Hose bibs.
6. Drain valves.
7. Water hammer arresters.
8. Air vents.
9. Flexible connectors
10. Flow Sensing Devices
11. Puddle flanges

1.03 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig (860 kPa), unless otherwise indicated.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

C. Field quality-control test reports.

D. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.01 BALANCING VALVES

A. Refer Section 15140

2.02 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers :

1. Pressure Rating: 125 psig (860 kPa) minimum, unless otherwise indicated.
2. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and for NPS 2-1/2 (DN 65) and larger.
3. End Connections: Threaded for NPS 2 (DN 50) and smaller;flanged for NPS 2-1/2 (DN 65) and larger.
4. Screen: Stainless steel with round perforations, unless otherwise indicated.
5. Perforation Size:

    a. StrainersNPS 2 (DN 50) and Smaller: 0.020 inch (0.51 mm) .
    b. Strainers NPS 2-1/2 to NPS 4 (DN 65 to DN 100): 0.045 inch (1.14 mm)

6. Drain: Factory-installed, hose-end drain valve.

2.03 HOSE BIBBS

A. Hose Bibbs :

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 (DN 15 or DN 20) threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig (860 kPa).
7. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
8. Finish for Service Areas: Rough bronze, or chrome or nickel plated.
9. Finish for Finished Rooms: Chrome or nickel plated.
10. Operation for Equipment Rooms: Wheel handle or operating key.
11. Include operating key with each operating-key hose bibb.

2.04 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig (2760-kPa) minimum CWP.
3. Size: NPS 3/4 (DN 20).
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

B. Gate-Valve-Type, Hose-End Drain Valves

1. Standard: MSS SP-80 for gate valves.
2. Pressure Rating: Class 125.
3. Size: NPS 3/4 (DN 20).
4. Body: ASTM B 62 bronze.
5. Inlet: NPS 3/4 (DN 20) threaded or solder joint.
6. Outlet: Garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

C. Stop-and-Waste Drain Valves :

1. Standard: MSS SP-110 for ball valves or MSS SP-80 for gate valves.
2. Pressure Rating: 200-psig (1380-kPa) minimum CWP or Class 125.
3. Size: NPS 3/4 (DN 20).
4. Body: Copper alloy or ASTM B 62 bronze.
5. Drain: NPS 1/8 (DN 6) side outlet with cap.

2.05 WATER HAMMER ARRESTERS

A. Water Hammer Arresters :

1. Standard: ASSE 1010 or PDI-WH 201.
2. Type: Metal bellows / Copper tube with piston.
3. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

2.06 AIR VENTS

A. Bolted-Construction Automatic Air Vents :

1. Body: Bronze.
2. Pressure Rating: 125-psig (860-kPa) minimum pressure rating at 140 deg F (60 deg C).
3. Float: Replaceable, corrosion-resistant metal.
4. Mechanism and Seat: Stainless steel.
5. Size: NPS 1/2 (DN 15) minimum inlet.
6. Air vents shall be installed on all coils and all other high points required for efficient operation and venting of system.
7. Air vents shall be provided at all high points in the pipework, whether indicated on the drawings or not.
8. Large diameter automatic air vents shall be provided at all primary venting positions, such as plant rooms and at the head of vertical risers.
9. Air bottles shall be provided at all venting points.
10. The Sub CONTRACTOR shall be responsible for the design and positioning of all air vents.

2.07 PUDDLE FLANGES

A. Where pipework passes through the external walls of the buildings or trenches below ground level, the CONTRACTOR shall supply and cast or built puddle flanges into the structure.

B. Puddle flanges are to be manufactured from the same material as the pipework of which they form a part.

C. Each puddle flange shall comprise a length of pipe, flanged or screwed at end according to diameter with an undrilled slip on flange welded on the outside at a point where it will be located mid way in the thickness of the wall. The puddle flange is to be painted externally with two coats of bituminous paint before being built into the structure.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install water regulators with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.

B. Install balancing valves in locations where they can easily be adjusted.

C. Install Y-pattern strainers for water on supply side of each pump.

D. Install water hammer arresters in water piping according to PDI-WH 201.

E. Install air vents at high points of water piping. [Install drain piping and discharge onto floor drain.]

END OF SECTION 15145

Sect.15150 - SANITARY WASTE, VENT AND STORM PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

1.02 SUMMARY

A. This Section includes the following for soil, waste, and vent piping inside the building:

1. Pipe, tube, and fittings.

1.03 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. EPDM: Ethylene-propylene-diene terpolymer rubber.

C. LLDPE: Linear, low-density polyethylene plastic.

D. NBR: Acrylonitrile-butadiene rubber.

E. PE: Polyethylene plastic.

F. PVC: Polyvinyl chloride plastic.

G. TPE: Thermoplastic elastomer.

1.04 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water (30 kPa) .
2. Sanitary Sewer, Force-Main Piping: 150 psig (1035 kPa).

B. Seismic Performance: Soil, waste, and vent piping and support and installation shall be capable of withstanding the effects of seismic events.

1.05 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

B. Shop Drawings:

1. Design Calculations: Signed and sealed by a qualified professional engineer for selecting seismic restraints.
2. Drainage System: Include plans, elevations, sections, and details.

C. Field quality-control inspection and test reports.

1.06 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.01 PIPING MATERIALS

A. Piping materials shall be as under. All drainage pipes and fittings shall be Kite Mark.

2.02 ABOVE GROUND SOIL, WASTE AND VENT PIPE

A. Plastic pipes shall be extruded un-plasticized PVC (UPVC) conforming to the following British Standards:
1. Pipes 32mm to 40mm diameter : uPVC pipe with Rubber ring push fit joints or solvent joints (as approved by consultant) as per BS 5255
1. Pipes 82mm to 160mm diameter: uPVC pipe with solvent weld or Rubber ring push fit joints (as approved by consultant) as per BS EN 1329.

2.03 BELOW GROUND SOIL AND WASTE PIPE

A. uPVC conforming to the following British Standards:
1. Pipes 110mm and 300mm diameter: uPVC pipe with solvent weld fitting as per BS 4660 (BS EN 1401)
2. Pipes larger than 300mm diameter: to BS 3506.

2.04 STORM WATER PIPE

A. Plastic pipes shall be extruded un-plasticized PVC (UPVC) conforming to the following British Standards:
1. uPVC pipe with solvent joints (as approved by consultant) as per DIN 8061/8062 and ISO 3633 Type B

2.05 CONTENSATE DRAIN PIPING (ABOVE AND BELOW GRADE)

A. uPVC conforming to the following British Standards:
1. Pipes 20mm and 300mm diameter: Upvc class ‘E’ pipe with solvent weld fitting as per BS 3505 (EN 1401).

2.06 PRESSURE PIPING FROM PUMPS (ABOVE AND BELOW GRADE)

A. uPVC conforming to the following British Standards:
   1. Pipes 20mm and 300mm diameter: Upvc class ‘E’ pipe with solvent weld fitting as per BS 3505 (EN 1401).

B. Alternatively (Kite Mark) pipes are acceptable only if approved by consultant.

2.07 IRRIGATION PIPING

A. uPVC conforming to the following British Standards:
   1. Pipes 20mm and 300mm diameter: Upvc class ‘D’ pipe with solvent weld fitting as per BS 3505 (EN 1401).

2.08 SPECIAL PIPE FITTINGS

2.09 ENCASEMENT FOR UNDERGROUND PIPING CROSSING DRIVEWAYS

A. All Drainage pipes crossing driveways and subjected to heavy traffic shall be provided in concrete encasement.

PART 3 - EXECUTION

3.01 EXCAVATION

A. Refer to "Earthwork" for excavating, trenching, and backfilling.

3.02 PIPING INSTALLATION

A. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

B. Install cleanout fitting with closure plug inside the building in sanitary force-main piping.

C. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

D. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.

E. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:

1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 2 DN 50 and smaller; 1 percent downward in direction of flow for piping NPS 3 (DN 75) and larger.
2. Horizontal Sanitary Drainage Piping: 1 percent downward in direction of flow.
3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

F. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.

G. Install underground PVC soil and waste drainage piping according to ASTM D 2321.

H. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction or Consultant.

3.03 HANGER AND SUPPORT INSTALLATION

A. Pipe hangers and supports are specified in Division 15 Section "Hangers and Supports." Install the following:

B. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 48 inches (1200 mm) with 3/8-inch (10-mm) rod.
2. NPS 3 (DN 80): 48 inches (1200 mm) with 1/2-inch (13-mm) rod.
3. NPS 4 and 5 (DN 100 and 125): 48 inches (1200 mm) with 5/8-inch (16-mm) rod.
4. NPS 6 (DN 150): 48 inches (1200 mm) with 3/4-inch (19-mm) rod.
5. NPS 8 to NPS 12 (DN 200 to DN 300): 48 inches (1200 mm) with 7/8-inch (22-mm) rod.

C. Install supports for vertical PVC piping every 48 inches (1200 mm).

3.04 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Equipment: Connect drainage piping as indicated.

3.05 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa). From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg (250 Pa). Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.06 PROTECTION

A. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

END OF SECTION 15150

Sect. 15155 - DRAINAGE PIPING SPECIALTIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

1.02 SUMMARY

A. This Section includes the following drainage piping specialties:
   1. Cleanouts.
   2. Floor drains.
   3. Trench drains.
   4. Channel drainage systems.
   5. Roof drains.
   6. Manhole Covers
   7. Miscellaneous drainage piping specialties.

1.03 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. FOG: Fats, oils, and greases.

C. FRP: Fiberglass-reinforced plastic.

D. HDPE: High-density polyethylene plastic.

E. PE: Polyethylene plastic.

F. PP: Polypropylene plastic.

G. PUR: Polyurethane plastic.

H. PVC: Polyvinyl chloride plastic.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated above.

B. Shop Drawings: Show fabrication and installation details for frost-resistant vent terminals.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.05 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

1.06 COORDINATION

A. Coordinate size and location of concrete bases.

B. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.01 CLEANOUTS

A. Plastic Floor Cleanouts:

1. Size: Same as connected branch.
2. Body: PVC.
3. Closure Plug: Stainless Steel.
4. Riser: Drainage pipe fitting and riser to clean out of same material as drainage piping.
5. Finish: Stainless steel cap

2.02 FLOOR DRAINS

A. Plastic Floor Drains:
1. Material: PVC as per piping material
2. Outlet: P-Trap (Side)
3. Sediment Bucket: Not required.
4. Top or Strainer Material: Stainless steel <Refer Architect finishes schedule>.
5. Top of Body and Strainer Finish: Stainless steel.
6. Top Shape: Square. <Refer Architect finishes schedule>.
7. Trap Material: Plastic drainage piping.
8. Trap Pattern: Standard Multi Floor Trap with Multiple inlets and one outlet.

B. Funnel floor drain where specified on drawings shall include a nickel bronze funnel secured to the grating

2.03 TRENCH DRAINS

A. Trench Drains :

1. Standard: ASME A112.6.3 for trench drains.
2. Outlet: Side.
3. Grate Material: Cast Iron as indicated on drawing and BOQ. <Also Refer Architect finishes schedule>.
4. Grate Finish: Epoxy coated for cast iron <Refer Architect finishes schedule>.
5. Dimensions of Frame and Grate: Refer drawings
6. Top Loading Classification: As mentioned on MEP drawings and BOQ.

2.04 ROOF DRAINS

A. Plastic Roof Drains:

1. Standard: ASME A112.21.2M.
2. Pattern: Balcony/ Roof drain.
3. Body Material: PVC with 2” Side outlet for Balcony Drains.
4. Dimensions of Body: Refer Drawings
5. Outlet: Bottom.
6. Dome Material: Stainless Steel <<Refer Architect finishes schedule>.

2.05 Pre- Fabricated Area Drains/Catch Basins:

A. DUCO coated cast Iron body with 300mm x 300mm Dimensions and 200mm Depth with flashing flange and heavy duty hinged slotted grate.

2.06 Channel Gratings

A. Internal Channel grating shall be stainless steel 304 and the external channel grating shall be heavy duty Cast iron to dimensions as indicated on drawings.

B. External channel grating and catch basins shall be in heavy duty ductile iron material.

2.07 MISCELLANEOUS DRAINAGE PIPING SPECIALTIES

A. Vent Caps:

1. Description: PP of same brand as of piping.
2. Size: Same as connected stack vent or vent stack.

B. Expansion Joints:

1. Standard: ASME A112.21.2M.
2. Body: Cast iron with bronze sleeve, packing, and gland.
3. End Connections: Matching connected piping.
4. Size: Same as connected soil, waste, or vent piping.

C. Manholes/gully traps covers

1. All covers shall be Cast Iron with black bitumen coating. Manhole covers shall have clear opening of 750 x 750 mm.

2. Manhole Cover sizes shall be as per as indicated in the drawing and Manhole schedule but shall NOT be less than 600mm x 600mm

3. All manholes and gully traps shall be vented as per drainage department requirements.

4. Gully trap covers shall have clear opening of 300 x 300 mm.

5. All manhole covers and frames shall comply with BS 497:1976 (BS EN 124:1994)

6. Covers in paved areas shall be medium duty type having weight as per Table 1

7. Covers in plinth protection shall be light duty having weight as per Table-1

8. Covers in Driveways shall be Heavy duty having weight as per Table-1

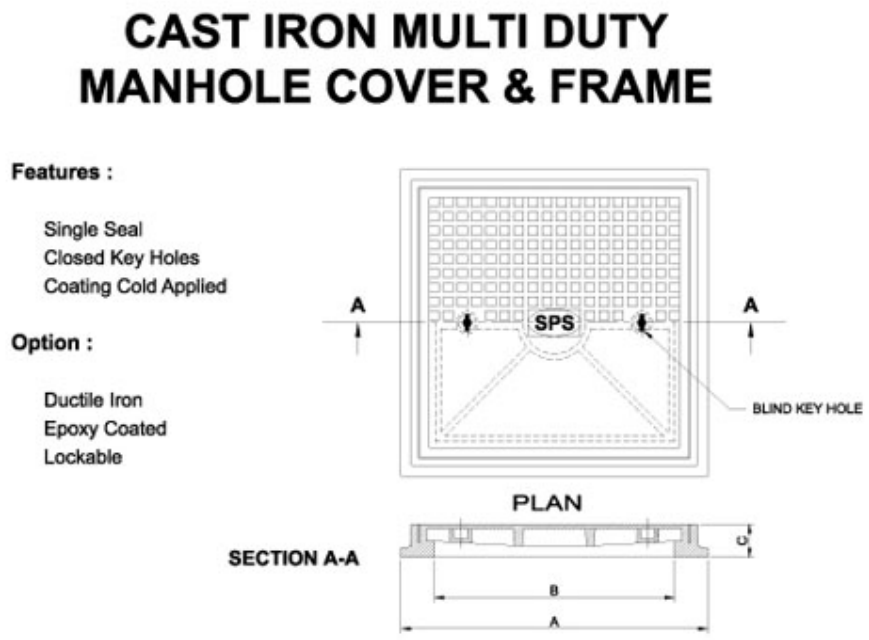


Table 1-1 (Manhole Covers Weights)

S.no	Cover material	Clean Opening	Type	Weight	Standard	Remarks
1	Cast Iron	750 x 750	Light duty	55 Kg	BS EN 124:1994	
2	Cast Iron	750 x 750	Medium duty	70 Kg	BS EN 124:1994	
3	Cast Iron	750 x 750	Heavy duty	95 Kg	BS EN 124:1994	

D. RCC Catch basins with Slot Grating

1. All cast iron covers shall be Slotted Cast Iron with black bitumen coating. Grating covers shall have clear opening of 600 x 600 mm.

E. Neutralization Tanks/ Dilution Tanks

Neutralization tanks shall be solid construction polyethylene body with inlet and outlet, optional vent connections, acid resistant epoxy coated bolted down gasketed lid, stainless steel hardware.

The tank is filled with neutralization medium, lump limestone 1" to 3" diameter size, water is then added to the tank to help dilution.

Capacity: Min 200 gallon capacity, having 6” inlet and outlet and 3” vent connections manufactured from high density polyethylene.

Refer Drawing for capacities but shall not be less than 200 Gallons

Function: Used in laboratories, industrial processes or other polluting sources to dilute and neutralize harmful wastes that may be discharged. Also used in chemical treatment plants or municipal water treatment facilities for diluting polluted effluent.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.
4. Locate at base of each vertical soil and waste stack.

B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

D. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.

2. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
3. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

E. Install trench drains at low points of surface areas to be drained. Set grates of drains flush with finished surface, unless otherwise indicated.

F. Assemble and install ASME A112.3.1, stainless-steel channel drainage systems according to ASME A112.3.1. Install on support devices so that top will be flush with surface.

G. Install fixture air-admittance valves on fixture drain piping.

H. Install stack air-admittance valves at top of stack vent and vent stack piping.

I. Install air-admittance-valve wall boxes recessed in wall.

J. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

K. Install through-penetration firestop assemblies in plastic stacks at floor penetrations.

L. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

M. Install vent caps on each vent pipe passing through roof.

N. Install frost-resistant vent terminals on each vent pipe passing through roof. Maintain 1-inch (25-mm) clearance between vent pipe and roof substrate.

O. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.

P. Install grease interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing.

1. Above-Floor Installation: Set unit with bottom resting on floor, unless otherwise indicated.
2. Flush with Floor Installation: Set unit and extension, if required, with cover flush with finished floor.
3. Recessed Floor Installation: Set unit in receiver housing having bottom or cradle supports, with receiver housing cover flush with finished floor.
4. Install cleanout immediately downstream from interceptors not having integral cleanout on outlet.

Q. Install grease removal devices on floor. Install trap, vent, and flow-control fitting according to authorities having jurisdiction. Install control panel adjacent to unit, unless otherwise indicated.

R. Install oil interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing.

S. Install solids interceptors with cleanout immediately downstream from interceptors that do not have integral cleanout on outlet. Install trap on interceptors that do not have integral trap and are connected to sanitary drainage and vent systems.

T. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.02 CONNECTIONS

A. Install piping adjacent to equipment to allow service and maintenance.

B. Grease Interceptors: Connect inlet and outlet to unit, and connect flow-control fitting and vent to unit inlet piping. Install valve on outlet of automatic drawoff-type unit.

C. Oil Interceptors: Connect inlet, outlet, vent, and gravity drawoff piping to unit; flow-control fitting and vent to unit inlet piping; and gravity drawoff and suction piping to oil storage tank.

3.03 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
1. Grease interceptors.
2. Oil interceptors.
3. Solids interceptors.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.

3.04 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled FOG disposal systems and grease removal devices and their installation, including piping and electrical connections, and to assist in testing.

B. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.05 DEMONSTRATION

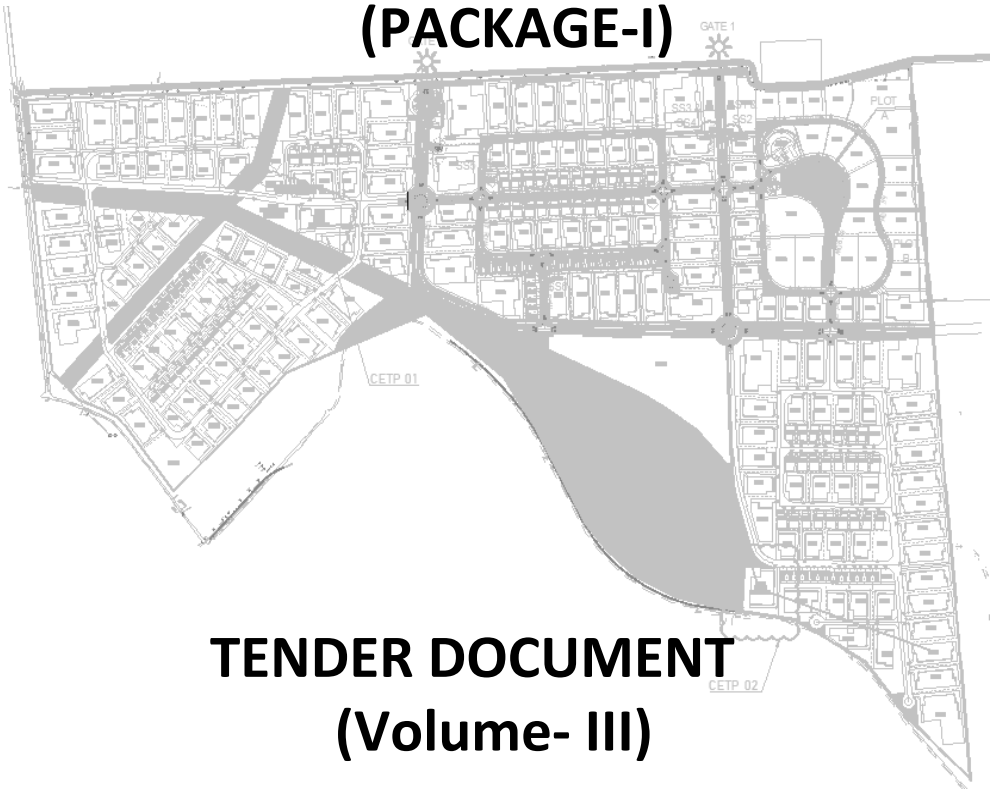
A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain FOG disposal systems and grease removal devices.

END OF SECTION

LIST OF APPROVED MANUFACTURERS (PLUMBING):

S.NO.	EQUIPMENT / MATERIAL	RECOMMENDED MANUFACTURERS
1	PP-R PIPES	A) BETA PIPES B) SWI PIPES C) POPULAR PIPES D) DADEX E) GM PIPES
2	PP-R COATED VALVES	A) BETA PIPES B) SWI PIPES C) POPULAR PIPES D) DADEX E) GM PIPES
3	VALVES (100M AND ABOVE)	A) TOZEN - USA B) HATTERSLEY – UK C) KITZ-JAPAN
4	MANHOLE COVERS	A) JAWS - LOCAL B) SUPER ALPINE - LOCAL
5	UPVC PIPES FOR DRAINAGE	A) BETA PIPES B) SWI PIPES C) AGM D) SMARTHOME-EGYPT E) GM PIPES
6	DRAIN SPECIALITIES	A) BETA PIPES B) SWI PIPES C) AGM D) SMARTHOME-EGYPT E) GM PIPES
7	SANITARY FITTINGS	A) ZILVER – CHINA B) KABIL – LOCAL C) TURKPLAST – LOCAL
8	UPVC PIPE & FITTINGS	A) PRESTIGE PLASTICS B) HYDROPLAST – CHINA C) NEPRO – UAE / SAUDI ARABIA D) GM PIPES
9	HANGERS & SUPPORTS	A) INKA, TURKEY B) LINK, TURKEY C) NORM, UAE

INFRASTRUCTURE DEVELOPMENT WORKS OF BLOCK-A ON 500 ACRES LAND OF PHASE-I (1500 ACRES) OF KARACHI INDUSTRIAL PARK (PACKAGE-I)



TENDER DOCUMENT (Volume- III)

BILL OF QUANTITIES

JUNE 2025

Lead Firm — SURBANA JURONG — JV-Team

GRAND SUMMARY

S.No	Description	Amount
1	**CIVIL WORKS (STRUCTURE)**	
(i)	UGWT & Pump Room	-
(ii)	Sub-Stations	-
(iii)	Watch Towers	-
(iv)	Emergency Gate	-
(v)	Gate House	-
	Total of Structure Works	**-**
2	**CIVIL WORKS (ARCHITECTURE)**	
(i)	UGWT & Pump Room	-
(ii)	Sub-Stations	-
(iii)	Watch Towers	-
(iv)	Gate House	-
(v)	Emergency Gate	-
(vi)	Precast Boundary Wall	-
	Total of Architecture Works	**-**
3	**ELECTRICAL WORKS**	**-**
4	**PLUMBING**	
(i)	EMERGENCY GATE	-
(ii)	GATE HOUSE	-
	Total of Plumbing Works	**-**
5	**HVAC**	**-**
6	**WATER SYPPLY SYSTEM**	**-**
7	**STORMWATER DRAINAGE SYSTEM**	**-**
8	**SEWERAGE SYSTEM**	**-**
9	**ROAD NETWORK**	**-**
TOTAL COST		**-**

UNDERGROUND WATER TANK & PUMP ROOM

Engineer's Estimate

S.No	Description	Amount
A	**SCHEDULE ITEM** Structural Work of UGWT and Pump Room	-
	Total of Schedule Items - A	**-**
B	**NON-SCHEDULE ITEM** Structural Work of UGWT and Pump Room	-
	Total of Non-Schedule Items - B	**-**
	TOTAL CARRIED TO GRAND SUMMARY (A+B)	**-**

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sched. Rate)	Rate (Rs.)	Amount (Rs.)
		SCHEDULE ITEMS				
1		**EARTH WORKS**				
1.1	Code -103,	Excavation for raft foundations, underground tanks and septic tanks (rectangular or square) in all kinds of soil (except gravelly and murum soil wet silt, clay or mud, conglomeration of gravel and boulders, soft, sandy or disintegrated and hard rock) and back filling the excavated material all round the trenches 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 up to one chain (30.5 R.m) and lift upto 5 feet (1.52 m).				
	Item # 10	From ± 0.00 m to -1.5m depth	600	Cum.		-
	Item # 10+28	From -1.5m to -2.4m depth	360	Cum.		-
	Item # 10+28x2	From -2.4m to -3.3m depth	355	Cum.		-
	Item # 10+28x3	From -3.3m to -4.2m depth	355	Cum.		-
	Item # 10+28x4	From -4.2m to -5.1m depth	90	Cum.		-
1.2	Code -103,	Excavation for raft foundations, underground tanks, septic tanks (rectangular or square) in gravelly soil and back filling the excavated material all round the trenches 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 up to one chain (30.5 R.m) and lift upto 5 feet (1.52 m).				
	Item # 11	From ± 0.00 m to -1.5m depth	1,400	Cum.		-
	Item # 11+28	From -1.5m to -2.4m depth	835	Cum.		-
	Item # 11+28x2	From -2.4m to -3.3m depth	830	Cum.		-
	Item # 11+28x3	From -3.3m to -4.2m depth	830	Cum.		-
	Item # 11+28x4	From -4.2m to -5.1m depth	200	Cum.		-
1.3	Code -103,	Excavation for raft foundations, underground tanks and septic tanks (rectangular or square) in wet silt clay or mud and back filling the excavated material all round the trenches 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 up to one chain (30.5 R.m) and lift up to 5 feet (1.52 m).				
	Item # 13	From ± 0.00 m to -1.5m depth	2,000	Cum.		-
	Item # 13+28	From -1.5m to -2.4m depth	1,190	Cum.		-
	Item # 13+28x2	From -2.4m to -3.3m depth	1,185	Cum.		-
	Item # 13+28x3	From -3.3m to -4.2m depth	1,185	Cum.		-
	Item # 13+28x4	From -4.2m to -5.1m depth	290	Cum.		-

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sched. Rate)	Rate (Rs.)	Amount (Rs.)
1.4	Code -103 Item #40	Bailing or pumping out sub-soil water during excavation, concreting, cast in situ concrete or masonry work in foundation etc. (only three operations to be allowed, trench volume under water to be measured first time for excavation, second time for concreting, and third time for cast in situ concrete or masonry work in foundaton etc,.	3,985	Cum.		-
1.5	Code -104 Item #8	Supplying earth from approved outside sources within a radius of 5 miles (8 km) including digging, loading and unloading and filling in foundation trenches, plinth or under floor, etc. including breaking clods, dressing, watering and consolidation by ramming in layers not exceeding 9 inches (229 mm) in depth to full compaction complete within a ;lead of one chain (30.5 R.m) and lift of 5 feet (1.52 m).	160	Cum.		-
1.6	Code -117 Item #1	Providing and laying soling stones 6 inches to 9 inches (152 mm to 229 mm) size under floors including packing with spawls and chips and consolidating etc. complete.	60	Cum.		-
Total Carried to Civil Summary						**-**

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sched. Rate)	Rate (Rs.)	Amount (Rs.)
2		**SUB STRUCTURE** **Note: All RCC Concrete will be used only Ready mixed.**				
		CONCRETE WORKS				
2.1	Code -106	Providing and laying in situ 1:4:8 (1 cement 4 sand and 8 coarse aggregate) cement concrete using crushed graded boulders 3/4 inch (19 mm) and down gauge in foundation, basement and plinth including form work, compacting, curing and removal of form work etc. complete, foundation and basement up to 5 feet (1.52 m) depth and plinth up to 4 feet (1.2 m) height from ground level.				
	Item # 11	Below plinth beam,situ,walls,tanks, over stone soling or where required (Cylindrical Strength 1280 Psi equal to Cubical strength 1600 Psi)	270	Cum.		-
2.2	Code -106	Providing and laying in situ 1:3:6 (1 cement 3 sand and 6 coarse aggregate) cement concrete using crushed graded boulders 3/4 inch (19 mm) and down gauge in foundation, basement and plinth including form work, compacting, curing and removal of form work etc. complete, foundation and basement up to 5 feet (1.52 m) depth and plinth up to 4 feet (1.2 m) height from ground level.				
	Item # 12	For Cast in situ / mass concrete or where required (Cylindrical Strength 1600 Psi equal to Cubical strength 2000 Psi)	-	Cum.		-
		REINFORCED CONCRETE WORKS				
2.3	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N/mm2 at 28 days) with a mix not leaner than 1:1:2 in foundation or bottom slab of rectangular underground tank including form works and its removal, levelling, compacting and curing etc. complete but excluding the cost of reinforcement.				
	Item # 99+138	Foundation or Bottom Slab of Rectangular Underground Tank (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)	1,590	Cum.		-
2.4	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N/mm2 at 28 days) with a mix not leaner than 1:1:2 in walls of rectangular underground water tank or septic tank including form works and its removal, compacting and curing etc. complete, but excluding the cost of reinforcement.				
	Item # 101+138	Walls of Rectangular Underground Tank (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)	315	Cum.		-

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sched. Rate)	Rate (Rs.)	Amount (Rs.)
2.5	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N/mm2 at 28 days) with a mix not leaner than 1:1:2 in top slab of rectangular underground water tank or septic tank its removal, compacting and curing ate. complete but excluding the cost of reinforcement.				
	Item # 104+138	Top Slab of Rectangular Underground Tank (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)	505	Cum.		-
2.6	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N/mm2 at 28 days) with a mix not leaner than 1:1:2 in columns of square or rectangular shape of regular section including form work and its removal, compacting and curing etc. but excluding the cost of reinforcement, in foundation basement and plinth.				
	Item # 4+138	Columns upto plinth (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)	70	Cum.		-
2.7	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N /mm 2 at 28 days) with a mix not leaner than 1:1:2 in straight beams, lintels cantilever beams of required shape or section including form work and its removal, compacting and curing etc. complete but excluding the cost of reinforcement, in basement and ground floor.				
	Item # 38+138	Straight beams, lintels cantilever beams of required shape or section (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)	80	Cum.		-
2.8	Code -114 Item # 166	Providing and laying hard grade ribbed deformed (minimum yield point 60,000 psi or 414 Mpa) reinforcement bars with & including the cost of straightening, cutting, bending, binding, wastage, and such overlaps as are not shown in the drawings, placing in position on cement concrete 1:2:4 precast or Ms. chairs, tying with binding wire, cost of chairs and wires etc. in all kinds of RCC work in foundation, basement, plinth and ground floor of building including septic tanks and under ground tanks and in projections for future extension. (Bars to be cut and placed in position at any level according to the Bar bending schedule prepared by the contractor and approved by the Engineer).	220,900	Kg		-
2.9	Code -108 Item # 12	Providing a coat of bitumen emulsion at 10 Lbs. per % sft. (0.49 Kg/sm) on walls and floor in ground floor etc. complete in all respects as per drawing, standard , specifications and as directed by the Engineer.	3,860	Sqm.		-

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sched. Rate)	Rate (Rs.)	Amount (Rs.)
2.10	Code -124 Item # 97	Providing and fixing PVC ribbed water stops 9" (229 mm) wide in vertical or horizontal expansion joints including cutting or jointing etc., complete in all floors.	270	Ru.m		-
2.11	Water Supply Main Hole Sub Head Code - 315 Item # 29	Providing & laying R.C.C 1:2:4 slab cover 3" thick average (pre-cast complete with M.S angle iron frame, M.S bars embedded in concrete) of any shape including the cost of reinforcement and welding etc. as per direction of Engineer Incharge. (For manhole Cover)	1	Cum.		-
		Total Carried to Civil Summary				**-**
		NON-SCHEDULE ITEMS (SUB-STRUCTURE)				
2.12	NSI	Providing fabricating, welding and fixing of 1" dia "Steel Rungs/ LADDER" spacing @ 12" c/c for UG Water Tank, manholes or as shown in drawing including complete required hard wares for fixing, Painting with anti corrosion paint (Red Oxide) and 03 coats of approved color & shade enamel paint at any height in any floor etc. complete in all respects as per drawing, standard , specifications and as directed by the Engineer.	150	Nos		-
		Total Carried to Civil Summary				**-**

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sched. Rate)	Rate (Rs.)	Amount (Rs.)
3		**SUPER STRUCTURE** **Note: All RCC Concrete will be used only Ready mixed.**				
		REINFORCED CONCRETE WORKS				
3.1	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N/mm2 at 28 days) with a mix not leaner than 1:1:2 in columns of square or rectangular shape of regular section including form work and its removal, compacting and curing etc. but excluding the cost of reinforcement, in the ground floor				
	Item # 24+138	Columns (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)	6	Cum.		-
3.2	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N /mm 2 at 28 days) with a mix not leaner than 1:1:2 in in straight beams, lintels cantilever beams of required shape or section including form work and its removal, compacting and curing etc. complete but excluding the cost of reinforcement, in basement and ground floor.				
	Item # 38+138	Beams /Arches/ purdi / bracing / lintels / nibs / sills / coping / parapet wall /bands/around opening and projections (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)	15	Cum.		-
3.3	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N /mm 2 at 28 days) with a mix not leaner than 1:1:2 in ordinary slab 5 inches (127 mm) to 6 inches (152 mm) thick Including form work and its removal compacting and curing etc. complete but excluding the cost of reinforcement, in basement plinth and ground floor				
	Item # 56+138	Slab i/c projections (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)	18	Cum.		-
3.4	Code -114 Item # 166	Providing and laying hard grade ribbed deformed (minimum yield point 60,000 psi or 414 Mpa) reinforcement bars with & including the cost of straightening, cutting, bending, binding, wastage, and such overlaps as are not shown in the drawings, placing in position on cement concrete 1:2:4 precast or Ms. chairs, tying with binding wire, cost of chairs and wires etc. in all kinds of RCC work in foundation, basement, plinth and ground floor of building including septic tanks and under ground tanks and in projections for future extension. (Bars to be cut and placed in position at any level according to the Bar bending schedule prepared by the contractor and approved by the Engineer).	5,950	Kg		-
Total Carried to Civil Summary						**-**

SUB-STATION

Engineer's Estimate

S.No	Description	Amount
A	**SCHEDULE ITEM** Structural Work of Sub Stations	-
	Total of Schedule Items - A	**-**
B	**NON-SCHEDULE ITEM** Structural Work of Sub Stations	-
	Total of Non-Schedule Items - B	**-**
	TOTAL CARRIED TO GRAND SUMMARY (A+B) FOR 7 SUBSTATION	**-**

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sched. Rate)	Rate (Rs.)	Amount (Rs.)
		SCHEDULE ITEMS				
1		**EARTH WORKS**				
1.1	Code -103,	Excavation for raft foundations, underground tanks and septic tanks (rectangular or square) in all kinds of soil (except gravelly and murum soil wet silt, clay or mud, conglomeration of gravel and boulders, soft, sandy or disintegrated and hard rock) and back filling the excavated material all round the trenches 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 up to one chain (30.5 R.m) and lift upto 5 feet (1.52 m).				
	Item # 10	From ± 0.00 m to -1.5m depth	140	Cum.		-
	Item # 10+28	From -1.5m to -2.4m depth	49	Cum.		-
1.2	Code -103,	Excavation for raft foundations, underground tanks, septic tanks (rectangular or square) in gravelly soil and back filling the excavated material all round the trenches 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 up to one chain (30.5 R.m) and lift upto 5 feet (1.52 m).				
	Item # 11	From ± 0.00 m to -1.5m depth	315	Cum.		-
	Item # 11+28	From -1.5m to -2.4m depth	105	Cum.		-
1.3	Code -103,	Excavation for raft foundations, underground tanks and septic tanks (rectangular or square) in wet silt clay or mud and back filling the excavated material all round the trenches 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 up to one chain (30.5 R.m) and lift up to 5 feet (1.52 m).				
	Item # 13	From ± 0.00 m to -1.5m depth	455	Cum.		-
	Item # 13+28	From -1.5m to -2.4m depth	140	Cum.		-
1.4	Code -103 Item #40	Bailing or pumping out sub-soil water during excavation, concreting, cast in situ concrete or masonry work in foundation etc. (only three operations to be allowed, trench volume under water to be measured first time for excavation, second time for concreting, and third time for cast in situ concrete or masonry work in foundaton etc,.	700	Cum.		-
1.5	Code -104 Item #8	Supplying earth from approved outside sources within a radius of 5 miles (8 km) including digging, loading and unloading and filling in foundation trenches, plinth or under floor, etc. including breaking clods, dressing, watering and consolidation by ramming in layers not exceeding 9 inches (229 mm) in depth to full compaction complete within a ;lead of one chain (30.5 R.m) and lift of 5 feet (1.52 m).	490	Cum.		-
1.6	Code -117 Item #1	Providing and laying soling stones 6 inches to 9 inches (152 mm to 229 mm) size under floors including packing with spawls and chips and consolidating etc. complete.	140	Cum.		-
		Total Carried to Civil Summary				**-**

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sched. Rate)	Rate (Rs.)	Amount (Rs.)
2		**SUB STRUCTURE** **Note: All RCC Concrete will be used only Ready mixed.**				
		CONCRETE WORKS				
2.1	Code -106	Providing and laying in situ 1:4:8 (1 cement 4 sand and 8 coarse aggregate) cement concrete using crushed graded boulders 3/4 inch (19 mm) and down gauge in foundation, basement and plinth including form work, compacting, curing and removal of form work etc. complete, foundation and basement up to 5 feet (1.52 m) depth and plinth up to 4 feet (1.2 m) height from ground level.				
	Item # 11	Below plinth beam,situ,walls,tanks, over stone soling or where required (Cylindrical Strength 1280 Psi equal to Cubical strength 1600 Psi)	140	Cum.		-
2.2	Code -106	Providing and laying in situ 1:3:6 (1 cement 3 sand and 6 coarse aggregate) cement concrete using crushed graded boulders 3/4 inch (19 mm) and down gauge in foundation, basement and plinth including form work, compacting, curing and removal of form work etc. complete, foundation and basement up to 5 feet (1.52 m) depth and plinth up to 4 feet (1.2 m) height from ground level.				
	Item # 12	For Cast in situ / mass concrete or where required (Cylindrical Strength 1600 Psi equal to Cubical strength 2000 Psi)	70	Cum.		-
		REINFORCED CONCRETE WORKS				
2.3	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N/mm2 at 28 days) with a mix not leaner than 1:1:2 in column footing of required shape including form works and its removal, levelling, compacting and curing etc. complete but excluding the cost of reinforcement.in foundation basement and plinth .				
	Item # 1+138	Founadation of Any Type (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)	105	Cum.		-
2.4	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N/mm2 at 28 days) with a mix not leaner than 1:1:2 in columns of square or rectangular shape of regular section including form work and its removal, compacting and curing etc. but excluding the cost of reinforcement, in foundation basement and plinth.				
	Item # 4+138	Columns upto plinth (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)	21	Cum.		-

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sched. Rate)	Rate (Rs.)	Amount (Rs.)
2.5	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N/mm2 at 28 days) with a mix not leaner than 1:1:2 in plinth beams of required shape and design including form work and its removal, compacting and curing etc. but excluding the cost of reinforcement, tn foundation basement and plinth.				
	Item # 8+138	Plinth Beams, projection, cantilever & nibs etc (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)	70	Cum.		-
2.6	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N/mm2 at 28 days) with a mix not leaner than 1:1:2 in foundation or bottom slab of rectangular underground tank including form works and its removal, levelling, compacting and curing etc. complete but excluding the cost of reinforcement..				
	Item # 99+138	Trenches, Manhole & Pits Bottom slab (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)	35	Cum.		-
2.7	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N/mm2 at 28 days) with a mix not leaner than 1:1:2 in walls of rectangular underground water tank or septic tank including form works and its removal, compacting and curing etc. complete, but excluding the cost of reinforcement.				
	Item # 101+138	Trenches, Manhole & Pits Walls (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)	84	Cum.		-
2.8	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N /mm 2 at 28 days) with a mix not leaner than 1:1:2 in top slab of rectangular underground water tank or septic tank its removal, compacting and curing ate. complete but excluding the cost of reinforcement .				
	Item # 104+138	Trenches, Manhole & Pits Top slab (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)	7	Cum.		-
2.9	Water Supply Main Hole Sub Head Code - 315 Item # 29	Providing & laying R.C.C 1:2:4 slab cover 3" thick average (pre-cast complete with M.S angle iron frame, M.S bars embedded in concrete) of any shape including the cost of reinforcement and welding etc. as per direction of Engineer Incharge. (For manhole Cover)	14	Cum.		-

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sched. Rate)	Rate (Rs.)	Amount (Rs.)
2.10	Code -114 Item # 166	Providing and laying hard grade ribbed deformed (minimum yield point 60,000 psi or 414 Mpa) reinforcement bars with & including the cost of straightening, cutting, bending, binding, wastage, and such overlaps as are not shown in the drawings, placing in position on cement concrete 1:2:4 precast or Ms. chairs, tying with binding wire, cost of chairs and wires etc. in all kinds of RCC work in foundation, basement, plinth and ground floor of building including septic tanks and under ground tanks and in projections for future extension. (Bars to be cut and placed in position at any level according to the Bar bending schedule prepared by the contractor and approved by the Engineer).	38,710	Kg		-
2.11	Code -108 Item # 12	Providing a coat of bitumen emulsion at 10 Lbs. per % sft. (0.49 Kg/sm) on walls and floor in ground floor etc. complete in all respects as per drawing, standard , specifications and as directed by the Engineer.	2,520	Sqm.		-
Total Carried to Civil Summary						**-**

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sched. Rate)	Rate (Rs.)	Amount (Rs.)
3		**SUPER STRUCTURE** **Note: All RCC Concrete will be used only Ready mixed.**				
		REINFORCED CONCRETE WORKS				
3.1	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N/mm2 at 28 days) with a mix not leaner than 1:1:2 in columns of square or rectangular shape of regular section including form work and its removal, compacting and curing etc. but excluding the cost of reinforcement, in the ground floor				
	Item # 24+138	Columns (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)	35	Cum.		-
3.2	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N /mm 2 at 28 days) with a mix not leaner than 1:1:2 in in straight beams, lintels cantilever beams of required shape or section including form work and its removal, compacting and curing etc. complete but excluding the cost of reinforcement, in basement and ground floor.				
	Item # 38+138	Beams /Arches/ purdi / bracing / lintels / nibs / sills / coping / parapet wall /bands/around opening and projections (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)	49	Cum.		-
3.3	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N /mm 2 at 28 days) with a mix not leaner than 1:1:2 in ordinary slab 5 inches (127 mm) to 6 inches (152 mm) thick Including form work and its removal compacting and curing etc. complete but excluding the cost of reinforcement, in basement plinth and ground floor				
	Item # 56+138	Slab i/c projections (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)	105	Cum.		-
3.4	Code -114 Item # 166	Providing and laying hard grade ribbed deformed (minimum yield point 60,000 psi or 414 Mpa) reinforcement bars with & including the cost of straightening, cutting, bending, binding, wastage, and such overlaps as are not shown in the drawings, placing in position on cement concrete 1:2:4 precast or Ms. chairs, tying with binding wire, cost of chairs and wires etc. in all kinds of RCC work in foundation, basement, plinth and ground floor of building including septic tanks and under ground tanks and in projections for future extension. (Bars to be cut and placed in position at any level according to the Bar bending schedule prepared by the contractor and approved by the Engineer).	28,070	Kg		-
Total Carried to Civil Summary						**-**

STRUCTURE WATCH TOWER

SUMMARY OF CIVIL WORKS

S.No	Description	Amount
A	**SCHEDULE ITEM**	
1	EARTH WORKS	-
2	SUB STRUCTURE	-
3	SUPER STRUCTURE	-
4	MASONRY WORKS	-
5	METAL WORKS	-
6	FLOOR FINISHES	-
7	WALL FINISHES	-
8	CEILING FINISHES	-
9	EXTERNAL FINISHES (BUILDING)	-
	Total of Schedule Items - A	**-**
	Add 30% Premium On Schedule Items 30%	-
	Total Schedule Items - A (Including Premium)	**-**
B	**NON-SCHEDULE ITEM**	
1	EARTH WORKS	-
2	SUB STRUCTURE	-
3	SUPER STRUCTURE	-
4	MASONRY WORKS	-
5	METAL WORKS	-
6	FLOOR FINISHES	-
7	WALL FINISHES	-
8	CEILING FINISHES	-
9	EXTERNAL FINISHES (BUILDING)	-
	Total of Non-Schedule Items - B	**-**
	TOTAL (A+B)	**-**
	TOTAL FOR 08 NOS CARRIED TO GRAND SUMMARY (A+B)	**-**

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sched. Rate)	Rate (Rs.)	Amount (Rs.)
		SCHEDULE ITEMS				
1		**EARTH WORKS**				
1.1	Code -103,	Excavation for raft foundations, underground tanks and septic tanks (rectangular or square) in all kinds of soil (except gravelly and murum soil wet silt, clay or mud, conglomeration of gravel and boulders, soft, sandy or disintegrated and hard rock) and back filling the excavated material all round the trenches 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 up to one chain (30.5 R.m) and lift upto 5 feet (1.52 m).				
	Item # 10	From ± 0.00 m to -1.5m depth	16	Cum.		-
	Item # 10+28	From -1.5m to -2.4m depth	8	Cum.		-
1.2	Code -103,	Excavation for raft foundations, underground tanks, septic tanks (rectangular or square) in gravelly soil and back filling the excavated material all round the trenches 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 up to one chain (30.5 R.m) and lift upto 5 feet (1.52 m).				
	Item # 11	From ± 0.00 m to -1.5m depth	40	Cum.		-
	Item # 11+28	From -1.5m to -2.4m depth	16	Cum.		-
1.3	Code -103,	Excavation for raft foundations, underground tanks and septic tanks (rectangular or square) in wet silt clay or mud and back filling the excavated material all round the trenches 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 up to one chain (30.5 R.m) and lift up to 5 feet (1.52 m).				
	Item # 13	From ± 0.00 m to -1.5m depth	80	Cum.		-
	Item # 13+28	From -1.5m to -2.4m depth	16	Cum.		-
1.4	Code -103 Item #40	Bailing or pumping out sub-soil water during excavation, concreting, cast in situ concrete or masonry work in foundation etc. (only three operations to be allowed, trench volume under water to be measured first time for excavation, second time for concreting, and third time for cast in situ concrete or masonry work in foundation etc	48	Cum.		-
1.5	Code -104 Item #8	Supplying earth from approved outside sources within a radius of 5 miles (8 km) including digging, loading and unloading and filling in foundation trenches, plinth or under floor, etc. including breaking clods, dressing, watering and consolidation by ramming in layers not exceeding 9 inches (229 mm) in depth to full compaction complete within a ;lead of one chain (30.5 R.m) and lift of 5 feet (1.52 m).	80	Cum.		-
1.6	Code -117 Item #1	Providing and laying soling stones 6 inches to 9 inches (152 mm to 229 mm) size under floors including packing with spawls and chips and consolidating etc. complete.	16	Cum.		-
		Total Carried to Civil Summary				**-**

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sched. Rate)	Rate (Rs.)	Amount (Rs.)
2		**SUB STRUCTURE** **Note: All RCC Concrete will be used only Ready mixed.**				
		CONCRETE WORKS				
2.1	Code -106	Providing and laying in situ 1:4:8 (1 cement 4 sand and 8 coarse aggregate) cement concrete using crushed graded boulders 3/4 inch (19 mm) and down gauge in foundation, basement and plinth including form work, compacting, curing and removal of form work etc. complete, foundation and basement up to 5 feet (1.52 m) depth and plinth up to 4 feet (1.2 m) height from ground level.				
	Item # 11	Below plinth beam,situ,walls,tanks, over stone soling or where required (Cylindrical Strength 1280 Psi equal to Cubical strength 1600 Psi)	8	Cum.		-
2.2	Code -106	Providing and laying in situ 1:3:6 (1 cement 3 sand and 6 coarse aggregate) cement concrete using crushed graded boulders 3/4 inch (19 mm) and down gauge in foundation, basement and plinth including form work, compacting, curing and removal of form work etc. complete, foundation and basement up to 5 feet (1.52 m) depth and plinth up to 4 feet (1.2 m) height from ground level.				
	Item # 12	For Cast in situ / mass concrete or where required (Cylindrical Strength 1600 Psi equal to Cubical strength 2000 Psi)	8	Cum.		-
		REINFORCED CONCRETE WORKS				
2.3	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N/mm2 at 28 days) with a mix not leaner than 1:1:2 in column footing of required shape including form works and its removal, levelling, compacting and curing etc. complete but excluding the cost of reinforcement.in foundation basement and plinth .				
	Item # 1+138	Foundation of Any Type (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)	40	Cum.		-
2.4	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N/mm2 at 28 days) with a mix not leaner than 1:1:2 in columns of square or rectangular shape of regular section including form work and its removal, compacting and curing etc. but excluding the cost of reinforcement, in foundation basement and plinth.				
	Item # 4+138	Columns upto plinth (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)	8	Cum.		-

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sched. Rate)	Rate (Rs.)	Amount (Rs.)
2.5	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N/mm2 at 28 days) with a mix not leaner than 1:1:2 in plinth beams of required shape and design including form work and its removal, compacting and curing etc. but excluding the cost of reinforcement, tn foundation basement and plinth.				
	Item # 8+138	Plinth Beams, projection, cantilever & nibs etc. (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)	8	Cum.		-
2.6	Code -114 Item # 166	Providing and laying hard grade ribbed deformed (minimum yield point 60,000 psi or 414 Mpa) reinforcement bars with & including the cost of straightening, cutting, bending, binding, wastage, and such overlaps as are not shown in the drawings, placing in position on cement concrete 1:2:4 precast or Ms. chairs, tying with binding wire, cost of chairs and wires etc. in all kinds of RCC work in foundation, basement, plinth and ground floor of building including septic tanks and under ground tanks and in projections for future extension. (Bars to be cut and placed in position at any level according to the Bar bending schedule prepared by the contractor and approved by the Engineer).	5,600	Kg		-
2.7	Code -108 Item # 12	Providing a coat of bitumen emulsion at 10 Lbs. per % sft. (0.49 Kg/sm) on walls and floor in ground floor etc. complete in all respects as per drawing, standard , specifications and as directed by the Engineer.	360	Sqm.		-
2.8	Code -124 Item # 199	Providing and carrying out Termite proofing in foundations, under floors and wood work surface with a solution using of confront TC with water and spraying the solution of the area to be treated as completed as per direction of Engineer in charge	120	Sqm.		-
Total Carried to Civil Summary						**-**

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sched. Rate)	Rate (Rs.)	Amount (Rs.)
3		**SUPER STRUCTURE** **Note: All RCC Concrete will be used only Ready mixed.**				
		REINFORCED CONCRETE WORKS				
3.1	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N/mm2 at 28 days) with a mix not leaner than 1:1:2 in columns of square or rectangular shape of regular section including form work and its removal, compacting and curing etc. but excluding the cost of reinforcement, in the ground floor				
	Item # 24+138	Columns (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)				
	Item # 24+138	Upto 4.57m (15'-0" ft.) Height	16	Cum.		-
	Item # 24+138+92	Above 4.57m (15'-0" ft.) Height	8	Cum.		-
3.2	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N /mm 2 at 28 days) with a mix not leaner than 1:1:2 in in straight beams, lintels cantilever beams of required shape or section including form work and its removal, compacting and curing etc. complete but excluding the cost of reinforcement, in basement and ground floor.				
		Beams /Arches/ purdi / bracing / lintels / nibs / sills / coping / parapet wall /bands/around opening and projections (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)				
	Item # 38+138	Upto 4.57m (15'-0" ft.) Height	8	Cum.		-
	Item # 38+138+92	Above 4.57m (15'-0" ft.) Height	8	Cum.		-
3.3	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N /mm 2 at 28 days) with a mix not leaner than 1:1:2 in ordinary slab 5 inches (127 mm) to 6 inches (152 mm) thick Including form work and its removal compacting and curing etc. complete but excluding the cost of reinforcement, in basement plinth and ground floor				
	Item # 56+138	Slab i/c projections (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)				
	Item # 56+138	Upto 4.57m (15'-0" ft.) Height	8	Cum.		-
	Item # 56+138+92	Above 4.57m (15'-0" ft.) Height	8	Cum.		-

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sched. Rate)	Rate (Rs.)	Amount (Rs.)
3.4	Code -114 Item # 166	Providing and laying hard grade ribbed deformed (minimum yield point 60,000 psi or 414 Mpa) reinforcement bars with & including the cost of straightening, cutting, bending, binding, wastage, and such overlaps as are not shown in the drawings, placing in position on cement concrete 1:2:4 precast or Ms. chairs, tying with binding wire, cost of chairs and wires etc. in all kinds of RCC work in foundation, basement, plinth and ground floor of building including septic tanks and under ground tanks and in projections for future extension. (Bars to be cut and placed in position at any level according to the Bar bending schedule prepared by the contractor and approved by the Engineer).				
	Item #166	Upto 4.57m (15'-0" ft.) Height	6,520	Kg		-
	Item # 166+174	Above 4.57m (15'-0" ft.) Height	4,080	Kg		-
Total Carried to Civil Summary						**-**

STRUCTURE GATE HOUSE 1

SUMMARY OF CIVIL WORKS

S.No	Description	Amount
A	**SCHEDULE ITEM**	
1	EARTH WORKS	-
2	SUB STRUCTURE	-
3	SUPER STRUCTURE	-
4	MASONRY WORKS	-
5	METAL WORKS	-
6	FLOOR FINISHES	-
7	WALL FINISHES	-
8	CEILING FINISHES	-
9	EXTERNAL FINISHES (BUILDING)	-
	Total of Schedule Items - A	**-**
B	**NON-SCHEDULE ITEM**	
1	EARTH WORKS	-
2	SUB STRUCTURE	-
3	SUPER STRUCTURE	-
4	MASONRY WORKS	-
5	METAL WORKS	-
6	FLOOR FINISHES	-
7	WALL FINISHES	-
8	CEILING FINISHES	-
9	EXTERNAL FINISHES (BUILDING)	-
	Total of Non-Schedule Items - B	**-**
	TOTAL CARRIED TO GRAND SUMMARY (A+B)	**-**

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sched. Rate)	Rate (Rs.)	Amount (Rs.)
		SCHEDULE ITEMS				
1		**EARTH WORKS**				
1.1	Code -103,	Excavation for raft foundations, underground tanks and septic tanks (rectangular or square) in all kinds of soil (except gravelly and murum soil wet silt, clay or mud, conglomeration of gravel and boulders, soft, sandy or disintegrated and hard rock) and back filling the excavated material all round the trenches 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 up to one chain (30.5 R.m) and lift upto 5 feet (1.52 m).				
	Item # 10	From ± 0.00 m to -1.5m depth	30	Cum.		-
	Item # 10+28	From -1.5m to -2.4m depth	20	Cum.		-
1.2	Code -103,	Excavation for raft foundations, underground tanks, septic tanks (rectangular or square) in gravelly soil and back filling the excavated material all round the trenches 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 up to one chain (30.5 R.m) and lift upto 5 feet (1.52 m).				
	Item # 11	From ± 0.00 m to -1.5m depth	65	Cum.		-
	Item # 11+28	From -1.5m to -2.4m depth	40	Cum.		-
1.3	Code -103,	Excavation for raft foundations, underground tanks and septic tanks (rectangular or square) in wet silt clay or mud and back filling the excavated material all round the trenches 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 up to one chain (30.5 R.m) and lift up to 5 feet (1.52 m).				
	Item # 13	From ± 0.00 m to -1.5m depth	95	Cum.		-
	Item # 13+28	From -1.5m to -2.4m depth	60	Cum.		-
1.4	Code -103 Item #40	Bailing or pumping out sub-soil water during excavation, concreting, cast in situ concrete or masonry work in foundation etc. (only three operations to be allowed, trench volume under water to be measured first time for excavation, second time for concreting, and third time for cast in situ concrete or masonry work in foundation etc.	120	Cum.		-
1.5	Code -104 Item #8	Supplying earth from approved outside sources within a radius of 5 miles (8 km) including digging, loading and unloading and filling in foundation trenches, plinth or under floor, etc. including breaking clods, dressing, watering and consolidation by ramming in layers not exceeding 9 inches (229 mm) in depth to full compaction complete within a ;lead of one chain (30.5 R.m) and lift of 5 feet (1.52 m).	75	Cum.		-
1.6	Code -117 Item #1	Providing and laying soling stones 6 inches to 9 inches (152 mm to 229 mm) size under floors including packing with spawls and chips and consolidating etc. complete.	25	Cum.		-
		Total Carried to Civil Summary				**-**

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sched. Rate)	Rate (Rs.)	Amount (Rs.)
2		**SUB STRUCTURE** **Note: All RCC Concrete will be used only Ready mixed.**				
		CONCRETE WORKS				
2.1	Code -106	Providing and laying in situ 1:4:8 (1 cement 4 sand and 8 coarse aggregate) cement concrete using crushed graded boulders 3/4 inch (19 mm) and down gauge in foundation, basement and plinth including form work, compacting, curing and removal of form work etc. complete, foundation and basement up to 5 feet (1.52 m) depth and plinth up to 4 feet (1.2 m) height from ground level.				
	Item # 11	Below plinth beam,situ,walls,tanks, over stone soling or where required (Cylindrical Strength 1280 Psi equal to Cubical strength 1600 Psi)	35	Cum.		-
2.2	Code -106	Providing and laying in situ 1:3:6 (1 cement 3 sand and 6 coarse aggregate) cement concrete using crushed graded boulders 3/4 inch (19 mm) and down gauge in foundation, basement and plinth including form work, compacting, curing and removal of form work etc. complete, foundation and basement up to 5 feet (1.52 m) depth and plinth up to 4 feet (1.2 m) height from ground level.				
	Item # 12	For Cast in situ / mass concrete or where required (Cylindrical Strength 1600 Psi equal to Cubical strength 2000 Psi)	10	Cum.		-
		REINFORCED CONCRETE WORKS				
2.3	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N/mm2 at 28 days) with a mix not leaner than 1:1:2 in column footing of required shape including form works and its removal, levelling, compacting and curing etc. complete but excluding the cost of reinforcement.in foundation basement and plinth .				
	Item # 1+138	Foundation of Any Type (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)	45	Cum.		-
2.4	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N/mm2 at 28 days) with a mix not leaner than 1:1:2 in columns of square or rectangular shape of regular section including form work and its removal, compacting and curing etc. but excluding the cost of reinforcement, in foundation basement and plinth.				
	Item # 4+138	Columns upto plinth (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)	20	Cum.		-

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sched. Rate)	Rate (Rs.)	Amount (Rs.)
2.5	Code -114 Item # 8+138	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N/mm2 at 28 days) with a mix not leaner than 1:1:2 in plinth beams of required shape and design including form work and its removal, compacting and curing etc. but excluding the cost of reinforcement, tn foundation basement and plinth. Plinth Beams, projection, cantilever & nibs etc. (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)	15	Cum.		-
2.6	Code -114 Item # 166	Providing and laying hard grade ribbed deformed (minimum yield point 60,000 psi or 414 Mpa) reinforcement bars with & including the cost of straightening, cutting, bending, binding, wastage, and such overlaps as are not shown in the drawings, placing in position on cement concrete 1:2:4 precast or Ms. chairs, tying with binding wire, cost of chairs and wires etc. in all kinds of RCC work in foundation, basement, plinth and ground floor of building including septic tanks and under ground tanks and in projections for future extension. (Bars to be cut and placed in position at any level according to the Bar bending schedule prepared by the contractor and approved by the Engineer).	11,040	Kg		-
2.7	Code -108 Item # 12	Providing a coat of bitumen emulsion at 10 Lbs. per % sft. (0.49 Kg/sm) on walls and floor in ground floor etc. complete in all respects as per drawing, standard , specifications and as directed by the Engineer.	375	Sqm.		-
2.8	Code -124 Item # 199	Providing and carrying out Termite proofing in foundations, under floors and wood work surface with a solution using of confront TC with water and spraying the solution of the area to be treated as completed as per direction of Engineer in charge	435	Sqm.		-
Total Carried to Civil Summary						**-**

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sched. Rate)	Rate (Rs.)	Amount (Rs.)
3		**SUPER STRUCTURE** **Note: All RCC Concrete will be used only Ready mixed.**				
		REINFORCED CONCRETE WORKS				
3.1	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N/mm2 at 28 days) with a mix not leaner than 1:1:2 in columns of square or rectangular shape of regular section including form work and its removal, compacting and curing etc. but excluding the cost of reinforcement, in the ground floor				
	Item # 24+138	Columns (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)				
	Item # 24+138	Upto 4.57m (15'-0" ft.) Height	20	Cum.		-
	Item # 24+138+92	Above 4.57m (15'-0" ft.) Height	5	Cum.		-
3.2	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N /mm 2 at 28 days) with a mix not leaner than 1:1:2 in in straight beams, lintels cantilever beams of required shape or section including form work and its removal, compacting and curing etc. complete but excluding the cost of reinforcement, in basement and ground floor.				
		Beams /Arches/ purdi / bracing / lintels / nibs / sills / coping / parapet wall /bands/around opening and projections (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)				
	Item # 38+138	Upto 4.57m (15'-0" ft.) Height	3	Cum.		-
	Item # 38+138+92	Above 4.57m (15'-0" ft.) Height	20	Cum.		-
3.3	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N /mm 2 at 28 days) with a mix not leaner than 1:1:2 in ordinary slab 5 inches (127 mm) to 6 inches (152 mm) thick Including form work and its removal compacting and curing etc. complete but excluding the cost of reinforcement, in basement plinth and ground floor				
	Item # 56+138	Slab i/c projections (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)				
	Item # 56+138	Upto 4.57m (15'-0" ft.) Height	3	Cum.		-
	Item # 56+138+92	Above 4.57m (15'-0" ft.) Height	-	Cum.		-

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sched. Rate)	Rate (Rs.)	Amount (Rs.)
3.4	Code -114 Item # 166	Providing and laying hard grade ribbed deformed (minimum yield point 60,000 psi or 414 Mpa) reinforcement bars with & including the cost of straightening, cutting, bending, binding, wastage, and such overlaps as are not shown in the drawings, placing in position on cement concrete 1:2:4 precast or Ms. chairs, tying with binding wire, cost of chairs and wires etc. in all kinds of RCC work in foundation, basement, plinth and ground floor of building including septic tanks and under ground tanks and in projections for future extension. (Bars to be cut and placed in position at any level according to the Bar bending schedule prepared by the contractor and approved by the Engineer).				
	Item #166	Upto 4.57m (15'-0" ft.) Height	5,475	Kg		-
	Item # 166+174	Above 4.57m (15'-0" ft.) Height	4,310	Kg		-
3.5	Code -119	Providing and fixing M. S. tees, angles and flats including welding all the sides of the section at the junction, gusset plates where reaquired bolts, nuts etc. complete with hoisting and erecting in position in steel trusses, frames, towers and stairs etc. of any design in ground floor				
	Item # 42+57	MS Steel Structure Framing	15,400	Kg		-
3.6	Code -122	Painting iron work with synthetic enamel paint of approved make and shade two coats over and including the cost of one priming coat complete at any height in any floor				
	Item # 159	Painting on MS Steel Structure Framing	500	Sq.m		-
		Total Carried to Civil Summary				**-**
		NON-SCHEDULE ITEMS				
3.7	NSI	Designing, Providing, fabricating, lifting and installing in position Pre-cast pre-stressed double tee span upto 15.5m or 50 ft., having openings of required sizes (if any) including all types of material, labor, cartage expenses from place of fabrication to installation in position and installation up to required height and level, including all types of reinforcement as per approved design by the Engineer. The responsibility of contractor shall submit coordinated and checked shop drawings, and design (without any additional cost) for engineer approval prior to the start of the worked. complete in all respect as per specifications and drawings and as directed by the Engineer. (For measurement and payments, slab areas of individual double tees will be taken)	150	Sq.m		-
		Total Carried to Civil Summary				**-**

EMERGENCY GATE

SUMMARY OF CIVIL WORKS

S.No	Description	Amount
A	**SCHEDULE ITEM**	
1	EARTH WORKS	-
2	SUB STRUCTURE	-
3	SUPER STRUCTURE	-
4	MASONRY WORKS	-
5	METAL WORKS	-
6	FLOOR FINISHES	-
7	WALL FINISHES	-
8	CEILING FINISHES	-
9	EXTERNAL FINISHES (BUILDING)	-
	Total of Schedule Items - A	**-**
B	**NON-SCHEDULE ITEM**	
1	EARTH WORKS	-
2	SUB STRUCTURE	-
3	SUPER STRUCTURE	-
4	MASONRY WORKS	-
5	METAL WORKS	-
6	FLOOR FINISHES	-
7	WALL FINISHES	-
8	CEILING FINISHES	-
9	EXTERNAL FINISHES (BUILDING)	-
	Total of Non-Schedule Items - B	**-**
	TOTAL CARRIED TO GRAND SUMMARY (A+B)	**-**

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sched. Rate)	Rate (Rs.)	Amount (Rs.)
		SCHEDULE ITEMS				
1		**EARTH WORKS**				
1.1	Code -103,	Excavation for raft foundations, underground tanks and septic tanks (rectangular or square) in all kinds of soil (except gravelly and murum soil wet silt, clay or mud, conglomeration of gravel and boulders, soft, sandy or disintegrated and hard rock) and back filling the excavated material all round the trenches 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 up to one chain (30.5 R.m) and lift upto 5 feet (1.52 m).				
	Item # 10	From ± 0.00 m to -1.5m depth	5	Cum.		-
	Item # 10+28	From -1.5m to -2.4m depth	2	Cum.		-
1.2	Code -103,	Excavation for raft foundations, underground tanks, septic tanks (rectangular or square) in gravelly soil and back filling the excavated material all round the trenches 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 up to one chain (30.5 R.m) and lift upto 5 feet (1.52 m).				
	Item # 11	From ± 0.00 m to -1.5m depth	10	Cum.		-
	Item # 11+28	From -1.5m to -2.4m depth	5	Cum.		-
1.3	Code -103,	Excavation for raft foundations, underground tanks and septic tanks (rectangular or square) in wet silt clay or mud and back filling the excavated material all round the trenches 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 up to one chain (30.5 R.m) and lift up to 5 feet (1.52 m).				
	Item # 13	From ± 0.00 m to -1.5m depth	15	Cum.		-
	Item # 13+28	From -1.5m to -2.4m depth	5	Cum.		-
1.4	Code -103 Item #40	Bailing or pumping out sub-soil water during excavation, concreting, cast in situ concrete or masonry work in foundation etc. (only three operations to be allowed, trench volume under water to be measured first time for excavation, second time for concreting, and third time for cast in situ concrete or masonry work in foundation etc	20	Cum.		-
1.5	Code -104 Item #8	Supplying earth from approved outside sources within a radius of 5 miles (8 km) including digging, loading and unloading and filling in foundation trenches, plinth or under floor, etc. including breaking clods, dressing, watering and consolidation by ramming in layers not exceeding 9 inches (229 mm) in depth to full compaction complete within a ;lead of one chain (30.5 R.m) and lift of 5 feet (1.52 m).	20	Cum.		-
1.6	Code -117 Item #1	Providing and laying soling stones 6 inches to 9 inches (152 mm to 229 mm) size under floors including packing with spawls and chips and consolidating etc. complete.	5	Cum.		-
		Total Carried to Civil Summary				**-**

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sched. Rate)	Rate (Rs.)	Amount (Rs.)
2		**SUB STRUCTURE** **Note: All RCC Concrete will be used only Ready mixed.**				
		CONCRETE WORKS				
2.1	Code -106	Providing and laying in situ 1:4:8 (1 cement 4 sand and 8 coarse aggregate) cement concrete using crushed graded boulders 3/4 inch (19 mm) and down gauge in foundation, basement and plinth including form work, compacting, curing and removal of form work etc. complete, foundation and basement up to 5 feet (1.52 m) depth and plinth up to 4 feet (1.2 m) height from ground level.				
	Item # 11	Below plinth beam,situ,walls,tanks, over stone soling or where required (Cylindrical Strength 1280 Psi equal to Cubical strength 1600 Psi)	5	Cum.		-
2.2	Code -106	Providing and laying in situ 1:3:6 (1 cement 3 sand and 6 coarse aggregate) cement concrete using crushed graded boulders 3/4 inch (19 mm) and down gauge in foundation, basement and plinth including form work, compacting, curing and removal of form work etc. complete, foundation and basement up to 5 feet (1.52 m) depth and plinth up to 4 feet (1.2 m) height from ground level.				
	Item # 12	For Cast in situ / mass concrete or where required (Cylindrical Strength 1600 Psi equal to Cubical strength 2000 Psi)	3	Cum.		-
		REINFORCED CONCRETE WORKS				
2.3	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N/mm2 at 28 days) with a mix not leaner than 1:1:2 in column footing of required shape including form works and its removal, levelling, compacting and curing etc. complete but excluding the cost of reinforcement.in foundation basement and plinth .				
	Item # 1+138	Foundation of Any Type (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)	10	Cum.		-
2.4	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N/mm2 at 28 days) with a mix not leaner than 1:1:2 in columns of square or rectangular shape of regular section including form work and its removal, compacting and curing etc. but excluding the cost of reinforcement, in foundation basement and plinth.				
	Item # 4+138	Columns upto plinth (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)	5	Cum.		-

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sched. Rate)	Rate (Rs.)	Amount (Rs.)
2.5	Code -114 Item # 8+138	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N/mm2 at 28 days) with a mix not leaner than 1:1:2 in plinth beams of required shape and design including form work and its removal, compacting and curing etc. but excluding the cost of reinforcement, tn foundation basement and plinth. Plinth Beams, projection, cantilever & nibs etc. (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)	3	Cum.		-
2.6	Code -114 Item # 166	Providing and laying hard grade ribbed deformed (minimum yield point 60,000 psi or 414 Mpa) reinforcement bars with & including the cost of straightening, cutting, bending, binding, wastage, and such overlaps as are not shown in the drawings, placing in position on cement concrete 1:2:4 precast or Ms. chairs, tying with binding wire, cost of chairs and wires etc. in all kinds of RCC work in foundation, basement, plinth and ground floor of building including septic tanks and under ground tanks and in projections for future extension. (Bars to be cut and placed in position at any level according to the Bar bending schedule prepared by the contractor and approved by the Engineer).	1800	Kg		-
2.7	Code -108 Item # 12	Providing a coat of bitumen emulsion at 10 Lbs. per % sft. (0.49 Kg/sm) on walls and floor in ground floor etc. complete in all respects as per drawing, standard , specifications and as directed by the Engineer.	120	Sqm.		-
2.8	Code -124 Item # 199	Providing and carrying out Termite proofing in foundations, under floors and wood work surface with a solution using of confront TC with water and spraying the solution of the area to be treated as completed as per direction of Engineer in charge	110	Sqm.		-
Total Carried to Civil Summary						**-**

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sched. Rate)	Rate (Rs.)	Amount (Rs.)
3		**SUPER STRUCTURE** **Note: All RCC Concrete will be used only Ready mixed.**				
		REINFORCED CONCRETE WORKS				
3.1	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N/mm2 at 28 days) with a mix not leaner than 1:1:2 in columns of square or rectangular shape of regular section including form work and its removal, compacting and curing etc. but excluding the cost of reinforcement, in the ground floor				
	Item # 24+138	Columns (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)				
	Item # 24+138	Upto 4.57m (15'-0" ft.) Height	5	Cum.		-
3.2	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N /mm 2 at 28 days) with a mix not leaner than 1:1:2 in in straight beams, lintels cantilever beams of required shape or section including form work and its removal, compacting and curing etc. complete but excluding the cost of reinforcement, in basement and ground floor. Beams /Arches/ purdi / bracing / lintels / nibs / sills / coping / parapet wall /bands/around opening and projections (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)				
	Item # 38+138	Upto 4.57m (15'-0" ft.) Height	3	Cum.		-
3.3	Code -114	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N /mm 2 at 28 days) with a mix not leaner than 1:1:2 in ordinary slab 5 inches (127 mm) to 6 inches (152 mm) thick Including form work and its removal compacting and curing etc. complete but excluding the cost of reinforcement, in basement plinth and ground floor				
	Item # 56+138	Slab i/c projections (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)				
	Item # 56+138	Upto 4.57m (15'-0" ft.) Height	3	Cum.		-
3.4	Code -114 Item # 166	Providing and laying hard grade ribbed deformed (minimum yield point 60,000 psi or 414 Mpa) reinforcement bars with & including the cost of straightening, cutting, bending, binding, wastage, and such overlaps as are not shown in the drawings, placing in position on cement concrete 1:2:4 precast or Ms. chairs, tying with binding wire, cost of chairs and wires etc. in all kinds of RCC work in foundation, basement, plinth and ground floor of building including septic tanks and under ground tanks and in projections for future extension. (Bars to be cut and placed in position at any level according to the Bar bending schedule prepared by the contractor and approved by the Engineer).				
	Item #166	Upto 4.57m (15'-0" ft.) Height	1340	Kg		-
		Total Carried to Civil Summary				**-**

UNDERGROUND WATER TANK & PUMP ROOM

Engineer's Estimate

	Description	Amount
A	**SCHEDULE ITEM** Architectural Work of PR	-
	Total of Schedule Items - A	**-**
B	**NON-SCHEDULE ITEM** Architectural Work of PR	-
	Total of Non-Schedule Items - B	**-**
	TOTAL CARRIED TO GRAND SUMMARY (A+B)	**-**

Engineer's Estimate

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
4		**MASONRY WORKS**				
		Solid Block Masonry				
	Code-110 & 109	Providing and laying 1:3:6 cement concrete solid block masonry more than 6 inches (152 mm) thick using graded screened crushed boulers **in place of screened bajri** 3/4 inch (19 mm) and down gauge set in cement sand mortar 1:4 **in place of lime cement mortar**				
4.1	Item # 34+77+92+120 Page # 112, 116, 117 & 98	Above 15 Feet Height	30	Cu.m		-
4.2	Item # 44+77+92+70	Above 15 Feet Height	5	Cu.m		-
		Total Carried to Summary				**-**
5		**METAL WORKS**				
		Painting on iron work				
5.1	Code -122 Item # 174	Painting on iron work with Synthetic enamel paint of approved make and shade by spray machine two coats over and including the cost of one priming coat complete at any height in any floor .	18	Sq.m		-
		Total Carried to Summary				**-**
6		**FLOOR & ROOF SCREEDING**				
		CC Flooring				
6.1	Code-117 Item # 30 Page # 234	Providing and laying floor of 3 inches (76 mm) thick 1:2:4 reinforced cement concrete using graded screened crushed boulers **in place of screened bajri** 3/4" (19 mm) and down gauge in ground floor including form work, consolidation, finishing and curing etc	206	Sq.m		-
		Roof Screeding				
6.2	Code-117 Item # 7+26	Providing and laying floors of 3 inches (76 mm) thick 1:2:4 cement concrete using graded screened crushed boulers **in place of screened bajri** 3/4 inch (19 mm) and down gauge in ground floor laid in panels including form work, consolidation, finishing and c	125	Sq.m		-
		Cement Concrete Khuras				
6.3	Code-124 Item #143	Providing and laying 1:2:4 cement concrete khuras 2" (51 mm) thick 2 ft. x 2 ft. (610 mm x 610 mm) size on roof including finishing with cement plaster 1:4, curing etc. complete.	2	Each		-
		PVC Pipe Spouts				
6.4	Code-124 Item #42	Providing and fixing PVC pipe spouts of 3" (80 mm) dia and required length including fixing in cement mortar 1:4 etc. complete	3	Rm		-
		Total Carried to Summary				**-**
7		**WALL FINISHES**				

Engineer's Estimate

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
		Internal Wall Plaster				
7.1	Code-122 Item # 6	1/2" (13 mm) thick **cement plaster** 1:6 on wall columns etc. in basement, plinth, mezzanine and ground floor including making edges, corners, grooves as specified and curing etc., complete in all respects as per specifications & relevant drawings and all w	150	Sq.m		-
		Enamel Paint				
7.2	Code-122 Item # 173	Painting on plastered surface with **Enamel paint** of approved make and shade by spray machine two coats over and including the cost of one priming coat, at any height in any floor. Complete in all respects as per specifications & relevant drawings and all w	150	Sq.m		-
		Internal Plaster For U.G.Water tank				
7.3	Code -122 Item # 12	1" (25 mm) thick cement plaster 1:4 on walls and columns etc. in basement, plinth, mezzanine and ground floor including making edges, corners, and curing etc.,complete.	1,600	Sq.m		-
		Water Proofing Agent				
7.4	Code -108 Item # 5	Extra for using water proofing agent pudlo in above item (quantity to be used as per manufacturer's specification/2.50Kg per 100Sft).etc., complete in all respects as per specifications & relevant drawings and all works to the satisfaction of the Enginee	450 Kg	Kg		-
		Total Carried to Summary				**-**
8		**CEILING FINISHES**				
		Internal Ceiling Plaster				
8.1	Code-122 Item # 02	1/4" (6.4 mm) thick cement plaster 1:4 on soffits of ceiling, cantilever slabs, sides and soffits of beams etc, in basement, mezzanine and ground floor including making edges, corners and curing etc, Complete in all respects as per specifications & releva	88	Sq.m		-
		Vinyl Distemper				
8.2	Code-122 Item # 151	Distempering with vinyl distemper (ICI) Deluxe Paintex of approved make and shade in two coats over and including the cost of one priming coat of lime wash including sand papering, dusting, and filling the holes, cracks and inequalities, if any, at any he	88	Sq.m		-
		Total Carried to Summary				**-**
9		**EXTERNAL FINISHES**				

Engineer's Estimate

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
		External Plain Plaster				
9.1	Code-122	3/4" (19 mm) thick cement plaster (Plain) 1:4 on walls and columns etc. in basement, plinth, mezzanine and ground floor including making edges, corners, grooves as specified and curing etc., complete in all respects as per specifications & relevant draw				
	Item # 8	Ground (Upto 15 feet Height)	455	Sq.m		-
	Item # 8+88	Ground (Above 15 feet Height)	62	Sq.m		-
		Weather Shield Paint				
9.2	Code-122 Item # 172	Painting three coats with **weather shield paint deluxe (ICI)** make of approved shade on plaster surface (External) and including the cost of cleaning the surface, sand papering etc. complete at any height in any floor etc., complete in all respects as per	517	Sq.m		-
		Pre-cast Road Kerb				
9.3	Code-127 Item # 115 Page#497	Providing and laying road kerb of precast cement concrete 1:2:4 (24" long 6" wide and 12" deep (610 mm long 152 mm wide and 305 mm deep) using screened graded bajri, from work and its removal compacting and curing laid in cement mortar 1:4 and	450.00	Rm		-
		CC 1:2:4 tuff paver 2" thick				
9.4	Code-117 Item # 178 Page#255	Providing and laying in floor C.C. 1:2:4: tuff paver 2" thick of approved design and colour pattren laid on sand cushion filling of joint with sand and warring etc. complete as per direction of Engineer Incharge. (the cost of sand cushion is included) **NO**				
		b) Average strength 5000 psi	2,520	Sq.m		-
		CC 1:2:4 tuff paver 2-1/2" thick				
9.5	Code-117 Item # 177 Page#255	Providing and laying in floor C.C. 1:2:4: tuff paver 2-1/2" thick of approved design and colour pattren laid on sand cushion filling of joint with sand and warring etc. complete as per direction of Engineer Incharge. (the cost of sand cushion is include				
		a) Average strength 7000 psi	350	Sq.m		-
		Earth Filling				
9.6	Code-104 Item # 8 Page#48	Supplying earth from approved outside sources within a radius of 5 miles (8 km) including digging, loading and unloading and filling in foundation trenches, plinth or under floor, etc. including breaking clods, dressing, watering and consolidation by ramm	330	Cu.m		-
		Total Carried to Summary				**-**
		NON-SCHEDULE ITEMS				

Engineer's Estimate

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
4		**MASONRY WORKS**				
Total Carried to Summary						N/A
5		**METAL WORKS**				
		MS louver door				
5.1	N.S.I	Providing, fabricating, welding & fixing in position MS louver door comprising 100mm x 50mm main tube frame with MS louvers as shown on drawing and epoxy paint of approved colour & shades as per manufacturer's specification etc, complete in all respect	18	Sq.m		
Total Carried to Summary						-

ARCH.SUBSTATION

Engineer's Estimate

S.No	Description	Amount
A	**SCHEDULE ITEM** Architectural Work of Sub Stations	-
	Total of Schedule Items - A	**-**
B	**NON-SCHEDULE ITEM** Architectural Work of Sub Stations	-
	Total of Non-Schedule Items - B	**-**
	TOTAL CARRIED TO GRAND SUMMARY (A+B) FOR 7 SUBSTATIONS	**-**

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
4		**DPC & MASONRY WORKS**				
		Damp Proof Course				
	Code -108 Item # 3	Providing and laying 2 inches (51 mm) thick damp proof course with cement concrete 1:2:4 cast in situ using graded screened bajri of 3/4 inch (19 mm) and down gauge mixed with any approved water proofing agent including compacting, curing form work and it	350.00	Sq.m		-
		Solid Block Masonry				
	Code-110 & 109	Providing and laying 1:3:6 cement concrete solid block masonry more than 6 inches (152 mm) thick using graded screened crushed boulers **in place of screened bajri** 3/4 inch (19 mm) and down gauge set in cement sand mortar 1:4 **in place of lime cement mortar**				
4.1	Item # 34+77+92+120 Page # 112, 116, 117 & 98	Above 15 Feet Height	210.00	Cu.m		-
4.2	Item # 44+77+92+70	Above 15 Feet Height	35.00	Cu.m		-
		Total Carried to Summary				**-**
5		**METAL WORKS**				
		Painting on iron work				
5.1	Code -122 Item # 174	Painting on iron work with Synthetic enamel paint of approved make and shade by spray machine two coats over and including the cost of one priming coat complete at any height in any floor .	252.00	Sq.m		-
		G.I. Pipe railing				
	Code -119 Item # 55	Providing and fixing G.I. Pipe railing of 1-1/2" (38 mm) diameter comprising, vertical posts and horizontal bracing of G.I- pipe of the same dia, as per design including cost of specials, bends, threading, cutting and making good the floor or wall of any	70.00	Rm		-
		Total Carried to Summary				**-**
6		**FLOOR & ROOF SCREEDING**				
		CC Flooring				
6.1	Code-117 Item # 30 Page # 234	Providing and laying floor of 3 inches (76 mm) thick 1:2:4 reinforced cement concrete using graded screened crushed boulers **in place of screened bajri** 3/4" (19 mm) and down gauge in ground floor including form work, consolidation, finishing and curing etc				
		i) LV & VCB Panel, Transformer Room and Passage	525.00	Sq.m		-
		ii) Ramp	315.00	Sq.m		-
		iii) Steps	21.00	Sq.m		-

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
		Roof Screeding				
6.2	Code-117 Item # 7+26	Providing and laying floors of 3 inches (76 mm) thick 1:2:4 cement concrete using graded screened crushed boulers **in place of screened bajri** 3/4 inch (19 mm) and down gauge in ground floor laid in panels including form work, consolidation, finishing and c	525.00	Sq.m		-
		Cement Concrete Khuras				
6.3	Code-124 Item #143	Providing and laying 1:2:4 cement concrete khuras 2" (51 mm) thick 2 ft. x 2 ft. (610 mm x 610 mm) size on roof including finishing with cement plaster 1:4, curing etc. complete.	14.00	Each		-
		PVC Pipe Spouts				
6.4	Code-124 Item #42	Providing and fixing PVC pipe spouts of 3" (80 mm) dia and required length including fixing in cement mortar 1:4 etc. complete	21.00	Rm		-
		Total Carried to Summary				**-**
7		**WALL FINISHES**				
		Internal Wall Plaster				
7.1	Code-122 Item # 6	1/2" (13 mm) thick **cement plaster** 1:6 on wall columns etc. in basement, plinth, mezzanine and ground floor including making edges, corners, grooves as specified and curing etc., complete in all respects as per specifications & relevant drawings and all w	2,695.00	Sq.m		-
		Enamel Paint				
7.2	Code-122 Item # 173	Painting on plastered surface with **Enamel paint** of approved make and shade by spray machine two coats over and including the cost of one priming coat, at any height in any floor. Complete in all respects as per specifications & relevant drawings and all w	2,695.00	Sq.m		-
		Total Carried to Summary				**-**
8		**CEILING FINISHES**				
		Internal Ceiling Plaster				
8.1	Code-122 Item # 02	1/4" (6.4 mm) thick cement plaster 1:4 on soffits of ceiling, cantilever slabs, sides and soffits of beams etc, in basement, mezzanine and ground floor including making edges, corners and curing etc, Complete in all respects as per specifications & releva	875.00	Sq.m		-
		Vinyl Distemper				
8.2	Code-122 Item # 151	Distempering with vinyl distemper (ICI) Deluxe Paintex of approved make and shade in two coats over and including the cost of one priming coat of lime wash including sand papering, dusting, and filling the holes, cracks and inequalities, if any, at any he	875.00	Sq.m		-
		Total Carried to Summary				**-**

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
9		**EXTERNAL FINISHES**				
		External Plain Plaster				
9.1	Code-122	3/4" (19 mm) thick cement plaster (Plain) 1:4 on walls and columns etc. in basement, plinth, mezzanine and ground floor including making edges, corners, grooves as specified and curing etc., complete in all respects as per specifications & relevant draw				
	Item # 8	Ground (Upto 15 feet Height)	1,400.00	Sq.m		-
	Item # 8+88	Ground (Above 15 feet Height)	315.00	Sq.m		-
		Weather Shield Paint				
9.2	Code-122 Item # 172	Painting three coats with **weather shield paint deluxe (ICI)** make of approved shade on plaster surface (External) and including the cost of cleaning the surface, sand papering etc. complete at any height in any floor etc., complete in all respects as per				
			1,715.00	Sq.m		-
		Pre-cast Road Kerb				
9.3	Code-127 Item # 115 Page#497	Providing and laying road kerb of precast cement concrete 1:2:4 (24" long 6" wide and 12" deep (610 mm long 152 mm wide and 305 mm deep) using screened graded bajri, from work and its removal compacting and curing laid in cement mortar 1:4 and				
			350.00	Rm		-
		CC 1:2:4 tuff paver 2" thick				
9.4	Code-117 Item # 178 Page#255	Providing and laying in floor C.C. 1:2:4: tuff paver 2" thick of approved design and colour pattren laid on sand cushion filling of joint with sand and warring etc. complete as per direction of Engineer Incharge. (the cost of sand cushion is included)				
		b) Average strength 5000 psi	350.00	Sq.m		-
		Earth Filling				
9.5	Code-104 Item # 8 Page#48	Supplying earth from approved outside sources within a radius of 5 miles (8 km) including digging, loading and unloading and filling in foundation trenches, plinth or under floor, etc. including breaking clods, dressing, watering and consolidation by ramm				
			175.00	Cu.m		-
Total Carried to Summary						**-**

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
		NON-SCHEDULE ITEMS				
4		**DPC & MASONRY WORKS**				
		Total Carried to Summary				**N/A**
5		**METAL WORKS**				
		MS louver door				
5.1	N.S.I	Providing, fabricating, welding & fixing in position MS louver door comprising 100mm x 50mm main tube frame with MS louvers as shown on drawing and epoxy paint of approved colour & shades as per manufacturer's specification etc, complete in all respect	245.00	Sq.m		-
		Total Carried to Summary				**-**
6		**FLOOR & ROOF SCREEDING**				
	N.S.I	Providing & laying 3mm thick Epoxy flooring by selef levelling of approved manufacturers' according to the finishing schedule & approved colour, shade, borders etc, including Preparation of surface and one coat of primer with adhesive etc, complete in all	525.00	Sq.m		-
	N.S.I	Providing & laying Epoxy skirting 150mm high, coating not lessthan 500 micron of approved manufacturers' according to the finishing schedule & approved colour, shade, borders etc, including Preparation of surface and one coat of primer with adhesive etc,	210.00	Sq.m		-
		Total Carried to Summary				**-**

ARCH.WATCH TOWER

BILL OF QUANTITIES

S.No	Description	Amount
A	**SCHEDULE ITEM**	
1	EARTH WORKS	-
2	SUB STRUCTURE	-
3	SUPER STRUCTURE	-
4	MASONRY WORKS	-
5	METAL WORKS	-
6	FLOOR FINISHES	-
7	WALL FINISHES	-
8	CEILING FINISHES	-
9	EXTERNAL FINISHES (BUILDING)	-
	Total of Schedule Items - A For 8-Nos Security Watch Tower	**-**
B	**NON-SCHEDULE ITEM**	
1	EARTH WORKS	-
2	SUB STRUCTURE	-
3	SUPER STRUCTURE	-
4	MASONRY WORKS	-
5	METAL WORKS	-
6	FLOOR FINISHES	-
7	WALL FINISHES	-
8	CEILING FINISHES	-
9	EXTERNAL FINISHES (BUILDING)	-
	Total of Non-Schedule Items - B For 8-Nos Security Watch Tower	**-**
	TOTAL CARRIED TO GRAND SUMMARY (A+B)	**-**

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
4		**MASONRY WORKS**				
		Solid Block Masonry				
4.01	Code-110 & 109	Providing and laying 1:3:6 cement concrete solid block masonry 4 to 6 inches (102mm - 152 mm) thick using graded screened crushed boulers **in place of screened bajri** 3/4 inch (19 mm) and down gauge set in cement sand mortar 1:4 **in place of lime cement mortar**				
	Item # 44+77+92+120 Page # 112, 116, 117 & 98	Up to 4.57 M Height	16	Cu.m		-
	Item # 44+77+92+70	Above 4.57 M Height	8	Cu.m		-
		Total Carried to Summary				-
5		**METAL WORKS**				
		MS Spiral Stair Case				
5.01	Code -124 Item # 139 Page # 422	Providing and installing cast iron spiral stair case with central post, hand rail and braces at required intervals etc. complete but excluding the cost of cement work in base and foundation 6 ft.(1.82 m) dia .	960	P.Kg		-
		Total Carried to Summary				-
7		**FLOOR & ROOF SCREEDING**				
		CC Flooring				
7.01	Code-117 Item # 30 Page # 234	Providing and laying floor of 3 inches (76 mm) thick 1:2:4 reinforced cement concrete using graded screened crushed boulers **in place of screened bajri** 3/4" (19 mm) and down gauge in ground floor including form work, consolidation, finishing and curing etc	80	Sq.m		-
		Roof Screeding				
7.02	Code-117 Item # 7+26 Page # 231 & 233	Providing and laying floors of 3 inches (76 mm) thick 1:2:4 cement concrete using graded screened crushed boulers **in place of screened bajri** 3/4 inch (19 mm) and down gauge in ground floor laid in panels including form work, consolidation, finishing and c	176	Sq.m		-
		Water Proofing Agent				
7.03	Code -108 Item # 5 Page # 108	Extra for using water proofing agent pudlo in item Nos. 4.0 (quantity to be used as per manufacturer's specification/2.50Kg per 9Sq.m).etc., complete in all respects as per specifications & relevant drawings and all works to the satisfaction of the Engine	16	Kg		-
		Total Carried to Summary				-

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
8		**WALL FINISHES**				

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
		Internal Wall Plaster				
8.01	Code-122 Item # 6 Page # 376	1/2" (13 mm) thick **cement plaster** 1:6 on wall columns etc. in basement, plinth, mezzanine and ground floor including making edges, corners, grooves as specified and curing etc., complete in all respects as per specifications & relevant drawings and all w	760	Sq.m		-
		Enamel Paint				
8.02	Code-122 Item # 157 Page # 389	Painting plastered surface with super glass synthetic enamel paint of approved make and shade two coats over and including the cost of one coat of priming complete at any height in any floo	760	Sq.m		-
		Total Carried to Summary				-
9		**CEILING FINISHES**				
		Internal Ceiling Plaster				
9.01	Code-122 Item # 02 Page # 376	1/4" (6.4 mm) thick cement plaster 1:4 on soffits of ceiling, cantilever slabs, sides and soffits of beams etc, in basement, mezzanine and ground floor including making edges, corners and curing etc, Complete in all respects as per specifications & releva	160	Sq.m		-
		Vinyl Distemper				
9.02	Code-122 Item # 151 Page # 389	Distempering with vinyl distemper (ICI) Deluxe Paintex of approved make and shade in two coats over and including the cost of one priming coat of lime wash including sand papering, dusting, and filling the holes, cracks and inequalities, if any, at any he	160	Sq.m		-
		Total Carried to Summary				-
10		**EXTERNAL FINISHES**				
		External Plain Plaster				
10.01	Code-122	3/4" (19 mm) thick cement plaster (Plain) 1:4 on walls and columns etc. in basement, plinth, mezzanine and ground floor including making edges, corners, grooves as specified and curing etc., complete in all respects as per specifications & relevant draw				
10.02	Code-122 Item # 8 Page # 376	Up to 4.57 M Height	1,400	Sq.m		-
10.03	Code-122 Item # 8+88 Page # 376	Above 4.57 M Height	400	Sq.m		-
		Grooves On External Plaster				
10.04	Code-122 Item # 37 Page # 378	Extra if deep cut grooves of approved sizes and design are made on plastered surface of any description in any floor	1,800	Sq.m		-
		Weather Shield Paint				

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
10.05	Code-122 Item # 172 Page # 390	Painting three coats with **weather shield paint deluxe (ICI)** make of approved shade on plaster surface (External) and including the cost of cleaning the surface, sand papering etc. complete at any height in any floor etc., complete in all respects as per	1,800	Sq.m		-
		Total Carried to Summary				**-**
		NON-SCHEDULE ITEMS				
	N.S.I	**Rain Water Spouts** Providing, Making and Fixing in position R.C.C Precast Rain Water spouts (size as shown in drawing), complete in all respects as per specifications & relevant drawings and all works to the satisfaction of the Engineer.	8	Each		-
		Total Carried to Summary				**-**

ARCH.GATE HOUSE

ENGINEER'S ESTIMATE

S.No	Description	Amount
A	**SCHEDULE ITEM**	
1	EARTH WORKS	-
2	SUB STRUCTURE	-
3	SUPER STRUCTURE	-
4	MASONRY WORKS	-
5	METAL WORKS	-
6	WOOD WORKS	-
7	FLOOR FINISHES	-
8	WALL FINISHES	-
9	CEILING FINISHES	-
10	EXTERNAL FINISHES (BUILDING)	-
	Total of Schedule Items - A	**-**
B	**NON-SCHEDULE ITEM**	
1	EARTH WORKS	-
2	SUB STRUCTURE	-
3	SUPER STRUCTURE	-
4	MASONRY WORKS	-
5	METAL WORKS	-
6	WOOD WORKS	-
7	FLOOR FINISHES	-
8	WALL FINISHES	-
9	CEILING FINISHES	-
10	EXTERNAL FINISHES (BUILDING)	-
	Total of Non-Schedule Items - B	**-**
	TOTAL CARRIED TO GRAND SUMMARY (A+B)	**-**

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
3		**DPC & MASONRY WORKS**				
		Damp Proof Course (DPC)				
3.01	Code -108 Item # 3 Page # 108	Providing and laying 2 inches (51 mm) thick damp proof course with cement concrete 1:2:4 cast in situ using graded screened bajri of 3/4 inch (19 mm) and down gauge mixed with any approved water proofing agent including compacting, curing form work and it				
		2" thick DPC	4	Sq.m		
		Water Proofing Agent				
3.02	Code -108 Item # 5 Page # 108	Extra for using water proofing agent pudlo in item Nos. 4.0 (quantity to be used as per manufacturer's specification/2.50Kg per 9Sq.m).etc., complete in all respects as per specifications & relevant drawings and all works to the satisfaction of the Engine	2	Kg		
4		**MASONRY WORKS**				
		Solid Block Masonry				
4.01	Code-110 & 109	Providing and laying 1:3:6 cement concrete solid block masonry 4 to 6 inches (102mm - 152 mm) thick using graded screened crushed boulers **in place of screened bajri** 3/4 inch (19 mm) and down gauge set in cement sand mortar 1:4 **in place of lime cement mor**				
	Item # 44+77+92+120 Page # 112, 116, 117 & 98	Up to 4.57 M Height	80	Cu.m		
	Item # 44+77+92+70	Above 4.57 M Height	22	Cu.m		
		Total Carried to Summary				
5		**METAL WORKS**				
		MS Moulded Steel Door Frame				
5.01	Code -119 Item # 43 Page # 289	Providing and fixing M.S. moulded steel door frame of 4" x 2-1/2" (102 mm x 64 mm) manufactured from mild steel sheet of 18 gauge (1.41 mm) conforming to BSS. 1245 having a single rebate size 1-1/2" x 1/2" (38 mm x 13 mm) with provision of 3 Nos. M.S. pla				
			17	Ru.m		
		Steel Gate				

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
5.02	Code -119 Item # 18 Page # 285	Providing and fixing steel gate of flat iron sections of approved design with or without M.S. sheet covering including hold fast, with or without rollers and track arrangement including providing wicket shutter of required size with all accessories and lo				
			1,600	P.Kg		
		MS Grill				

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
5.03	Code -119 Item # 34 Page # 288	Providing and fixing M. S. square bars at required spacing with horizontal flat iron as per approved design including making holes fixing with sunk iron screws, painting two coats of red oxide paint etc. complete as required in any floor.	95	P.Kg		
		Painting on iron work				
5.04	Code -122 Item # 174 Page # 391	Painting on iron work with Synthetic enamel paint of approved make and shade by spray machine two coats over and including the cost of one priming coat complete at any height in any floor .	90	Sq.m		
		Upvc Door Shutter				
5.05	Code -120 Item # 171 Page # 331	P/F 1-1/2 Inch(38 mm) thick best quality PVC/UPVC door shutter panelled (approved design), approved iron hings and tower bolt, etc. as required.	7	Sq.m		
		Aluminum Openable Windows & Ventilators				
5.06	Code -119 Item # 68 Page # 294	Providing and fixing fully glazed Champagne anodized aluminium Fixed/openable windows Partition as per British standard manufactured by Lucky, Alcop, Krudson, Pakistan Cables and A.C.P. (fixing through their approved fabricators), Deluxe model box section	4	Sq.m		
		Aluminum Sliding Windows				
5.07	Code -119 Item # 71 Page # 295	Providing and fixing doubble glazed Champagne anodized aluminium Sliding windows as per British standard manufactured by Lucky, Alcop, Krudson, Pakistan Cables and A.C.P. (fixing through their approved fabricators), Executive model section dubble or singl	6	Sq.m		
		Plain Glass				
5.08	Code -119 Item # 120 Page # 307	Providing and fixing plain glass panes 6mm thick to M.S. Box pipe / Aluminium doors, windows and ventilators etc. including the cost of labour but excluding the cost of M.S. square pipe beading, rubber packing and screw in any floor at any height.	6	Sq.m		
		Total Carried to Summary				
6		**<u>WOOD WORKS</u>**				
		Floor Cabinet				
6.01	Cod-124 Item # 210 Page # 430	Proving & fixing kitchen floor cabinet making of shutter board box & 3/4" thick high glass lamination lasani shutter , PVC beading , deodar wooden frame 2.5"x1.25" size making tray drawer of approved design etc. fixed with rawal plugs,screws i/c the cos	1	Sq.m		
		Counter Top				

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
6.02	Code-117 Item # 59 Page # 239	Providing and laying floor of 1 inch (25 mm) thick marble tiles more than 5 Sq.ft. upto 7 Sq.ft. size (above 0.46 Sq.m upto 0.65 Sq.m) fine dressed on the surface without winding in ground floor over 1 inch (25 mm) lime mortar 1:2 (one lime, two sand) set	1	Sq.m		
		Total Carried to Summary				
7		**FLOOR & ROOF SCREEDING**				
7.01	Code-105 & 109 Item # 17+120 Page # 52 & 98	Providing and laying 1:5:10 (1 cement 5 sand and 10 coarse aggregate) cement concrete using graded screened crushed boulers 3/4" down **in place of gravel (bajri**) 1 inch (25 mm) and down gauge in foundation or where required including levelling, compacting	1	Cu.m		
		CC Flooring				
7.02	Code-117 Item # 30 Page # 234	Providing and laying floor of 3 inches (76 mm) thick 1:2:4 reinforced cement concrete using graded screened crushed boulers **in place of screened bajri** 3/4" (19 mm) and down gauge in ground floor including form work, consolidation, finishing and curing etc	10	Sq.m		
		Porcelain Tile Flooring				
7.03	Code-117 Item # 180 Page # 255	Providing and laying light colour, glazed/non skid vitrified porcelean tiles (Polished) exceeding 1600 sqcm and upto 3600 Sqcm each, (Pak made) on walls and floors, in any floor, laid with dry bond (stile bond) over a base of 1" thick cement mortar (1:3)	17	Sq.m		
		Ceramic Glazed Tile Flooring				
7.04	Code-117 Item # 82 Page # 242	Providing and laying floor of 6mm (approx: 1/4") thick coloured glazed tiles 12" x 12" (304mm x 304mm) of master make (Pakistani) first grade in ground floor laid over 1" (25mm) thick cement mortar 1:2 (1 cement and 2 sand) including jointing and washing	3	Sq.m		
		Roof Screeding				
7.05	Code-117 Item # 7+26 Page # 231 & 233	Providing and laying floors of 3 inches (76 mm) thick 1:2:4 cement concrete using graded screened crushed boulers **in place of screened bajri** 3/4 inch (19 mm) and down gauge in ground floor laid in panels including form work, consolidation, finishing and c	22	Sq.m		
		Total Carried to Summary				
8		**WALL FINISHES**				
		Internal Wall Plaster				

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
8.01	Code-122 Item # 6 Page # 376	1/2" (13 mm) thick **cement plaster** 1:6 on wall columns etc. in basement, plinth, mezzanine and ground floor including making edges, corners, grooves as specified and curing etc., complete in all respects as per specifications & relevant drawings and all w	95	Sq.m		
		Enamel Paint				
8.02	Code-122 Item # 157 Page # 389	Painting plastered surface with super glass synthetic enamel paint of approved make and shade two coats over and including the cost of one coat of priming complete at any height in any floo	95	Sq.m		
		Dado & Skirting				
		Porcelain Tile Skirting				
8.03	Code-117 Item # 180 Page # 255	Providing and laying light colour, glazed/non skid vitrified porcelean tiles (Polished) exceeding 1600 sqcm and upto 3600 Sqcm each, (Pak made) on walls and floors, in any floor, laid with dry bond (stile bond) over a base of 1" thick cement mortar (1:3)	16	Sq.m		
		Ceramic Glazed Tile Dado				
8.04	Code-117 Item # 82 Page # 242	Providing and laying floor of 6mm (approx: 1/4") thick coloured glazed tiles 12" x 12" (304mm x 304mm) of master make (Pakistani) first grade in ground floor laid over 1" (25mm) thick cement mortar 1:2 (1 cement and 2 sand) including jointing and washing	15	Sq.m		
		Total Carried to Summary				
9		**CEILING FINISHES**				
		Internal Ceiling Plaster				
9.01	Code-122 Item # 02 Page # 376	1/4" (6.4 mm) thick cement plaster 1:4 on soffits of ceiling, cantilever slabs, sides and soffits of beams etc, in basement, mezzanine and ground floor including making edges, corners and curing etc, Complete in all respects as per specifications & releva	20	Sq.m		
		Vinyl Distemper				
9.02	Code-122 Item # 151 Page # 389	Distempering with vinyl distemper (ICI) Deluxe Paintex of approved make and shade in two coats over and including the cost of one priming coat of lime wash including sand papering, dusting, and filling the holes, cracks and inequalities, if any, at any he	20	Sq.m		
		Total Carried to Summary				
10		**EXTERNAL FINISHES**				
		External Plain Plaster				

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
10.01	Code-122	3/4" (19 mm) thick cement plaster (Plain) 1:4 on walls and columns etc. in basement, plinth, mezzanine and ground floor including making edges, corners, grooves as specified and curing etc., complete in all respects as per specifications & relevant draw				
10.02	Code-122 Item # 8 Page # 376	Up to 4.57 M Height	175	Sq.m		
10.03	Code-122 Item # 8+88 Page # 376	Above 4.57 M Height	50	Sq.m		
		Grooves On External Plaster				
10.04	Code-122 Item # 37 Page # 378	Extra if deep cut grooves of approved sizes and design are made on plastered surface of any description in any floor	225	Sq.m		
		Weather Shield Paint				
10.05	Code-122 Item # 172 Page # 390	Painting three coats with **weather shield paint deluxe (ICI)** make of approved shade on plaster surface (External) and including the cost of cleaning the surface, sand papering etc. complete at any height in any floor etc., complete in all respects as per	225	Sq.m		
		Aluminium Composite Panels Cladding On Ceilling of Main Gate				
10.06	Code-124 Item # 201 Page # 428	Providing & fixing of Alucobond USA aluminium composite panels (Cladding) 4 mm thick with 0.3/0.3 mm skin thickness finished PVDF coat. Class B2 non FR. Framing will be aluminum fube 2"x1" with relevant fittings etc. complete the in all respect as direct	35	Sq.m		
		Total Carried to Summary				
		NON-SCHEDULE ITEMS				
		Rain Water Spouts				
	N.S.I	Providing, Making and Fixing in position R.C.C Precast Rain Water spouts (size as shown in drawing), complete in all respects as per specifications & relevant drawings and all works to the satisfaction of the Engineer.	2	Each		
		Lettering On External Surface Of Main Gate				
	N.S.I	Provide, make, finish and fix in position LETTERING, each letter 600mm x 600mm on top of external surface of main gate ***("KARACHI INDUSTRIAL PARK")***, *comprising of 12mm thick approved white shade Acrylic sheet on front & either side, 8mm thick back of ha*	42	Each		
		Total Carried to Summary				

ARCH.EMERGENCY GATE HOUSE

ENGINEER'S ESTIMATE

S.No	Description	Amount
A	**SCHEDULE ITEM**	
1	EARTH WORKS	-
2	SUB STRUCTURE	-
3	SUPER STRUCTURE	-
4	MASONRY WORKS	-
5	METAL WORKS	-
6	WOOD WORKS	-
7	FLOOR FINISHES	-
8	WALL FINISHES	-
9	CEILING FINISHES	-
10	EXTERNAL FINISHES (BUILDING)	-
	Total of Schedule Items - A	**-**
B	**NON-SCHEDULE ITEM**	
1	EARTH WORKS	-
2	SUB STRUCTURE	-
3	SUPER STRUCTURE	-
4	MASONRY WORKS	-
5	METAL WORKS	-
6	WOOD WORKS	-
7	FLOOR FINISHES	-
8	WALL FINISHES	-
9	CEILING FINISHES	-
10	EXTERNAL FINISHES (BUILDING)	-
	Total of Non-Schedule Items - B	**-**
	TOTAL CARRIED TO GRAND SUMMARY (A+B)	**-**

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch.	Rate (RS)	Amount (RS)
3		**DPC & MASONRY WORKS**				
		Damp Proof Course (DPC)				
3.01	Code -108 Item # 3 Page # 108	Providing and laying 2 inches (51 mm) thick damp proof course with cement concrete 1:2:4 cast in situ using graded screened bajri of 3/4 inch (19 mm) and down gauge mixed with any approved water proofing agent including compacting, curing form work and it				
		2" thick DPC	4	Sq.m		-
		Water Proofing Agent				
3.02	Code -108 Item # 5 Page # 108	Extra for using water proofing agent pudlo in item Nos. 4.0 (quantity to be used as per manufacturer's specification/2.50Kg per 9Sq.m).etc., complete in all respects as per specifications & relevant drawings and all works to the satisfaction of the Engine	2	Kg		-
4		**MASONRY WORKS**				
		Solid Block Masonry				
4.01	Code-110 & 109	Providing and laying 1:3:6 cement concrete solid block masonry 4 to 6 inches (102mm - 152 mm) thick using graded screened crushed boulers **in place of screened bajri** 3/4 inch (19 mm) and down gauge set in cement sand mortar 1:4 **in place of lime cement mor**				
	Item # 44+77+92+120 Page # 112, 116, 117 & 98	Up to 4.57 M Height	16	Cu.m		-
		Total Carried to Summary				-
5		**METAL WORKS**				
		MS Moulded Steel Door Frame				
5.01	Code -119 Item # 43 Page # 289	Providing and fixing M.S. moulded steel door frame of 4" x 2-1/2" (102 mm x 64 mm) manufactured from mild steel sheet of 18 gauge (1.41 mm) conforming to BSS. 1245 having a single rebate size 1-1/2" x 1/2" (38 mm x 13 mm) with provision of 3 Nos. M.S. pla				
			17	Ru.m		-
		Steel Gate				

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch.	Rate (RS)	Amount (RS)
5.02	Code -119 Item # 18 Page # 285	Providing and fixing steel gate of flat iron sections of approved design with or without M.S. sheet covering including hold fast, with or without rollers and track arrangement including providing wicket shutter of required size with all accessories and lo	1,000	P.Kg		-
		MS Grill				
5.03	Code -119 Item # 34 Page # 288	Providing and fixing M. S. square bars at required spacing with horizontal flat iron as per approved design including making holes fixing with sunk iron screws, painting two coats of red oxide paint etc. complete as required in any floor.	189	P.Kg		-
		Painting on iron work				
5.04	Code -122 Item # 174 Page # 391	Painting on iron work with Synthetic enamel paint of approved make and shade by spray machine two coats over and including the cost of one priming coat complete at any height in any floor .	50	Sq.m		-
		Upvc Door Shutter				
5.05	Code -120 Item # 171 Page # 331	P/F 1-1/2 Inch(38 mm) thick best quality PVC/UPVC door shutter panelled (approved design), approved iron hings and tower bolt, etc. as required.	7	Sq.m		-
		Aluminum Openable Windows & Ventilators				
5.06	Code -119 Item # 68 Page # 294	Providing and fixing fully glazed Champagne anodized aluminium Fixed/openable windows Partition as per British standard manufactured by Lucky, Alcop, Krudson, Pakistan Cables and A.C.P. (fixing through their approved fabricators), Deluxe model box section	7	Sq.m		-
		Aluminum Sliding Windows				
5.07	Code -119 Item # 71 Page # 295	Providing and fixing doubble glazed Champagne anodized aluminium Sliding windows as per British standard manufactured by Lucky, Alcop, Krudson, Pakistan Cables and A.C.P. (fixing through their approved fabricators), Executive model section dubble or singl	6	Sq.m		-
		Plain Glass				
5.08	Code -119 Item # 120 Page # 307	Providing and fixing plain glass panes 6mm thick to M.S. Box pipe / Aluminium doors, windows and ventilators etc. including the cost of labour but excluding the cost of M.S. square pipe beading, rubber packing and screw in any floor at any height.	13	Sq.m		-

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch.	Rate (RS)	Amount (RS)
Total Carried to Summary						-

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch.	Rate (RS)	Amount (RS)
6		**WOOD WORKS**				
		Floor Cabinet				
6.01	Cod-124 Item # 210 Page # 430	Proving & fixing kitchen floor cabinet making of shutter board box & 3/4" thick high glass lamination lasani shutter , PVC beading , deodar wooden frame 2.5"x1.25" size making tray drawer of approved design etc. fixed with rawal plugs,screws i/c the cos	2	Sq.m		-
		Counter Top				
6.02	Code-117 Item # 59 Page # 239	Providing and laying floor of 1 inch (25 mm) thick marble tiles more than 5 Sq.ft. upto 7 Sq.ft. size (above 0.46 Sq.m upto 0.65 Sq.m) fine dressed on the surface without winding in ground floor over 1 inch (25 mm) lime mortar 1:2 (one lime, two sand) set	2	Sq.m		-
		Total Carried to Summary				-
7		**FLOOR & ROOF SCREEDING**				
7.01	Code-105 & 109 Item # 17+120 Page # 52 & 98	Providing and laying 1:5:10 (1 cement 5 sand and 10 coarse aggregate) cement concrete using graded screened crushed boulers 3/4" down **in place of gravel (bajri**) 1 inch (25 mm) and down gauge in foundation or where required including levelling, compacting	1	Cu.m		-
		CC Flooring				
7.02	Code-117 Item # 30 Page # 234	Providing and laying floor of 3 inches (76 mm) thick 1:2:4 reinforced cement concrete using graded screened crushed boulers **in place of screened bajri** 3/4" (19 mm) and down gauge in ground floor including form work, consolidation, finishing and curing etc	10	Sq.m		-
		Porcelain Tile Flooring				
7.03	Code-117 Item # 180 Page # 255	Providing and laying light colour, glazed/non skid vitrified porcelean tiles (Polished) exceeding 1600 sqcm and upto 3600 Sqcm each, (Pak made) on walls and floors, in any floor, laid with dry bond (stile bond) over a base of 1" thick cement mortar (1:3)	11	Sq.m		-
		Ceramic Glazed Tile Flooring				
7.04	Code-117 Item # 82 Page # 242	Providing and laying floor of 6mm (approx: 1/4") thick coloured glazed tiles 12" x 12" (304mm x 304mm) of master make (Pakistani) first grade in ground floor laid over 1" (25mm) thick cement mortar 1:2 (1 cement and 2 sand) including jointing and washing	3	Sq.m		-
		Roof Screeding				

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch.	Rate (RS)	Amount (RS)
7.05	Code-117 Item # 7+26 Page # 231 & 233	Providing and laying floors of 3 inches (76 mm) thick 1:2:4 cement concrete using graded screened crushed boulers **in place of screened bajri** 3/4 inch (19 mm) and down gauge in ground floor laid in panels including form work, consolidation, finishing and c	25	Sq.m		-
Total Carried to Summary						**-**

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch.	Rate (RS)	Amount (RS)
8		**WALL FINISHES**				
		Internal Wall Plaster				
8.01	Code-122 Item # 6 Page # 376	1/2" (13 mm) thick **cement plaster** 1:6 on wall columns etc. in basement, plinth, mezzanine and ground floor including making edges, corners, grooves as specified and curing etc., complete in all respects as per specifications & relevant drawings and all w	86	Sq.m		-
		Enamel Paint				
8.02	Code-122 Item # 157 Page # 389	Painting plastered surface with super glass synthetic enamel paint of approved make and shade two coats over and including the cost of one coat of priming complete at any height in any floo	86	Sq.m		-
		Dado & Skirting				
		Porcelain Tile Skirting				
8.03	Code-117 Item # 180 Page # 255	Providing and laying light colour, glazed/non skid vitrified porcelean tiles (Polished) exceeding 1600 sqcm and upto 3600 Sqcm each, (Pak made) on walls and floors, in any floor, laid with dry bond (stile bond) over a base of 1" thick cement mortar (1:3)	20	Sq.m		-
		Ceramic Glazed Tile Dado				
8.04	Code-117 Item # 82 Page # 242	Providing and laying floor of 6mm (approx: 1/4") thick coloured glazed tiles 12" x 12" (304mm x 304mm) of master make (Pakistani) first grade in ground floor laid over 1" (25mm) thick cement mortar 1:2 (1 cement and 2 sand) including jointing and washing	17	Sq.m		-
		Total Carried to Summary				**-**
9		**CEILING FINISHES**				
		Internal Ceiling Plaster				
9.01	Code-122 Item # 02 Page # 376	1/4" (6.4 mm) thick cement plaster 1:4 on soffits of ceiling, cantilever slabs, sides and soffits of beams etc, in basement, mezzanine and ground floor including making edges, corners and curing etc, Complete in all respects as per specifications & releva	15	Sq.m		-
		Vinyl Distemper				
9.02	Code-122 Item # 151 Page # 389	Distempering with vinyl distemper (ICI) Deluxe Paintex of approved make and shade in two coats over and including the cost of one priming coat of lime wash including sand papering, dusting, and filling the holes, cracks and inequalities, if any, at any he	15	Sq.m		-
		Total Carried to Summary				**-**

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch.	Rate (RS)	Amount (RS)
10		**EXTERNAL FINISHES**				
		External Plain Plaster				
10.01	Code-122	3/4" (19 mm) thick cement plaster (Plain) 1:4 on walls and columns etc. in basement, plinth, mezzanine and ground floor including making edges, corners, grooves as specified and curing etc., complete in all respects as per specifications & relevant draw				
10.02	Code-122 Item # 8 Page # 376	Up to 4.57 M Height	126	Sq.m		-
		Grooves On External Plaster				
10.03	Code-122 Item # 37 Page # 378	Extra if deep cut grooves of approved sizes and design are made on plastered surface of any description in any floor	126	Sq.m		-
		Weather Shield Paint				
10.04	Code-122 Item # 172 Page # 390	Painting three coats with **weather shield paint deluxe (ICI)** make of approved shade on plaster surface (External) and including the cost of cleaning the surface, sand papering etc. complete at any height in any floor etc., complete in all respects as per	126	Sq.m		-
		Total Carried to Summary				**-**
		NON-SCHEDULE ITEMS				
		Rain Water Spouts				
	N.S.I	Providing, Making and Fixing in position R.C.C Precast Rain Water spouts (size as shown in drawing), complete in all respects as per specifications & relevant drawings and all works to the satisfaction of the Engineer.	4	Each		-
		Total Carried to Summary				**-**

PRECAST BOUNDARY WALL

SUMMARY OF CIVIL WORKS

S.No	Description	Amount
A	**SCHEDULE ITEM**	
1	EARTH WORKS	-
2	SUB STRUCTURE	-
3	SUPER STRUCTURE	-
4	MASONRY WORKS	-
5	METAL WORKS	-
6	FLOOR FINISHES	-
7	WALL FINISHES	-
8	CEILING FINISHES	-
9	EXTERNAL FINISHES (BUILDING)	-
	Total of Schedule Items - A	**-**
B	**NON-SCHEDULE ITEM**	
1	EARTH WORKS	
2	SUB STRUCTURE	
3	SUPER STRUCTURE	-
4	MASONRY WORKS	
5	METAL WORKS	
6	FLOOR FINISHES	
7	WALL FINISHES	
8	CEILING FINISHES	
9	EXTERNAL FINISHES (BUILDING)	
	Total of Non-Schedule Items - B	**-**
	TOTAL CARRIED TO GRAND SUMMARY (A+B)	**-**

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sched. Rate)	Rate (Rs.)	Amount (Rs.)
		SCHEDULE ITEMS				
1		**EARTH WORKS**				
1.1	Code -103,	Excavation for raft foundations, underground tanks and septic tanks (rectangular or square) in all kinds of soil (except gravelly and murum soil wet silt, clay or mud, conglomeration of gravel and boulders, soft, sandy or disintegrated and hard rock) and back filling the excavated material all round the trenches 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 up to one chain (30.5 R.m) and lift upto 5 feet (1.52 m).				
	Item # 10	From ± 0.00 m to -1.5m depth	750	Cum.		-
		Total Carried to Civil Summary				**-**
2		**SUB STRUCTURE**				
		CONCRETE WORKS				
2.1	Code -106	Providing and laying in situ 1:4:8 (1 cement 4 sand and 8 coarse aggregate) cement concrete using crushed graded boulders 3/4 inch (19 mm) and down gauge in foundation, basement and plinth including form work, compacting, curing and removal of form work etc. complete, foundation and basement up to 5 feet (1.52 m) depth and plinth up to 4 feet (1.2 m) height from ground level.				
	Item # 11	Below plinth beam,situ,walls,tanks, over stone soling or where required (Cylindrical Strength 1280 Psi equal to Cubical strength 1600 Psi)	250	Cum.		-
2.2	Code -106	Providing and laying in situ 1:3:6 (1 cement 3 sand and 6 coarse aggregate) cement concrete using crushed graded boulders 3/4 inch (19 mm) and down gauge in foundation, basement and plinth including form work, compacting, curing and removal of form work etc. complete, foundation and basement up to 5 feet (1.52 m) depth and plinth up to 4 feet (1.2 m) height from ground level.				
	Item # 12	For Cast in situ / mass concrete or where required (Cylindrical Strength 1600 Psi equal to Cubical strength 2000 Psi)	600	Cum.		-
2.7	Code -108 Item # 12	Providing a coat of bitumen emulsion at 10 Lbs. per % sft. (0.49 Kg/sm) on walls and floor in ground floor etc. complete in all respects as per drawing, standard , specifications and as directed by the Engineer.	4,600	Sqm.		-
		External Plain Plaster				
2.71	Code-122	3/4" (19 mm) thick cement plaster (Plain) 1:4 on walls and columns etc. in basement, plinth, mezzanine and ground floor including making edges, corners, grooves as specified and curing etc., complete in all respects as per specifications & relevant drawings and all works to the satisfaction of the Engineer.				
2.72	Code-122 Item # 8 Page # 376	Up to 4.57 M Height	3,650	Sq.m		-

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sched. Rate)	Rate (Rs.)	Amount (Rs.)
	Code-124 Item # 3 Page # 409	**Angle iron posts** Providing and fixing angle iron fencing posts embedded in concrete and painting exposed portion with aluminium paint 3 coats including necessary holes but excluding the cost of excavation and concrete, complete .	11,650	P.Kg		-
	Code-124 Item # 17 Page # 410	**Barbed wire** Providing and fixing galvanized iron barbed wire fencing (with four points) to the posts of any description complete with hooks and binding wire etc- if required (cost of posts not included).	4,450	P.Kg		-
		Total Carried to Civil Summary				**-**
		NON SCHEDULE ITEMS				
3		**SUPER STRUCTURE**				
		Pre-cast R.C.C H type Column and planks				
3		Supply & Erection of Precast Planks (2" thick) Boundary Wall in 8'-0" clear height from NGL including, excavation, lean concrete, steel reinforcement bars & strand, Rcc footing & pedestal columns, back fill with excavated soil (as per drawing),	8,100	R.m		-
		Total Carried to Civil Summary				**-**

ELECTRICAL

ENGINEER'S ESTIMATE
SUMMARY OF COST

S.NO:	DESCRIPTION	AMOUNT
A	**SCHEDULE ITEMS**	
1	SINGLE PVC INSULATED WIRE IN EXISTING CONDUIT	-
2	INDOOR / POLE MOUNTED TRANSFORMER	-
3	VCB	-
4	TERMINATION OF HT CABLES (3 CORE)	-
	Total of Schedule Items	-
B	**NON-SCHEDULE ITEMS**	
1	MEDIUM VOLTAGE SWITCHGEARS	-
2	PAD MOUNTED UNITS (PMU)	-
3	MEDIUM VOLTAGE CABLES	-
4	LOW VOLTAGE CABLES	-
5	CABLE CONTAINMENT	-
6	L.V SWITCH BOARD & DISTRIBUTION BOARDS	-
7	EARTHING SYSTEM	-
8	PUMPING & SUB STATION ELECTRIFICATION WORKS	-
9	STREET LIGHTING	-
	Total of Non-Schedule Items - B	**-**
	TOTAL AMOUNT (A+B)	**-**

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	DESCRIPTION	QTY	UNIT	RATE (Pak Rs.)	AMOUNT (Pak Rs.)
1	**2-26**	**SINGLE PVC INSULATED WIRE IN EXISTING CONDUIT**				
a)	2-26-05	Supply & drawing of 10 mm², single core, PVC insulated wire in all kinds of existing or given conduit/cable duct as required.(For Street Light)	19,310	P/Meter		-
		Amount Carried to Electrical Summary				**-**
2	**3-11**	**INDOOR / POLE MOUNTED TRANSFORMER**				
a)	3-11-05	Providing, fixing and commissioning Pad mounted, step down 11000/ 400 volts three phase, 50Hz, Transformer as per electricity code complete in all respect as reqd.				
i	d	630 KVA (For Pumping Station)	1	Each		-
		Amount Carried to Electrical Summary				**-**
3	**3-12**	**VCB**				
a)	3-12-01	Providing, fixing, testing and commissioning of H.T 11 KV, 630 A, Transformer Protection VCB Panel, as per K.E specifications, complete in all respect as approved by the Engineer Incharge.(For Pumping Station)	1	Each		-
		Amount Carried to Electrical Summary				**-**
4	**3-14**	**TERMINATION OF HT CABLES (3 CORE)**				
a)	3-14-01	Providing and fixing indoor/outdoor, 3 core, 11KV, XLPE, heat shrink termination ends Kit complete in all respect as required.				
i	c)	120 mm2 to 185 mm2 (For Pumping Station)	2	Job		-
		Amount Carried to Electrical Summary				**-**

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	DESCRIPTION	QTY	UNIT	RATE (Pak Rs.)	AMOUNT (Pak Rs.)
		All items under this head to be carried out as per technical specifications and approval, Drawings, relevant BSI /ASTM Standards, IEC regulation, entire satisfaction of the Employer, and as mentioned in General Notes or noted otherwise, Including providing of shop and as built drawings. complete in all respects.				
1		**MEDIUM VOLTAGE SWITCHGEARS** Supply, installation, testing and commissioning of following floor standing totally enclosed, Cubical type, dust protected and vermin proof Medium Voltage Panel with incoming and outgoing VCBs and other components as per SLD drawing including MV Cable terminations, (as shown on the drawings), as per drawing, specifications and approvals, complete in all respect.				
a)		11kV 630A TP, MV Switchgear with 1 No. Incoming VCB Panel and 6 Nos. Outgoing VCB Panels as per K.E specifications and approvals.	2	No.		-
b)		Supply and installation of following Accessories / Signs / Shock charts for electrical substations as per specifications and K.E regulations, including all mounting accessories, complete in all respects.				
i		600mm wide, 6 mm thick rated for 15kV insulation level Rubber mat piece to be installed all along MV Switchgears / RMU in substation rooms.	3	Job		-
ii		Danger Boards / Signs, Emergency Shock charts etc.	3	No.		-
		Amount Carried to Electrical Summary				**-**

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	DESCRIPTION	QTY	UNIT	RATE (Pak Rs.)	AMOUNT (Pak Rs.)
2 a)		**PAD MOUNTED UNITS (PMU)** Supply, installation, testing and commissioning of following PMUs with MV Switchgear, LT and Transformer Compartments including metal enclosure and canopy (IP66 - Weather proof), complete earthing arrangement, earth fault indicator, all accessories / components, RCC foundation pad (including all related civil work). The transformer shall be 3-Phae oil immersed type Pad mounted 11,000/415 Volts, DYN-11, copper wound type distribution transformer, class F insulation with off load tap changer +5%, +2.5%, 0, -2.5%, -5% in steps. Transformer shall be complete with all accessories, clamps / connectors, Winding temprature indicator (WTI) and sensor for monitoring purpose and necessary installation accessories etc. The MV and LV compartments shall have sufficent space and terminals for termination of reqired number of incoming and outgoing cables as per drawings, specifications, cable shedules, data sheet etc. Installation need to be completed in all respect and as per specification. Transformer to be earthed separately.				
i		PMU with 630 KVA Transformer	8	No.		-
		Amount Carried to Electrical Summary				**-**

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	DESCRIPTION	QTY	UNIT	RATE (Pak Rs.)	AMOUNT (Pak Rs.)
3		**MEDIUM VOLTAGE CABLES**				
a)		Supply, laying, termination, tagging, testing and commissioning of following size Aluminum conductor, multi core, AL/XLPE/SWA/PVC, armoured, 15kV voltage grade cables, directly buried in already excavated trenches / laying in already provided uPVC road crossing sleeves including lugs, cable glands, cable ID marker etc. Complete in all respects, as per drawing and specifications and to the entire satisfaction of the engineer and employer. Note: Contractor is advised to confirm the actual lengths as per site conditions before commencement of work / ordering of cables.				
i		3 CORE -400 Sq.mm Al.XLPE/SWA/PVC 15kV Cable (Temporary Connection from BQIP Grid Station to Sub Station 1&2)	17,883	Rm.		-
ii		3 CORE -400 Sq.mm Al.XLPE/SWA/PVC 15kV Cable (from Sub Station to PMUs ,PMU to PMU,Sub Station to Pumping Station)	8,336	Rm.		-
iii		3 Core, 120 Sq.mm AL/XLPE/SWA/PVC 15kV Cable (Pumping Station MV Panel to Transformer)	15	Rm.		-
b)		MV Straight Joint Kits for 15kV 3 Core, 400 Sq.mm AL/XLPE/SWA/PVC cable	18	No.		-
c)		MV termination kit for 15kV 3 Core, 400 Sq.mm AL/XLPE/PVC/SWA/PVC Cable (Indoor)	4	No.		-
		Amount Carried to Electrical Summary				**-**

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	DESCRIPTION	QTY	UNIT	RATE (Pak Rs.)	AMOUNT (Pak Rs.)
4		**LOW VOLTAGE CABLES** Supply, laying, termination, tagging, testing and commissioning of following size copper conductor, multi core/single core, Cu/PVC, Cu/XLPE/SWA/PVC, Cu/XLPE/PVC, armoured / unarmoured, 600/1000 voltage grade cables, directly buried in already excavated trenches / laying in already provided uPVC conduits / Road crossing sleeves including lugs, cable glands, cable ID marker etc. Complete in all respects, as per drawing and specifications and the entire satisfaction of the engineer and employer. Note: Contractor is advised to confirm the actual lengths as per site conditions before commencement of work / ordering of cables.				
a)		**4 Core, Cu/XLPE/SWA/PVC Cable (600/1000V)**				
i		4 Core, 25 Sq.mm Cu/XLPE/SWA/PVC	589	Rm.		-
ii		4 Core, 16 Sq.mm Cu/XLPE/SWA/PVC	3,341	Rm.		-
b)		**4 Core, Cu/PVC/PVC Cable (600/1000V)**				
i		4 Core, 16 Sq.mm Cu.PVC/PVC	16	Rm.		-
c)		**4 Core, Cu.PVC/SWA/PVC (600/1000V)**				
i		4 Core -25 Sq.mm Cu.PVC/SWA/PVC	1,597	Rm.		-
d)		**1 Core, Cu/PVC Cable as ECC (600/1000V)**				
i		1 Core, 16 Sq.mm Cu/PVC	1,613	Rm.		-
		Amount Carried to Electrical Summary				**-**

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	DESCRIPTION	QTY	UNIT	RATE (Pak Rs.)	AMOUNT (Pak Rs.)
5		**CABLE CONTAINMENT** CONDUIT & PIPES				
a)		Supply and installation of following size internal diameter PVC / uPVC Class-D pipe / Flexible PVC Conduit as race ways with all accessories, recessed / surface on wall / column / under floor, as per drawings and specifications, complete in all respect.				
i		25 mm dia PVC Conduit	100	Rm.		-
b)		Supply and laying of following size uPVC Class-D Pipes as Road Crossing Sleeves for MV / LV / Street Lighting / Fiber cables, burried in ground / under road / under floor including concreting (excluding excavation and backfilling), as per detail shown on the drawing, complete in all respect and the entire satisfaction of the engineer and employer.				
i		6 x 150mm dia uPVC Pipe (Class-D) as Road Crossing Sleeves (For MV Cables)	300	Rm.		-
ii		4 x 150mm dia uPVC Pipe (Class-D) as Road Crossing Sleeves (For MV Cables)	90	Rm.		-
iii		2 x 150mm dia uPVC Pipe (Class-D) as Road Crossing Sleeves (For MV Cables)	1,107	Rm.		-
iv		2 x 150mm dia uPVC Pipe (Class-D) as Road Crossing Sleeves (For Street Light Cables)	200	Rm.		-
v		2 x 150mm dia uPVC Pipe (Class-D) as Road Crossing Sleeves (For Fiber Optic)	30	Rm.		-
vi		2 x 50mm dia uPVC Pipe (Class-D) as Road Crossing Sleeves (For Fiber Optic)	282	Rm.		-
c)		Supply and laying of following size uPVC Class-D Pipes for Street Lighting / Fiber cables, burried in ground / under road / under floor (excluding excavation and backfilling), as per detail shown on the drawing, complete in all respect and the entire satisfaction of the engineer and employer.				
i		50mm dia uPVC Pipe (Class-D) for Fiber Cables	95,054	Rm.		-
ii		50mm dia uPVC Pipe (Class-D) for Street Lighting	19,112	Rm.		-
		EXCAVATION AND BACKFILLING OF TRENCHES				
d)		Excavation of trenches in hard / soft soil upto maximum 4 ft deep as required (including excavation for cable loops), cost including providing fresh sand 6" above and 6" under cable & pipe, laying protection A class bricks on sand, warning tape and backfilling, compaction etc., as per detail shown on the drawing, complete in all respect and the entire satisfaction of the engineer and employer. (for MV / LV / Street Lighting / Fiber cables)	24,924	Cu.m		-
e)		Supply and installation of MV Cable marker as per standard and specification, complete in all respects.	167	No.		-

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	DESCRIPTION	QTY	UNIT	RATE (Pak Rs.)	AMOUNT (Pak Rs.)
f)		Supply and installation of following Cable Trench Covers consisting of Heavy duty MS Chequered plate 6mm thick, including angle iron supports, as per drawing and details. Complete in all respect with suitable dimensions for easy handling as approved by the engineer and to the entire satisfaction of the engineer and employer. (Civil works cost not included.)				
i		Cable Trench Covers consisting of Heavy Duty MS Chequered Plate (Trench Size 2'-6" Wide)	120	Rm.		-
ii		Cable Trench Covers consisting of Heavy Duty MS Chequered Plate (Trench Size 3'-0" Wide)	30	Rm.		-
g)		Providing and Construction of Manhole internal size 3'-0" x 3'-0" x 3'-0" deep, all work consisting of excavation, backfilling, lean 1:4:8 concrete, block masanry with 1:4 cement sand mortar, internal & external plaster 1/2" thick, 1:4 cement sand mortar with padlo mixed, bitumen coating on external and internal surface contact with earth and heavy duty cast iron cover etc. complete in all respect, as per specification and drawings.	5	No.		-
h)		Providing and Construction of Handhole internal size 2'-0" x 2'-0" x 2'-0" deep, all work consisting of excavation, backfilling, lean 1:4:8 concrete, block masanry with 1:4 cement sand mortar, internal & external plaster 1/2" thick, 1:4 cement sand mortar with padlo mixed, bitumen coating on external and internal surface contact with earth and heavy duty cast iron cover etc. complete in all respect, as per specification and drawings. (for Fiber Optic Cables)	188	No.		-
		Amount Carried to Electrical Summary				**-**

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	DESCRIPTION	QTY	UNIT	RATE (Pak Rs.)	AMOUNT (Pak Rs.)
6		**L.V SWITCH BOARD & DISTRIBUTION BOARDS**				
a)		Supply, installation, testing and commissioning of following floor mounted, totally enclosed, cubical type LV Panel, IP-42, Form-2, made with 14 SWG sheet steel metal housing powder coated with approved color, dust protected, vermin proof housing complete with incoming and outgoing circuit breakers, fuse Unit, contactors, solid-state microprocessor based control relay, capacitors bank, reactors, TPN+E copper busbars, connection terminals, connection bars, CT's, energy analyzers, meters, indication lamps, selector switches and other all components and mounting accessories etc., including RCC foundation pad (all related civil work) as per specifications and drawings, complete in all respect.				
i		LV PANEL (for Pumping Station)	1	No.		-
b)		Supply, installation, testing and commissioning of following Wall/Flush/floor mounted Distribution Boards (DBs), IP-42 or as shown, made with 16 SWG sheet steel metal housing powder coated with approved color, dust protected, vermin proof housing complete with incoming and outgoing circuit breakers, fuse Unit, contactors, TPN+E copper busbars, connection terminals, connection bars, CT's, energy analyzers, meters, indication lamps, selector switches and other all components, Pull Boxes / Gutter and mounting accessories etc., including RCC foundation pad (all related civil work) as per specifications and drawings, complete in all respect.				
i		DB-LP	3	No.		-
ii		DB-PS	1	No.		-
iii		DB-ST	8	No.		-
iv		DB-EGH	1	No.		-
v		DB-EGHP	1	No.		-
vi		DB-LP-GATE HOUSE	1	No.		-
vii		MCC-1 (IP-54)	1	No.		-
viii		MCC-2 (IP-54)	1	No.		-
ix		MCC-3 (IP-54)	1	No.		-
		Amount Carried to Electrical Summary				**-**

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	DESCRIPTION	QTY	UNIT	RATE (Pak Rs.)	AMOUNT (Pak Rs.)
7		**EARTHING SYSTEM** Supply, installation, testing and commissioning of following items for complete earthing system including all connecting / fixing accessories as per drawings, specifications and as mentioned in General Notes, complete in all respects.				
a)		Supply, installation, testing and commissioning of Earth pit with Rod type earth electrode, 3/4" dia and 9 Ft. long copper bonded rod to achieve the required earth resistance for complete Power Earthing system, including Bentonite chemical, other all required materials and connecting accessories, boring as required to achieve the target earth resistance (at least 20 ft deep), labor, tools, transportation etc., as per drawings and specifications, complete in all respects with detailed test reports. (for LCPs & Street Lighting Circuit earthing)	65	No.		-
b)		Supply, installation, testing and commissioning of Earth pit with Rod type earth electrode, 3/4" dia and 9 Ft. long copper bonded rod to achieve the required earth resistance for complete Power Earthing system, including Bentonite chemical, other all required materials and connecting accessories, boring as required to achieve the target earth resistance (at least 20 ft deep), labor, tools, transportation etc., as per drawings and specifications, complete in all respects with detailed test reports. (For Substations & Pumping Station)	12	No.		-
c)		Supply, installation, testing and commissioning of Earth pit with Rod type earth electrode, 3/4" dia and 9 Ft. long copper bonded rod to achieve the required earth resistance for complete Power Earthing system, including Bentonite chemical, other all required materials and connecting accessories, boring as required to achieve the target earth resistance (at least 20 ft deep), labor, tools, transportation etc., as per drawings and specifications, complete in all respects with detailed test reports. (For PMU)	8	No.		-
d)		Supply, installation, testing and commissioning of Copper Earth Bar 475 mm x 90 mm x 96 mm with single disconnecting link for earthing system as per drawings and instruction of engineer, including all mounting accessories etc., complete in all respect.	12	No.		-
e)		Supply, laying, termination, tagging, testing and commissioning of following size PVC insulated single core Cu. Conductor cable as earth continuity conductor (ECC) installed on surface / in already installed raceway / in already excavated trench / in already laid pipe, complete in all respect.				
i		1 Core, 120 Sq.mm Cu/PVC	120	Rm.		-
ii		1 Core, 16 Sq.mm Cu/PVC	80	Rm.		-
iii		1 Core, 10 Sq.mm Cu/PVC	570	Rm.		-

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	DESCRIPTION	QTY	UNIT	RATE (Pak Rs.)	AMOUNT (Pak Rs.)
		Amount Carried to Electrical Summary				-
8		**PUMPING , SUB STATION ,SECURITY TOWER, GATE HOUSE & EMERGENCY GATE HOUSE ELECTRIFICATION WORKS**				
a)		**CABLE TRAY** Supply and installing of following size of perforated Cable Tray , fabricated with 14 SWG MS Sheet steel Hot dip Galvanized (ensure 80um microns) including all installation accessories such as appropriate sizes & lengths of MS Rod / Angle Iron Supports and Rawl Bolts, including cutting, jointing and necessary required hardware etc. Complete in all respect as shown in drawings & specification or as directed by the Engineer.				
i		300 mm x 100 mm (1'-0" x 0'-4")	10	Rm.		-
b)		**LIGHT FIXTURES / FANS** Supply, installing, testing and commissioning of following Light Fixtures complete with starters, Electronic ballast (mention otherwise), lamps, drivers,mounting accessories etc., complete in all respects. Lighting fixtures Sample must be submitted to consultant for approval.				
i		Surface / Wall mounted 4' LED Batten light Fixture (IP-55), 4000K with 25W LED lamp	21	No.		-
ii		Wall mounted LED Bulkhead Light Fixture (IP-65) with 40WLED lamp	29	No.		-
ii		Wall Mounted Flood Light Fixture, Aluminum Profile Housing with 300 W LED (IP-65)	64	No.		-
iv		Ceiling Recessed LED Down Light Fixture with aluminum housing, IP-44 rated with 10W LED lamp	64	No.		-
v		Ceiling Recessed LED Down Light Fixture with aluminum housing, IP-20 rated with 20W LED lamp	13	No.		-
vi		Ceiling Recessed LED Down Light Fixture with aluminum housing, IP-44 rated with 20W LED lamp	26	No.		-
vii		Ceiling Recessed LED Down Light Fixture with aluminum housing, IP-44 rated with 12W LED lamp	3	No.		-
viii		Wall mounted LED Bulkhead Light Fixture (IP-65) with 20W LED lamp	16	No.		-
ix		Wall/Floor Mounted Flood Light Fixture, Aluminum Profile Housing with 300 W LED (IP-65), 1300 mm Height of moveable frame/Platform on wheels, with 180 Degree range of motion on both X and Y Axis , with flexable Power Cord.	8	No.		-
x		56"/48" dia Sweep Ceiling Fan complete with hook	2	No.		-
xi		18" dia Wall Bracket Fan	2	No.		-
xii		8" dia Exhaust Fan	2	No.		-
c)		**WIRING ACCESSORIES**				

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	DESCRIPTION	QTY	UNIT	RATE (Pak Rs.)	AMOUNT (Pak Rs.)
		Supply, installation, testing and commissioning of following gang type Switches, & Sockets including 16 SWG Sheet Steel powder coated back boxes with earth terminal, recessed in wall, with all accessories as per specification, complete in all respects.				
i		One Gang Switch 10A	1	No.		-
ii		Two Gang Switch 10A	7	No.		-
iii		Three Gang Switch 10A	4	No.		-
iv		Four Gang Switch 10A	19	No.		-
v		Two Gang Two Way Switch 10A	16	No.		-
vi		13A, Switch Socket Outlet (Weatherproof type)	32	No.		-
vii		13A, International Switch Socket Outlet	11	No.		-
viii		15A, 3-Pin Switch Socket Outlet	18	No.		-
ix		13A, 3-Pin Flat Duplex Switch Socket Outlet	8	No.		-
x		32A, 5-Pin Industrial Socket with Plug top	2	No.		-
xi		20A DP Isolator	1	No.		-
d)		**WIRING FOR LIGHTS, FANS & SOCKETS**				
i		Supply, laying, tagging, testing and commissioning of Circuit wiring from DB to Switchboard including wiring between switch on the same circuit with 2x2.5 sq.mm. + 1x2.5 sq.mm as ECC single core copper conductor PVC insulated wires in 25mm dia PVC conduit surface / recessed in wall, column, ceiling etc., including with all conduit accessories, back boxes etc., as per drawing & specification, complete in all respect.	49	No.		-
ii		Supply, laying, tagging, testing and commissioning of Point wiring for light/fan point from Switch Board to Light/fan Point with 3x1.5 sq.mm. single core copper conductor PVC insulated wires in 20mm dia PVC conduit, surface / recessed in wall, column, ceiling etc., including with all conduit accessories, back boxes etc. as per drawing & specification, complete in all respect.	137	No.		-
iii		Supply, laying, tagging, testing and commissioning of Point wiring from Light/fan point to Light/fan point with 3x1.5 sq.mm. single core copper conductor PVC insulated wires in 20mm dia PVC conduit, surface / recessed in wall, column, ceiling etc., including with all conduit accessories, back boxes etc. as per drawing & specification, complete in all respect.	105	No.		-
iv		Supply, laying, tagging, termination, testing and commissioning of Circuit wiring from DB to first Light Point with 2x2.5 sq.mm + 1x2.5 sq.mm as ECC single core copper conductor PVC insulated wires in 20mm dia PVC conduit, surface / recessed in wall, column, ceiling, under floor etc., including with all conduit accessories, as per drawing and specification, complete in all respect.	8	No.		-

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	DESCRIPTION	QTY	UNIT	RATE (Pak Rs.)	AMOUNT (Pak Rs.)
		Supply, laying, tagging, termination, testing and commissioning of wiring for 13/15A Socket outlet with 2x4 sq.mm + 1x4 sq.mm as ECC single core copper conductor PVC insulated wires in 25mm dia PVC conduit, surface / recessed in wall, column, ceiling, under floor etc, including with all conduit accessories, back boxes etc. as per drawing and specification, complete in all respect.				
v		DB to Socket	35	No.		-
vi		Socket to socket (included Looping of Adjusent socket)	32	No.		-
vii		Supply, laying, tagging, termination, testing and commissioning of wiring for 20A SPN Isolator with 2x4 sq.mm + 1x4 sq.mm as ECC single core copper conductor PVC insulated wires in 25mm dia PVC conduit, surface / recessed in wall, column, ceiling, under floor etc., including with all conduit accessories, as per drawing and specification, complete in all respect.	1	No.		-
e)		**UPS**				
i		Supply testing and commissioning of True Online Double Conversion UPS rating 6 kVA Single Phase , minimum 0.9 output power factor with 10 minutes battery backup, batteries with related DC cables from UPS to batteries, external By-pass etc. as per specification and drawings, complete in all respect.	1	No.		-

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	DESCRIPTION	QTY	UNIT	RATE (Pak Rs.)	AMOUNT (Pak Rs.)
		Amount Carried to Electrical Summary				-
9		**STREET LIGHTING**				
a)		Supply, installation, testing and commissioning of following Octagonal Street lighting pole, hot dipped galvanized (Zinc coating not less then 80 micron) from inside and outside with 4mm wall thickness including base plate anchor bolt, nuts and washer, self inspection door with special keys, cable connection box, all required materials and accessories etc., complete in all respects as per specification and drawings.				
i		8 meter High Single Arm Pole	437	No.		-
b)		Construction and installation of Pole foundation in concrete class "A", reinforcement as per AASHTO M31, lean concrete, nuts, base plate, anchor bolts etc. Excavation and backfilling for the Pole foundation shall be included in this job. Foundation constructed above the drain or any location in project. Complete in all respects as per specifications and drawings.	437	No.		-
c)		Supply, installation, testing and commissioning of Street light fixture with 160W LED, min. Luminous Flux/watt 130, Color temperature shall be 4000K, Surge Protection min. 15kV, IP-66 & IK-09 Rated, 0.9 or above power factor, min 50000 hours life cycle (L70B10), including driver, Painted Aluminum Injection housing material, other all required installation accessories, as per specification and drawing, complete in all respect.Lighting fixture samples must be submitted to Consultant for approval.	437	No.		-
d)		Supply, installation, testing and commissioning of Terminal Box IP 65 including terminals with 1 No. 4A Circuit Breaker, as per specification and drawing, complete in all respect.	437	No.		-
e)		Supply, installation, testing and commissioning of following Lighitng Control Panels (LCP), pad mounted Weatherproof outdoor type, made with 14/16 SWG sheet metal, dust protected, vermin proof housing, confirming to protection class (IP-65), epoxy powder coated paint with approved color, having all the necessary switching, protections, RCC foundation pad (including all related civil work), including all mounting and installation materials and accessories as per specifications and drawings, complete in all respect.				
i		LCP-1/PMU-1	1	No.		-
ii		LCP-2/PMU-2	1	No.		-

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	DESCRIPTION	QTY	UNIT	RATE (Pak Rs.)	AMOUNT (Pak Rs.)
iii		LCP-3/PMU-3	1	No.		-
iv		LCP-4/PMU-4	1	No.		-
v		LCP-5/PMU-5	1	No.		-
vi		LCP-6/PMU-6	1	No.		-
vii		LCP-7/PMU-7	1	No.		-
viii		LCP-8/PMU-8	1	No.		-
f)		Supply, laying, termination, testing and commissioning of 3 Core 2.5 Sq.mm Cu.PVC/PVC, 450/750 volts grade cable in hollow pole from terminal box to street light fixtures as per drawing, specifications and sandards, including all required accessories, connectors etc. Complete in all respect.	4,370	Rm.		-
g)		Supply, laying, termination, tagging, testing and commissioning of following size copper conductor, multi core, Cu.PVC/PVC, 600/1000 voltage grade cables from LCPs to first Lighting Pole and Pole to Pole, laying in already laid uPVC pipe including lugs, cable glands, cable ID marker etc. Complete in all respects, as per drawing and specifications and the entire satisfaction of the engineer and employer. Note: Contractor is advised to confirm the actual lengths as per site conditions before commencement of work.				
		4 Core Cu/PVC/PVC (600/1000V)				
i		4 Core -10 Sq.mm Cu/PVC/PVC	19,312	Rm.		-

ENGINEER'S ESTIMATE

S.No	PWD Schedule 2022 Ref.No	DESCRIPTION	QTY	UNIT	RATE (Pak Rs.)	AMOUNT (Pak Rs.)
		Amount Carried to Electrical Summary				-

PLUMBING

Summary

S. NO.	DESCRIPTION	TOTAL AMOUNT IN PAK RUPEES
A.	**SCHEDULE ITEMS**	
1	Plumbing Fixtures	0
2	Manholes	0
	SUB-TOTAL-A Rs.	**0**
B.	**NON-SCHEDULE ITEMS**	
1	Water Supply	0
2	Sanitary Sewage	0
3	Fire Fighting Works	0
	SUB-TOTAL-B Rs.	**0**
	TOTAL AMOUNT (A+B) FOR 1 No.	**0**

Engineer's Estimate

Item No.	PWD Schedule 2022 Ref.No	Description	Qty	Unit	Rate (Rs.)	Amount (Rs.)
A	**SCHEDULE ITEMS**					
1		**PLUMBING FIXTURES:**				
1.1	**301-1**	Providing and fixing best quality squatting type glazed earthward W.C.Pan, Pakistan (of not less than 18" clear opening as measured between the flushing rimes) Complete with and including the cost of 13.6 liters best quality low level plastic flushing cistern with internal fittings complete, P.V.C. flushing pipe suitable for this type with fittings and making requisite number of holes in walls, plinth & floor for pipe connections and making good in cement concrete 1:2:4.	1	Nos.		-
1.2	**301-8 & 10 & 14**	Providing and fixing 25 inches x 18 inches (635 mm x 457 mm) lavatory basin in white glazed earthenware (Pakistani) complete with and including the cost of Brass oxidized bolts kit built into wall /2 inch (15 mm) dia. Chrome plated mixer 1-1/4" inches (32mm) rubber plug and chrome plated brass chain, 1-1/4 inches (32 mm) dia brass waste of approved pattern, 1-1/4 inches (32 mm) dia. Malleable iron or C.P. brass traps malleable iron or brass unions and making requisite number of holes in walls plinth and floor for pipe connections and making god in cement concrete 1:2:4 Extra over item No. 8 and 9 (Wash basin) for providing and fixing best available (Pakistani make) white glazed earthenware pedestal.. Extra over item No.8 and 9 for providing single hole chromium plated mixer tap 1/2 inch (15 mm) dia (English or approved foreign make).	1	Nos.		-
1.3	**301-21**	Providing and fixing approved quality stainless steel sink 60" x 20" Pak made (Atlas) complete with brass oxidized bolt kit/angle iron brackets built into walls ½" dia CP sink mixer 1-1/4" rubber plug and CP brass chain 1-1/4" CP brass waste 1-1/4" dia malleable iron or CP brass bottle trap with malleable iron or brass unions and making requisite number of holes in walls, plinth and floor for pipe connections and making good in cement concrete 1:2:4	1	Nos.		-

Continued..

Item No.	PWD Schedule 2022 Ref.No	Description	Qty	Unit	Rate (Rs.)	Amount (Rs.)
		PLUMBING FIXTURES (Cont....)				
1.4	**302-6**	Providing and fixing 20 inches x 16 inches (508 mm x 406 mm) Looking mirror of Belgium glass complete with Plastic frame and C.P. Brass screws.	1	Nos.		-
1.5	**302-9**	Providing and fixing bath room accessories of set of 6 pieces consist of one shelf, one towel rod with bracket, one soap dish, one tooth brush holder with glass and cover, one tissue paper holder one double hook one towel ring etc. complete of approved quality as per direction of Engineer in-charge.	1	Nos.		-
1.6	**302-13**	Providing and fixing chrome plated Muslim bib-cock without Muslim shower of approved quality	2	Nos.		-
		CARRIED TO SUMMARY				**-**

Item No.	PWD Schedule 2022 Ref.No	Description	Qty	Unit	Rate (Rs.)	Amount (Rs.)
2		**MANHOLES**				
2.1	**315-3**	Providing manhole Type 'B" size 3'-0" x 2'-6" or 914mm x 762mm x 4ft (1.22mm) deep as per approved design and specifications complete for 4" to 12" diameter pipe, 4 ft. to 7'-5" Depth with cast iron cover and frame weights 1 Cwt. 3 Qtrs or 88.9 kg,in 6" thick RCC 1:2:4 slab 8" thick,c.c. 1:3:6 block masonry walls set in 1:3 c.m. 6" inch thick, 1:3:6, c.c. in foundation 1:2:4 c.c. in benching, 1/2" thick cement plaster in 1:4 c.m. to all inside wall surfaces, channels and benching etc. and top including providing and fixing cast iron foot rest at every foot of depth and making requisite number of main and branch channels complete but excluding that cost of excavation, backfilling , disposal of excavated sruff, manhole cover and frame.	1	Nos.		-
		CARRIED TO SUMMARY				**-**

Item No.	PWD Schedule 2022 Ref.No	Description	Qty	Unit	Rate (Rs.)	Amount (Rs.)
B	**NON-SCHEDULE ITEMS**					
1		**WATER SUPPLY:**				
1.1		**Cold and Hot Water Supply Piping**				
	Non-Sch	Supply, installation Testing and Commissioning of PPR PN - 20 Cold/Hot water pipes as per DIN 8077-8078 with molded fittings PN - 25 as per DIN 16962, including pipe supports a as indicated on the drawing, as per specifications and Engineers approval.				
i		20mm dia	16	Rm		0
ii		25mm dia	30	Rm		0
iii		32mm dia	5	Rm		0
iv		40mm dia	0	Rm		0
v		50mm dia	0	Rm		0
1.2		**Valves**				
	Non-Sch	Providing and fixing of PPR Coated, brass Gate valves (of same material as piping) as indicated on the drawing, as per specifications and Engineers approval.				
i		25mm dia	2	Nos.		0
ii		32mm dia	1	Nos.		0
iii		40mm dia	0	Nos.		0
iv		50mm dia	0	Nos.		0
1.3		**Water Tanks and Connection**				
1.3.1	Non-Sch	Connection for water tank including with valves, supports, excavation and Backfill, complete all in accordance with the drawing and specifications.	1	Item		0
1.3.2	Non-Sch	Connection to overhead water tanks using Float switch	0	Nos.		0
1.3.3	Non-Sch	Cast Iron Medium Duty Cover For RCC water tanks	0	Nos.		0
1.4		**GRP Water Overhead Tank**				
	Non-Sch	Supply and installation of 200 Gallon Loft type GRP Water tanks including Drain valve, Air Relief Valve, vent pipes, Access/Manhole Covers, accessories, valves, supports, ladders, low and high level float switches, etc., complete all in accordance with the specifications.	1	No.		0
		CARRIED TO SUMMARY	**Total**			**-**

Item No.	PWD Schedule 2022 Ref.No	Description	Qty	Unit	Rate (Rs.)	Amount (Rs.)
2		**SANITARY SEWAGE:**				
2.1		**Soil, Waste, Vent and Rainwater Pipes**				
2.1.1	Non-Sch	Providing and fixing, uPVC pipes and fittings as per BS EN 1329 for above ground installations for Soil, Waste, Vent & Rw pipes including cleanout plug, clamps, hanger collars, supports, specials (bend, tees, Y-tee etc.) as indicated on the drawing, as per specifications and Engineers approval.				
i		50mm dia	6	Rm		0
ii		75mm dia	12	Rm		0
iii		100mm dia	9	Rm		0
2.1.2	Non-Sch	Providing and fixing, uPVC pipes and fittings as per BS EN 1401 for below ground installations for Soil pipes including excavation, backfill, fittings (bend, tees, Y-tee etc.) as indicated on the drawing, as per specifications and Engineers approval.				
i		150mm dia	15	Rm		0
2.2		**Drainage Specialties**				
2.2.1	Non-Sch	Providing and fixing, PVC floor trap with multiple dia inlet and cleanout plug of the approved self cleaning design with S.Steel grating, as indicated on the drawing, as per specifications and Engineers approval.	2	Nos		0
2.2.2	Non-Sch	Providing and fixing UPVC cowl for vent pipe of the following dia including all accessories complete in all respects.				
i		75mm dia	2	Nos		0
ii		100mm dia	2	Nos		0
iii		150mm dia	0	Nos		0
2.3	Non-Sch	Providing and fixing, PVC Roof Drains as per specifications and Engineers approval.	0	Nos		0
		SANITARY SEWAGE (Cont....)				
2.4		**Gully Traps**				
	Non-Sch	Construction of 18" x 18" Cement Concrete gully trap with 12"x 12" heavy duty manhole cover as specified and shown on the drawing, as per specifications and Engineers approval.	1	Nos.		0
2.5		**External Connection**				
	Non-Sch	Connection to external Sewage network, after obtaining approval from local authorities including the cost of excavation, Piping as specified and shown on the drawing, as per specifications and Engineers approval.	1	Job.		0
		CARRIED TO SUMMARY	**Total**			**-**

Item No.	PWD Schedule 2022 Ref.No	Description	Qty	Unit	Rate (Rs.)	Amount (Rs.)
3		**FIRE FIGHTING**				
3.1		Supply and installation of below mentioned Portable Fire Extinguishers with Wall mount brackets as indicated on the drawings, as per specifications and Engineers Recommendation				
i	Non-Sch	6 Kg C02 wall mounted fire extinguisher	1	Nos.		0
ii	Non-Sch	5 Kg Dry powder wall mounted fire extinguisher	1	Nos.		0
		Sub Total for Non Schedule Items	**Total**			**-**

Summary

S. NO.	DESCRIPTION	TOTAL AMOUNT IN PAK RUPEES
A.	**SCHEDULE ITEMS**	
1	Plumbing Fixtures	0
2	Manholes	0
	SUB-TOTAL-A Rs.	**0**
B.	**NON-SCHEDULE ITEMS**	
1	Water Supply	0
2	Sanitary Sewage	0
3	Fire Fighting Works	0
	SUB-TOTAL-B Rs.	**0**
	TOTAL AMOUNT (A+B) FOR 1 No.	**0**

Item No.	PWD Schedule 2022 Ref.No	Description	Qty	Unit	Rate (Rs.)	Amount (Rs.)
A	**SCHEDULE ITEMS**					
1		**PLUMBING FIXTURES:**				
1.1	**301-1**	Providing and fixing best quality squatting type glazed earthward W.C.Pan, Pakistan (of not less than 18" clear opening as measured between the flushing rimes) Complete with and including the cost of 13.6 liters best quality low level plastic flushing cistern with internal fittings complete, P.V.C. flushing pipe suitable for this type with fittings and making requisite number of holes in walls, plinth & floor for pipe connections and making good in cement concrete 1:2:4.	1	Nos.		-
1.2	**301-8 & 10 & 14**	Providing and fixing 25 inches x 18 inches (635 mm x 457 mm) lavatory basin in white glazed earthenware (Pakistani) complete with and including the cost of Brass oxidized bolts kit built into wall /2 inch (15 mm) dia. Chrome plated mixer 1-1/4" inches (32mm) rubber plug and chrome plated brass chain, 1-1/4 inches (32 mm) dia brass waste of approved pattern, 1-1/4 inches (32 mm) dia. Malleable iron or C.P. brass traps malleable iron or brass unions and making requisite number of holes in walls plinth and floor for pipe connections and making god in cement concrete 1:2:4 Extra over item No. 8 and 9 (Wash basin) for providing and fixing best available (Pakistani make) white glazed earthenware pedestal.. Extra over item No.8 and 9 for providing single hole chromium plated mixer tap 1/2 inch (15 mm) dia (English or approved foreign make).	1	Nos.		-
1.3	**301-21**	Providing and fixing approved quality stainless steel sink 60" x 20" Pak made (Atlas) complete with brass oxidized bolt kit/angle iron brackets built into walls ½" dia CP sink mixer 1-1/4" rubber plug and CP brass chain 1-1/4" CP brass waste 1-1/4" dia malleable iron or CP brass bottle trap with malleable iron or brass unions and making requisite number of holes in walls, plinth and floor for pipe connections and making good in cement concrete 1:2:4	1	Nos.		-

Continued..

Item No.	PWD Schedule 2022 Ref.No	Description	Qty	Unit	Rate (Rs.)	Amount (Rs.)
		PLUMBING FIXTURES (Cont....)				
1.4	**302-6**	Providing and fixing 20 inches x 16 inches (508 mm x 406 mm) Looking mirror of Belgium glass complete with Plastic frame and C.P. Brass screws.	1	Nos.		-
1.5	**302-9**	Providing and fixing bath room accessories of set of 6 pieces consist of one shelf, one towel rod with bracket, one soap dish, one tooth brush holder with glass and cover, one tissue paper holder one double hook one towel ring etc. complete of approved quality as per direction of Engineer in-charge.	1	Nos.		-
1.6	**302-13**	Providing and fixing chrome plated Muslim bib-cock without Muslim shower of approved quality	2	Nos.		-
		CARRIED TO SUMMARY				**-**

Item No.	PWD Schedule 2022 Ref.No	Description	Qty	Unit	Rate (Rs.)	Amount (Rs.)
2		**MANHOLES**				
2.1	**315-3**	Providing manhole Type 'B" size 3'-0" x 2'-6" or 914mm x 762mm x 4ft (1.22mm) deep as per approved design and specifications complete for 4" to 12" diameter pipe, 4 ft. to 7'-5" Depth with cast iron cover and frame weights 1 Cwt. 3 Qtrs or 88.9 kg,in 6" thick RCC 1:2:4 slab 8" thick,c.c. 1:3:6 block masonry walls set in 1:3 c.m. 6" inch thick, 1:3:6, c.c. in foundation 1:2:4 c.c. in benching, 1/2" thick cement plaster in 1:4 c.m. to all inside wall surfaces, channels and benching etc. and top including providing and fixing cast iron foot rest at every foot of depth and making requisite number of main and branch channels complete but excluding that cost of excavation, backfilling , disposal of excavated sruff, manhole cover and frame.	1	Nos.		-
		CARRIED TO SUMMARY				**-**

Item No.	PWD Schedule 2022 Ref.No	Description	Qty	Unit	Rate (Rs.)	Amount (Rs.)
B	**NON-SCHEDULE ITEMS**					
1		**WATER SUPPLY:**				
1.1		**Cold and Hot Water Supply Piping**				
	Non-Sch	Supply, installation Testing and Commissioning of PPR PN - 20 Cold/Hot water pipes as per DIN 8077-8078 with molded fittings PN - 25 as per DIN 16962, including pipe supports a as indicated on the drawing, as per specifications and Engineers approval.				
i		20mm dia	16	Rm		0
ii		25mm dia	3	Rm		0
iii		32mm dia	25	Rm		0
iv		40mm dia	6	Rm		0
v		50mm dia	0	Rm		0
1.2		**Valves**				
	Non-Sch	Providing and fixing of PPR Coated, brass Gate valves (of same material as piping) as indicated on the drawing, as per specifications and Engineers approval.				
i		25mm dia	2	Nos.		0
ii		32mm dia	2	Nos.		0
iii		40mm dia	1	Nos.		0
iv		50mm dia	0	Nos.		0
1.3		**Water Tanks and Connection**				
1.3.1	Non-Sch	Connection for water tank including with valves, supports, excavation and Backfill, complete all in accordance with the drawing and specifications.	1	Item		0
1.3.2	Non-Sch	Connection to overhead water tanks using Float switch	0	Nos.		0
1.3.3	Non-Sch	Cast Iron Medium Duty Cover For RCC water tanks	0	Nos.		0
1.4		**GRP Water Overhead Tank**				
	Non-Sch	Supply and installation of 200 Gallon Loft type GRP Water tanks including Drain valve, Air Relief Valve, vent pipes, Access/Manhole Covers, accessories, valves, supports, ladders, low and high level float switches, etc., complete all in accordance with the specifications.	1	No.		0
		CARRIED TO SUMMARY	**Total**			**-**

Item No.	PWD Schedule 2022 Ref.No	Description	Qty	Unit	Rate (Rs.)	Amount (Rs.)
2		**SANITARY SEWAGE:**				
2.1		**Soil, Waste, Vent and Rainwater Pipes**				
2.1.1	Non-Sch	Providing and fixing, uPVC pipes and fittings as per BS EN 1329 for above ground installations for Soil, Waste, Vent & Rw pipes including cleanout plug, clamps, hanger collars, supports, specials (bend, tees, Y-tee etc.) as indicated on the drawing, as per specifications and Engineers approval.				
i		50mm dia	7	Rm		0
ii		75mm dia	3	Rm		0
iii		100mm dia	3	Rm		0
2.1.2	Non-Sch	Providing and fixing, uPVC pipes and fittings as per BS EN 1401 for below ground installations for Soil pipes including excavation, backfill, fittings (bend, tees, Y-tee etc.) as indicated on the drawing, as per specifications and Engineers approval.				
i		150mm dia	18	Rm		0
2.2		**Drainage Specialties**				
2.2.1	Non-Sch	Providing and fixing, PVC floor trap with multiple dia inlet and cleanout plug of the approved self cleaning design with S.Steel grating, as indicated on the drawing, as per specifications and Engineers approval.	2	Nos		0
2.2.2	Non-Sch	Providing and fixing UPVC cowl for vent pipe of the following dia including all accessories complete in all respects.				
i		75mm dia	2	Nos		0
ii		100mm dia	2	Nos		0
iii		150mm dia	0	Nos		0
2.3	Non-Sch	Providing and fixing, PVC Roof Drains as per specifications and Engineers approval.	0	Nos		0
		SANITARY SEWAGE (Cont....)				
2.4		**Gully Traps**				
	Non-Sch	Construction of 18" x 18" Cement Concrete gully trap with 12"x 12" heavy duty manhole cover as specified and shown on the drawing, as per specifications and Engineers approval.	1	Nos.		0
2.5		**External Connection**				
	Non-Sch	Connection to external Sewage network, after obtaining approval from local authorities including the cost of excavation, Piping as specified and shown on the drawing, as per specifications and Engineers approval.	1	Job.		0
		CARRIED TO SUMMARY	**Total**			**-**

Item No.	PWD Schedule 2022 Ref.No	Description	Qty	Unit	Rate (Rs.)	Amount (Rs.)
3		**FIRE FIGHTING**				
3.1		Supply and installation of below mentioned Portable Fire Extinguishers with Wall mount brackets as indicated on the drawings, as per specifications and Engineers Recommendation				
i	Non-Sch	6 Kg C02 wall mounted fire extinguisher	1	Nos.		0
ii	Non-Sch	5 Kg Dry powder wall mounted fire extinguisher	1	Nos.		0
		Sub Total for Non Schedule Items	**Total**			**-**

HVAC

Summary

S. NO.	DESCRIPTION	TOTAL AMOUNT IN PAK RUPEES
1	DX- SPLIT TYPE AIRCONDITIONING UNITS	-
2	HVAC FANS	-
3	CONDENSATE DRAIN PIPING	-
4	HANGER & SUPPORTS	-
5	CIVIL WORKS	-
6	GENERAL MECHANICAL ITEMS	-

Summary

	GRAND TOTAL SUMMARY	**-**

S.No.	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
1	2	3	4	5	6=(3X5)
1	**DX- SPLIT TYPE AIRCONDITIONING UNITS** Supply, Installation, Testing & Commissioning of DX Split Air-conditioning Units, complete refrigerant piping, insulation, cladding, refrigerant tray, cable tray & acessories. Indoor unit with all sections and components given in the schedule and specific				
	GROUND FLOOR				
i	DX-01 / CU-01 (1.0 TR Capacity Wall Mounted Type)	1	Nos.		-
	AMOUNT CARRIED TO HVAC SUMMARY				**-**
2	**HVAC FANS** Supply, installation, testing and commissioning of HVAC fans, as per equipment schedule, as shown on the drawings including all labour, material and accessories, complete in all respect and to the satisfaction of engineer incharge.				
	GROUND FLOOR				
i	EF-01 & 02 (300 cfm)	1	Nos.		-
	AMOUNT CARRIED TO HVAC SUMMARY				**-**
3	**CONDENSATE PIPING** Providing and fixing, uPVC Class 'E' pipes and fittings as per BS 3505 (EN 1401) for Condenser Water drainage including fittings, bends, cuttings, filling etc. as indicated on drawings, as per specifications and Engineers approval.				
i	25mm dia	25	Rm		-
	AMOUNT CARRIED TO HVAC SUMMARY				**-**
4	**HANGER & SUPPORTS** Supply, installation, testing and commissioning of Galvanized Hanger and Supports for piping, ducting, all HVAC Equipments, as shown on the drawings and as specified in technical specification, complete with angle iron, rawal bolts, threading rods, nuts a	1	Lot		-
	AMOUNT CARRIED TO HVAC SUMMARY				**-**
5	**CIVIL WORKS**				

S.No.	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
1	2	3	4	5	6=(3X5)
	Making and cutting in walls, slabs and preparation of RCC foundation for Condensing Unit, Fans and all other HVAC equipments in all other work such as Openings, Penetrations, Firestopping, Acoustic Cork sheet, Wooden Frame Sleeves and Pipe Sleeves, plaste	1	Job		-
	AMOUNT CARRIED TO HVAC SUMMARY				**-**
6	**GENERAL MECHANICAL ITEMS**				
i	**PAINTING & FINISHES** Providing Painting and Finishing,as directed by the Engineer Incharge, complete in all respect.	1	Job		-
	AMOUNT CARRIED TO HVAC SUMMARY				**-**
	GRANT TOTAL OF HVAC WORKS				**-**

WATER SUPPLY

Engineer's Estimate

S.No	Description	Amount
A	**SCHEDULE ITEM** Water Supply System (Pipe Works) Part-I	-
	Total of Schedule Items - A	**-**
B	**NON-SCHEDULE ITEM** Water Supply System	-
	Total of Non-Schedule Items - B	**-**
	TOTAL CARRIED TO GRAND SUMMARY (A+B)	**-**

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
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 d				
1.1		**From ± 0'-0" to 5' - 0"**	24,603.00	Cm		-
		From -5' - 0" to -8' - 0"	281.00	Cm		-
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				
2.1		**With surplus earth from foundation, etc.**	14,984.00	Cm		-
	Code - 102 Item#14 P-35	**GRADED MATERIAL** 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. comp				
3						
3.1		**With new earth excavated from outside.**	6,899.00	Cm		-
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 ,				
4.1						
4.2		**Concrete Cylindrical strength of 3000Psi for Thurst block**	770.00	Cm		-
		Total Carried to Summary				**-**
		NON-SCHEDULE ITEMS				
5	NSI	**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.	2,722.0	Cm		-
6	NSI	**PIPES (HDPE)** Providing, Laying, jointing, commissioning, testing and fixing all relevant fitting including tee, bends, expander, end cap, stub end, flanges for fittings etc. including. disinfection of HDPE pipes PN-10 of below mentioned diameter and pressure confirm				
6.1		**125 mm OD**	1,066.00	Rm		-
6.2		**160 mm OD**	337.00	Rm		-
		180 mm OD	44.00	Rm		-
		315 mm OD	2,623.00	Rm		-
		355 mm OD	520.00	Rm		-
		450 mm OD	201.00	Rm		-
		630 mm OD	912.00	Rm		-

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
7		**GATE VALVE**				
	NSI	Providing & Fixing of Flange End Ductile iron 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				
7.1		**DN-110 mm (PN-16)**	11.0	No		-
8		**AIR RELEASE VALVE**				
	NSI	Supplying, installing, jointing and fixing Ductile Iron Air Valve (Double acting) with SS ball heavy duty pattern of approved manufacturer's specification (test pressure) as per standard including competible isolating flanged gate valve, m.s flanges etc				
8.1		**DN-50 mm (PN-16)**	1.0	No		-
		DN-75 mm (PN-16)	3.0	No		-
		DN-100 mm (PN-16)	2.0	No		-
9		**WASHOUT VALVES**				
	NSI	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		**DN-50 mm (PN-16)**	2.0	No		-
		DN-75 mm (PN-16)	4.0	No		-
		DN-150 mm (PN-16)	2.0	No		-
10		**VALVE CHAMBER**				
	NSI	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 finishin				
		Internal Size of Valve Chamber				
10.1		1.2m x 1.2m x 1.2m	17.0	No		-
		1.5m x 1.5m x 1.5m	18.0	No		-
11		**M.S PIPE**				
	NSI	Manufacturing, supplying, laying, jointing, testing, disinfection & commissioning of Black steel M.S Pipe made out of M.S sheet confirming to API 5L grade X 42 (Spirally Welded) with ERW & External 3-Layer Polyethylene (3LPE) Coating as per DIN 30670 & i				
		400 mm O.D x 7.1 mm WT	50.0	Rm		-
		600 mm O.D x 7.1 mm WT	50.0	Rm		-

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
12		**BUTTERFLY VALVES**				
	NSI	Providing, Fixing, testing & commissioning of Ductile Iron Body Butterfly Valve with Flange End having Nominal Pressure PN-16, **competible with pipe diameter** complete in all respect as per specifications & as directed by the Engineer/Incharge.				
		DN-315 mm (PN-16)	17.0	No		-
		DN-355 mm (PN-16)	4.0	No		-
		DN-450 mm (PN-16)	2.0	No		-
		DN-630 mm (PN-16)	4.0	No		-
13		**PUMPS AND MOTORS**				
	NSI	Providing, installing testing and commissioning of dry setup vertical pumps (KSB/Grundfos/Xylem) including cost of motor of approved quality and required H.P. having rpm not exceeding 1450 rpm and efficiency not less than 85% , i/c supply pump (Bowl Asse				
		Pumps 1860 IGPM and head of 39 m	5.0	No		-
		Pumps 1860 IGPM and head of 24 m	5.0	No		-
14		**NON-RETURN VALVE**				
	NSI	Supplying, installing, jointing, fixing and Commissioning of PN-16 flanged Non-slam nozzle type check valve as per tehnical specifications complete in all respects as shown on the drawings or as directed by the Engineer. Complete in all respect as per sp				
		DN-400 mm (PN-16)	10.0	No		-
15		**FIRE-PROTECTION SPECIALTIES**				
15.1		**Pillar type Fire Hydrant**				
	NSI	Supply and Installation of UL/FM Pillar type fire hydrant as per AWWA C503 and NFPA-24 with one front outlet size 100mm diameter and two side outlets each 65mm diameter as indicated on the drawings complete with Concrete base, Supports, Shut off valves a	44.0	No		-
15.2		**Fire Hose House with Cabinet**				
	NSI	Supply, installation, testing and Commissioning of Dual compartment Stainless Steel Fire Hose House comprising of below mentioned items with S.Steel lock and handle, as per drawings, specifications and Engineers Recommendation. 2 1/2" diameter, 30m high pressure rubber hose reel tested on 30 bar and inlet lock shield control valve and Adjustable plastic Nozzle for Jet, spray and Shut off. 6 kg Co2 Extinguisher 5 KG ABC type Dry powder Extinguisher	22.0	No		-

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
	NSI	**OVERHEAD GANTRY** Supply, Installation, Testing and commissioning of 1.5 ton a manually operated overhead gantry crane unit as per ASME B30.2 inside the pump room including crane rails, drive unit, manually operated chain Block, girders, as per inspection bay span as per	2.0	No		-
	NSI	**FLOW METERS** Provide and install Electro-magnetic flow meters required from approved manufacturers. complete in all respects as per the standards or as directed by the Engineer. Complete in all respect as per specifications & relevant drawings and all works to the	2.0	No		-
		Total Carried to Summary				**-**

DRAINAGE SYSTEM

Engineer's Estimate

S.No	Description	Amount
A	**SCHEDULE ITEM** Stormwater Drain	-
	Total of Schedule Items - A	**-**
B	**NON-SCHEDULE ITEM** Stormwater Drain	-
	Total of Non-Schedule Items - B	**-**
	TOTAL CARRIED TO GRAND SUMMARY (A+B)	**-**

BILL OF QUANTITIES

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
1	2	3	5		6	7 = 5 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).				
		From ± 0m to 1.5m				
1.1		**For Pipe/Pond/Ditch**	27,694.00	Cm		0.00
	Code -103 Item# 2+28, P-40, P-43	**From ± 1.5m to 2.5m**				
1.2		**For Pipe/Pond/Ditch**	4,454.00	Cm		0.00
2		**BACKFILLING**				
	Code -102 Item# 13, P-35	Filling depressions with excavated stuff in 6 inches (152 mm) layers within one chain (30.5 R.m) lead including levelling, dressing, watering and consolidating complete.				
2.1		**Fill and backfill materials obtained from required Excavation**	2,191.00	Cm		0.00
3		**REINFORCEMENT**				
	Code -114 Item# 166, P-197	Providing and laying hard grade ribbed deformed (minimum yield point 60,000 psi) reinforcement bars with & including the cost of straightening, cutting, bending, binding, wastage, and such overlaps as are not shown in the drawings, placing in position on cement concrete 1:2:4 precast or m.s. chairs, tying with binding wire, cost of chairs and wires etc. in all kinds of RCC work in foundation, basement, plinth and ground floor of building including septic tanks and under ground tanks and in projections for future extension . (Bars to be cut and placed in position at any level according to the Bar bending schedule prepared by the contractor and approved by the Engineer).				
3.1		**Deformed bars (Grade-60)**	1,541,047.41	Kg		0.00
4		**PLAIN CEMENT CONCRETE WORKS**				
	Code -106 Item# 11, P-58	Providing and laying in situ 1:4:8 (1 cement 4 sand and 8 coarse aggregate) cement concrete using crushed graded boulders 3/4 inch (19 mm) and down gauge in foundation, basement and plinth including form work, compacting, curing and removal of form work etc. complete, foundation and basement up to 5 feet (1.52 m) depth and plinth up to 4 feet (1.2 m) height from ground level.				
4.1		**Below plinth beam,situ,walls,tanks, over stone soling or where required (Cylindrical Strength 1280 Psi equal to Cubical strength 1600 Psi)**	1,485.00	Cm		0.00

BILL OF QUANTITIES

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
1	2	3	5		6	7 = 5 X 6
5		**REINFORCED CONCRETE WORKS**				
5.1	Code -114 Item# 99+138, P-189, P-195	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N/mm2 at 28 days) with a mix not leaner than 1:1:2 in foundation or bottom slab of rectangular underground tank including form works and its removal, levelling, compacting and curing etc. complete but excluding the cost of reinforcement. **Bottom Slab of Rectangular Drain (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)**	4,100.00	Cm		0.00
5.2	Code -114 Item# 101+138, P-189, P-195	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N/mm2 at 28 days) with a mix not leaner than 1:1:2 in walls of rectangular underground water tank or septic tank including form works and its removal, compacting and curing etc. complete, but excluding the cost of reinforcement. **Walls of Rectangular Drain (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)**	4,672.00	Cm		0.00
5.3	Code -114 Item# 104+138, P-190, P-195	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N/mm2 at 28 days) with a mix not leaner than 1:1:2 in top slab of rectangular underground water tank or septic tank its removal, compacting and curing ate. complete but excluding the cost of reinforcement. **Top Slab of Rectangular Drain (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)**	4,062.00	Cm		0.00
6		**BITUMEN COATING**				
6.1	Code -108 Item #12, P-81	Providing a coat of bitumen emulsion at 10 Lbs. per % sft. (0.49 Kg/sm). **For Drain & Chamber**	28,840.00	Sm		0.00
7		**WATER STOPPER**				
7.1	Code -124 Item# 97, P-418	Providing and fixing PVC ribbed water stops 9" (229 mm) wide in vertical or horizontal expansion joints including cutting or jointing etc., complete in all floors. **For Rectangular Drain**	2,188.00	Rm		0.00
		Total Carried Summary				**0.00**

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
1	2	3	5		6	7 = 5 X 6
		NON-SCHEDULE ITEMS				
8	NSI	**R.C.C ACCESS COVER** Precast access covers of strength 4000psi, fairfaced reinforced concrete using sulphate resistant cement, painted galvanised frame and lifting hooks including placing in position complete in all respect as shown on the drawings and specifications. (excluding reinforcement & cost of cement)				
		For Rectangular Drain	49.00	Cm		0.00
9	NSI	**PIPES (Upvc)** Providing, laying jointing, installing and fixing UPVC pipes SN-4, Confirmed to BS3505/PS3501 (cement solvent) of class "B" & manufacturer's specification including cutting, jointing, specials, transportation loading unloading at the site of work stacking, and testing as per standard with water minimum pressure as specified etc, complete in all respect, as per specifications & relevant drawings and all works to the entire satisfaction of the Engineer.				
		a) 200mm dia	755	Rm		0.00
10	NSI	**STEEL GRATING WITH FRAME** Manufacturing, supplying & fixing D400 steel grating having 10mm flat strips with frame of size as shown in drawings i/c fabricating, epoxy coating, complete in all respect as per drawings, specifications and as directed by Engineer. - DI Grating with Frame 450 x 600 hinged & bolt (anti-theft).	450.0	Each		0.00
11	NSI	**M. S LADDER RUNGS** Providing fabricating, welding and fixing of 1" dia "Steel Rungs/ LADDER" spacing @ 12" c/c for UG Water Tank, manholes or as shown in drawing including complete required hard wares for fixing, Painting with anti corrosion paint (Red Oxide) and 03 coats of approved color & shade enamel paint at any height in any floor etc. complete in all respects as per drawing, standard , specifications and as directed by the Engineer.	1800.00	No.		0.00
					Total Carried to Summary	

SEWERAGE SYSTEM

Engineer's Estimate

S.No	Description	Amount
A	**SCHEDULE ITEM** Sewerage System (Pipe Line) Part-I	-
	Total of Schedule Items - A	**-**
B	**NON-SCHEDULE ITEM** Sewerage System (Pipe Line) Part-I	-
	Total of Non-Schedule Items - B	**-**
	TOTAL CARRIED TO GRAND SUMMARY (A+B)	**-**

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
1	2	3	4	5	6	7 = 4 x 6
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 d				
1.1		**From ± 0'-0" to -5' - 0"**				
		For Pipe Line	38,499.46	Cm		-
		For Manhole	1,888.69	Cm		-
1.2	Code-103, Item#2+28 P-40,43	**From -5' - 0" to -8' - 0"**				
		For Pipe Line	20,295.52	Cm		-
		For Manhole	1,199.51	Cm		-
1.3		**From -8' - 0" to -11' - 0"**				
		For Pipe Line		Cm		-
		For Manhole	27.59	Cm		-
2	Code - 102,Item#13 P-35	**BACKFILLING** Filling depressions with excavated stuff in 6 inches (152 mm) layers within one chain (30.5 R.m) lead including levelling, dressing, watering and consolidating etc, complete as per specifications, drawings and to the entire satisfaction of Engineer.				
2.1		**Fill and backfill materials obtained from required Excavation**	42,185.34	Cm		-
2.2	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, com	3,845.92	Cm		-
3	Code-106 Item# 11 P-58	**PLAIN CEMENT CONCRETE WORKS** Providing and laying in situ 1:4:8 (1 cement 4 sand and 8 coarse aggregate) cement concrete using crushed graded boulders 3/4 inch (19 mm) and down gauge in foundation, basement and plinth including form work, compacting, curing and removal of form work e				
3.1		Below toundation, trenches, manhole situ,tanks, and where required ***(Ratio 1:4:8)*** **(1000 Psi)**	160.68	Cm		-
4	Code - 105 Item#8, P-51	**FOR PIPE ENCASEMENT** 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 as per specifications, drawings and to the				
4.1		Below foundation, trenches, manhole situ,tanks, and where required **(Ratio 1:2:4)**	686.02	Cm		-
5	Code -114 'Item # 99+138, P-189, P-195	**REINFORCED CONCRETE WORKS** Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N/mm2 at 28 days) with a mix not leaner than 1:1:2 in found				
5.1		**BOTTOM SLAB** (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)	238.97	Cm		-

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
1	2	3	4	5	6	7 = 4 x 6
	Code -114 'Item # 101+138, P-189, P-195	Providing and laying reinforced cement concrete with using crushed graded boulders 3/4" inch (19 mm) and down gauge having a minimum works cube crushing strength of 4500 lbs. per sq. inch (31.04 N/mm2 at 28 days) with a mix not leaner than 1:1:2 in top s				
5.26		**WALLS** (Cylindrical Strength 4000 Psi equal to Cubical strength 4500 Psi)	578.55	Cm		-
		STEEL REINFORCEMENT				
	Code -114 Item#166, P-197	Providing and laying hard grade ribbed deformed (minimum yield point 60,000 psi) reinforcement bars with & including the cost of straightening, cutting, bending, binding, wastage, and such overlaps as are not shown in the drawings, placing in position on				
6.17		**Deformed bars (Grade-60)**	98,594.06	Kg		-
		BITUMEN COATING				
	Code -108 Item#12, P-81	Providing a coat of bitumen emulsion at 10 Lbs. per % sft. (0.49 Kg/sm).				
7.18		**For Manhole**	3,538.85	Sm		-
		PVC WATER STOPPER BAR				
	Code -124 Item#97, P-418	Providing and fixing PVC ribbed water stops 9" (229 mm) wide in vertical or horizontal expansion joints including cutting or jointing etc., complete in all floors.				
8.19		For Any type of Tanks/Walls, manhole and where required etc.	341.06	Rm		-
		PIPES (RCC)				
	Code - 312 Item#07, P-584	Providing R.C.C. pipes and collars of class 'C' and fixing in trench including cutting, fitting and jointing with maxphalt composition and cement mortar (1:1) and back filling the excavated material in trench including testing with water to a pressure hea				
9.1		**460 mm dia**	5,730.00	Rm		-
		Total Carried to Summary				**-**

S.No	PWD Schedule 2022 Ref.No	Description	Qty	Unit (Sch. Rate)	Rate (RS)	Amount (RS)
1	2	3	4	5	6	7 = 4 x 6
		NON-SCHEDULE ITEMS				
10	NSI	**R.C.C MANHOLE COVER** Providing and fixing R.C.C precast manhole cover including steel reinforcement, angle iron frame with painting & lifting hook etc. complete in all respects as per drawing, standard , specifications and as directed by the Engineer.				
10.1		**RCC Precast cover circular shape (24" dia)**	351.0	No		-
11	NSI	**M. S LADDER FOR MANHOLE** Providing fabricating, welding and fixing of 1" dia "Steel Rungs/ LADDER" spacing @ 12" c/c for UG Water Tank, manholes or as shown in drawing including complete required hard wares for fixing, Painting with anti corrosion paint (Red Oxide) and 03 coats	1,718.2	No		-
12	NSI	**GRANULAR BEDDING** Providing, spreading, and consolidating of granular bedding material of approved quality including watering etc, complete as per specifications, drawings and to the entire satisfaction of Engineer.	11,178.0	Cm		-
13	NSI	**uPVC PIPES** Providing, laying jointing, installing and fixing UPVC pipes, Confirmed to BS3505/PS3501 (cement solvent) of class "B" & manufacturer's specification including fittings (Tee, Bend and End plug etc), cutting, jointing, specials, transportation loading				
		400 mm dia	12,729.0	Rm		-
		450 mm dia	375.0	Rm		-
		500 mm dia	213.0	Rm		-
		600 mm dia	1,969.0	Rm		-
		Total Carried to Summary				**-**

ROAD NETWORK

KARACHI INDUSTRIAL PARK

BILL OF QUANTITIES

GRAND SUMMARY OF ROAD WORKS

Bill No.	Description	Amount (Rs)
1	ROAD WORKS FOR KARACHI INDUSTRIAL PARK	-
	TOTAL COST OF PROJECT	-

SEAL OF THE COMPANY

INITIAL

SIGNATURE

KARACHI INDUSTRIAL PARK

BILL OF QUANTITIES

ABSTRACT OF KIP AREA ROAD WORKS

S.No.	PWD Schedule 2022 Ref.No	DESCRIPTION	UNIT	As Per BOQ		
				QTY	RATE 2022 (Pak Rs.)	AMOUNT (Pak Rs.)
1	2	3	4	5	6	7 = 5x6
	PART-A	SCHEDULE ITEMS				
1	Chapter-102 Item#2, P-34	Clearing jungle (dense) bycutting, removing all shrubs, trees, upto 6 inches (152mm) girth, etc. and taking out their entire roots and filling the hollows with earth complete with dressing, consolidating and watering the filling including stacking the ser	Sq.m	289,560		-
2	Chapter-127 Item #173, P-448	Compaction of Natural Ground i/c leveling, dressing and watering complte as per direcetion of Engineer-in-Charge. (Non cohesive soil upto 100% of modified AASHTO density.) (Cohesive soil upto 95% of modified AASHTO density.) *Ref. S.H. 127. Brief Specif*	Sq.m	289,560		-
3	Chapter-127-Item#1,P-427	Excavation or cutting in all kinds of soil (except gravelly, murum, wet silt, clay or mud and rock) to a required grade, camber and side slopes including dressing top and sides and disposal of excavated stuff within a lift of 5 ft. (1.52 m) and lead upto	Cu.m	9,050		-
4	Chapter-127 Item#9, P-427	Extra if excavated earth is required to be filled in road embankment by placing it in layers not exceeding 9" (229 mm) in depth as per approved section including dressing top and sides of the bank on item 1 to 4	Cu.m	8,145		-
5	Chapter-127 Item#10, P-427	Making earthen embankments with earth taken from approved borrow pits including cost of excavation, placing earth in layers notexceeding 9" (229 m)depth as. per approved section including dressing top and sides of the bank within a lift of 5 ft. (1.652m)	Cu.m	256,715		-
6	Chapter-127 Item#18, P-428	Compaction of earthen embankments to full depth and width below sub-grade level by approved mechanical means in layers not exceeding 9" (229 mm) in depth at optimum moisture content including watering, mixing by mechanical means complete (the sub-grade em	Cu.m	264,860		-
7	Chapter-127 Item#20, P-429	Preparation of sub-grade over bottom of excavation with required dressing to required grade, camber and side slopes including cutting to required depth and . breaking clods watering and consolidation with suitable mechanical means to attain minimum densit	Sq.m	38,288		-
8	Chapter-127 Item#29,P-430	Supplying and laying machine crushed 2-1/2" to 3/4" (64 mm to 19 mm) stone ballast of approved grade and quality in sub-base or base courses in required grade and camber and compacting to the required density by approved mechanical means (Vibratory Rolle	Cu.m	30,882		-
9	Chapter-127 Item#40,P-431	Supplying and laying machine crushed 3/4" to 3/16" (19 mm to 4.8 mm) stone ballast of approved grade and quality in sub-base or base courses in required grade and camber and compacting to the required density by approved mechanical means (Vibratory Rolle	Cu.m	23,162		-
10	Chapter-127 Item#77,P-437	**Asphalt Base Course** Providing and laying hot-mix bituminous concrete pavement laid with mechanical paver and mixe d in central mixing plant in required thickness and density , rolled hot with different types of rollers complete as pe rspecifications and	Ton	27,707		-

KARACHI INDUSTRIAL PARK

BILL OF QUANTITIES

ABSTRACT OF KIP AREA ROAD WORKS

S.No.	PWD Schedule 2022 Ref.No	DESCRIPTION	UNIT	As Per BOQ		
				QTY	RATE 2022 (Pak Rs.)	AMOUNT (Pak Rs.)
1	2	3	4	5	6	7 = 5x6
12	Chapter-127 Item#78,P-437	**Asphalt Wearing Course** Providing and laying hot-mix bituminous concrete pavement laid with mechanical paver and mixe d in central mixing plant in required thickness and density , rolled hot with different types of rollers complete as pe rspecifications a	Ton	17,757		-
13	Chapter-127 Item#115,P-441	Providing and laying road kerb of precast cement concrete 1:2:4 (24" long 6" wide and 12" deep (610 mm long 152 mm wide and 305 mm deep) using screened graded bajri, from work and its removal compacting and curing laid in cement mortar 1:4 and cement plas	m	69,970		-
14	Chapter-117 Item#177,P-232	Providing and laying in floor C.C. 1:2:4: tuff paver 2-1/2" thick of approved design and colour pattren (average strength 7000 psi) laid on sand cushion filling of joint with sand and warring etc. complete as per direction of Engineer Incharge. (the cost	Sq.m	35,500		-
15	Chapter-CMMT Item# 2 , P-716	Cartage of sand, bajri, lime, surkhi, murum, manure, earth, building rubbish including loading, unloading and stacking etc. at site. (Lead 1/2mile~0.8km)				

KARACHI INDUSTRIAL PARK

BILL OF QUANTITIES

ABSTRACT OF KIP AREA ROAD WORKS

S.No.	PWD Schedule 2022 Ref.No	DESCRIPTION	UNIT	As Per BOQ		
				QTY	RATE 2022 (Pak Rs.)	AMOUNT (Pak Rs.)
1	2	3	4	5	6	7 = 5x6
		1/2 mile (0.80 km) lead or part thereof.	Cu.m			-
		1 mile (1.6 km) lead	Cu.m	8,145		-
		2 miles (3.2 km) lead	Cu.m	-		-
		3 miles (4.8 km) lead.	Cu.m	-		-
		Extra per mile(1.6km)above3milesto6miles (4.8 km to 9.6 km) of lead.	Cu.m	-		-
		Extra per mile(1.6km)above6milesto10miles (9.6 km to 16 km) of lead.	Cu.m	-		-
		Extra per mile(1.6km)above 10miles to 15miles (16 km to 24 km) of lead.	Cu.m	-		-
		Extra per mile(1.6km)above 15miles to 20miles (24 km to 32 km) of lead.	Cu.m	256,715		-
16	Chapter-126 Item# 2, 3, P=411	Supplying and stacking well decayed cowdung manure from approved source including all leads and lifts. Spreading cowdung manure and mixing the same upto any depth in the prepared bed including breaking clods, dressing fine for grassing, including, disposa	Cu.m	18,196		-
17	Chapter-126 Item# 11, 13, P-411	Supply live (Dacca) grass in slabs with earth intact including all lead and lifts. Grassing fine by dribbling grassroots 3" apart including watering, weeding till such time the grass is set and becomes green and is fit for mowing.	Sq.m	181,960		-
18	Chapter-127 Item# 189, P-449	**Traffic Road Sign** Traffic road signs catagory-1, including fixingin cement concrete1:2:4 complete as per directions of Engineer-in-Charge	Each	89		-
		Traffic road signs catagory-2, including fixingin cement concrete1:2:4 complete as per directions of Engineer-in-Charge	Each	117		-
		Traffic road signs category 3(a) ,including fixingin cement concrete1:2:4 complete as per directions of Engineer-in-Charge	Each	10		-
19	Chapter-127 Item# 203, P-450	Pavement marking in reflective TP Paint for lines of 15cm widht, with road marking machine complete as per directions of Engineer-in-charge				
		1) Yellow Color	R.m	3,503		-
		2) White Colour	R.m	33,805		-
		3)Zebra Crossing	Sq.M	960		-
		4) Stop Lines	R.m	230		-
20	Chapter-127 Item# 207, P-450	Pavement marking in reflective TP Paint for 4 meter arrow with road marking machine complete as per directions of Engineer-in-charge	Each	124		-
21	Chapter-127 Item# 215, P-450	Refelectorised Plastic pavement stud (Raisedprogiletype-double),fixed with epoxy adhesive complete as per direction of Engineer-in-charge	Each	2,998		-
Total Amount						-

PIDC

PIDC

SURBANA JURONG · OMS · ICONSULT INNOVATION THROUGH EXCELLENCE

Lead Firm

JV-Team

INFRASTRUCTURE DEVELOPMENTS WORKS ON 500 ACRES LAND OF PROPOSED KARACHI INDUSTRIAL PARK (PACKAGE-I)

VOLUME-IV

TENDER DRAWINGS

JUNE, 2025

CLIENT:

PIDC

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

GENERAL DRAWINGS

ROADWORKS DRAWINGS		
S.NO.	DRAWING TITLE	DRAWING NO.
GENERAL DRAWINGS		
1	LIST OF DRAWINGS	EA-01098-KIP-H-0000
2	GENERAL NOTES & ABBREVIATIONS	EA-01098-KIP-H-0001
3	LOCATION PLAN	EA-01098-KIP-H-0002
4	MASTER PLAN	EA-01098-KIP-H-0003
5	TOPOGRAPHIC PLAN	EA-01098-KIP-H-0250
6	ALIGNMENT COORDINATES SHEET 1	EA-01098-KIP-H-0500
7	ALIGNMENT COORDINATES SHEET 2	EA-01098-KIP-H-0501
8	ROAD LAYOUT SHEET INDEX PLAN	EA-01098-KIP-H-1000
9	ROAD LAYOUT PLAN SHEET 1	EA-01098-KIP-H-1001
10	ROAD LAYOUT PLAN SHEET 2	EA-01098-KIP-H-1002
11	ROAD LAYOUT PLAN SHEET 3	EA-01098-KIP-H-1003
12	ROAD LAYOUT PLAN SHEET 4	EA-01098-KIP-H-1004
13	PROPOSED CROSS SECTION	EA-01098-KIP-H-1200
14	TRAFFIC SIGNS & PAVEMENT MARKING SHEET 1	EA-01098-KIP-H-1500
15	TRAFFIC SIGNS & PAVEMENT MARKING SHEET 2	EA-01098-KIP-H-1501
16	TRAFFIC SIGNS & PAVEMENT MARKING SHEET 3	EA-01098-KIP-H-1502
17	TRAFFIC SIGNS & PAVEMENT MARKING SHEET 4	EA-01098-KIP-H-1503
18	GEOMETRIC STANDARDS	EA-01098-KIP-H-2000
19	PAVEMENT MARKING DETAILS	EA-01098-KIP-H-2001
20	MISCELLENEOUS DETAIL	EA-01098-KIP-H-2002
21	TRAFFIC SIGNS	EA-01098-KIP-H-2003
22	CONSTRUCTION DETAIL OF TRAFFIC SIGNS	EA-01098-KIP-H-2004

ROADWORKS DRAWINGS		
S.NO.	DRAWING TITLE	DRAWING NO.
PROFILES		
1	PROFILES SHEET - 01 RD 40-1 STA: 0+000 TO 1+000	EA-1098-KIP-H-PP-3000
2	PROFILES SHEET - 02 RD 40-1 STA: 1+000 TO 1+829.766	EA-1098-KIP-H-PP-3001
3	PROFILES SHEET - 03 RD 30-1 STA: 0+000 TO 0+639.844	EA-1098-KIP-H-PP-3002
4	PROFILES SHEET - 04 RD 30-2 STA: 0+000 TO 1+000	EA-1098-KIP-H-PP-3003
5	PROFILES SHEET - 05 RD 30-2 STA: 1+000 TO 2+000	EA-1098-KIP-H-PP-3004
6	PROFILES SHEET - 06 RD 30-2 STA: 2+000 TO 2+414.911	EA-1098-KIP-H-PP-3005
7	PROFILES SHEET - 07 RD 30-3 STA: 0+000 TO 0+588.832	EA-1098-KIP-H-PP-3006
8	PROFILES SHEET - 08 RD 30-4 STA: 0+000 TO 1+000	EA-1098-KIP-H-PP-3007
9	PROFILES SHEET - 09 RD 30-4 STA: 1+000 TO 1+643.929	EA-1098-KIP-H-PP-3008
10	PROFILES SHEET - 10 RD 30-5 STA: 0+000 TO 0+943.000	EA-1098-KIP-H-PP-3009
11	PROFILES SHEET - 11 RD 30-6 STA: 0+000 TO 0+664.198	EA-1098-KIP-H-PP-3010
12	PROFILES SHEET - 12 RD 30-7 STA: 0+000 TO 0+666.568	EA-1098-KIP-H-PP-3011
13	PROFILES SHEET - 13 RD 30-8 STA: 0+000 TO 0+668.938	EA-1098-KIP-H-PP-3012
14	PROFILES SHEET - 14 RD 30-9 STA: 0+000 TO 0+724.518	EA-1098-KIP-H-PP-3013
15	PROFILES SHEET - 15 RD 30-10 STA: 0+000 TO 0+378.011	EA-1098-KIP-H-PP-3014
16	PROFILES SHEET-16 CS-1 STA: 0+000 TO 0+175.327 CS-2 STA: 0+000 TO 0+176.387 CS-3 STA: 0+000 TO 0+177.963	EA-1098-KIP-H-PP-3015

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	FAHAD	SCALE	N.T.S
DESIGN	SAIM	DATE	JUN,2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LIST OF DRAWINGS

PROJ CODE	DRAWING NO.	REV.
01098	**EA-01098-KIP-H-0000**	00

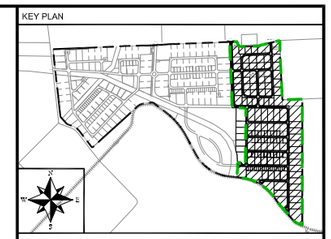
GENERAL NOTES

1. ALL DIMENSIONS AND DISTANCES SHOWN ON DRAWINGS PERTAINING TO TYPICAL DETAILS AND ROAD PLANS AND PROFILES ARE IN METRIC SYSTEM UNLESS OTHERWISE NOTED.
2. ALL COORDINATES AND LEVELS ARE GIVEN IN METERS.
3. FRL,INVERT LEVELS,SIZES OF EXISTING CULVERT WHICH ARE EMBEDDED UNDER GROUND SHOULD BE CONFIRM AT SITE BEFORE CONSTRUCTION.
4. AVAILABLITY AND QUALITY OF EXISTING AGGREGATE BASE COURSE SHOULD BE CONFIRMED AT SITE.
5. THE CONTRACTOR WILL ENSURE THAT ALL THE SUITABLE RECOVERED MATERIAL BY EXISTING ROADWAY EXCAVATION SHALL BE USED IN NEW CONSTRUCTION.
6. EXISTING LAYER OF BASE COURSE WILL BE RECOMPACTED & USED AS A SUBBASE WHERE APPLICABLE.
7. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY LOCATION OF ALL UTILITIES AS SHOWN IN THE PLAN OR AS OTHER WISE ENCOUNTERED DURING CONSTRUCTION.
8. THE UTILITIES LINES SHOULD BE RELOCATED ACCORDING TO THE INSTRUCTIONS OF ENGINEER AND TO THE SATISFACTION OF CONCERNED AUTHORITIES IN COORDINATION WITH SUPERVISORY STAFF.
9. THE ENGINEER MAY VARY FEATURES OF DESIGN AS DEEMED NECESSARY TO CONFIRM TO THE VARYING SITE CONDITION DURING THE EXECUTION OF WORK OR AS MAY BE DISCOVERED FROM THE STAKE OUT SURVEY. ALL SUCH CHANGES SHALL BE GOVERNED BY THE RELEVANT CONTRACT CONDITIONS.
10. THE GROUND HEIGHT, STRUCTURE LOCATIONS, ELEVATION, SKEW ANGLE AND GRADES SHALL BE CHECKED DURING STAKE OUT SURVEY BEFORE EXECUTION OF THE WORKS SUFFICIENTLY IN ADVANCE, ADJUSTMENTS IN THE RELEVANT DRAWINGS IF ANY SHALL BE APPROVED BY THE ENGINEER BEFORE EXECUTION.
11. MINIMUM VERTICAL CLEARANCE FOR OVER HEAD UTILITIES CROSSING THE ROAD SHALL BE 5.5 METRES.
12. SULPHATE RESISTANCE CEMENT WILL BE USED IN CURBS ,CURB & GUTTER & EDGE BLOCKS.
13. BEFORE CLOSURE OF ROAD FOR CONSTRUCTION PROPER DIVERSION WILL BE PROVIDED FOR SMOOTH FLOW OF TRAFFIC,AND GUIDE THE DIVERSION WITH TRAFFIC SIGN.
14. THE ENGINEER INCHARGE SHOULD BE CAREFUL ABOUT THE EXISTING SEWERAGE LINES OR DRAINAGE SYSTEM WHICH ARE SHOWING OR NOT SHOWING IN THE PLAN.
15. THE ENGINEER INCHARGE SHOULD ENSURE UNNECESSARY CUTTING/REMOVAL OF TREES.

ABBREVIATIONS

DWG.	DRAWING
HOR.	HORIZONTAL
VER.	VERTICAL
Km.	KILOMETRE
m.	METRE
mm.	MILLIMETRE
MAX.	MAXIMUM
MIN.	MINIMUM
MSL.	MEAN SEA LEVEL
NO.	NUMBER
N.T.S	NOT TO SCALE
R	RADIUS
R.O.W.	RIGHT OF WAY
Sq.	SQUARE
ST	STRAIGHT
STA	STATION
C/L	CENTER LINE
BR.	BRIDGE
BC	BOX CULVERT
SC	SLAB CULVERT
AC	ARCH CULVERT
PC	PIPE CULVERT
Lt/LT	LEFT
Rt/RT	RIGHT
SOP	SURVEY OF PAKISTAN
BM	BENCH MARK
R.C.C.	REINFORCED CEMENT CONCRETE
P.S.C	PRESTRESSED CEMENT CONCRETE
G.T.S.	GREAT TRIANGULATION SURVEY
FRL	FINSHED ROAD LEVEL
GR.L	GROUND LEVEL
U.G.	UNDER GROUND
PRM	PERMANENT REFERENCE MONUMENT
OH	OVER HEAD BRIDGE
T&T	TELEPHONE & TELEGRAPH
IP	INSPECTION PATH
F.P.	FOOT PATH
R.L	REDUCED LEVEL
TBM	TEMPORARY BENCH MARK
BOP	BEGINNING OF PROJECT
EOP	END OF PROJECT
WP	WALL PROTECTION
FP	FOOT PATH
LFT	LEFT TURN

KEY PLAN



NOTE:

LEGEND:

KIP PROJECT BOUNDARY

PROJECT CURRENT SCOPE

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN.2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	FAHAD	SCALE	N.T.S
DESIGN	SAIM	DATE	JUN.2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

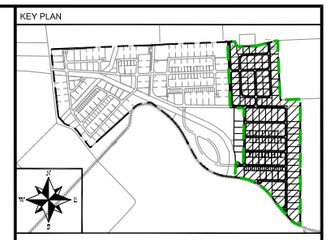
DRAWING TITLE:

GENERAL NOTES & ABBREVIATIONS

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-H-0001	00



KEY PLAN



NOTE:

LEGEND:

KIP PROJECT BOUNDARY

PROJECT CURRENT SCOPE

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN.2025

PROJECT:

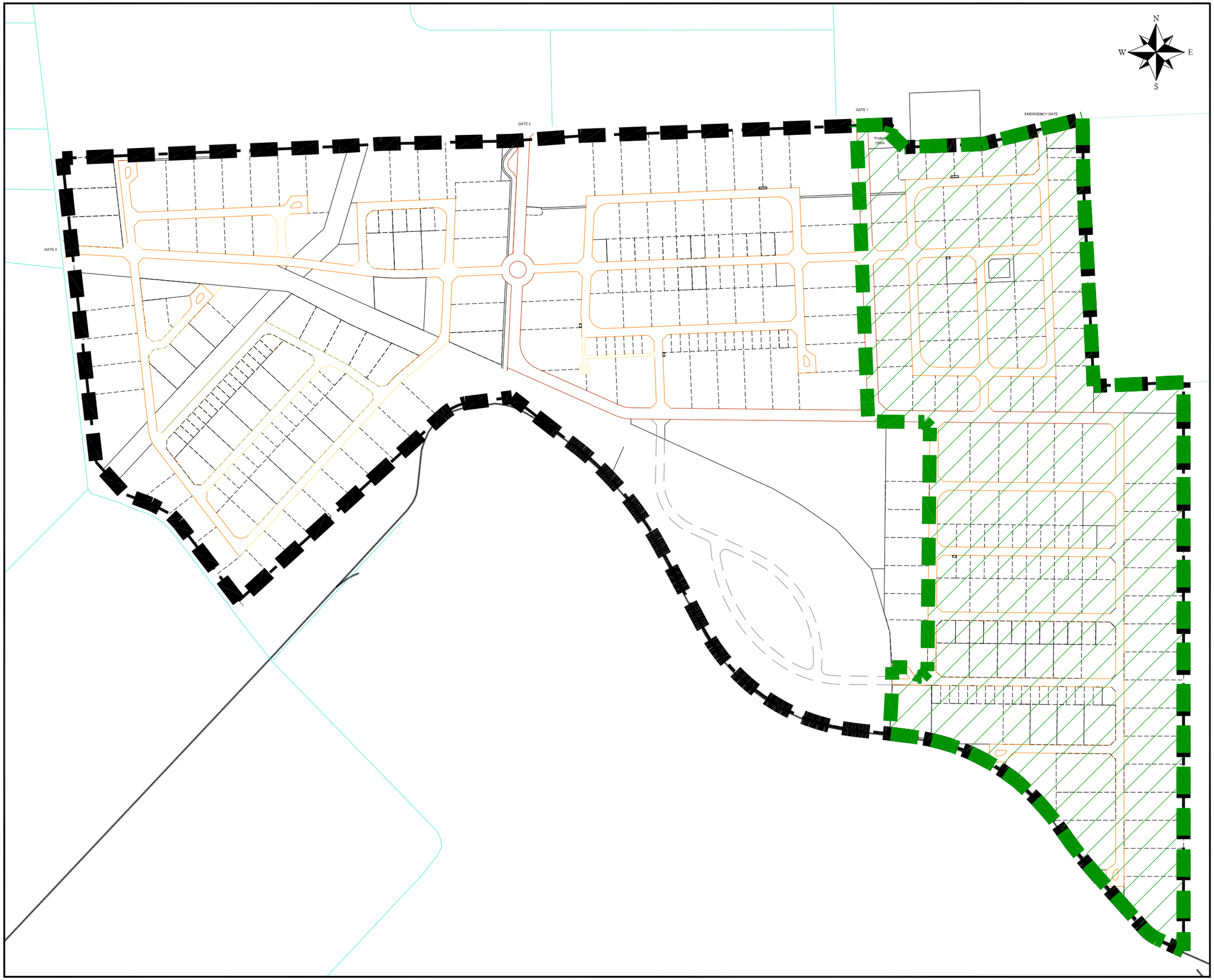
KARACHI INDUSTRIAL PARK SEZ

DRAWN	FAHAD	SCALE	N.T.S
DESIGN	SAIM	DATE	JUN.2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

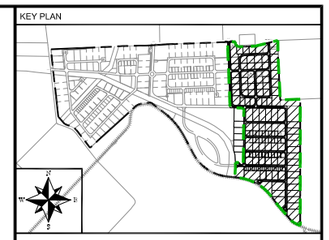
DRAWING TITLE:

LOCATION PLAN

PROJ CODE	DRAWING NO.	REV.
01098	**EA-01098-KIP-H-0002**	00



KEY PLAN



NOTE:

LEGEND:

KIP PROJECT BOUNDARY

PROJECT CURRENT SCOPE

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN.2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	FAHAD	SCALE	1:6500 (A1)
DESIGN	SAIM	DATE	JUN.2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

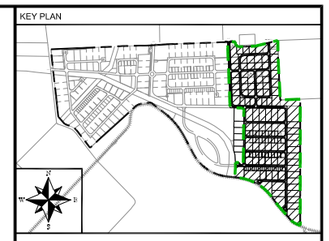
MASTER PLAN

PROJ CODE	DRAWING NO.	REV.
01098	**EA-01098-KIP-H-0003**	00

TOPOGRAPHIC SURVEY PLAN



KEY PLAN



NOTE:

LEGEND:

KIP PROJECT BOUNDARY

PROJECT CURRENT SCOPE

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

SUBSANA JURDING | OMS | ICONSULT INNOVATIVE THROUGH EXCELLENCE

Lead Firm JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN.2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	FAHAD	SCALE	1:6500 (A1)
DESIGN	SAIM	DATE	JUN.2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

TOPOGRAPHIC PLAN

PROJ CODE	DRAWING NO.	REV.
01098	**EA-01098-KIP-H-0250**	00

ALIGNMENT NAME: RD-40-1		
Station	**Northing**	**Easting**
0+000.00	2747185.4776	335805.6258
0+025.00	2747160.4972	335806.6152
0+050.00	2747135.5167	335807.6046
0+075.00	2747110.5363	335808.5940
0+100.00	2747085.5559	335809.5834
0+125.00	2747060.5755	335810.5727
0+150.00	2747035.5951	335811.5621
0+175.00	2747010.6147	335812.5515
0+200.00	2746985.6342	335813.5409
0+225.00	2746960.6538	335814.5303
0+250.00	2746935.6734	335815.5197
0+275.00	2746910.6930	335816.5090
0+300.00	2746885.7126	335817.4984
0+325.00	2746860.7322	335818.4878
0+350.00	2746835.7518	335819.4772
0+375.00	2746810.7713	335820.4666
0+400.00	2746785.7909	335821.4560
0+425.00	2746760.8105	335822.4454
0+450.00	2746735.8301	335823.4347
0+475.00	2746710.8497	335824.4241
0+500.00	2746685.8693	335825.4135
0+525.00	2746660.8889	335826.4029
0+550.00	2746635.9084	335827.3923
0+575.00	2746610.9280	335828.3817
0+600.00	2746585.9476	335829.3711
0+625.00	2746560.9672	335830.3604
0+650.00	2746535.9868	335831.3498
0+675.00	2746511.0064	335832.3392
0+700.00	2746486.0260	335833.3286
0+725.00	2746461.0455	335834.3180
0+750.00	2746436.0651	335835.3074
0+775.00	2746411.0847	335836.2967
0+800.00	2746386.1043	335837.2861
0+825.00	2746361.1239	335838.2755
0+850.00	2746336.1435	335839.2649
0+875.00	2746311.1631	335840.2543
0+900.00	2746286.1826	335841.2437
0+925.00	2746261.2022	335842.2331
0+950.00	2746236.2218	335843.2224
0+975.00	2746211.2414	335844.2118
1+000.00	2746186.2610	335845.2012
1+025.00	2746161.5331	335848.0401
1+050.00	2746141.2442	335862.0918
1+075.00	2746131.4176	335884.7309
1+100.00	2746130.8306	335909.7128
1+125.00	2746130.5752	335934.7115
1+150.00	2746130.3199	335959.7102
1+175.00	2746130.0645	335984.7089
1+200.00	2746129.8091	336009.7076
1+225.00	2746129.5538	336034.7062
1+250.00	2746129.2984	336059.7049
1+275.00	2746129.0430	336084.7036
1+300.00	2746128.7877	336109.7023
1+325.00	2746128.5323	336134.7010
1+350.00	2746128.2769	336159.6997
1+375.00	2746128.0216	336184.6984
1+400.00	2746127.7662	336209.6971
1+425.00	2746127.5108	336234.6958
1+450.00	2746127.2554	336259.6945
1+475.00	2746127.0001	336284.6932

ALIGNMENT NAME: RD-40-1		
Station	**Northing**	**Easting**
1+500.00	2746126.7447	336309.6919
1+525.00	2746126.4893	336334.6906
1+550.00	2746126.2340	336359.6893
1+575.00	2746125.9786	336384.6880
1+600.00	2746125.7232	336409.6867
1+625.00	2746125.4679	336434.6854
1+650.00	2746125.2125	336459.6841
1+675.00	2746124.9571	336484.6828
1+700.00	2746124.7018	336509.6815
1+725.00	2746124.4464	336534.6802
1+750.00	2746124.1910	336559.6789
1+775.00	2746123.9357	336584.6776
1+800.00	2746123.6803	336609.6762
1+825.00	2746123.4249	336634.6749
1+829.77	2746123.3763	336639.4406

ALIGNMENT NAME: RD-30-1		
Station	**Northing**	**Easting**
0+000.00	2746702.0602	335824.7722
0+025.00	2746703.0506	335849.7526
0+050.00	2746704.0411	335874.7330
0+075.00	2746705.0315	335899.7134
0+100.00	2746706.0220	335924.6937
0+125.00	2746707.0124	335949.6741
0+150.00	2746708.0028	335974.6545
0+175.00	2746708.9933	335999.6349
0+200.00	2746709.9837	336024.6152
0+225.00	2746710.9742	336049.5956
0+250.00	2746711.9646	336074.5760
0+275.00	2746712.9551	336099.5563
0+300.00	2746713.9455	336124.5367
0+325.00	2746714.9359	336149.5171
0+350.00	2746715.9264	336174.4975
0+375.00	2746716.9168	336199.4778
0+400.00	2746717.9073	336224.4582
0+425.00	2746718.8977	336249.4386
0+450.00	2746719.8881	336274.4190
0+475.00	2746720.8786	336299.3993
0+500.00	2746721.8690	336324.3797
0+525.00	2746722.8595	336349.3601
0+550.00	2746723.8499	336374.3404
0+575.00	2746724.8404	336399.3208
0+600.00	2746725.8308	336424.3012
0+625.00	2746726.8212	336449.2816
0+639.84	2746727.4092	336464.1099

ALIGNMENT NAME: RD-30-2		
Station	**Northing**	**Easting**
0+775.00	2746379.8333	336477.8799
0+800.00	2746354.8529	336478.8693
0+825.00	2746329.8708	336479.7660
0+850.00	2746306.3107	336472.4166
0+875.00	2746290.1701	336453.7466
0+900.00	2746286.0307	336429.3587
0+925.00	2746286.2860	336404.3600
0+950.00	2746286.5414	336379.3613
0+975.00	2746286.7968	336354.3626
1+000.00	2746287.0521	336329.3639
1+025.00	2746287.3075	336304.3652
1+050.00	2746287.5629	336279.3665
1+075.00	2746287.8182	336254.3678
1+100.00	2746288.0736	336229.3692
1+125.00	2746288.3290	336204.3705
1+150.00	2746288.5843	336179.3718
1+175.00	2746288.8397	336154.3731
1+200.00	2746289.0951	336129.3744
1+225.00	2746289.3504	336104.3757
1+250.00	2746289.6058	336079.3770
1+275.00	2746292.1725	336054.5943
1+300.00	2746302.4533	336031.9329
1+325.00	2746319.5829	336013.8827
1+350.00	2746341.6755	336002.4307
1+375.00	2746366.2965	335998.6965
1+400.00	2746391.2769	335997.7071
1+425.00	2746416.2573	335996.7177
1+450.00	2746441.2377	335995.7283
1+475.00	2746466.2181	335994.7389
1+500.00	2746491.1986	335993.7496
1+525.00	2746516.1790	335992.7602
1+550.00	2746541.1594	335991.7708
1+575.00	2746566.1398	335990.7814
1+600.00	2746591.1202	335989.7920
1+625.00	2746616.1006	335988.8026
1+650.00	2746641.0810	335987.8133
1+675.00	2746666.0615	335986.8239
1+700.00	2746691.0419	335985.8345
1+725.00	2746716.0223	335984.8451
1+750.00	2746741.0027	335983.8557
1+775.00	2746765.9831	335982.8663
1+800.00	2746790.9635	335981.8769
1+825.00	2746815.9439	335980.8876
1+850.00	2746840.9244	335979.8982
1+875.00	2746865.9048	335978.9088
1+900.00	2746890.8878	335978.2690
1+925.00	2746915.1525	335983.7879
1+950.00	2746936.2758	335996.9423
1+975.00	2746951.9324	336016.2841
2+000.00	2746960.3986	336039.6841
2+025.00	2746962.1299	336064.6001
2+050.00	2746963.1204	336089.5805
2+075.00	2746964.1108	336114.5609
2+100.00	2746965.1013	336139.5413
2+125.00	2746966.0917	336164.5216
2+150.00	2746967.0822	336189.5020
2+175.00	2746968.0726	336214.4824
2+200.00	2746969.0630	336239.4627
2+225.00	2746970.0535	336264.4431
2+250.00	2746971.0439	336289.4235

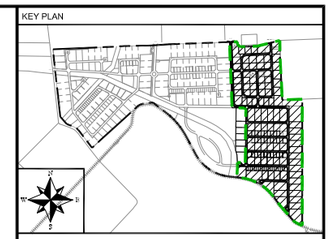
ALIGNMENT NAME: RD-30-2		
Station	**Northing**	**Easting**
2+275.00	2746972.0344	336314.4039
2+300.00	2746973.0248	336339.3842
2+325.00	2746974.0153	336364.3646
2+350.00	2746975.0057	336389.3450
2+375.00	2746975.9961	336414.3254
2+400.00	2746976.9866	336439.3057
2+414.91	2746977.5773	336454.2040

ALIGNMENT NAME: RD-30-3		
Station	**Northing**	**Easting**
0+000.00	2746717.9409	336225.3074
0+025.00	2746692.9605	336226.2968
0+050.00	2746667.9801	336227.2862
0+075.00	2746642.9997	336228.2756
0+100.00	2746618.0193	336229.2650
0+125.00	2746593.0389	336230.2544
0+150.00	2746568.0584	336231.2438
0+175.00	2746543.0780	336232.2331
0+200.00	2746518.0976	336233.2225
0+225.00	2746493.1172	336234.2119
0+250.00	2746468.1368	336235.2013
0+275.00	2746443.1564	336236.1907
0+300.00	2746418.1760	336237.1801
0+325.00	2746393.1955	336238.1694
0+350.00	2746368.2151	336239.1588
0+375.00	2746343.2347	336240.1482
0+400.00	2746318.2543	336241.1376
0+425.00	2746293.2721	336242.0764
0+450.00	2746268.2739	336242.1373
0+475.00	2746243.2752	336241.8819
0+500.00	2746218.2766	336241.6266
0+525.00	2746193.2779	336241.3712
0+550.00	2746168.2792	336241.1158
0+575.00	2746143.2805	336240.8605
0+590.83	2746127.4513	336240.6988

ALIGNMENT NAME: RD-30-4		
Station	**Northing**	**Easting**
0+000.00	2746123.3763	336639.4406
0+025.00	2746123.1209	336664.4393
0+050.00	2746121.9949	336689.3718
0+075.00	2746110.4871	336711.2043
0+100.00	2746089.1952	336723.6840
0+125.00	2746064.3154	336725.1095
0+150.00	2746039.3154	336725.1095
0+175.00	2746014.3154	336725.1095
0+200.00	2745989.3154	336725.1095
0+225.00	2745964.3154	336725.1095
0+250.00	2745939.3154	336725.1095
0+275.00	2745914.3154	336725.1095
0+300.00	2745889.3154	336725.1095
0+325.00	2745864.3154	336725.1095
0+350.00	2745839.3154	336725.1095
0+375.00	2745814.3154	336725.1095
0+400.00	2745789.3154	336725.1095

ALIGNMENT NAME: RD-30-4		
Station	**Northing**	**Easting**
0+425.00	2745764.3154	336725.1095
0+450.00	2745739.3154	336725.1095
0+475.00	2745714.3154	336725.1095
0+500.00	2745689.3154	336725.1095
0+525.00	2745664.3154	336725.1095
0+550.00	2745639.3154	336725.1095
0+575.00	2745614.3154	336725.1095
0+600.00	2745589.3154	336725.1095
0+625.00	2745564.3154	336725.1095
0+650.00	2745539.3154	336725.1095
0+675.00	2745514.3154	336725.1095
0+700.00	2745489.3154	336725.1095
0+725.00	2745464.3154	336725.1095
0+750.00	2745439.3154	336725.1095
0+775.00	2745414.3154	336725.1095
0+800.00	2745389.3154	336725.1095
0+825.00	2745364.3154	336725.1095
0+850.00	2745339.3154	336725.1095
0+875.00	2745314.3154	336725.1095
0+900.00	2745289.3154	336725.1095
0+925.00	2745264.3154	336725.1095
0+950.00	2745239.3154	336725.1095
0+975.00	2745214.3154	336725.1095
1+000.00	2745189.3154	336725.1095
1+025.00	2745164.3154	336725.1095
1+050.00	2745139.3154	336725.1095
1+075.00	2745114.3154	336725.1095
1+100.00	2745089.3154	336725.1095
1+125.00	2745064.3154	336725.1095
1+150.00	2745039.3154	336725.1095
1+175.00	2745014.3154	336725.1095
1+200.00	2744989.3154	336725.1095
1+225.00	2744964.3154	336725.1095
1+250.00	2744939.3154	336725.1095
1+275.00	2744914.3154	336725.1095
1+300.00	2744889.3154	336725.1095
1+325.00	2744864.3154	336725.1095
1+350.00	2744839.3154	336725.1095
1+375.00	2744814.3154	336725.1095
1+400.00	2744789.3154	336725.1095
1+425.00	2744764.3154	336725.1095
1+450.00	2744739.3154	336725.1095
1+475.00	2744714.3154	336725.1095
1+500.00	2744689.3154	336725.1095
1+525.00	2744664.3154	336725.1095
1+550.00	2744639.3154	336725.1095
1+575.00	2744614.3154	336725.1095
1+600.00	2744589.3154	336725.1095
1+625.00	2744564.3154	336725.1095
1+643.93	2744545.3861	336725.1095

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN.2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	FAHAD	SCALE	N.T.S
DESIGN	SAIM	DATE	JUN.2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

ALIGNMENT COORDINATES DATA SHEET - 01

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-H-0500	00

ALIGNMENT NAME: RD-30-5		
Station	**Northing**	**Easting**
0+000.00	2746129.2599	336063.4694
0+025.00	2746104.2612	336063.2140
0+050.00	2746079.2625	336062.9586
0+075.00	2746054.2638	336062.7033
0+100.00	2746029.2651	336062.4479
0+125.00	2746004.2665	336062.1925
0+150.00	2745979.2678	336061.9372
0+175.00	2745954.2691	336061.6818
0+200.00	2745929.2704	336061.4264
0+225.00	2745904.2717	336061.1711
0+250.00	2745879.2730	336060.9157
0+275.00	2745854.2743	336060.6603
0+300.00	2745829.2756	336060.4050
0+325.00	2745804.2769	336060.1496
0+350.00	2745779.2782	336059.8942
0+375.00	2745754.2795	336059.6389
0+400.00	2745729.2808	336059.3835
0+425.00	2745704.2821	336059.1281
0+450.00	2745679.2834	336058.8728
0+475.00	2745654.2847	336058.6174
0+500.00	2745629.2860	336058.3620
0+525.00	2745604.2873	336058.1067
0+550.00	2745579.2886	336057.8513
0+575.00	2745554.2899	336057.5959
0+600.00	2745529.2912	336057.3406
0+625.00	2745504.2925	336057.0852
0+650.00	2745479.2938	336056.8298
0+675.00	2745454.2951	336056.5745
0+700.00	2745429.2965	336056.3191
0+725.00	2745404.2978	336056.0637
0+750.00	2745379.2991	336055.8084
0+775.00	2745354.3004	336055.5530
0+800.00	2745329.3017	336055.2976
0+825.00	2745304.3030	336055.0423
0+850.00	2745279.3043	336054.7869
0+875.00	2745254.3056	336054.5315
0+900.00	2745229.3069	336054.2762
0+925.00	2745204.3082	336054.0208
0+943.00	2745186.3091	336053.8369

ALIGNMENT NAME: RD-30-6		
Station	**Northing**	**Easting**
0+000.00	2745882.2728	336060.9464
0+025.00	2745882.0175	336085.9450
0+050.00	2745881.7621	336110.9437
0+075.00	2745881.5067	336135.9424
0+100.00	2745881.2513	336160.9411
0+125.00	2745880.9960	336185.9398
0+150.00	2745880.7406	336210.9385
0+175.00	2745880.4852	336235.9372
0+200.00	2745880.2299	336260.9359
0+225.00	2745879.9745	336285.9346
0+250.00	2745879.7191	336310.9333
0+275.00	2745879.4638	336335.9320
0+300.00	2745879.2084	336360.9307
0+325.00	2745878.9530	336385.9294
0+350.00	2745878.6977	336410.9281
0+375.00	2745878.4423	336435.9268
0+400.00	2745878.1869	336460.9255
0+425.00	2745877.9316	336485.9242
0+450.00	2745877.6762	336510.9229
0+475.00	2745877.4208	336535.9216
0+500.00	2745877.1655	336560.9203
0+525.00	2745876.9101	336585.9190
0+550.00	2745876.6547	336610.9177
0+575.00	2745876.3994	336635.9164
0+600.00	2745876.1440	336660.9151
0+625.00	2745875.8886	336685.9137
0+650.00	2745875.6333	336710.9124
0+664.20	2745875.4882	336725.1095

ALIGNMENT NAME: RD-30-7		
Station	**Northing**	**Easting**
0+000.00	2745650.2849	336058.5765
0+025.00	2745650.0296	336083.5752
0+050.00	2745649.7742	336108.5739
0+075.00	2745649.5188	336133.5726
0+100.00	2745649.2635	336158.5713
0+125.00	2745649.0081	336183.5700
0+150.00	2745648.7527	336208.5687
0+175.00	2745648.4974	336233.5674
0+200.00	2745648.2420	336258.5661
0+225.00	2745647.9866	336283.5648
0+250.00	2745647.7313	336308.5635
0+275.00	2745647.4759	336333.5622
0+300.00	2745647.2205	336358.5609
0+325.00	2745646.9651	336383.5596
0+350.00	2745646.7098	336408.5583
0+375.00	2745646.4544	336433.5570
0+400.00	2745646.1990	336458.5557
0+425.00	2745645.9437	336483.5544
0+450.00	2745645.6883	336508.5531
0+475.00	2745645.4329	336533.5518
0+500.00	2745645.1776	336558.5505
0+525.00	2745644.9222	336583.5492
0+550.00	2745644.6668	336608.5479
0+575.00	2745644.4115	336633.5465
0+600.00	2745644.1561	336658.5452
0+625.00	2745643.9007	336683.5439
0+650.00	2745643.6454	336708.5426
0+666.57	2745643.4761	336725.1095

ALIGNMENT NAME: RD-30-8		
Station	**Northing**	**Easting**
0+000.00	2745418.2970	336056.2067
0+025.00	2745418.0417	336081.2054
0+050.00	2745417.7863	336106.2041
0+075.00	2745417.5309	336131.2028
0+100.00	2745417.2756	336156.2015
0+125.00	2745417.0202	336181.2002
0+150.00	2745416.7648	336206.1989
0+175.00	2745416.5095	336231.1976
0+200.00	2745416.2541	336256.1963
0+225.00	2745415.9987	336281.1950
0+250.00	2745415.7434	336306.1937
0+275.00	2745415.4880	336331.1924
0+300.00	2745415.2326	336356.1911
0+325.00	2745414.9773	336381.1898
0+350.00	2745414.7219	336406.1885
0+375.00	2745414.4665	336431.1872
0+400.00	2745414.2112	336456.1859
0+425.00	2745413.9558	336481.1846
0+450.00	2745413.7004	336506.1833
0+475.00	2745413.4451	336531.1820
0+500.00	2745413.1897	336556.1807
0+525.00	2745412.9343	336581.1793
0+550.00	2745412.6789	336606.1780
0+575.00	2745412.4236	336631.1767
0+600.00	2745412.1682	336656.1754
0+625.00	2745411.9128	336681.1741
0+650.00	2745411.6575	336706.1728
0+668.94	2745411.4640	336725.1095

ALIGNMENT NAME: RD-30-9		
Station	**Northing**	**Easting**
0+000.00	2745186.8527	336000.6291
0+025.00	2745186.5973	336025.6278
0+050.00	2745186.3419	336050.6265
0+075.00	2745186.0866	336075.6252
0+100.00	2745185.8312	336100.6239
0+125.00	2745185.5758	336125.6226
0+150.00	2745185.3205	336150.6213
0+175.00	2745185.0651	336175.6200
0+200.00	2745184.8097	336200.6187
0+225.00	2745184.5544	336225.6174
0+250.00	2745184.2990	336250.6160
0+275.00	2745184.0436	336275.6147
0+300.00	2745183.7883	336300.6134
0+325.00	2745183.5329	336325.6121
0+350.00	2745183.2775	336350.6108
0+375.00	2745183.0222	336375.6095
0+400.00	2745182.7668	336400.6082
0+425.00	2745182.5114	336425.6069
0+450.00	2745182.2561	336450.6056
0+475.00	2745182.0007	336475.6043
0+500.00	2745181.7453	336500.6030
0+525.00	2745181.4899	336525.6017
0+550.00	2745181.2346	336550.6004
0+575.00	2745180.9792	336575.5991
0+600.00	2745180.7238	336600.5978
0+625.00	2745180.4685	336625.5965
0+650.00	2745180.2131	336650.5952
0+675.00	2745179.9577	336675.5939
0+700.00	2745179.7024	336700.5926
0+724.52	2745179.4519	336725.1095

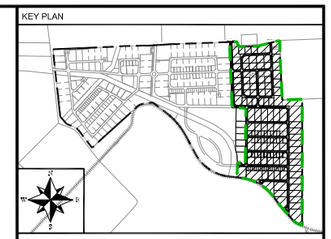
Alignment Name: RD-30-10		
Station	**Northing**	**Easting**
0+000.00	2744945.7558	336347.1178
0+025.00	2744945.5004	336372.1165
0+050.00	2744945.2450	336397.1152
0+075.00	2744944.9897	336422.1139
0+100.00	2744944.7343	336447.1126
0+125.00	2744944.4789	336472.1113
0+150.00	2744944.2236	336497.1100
0+175.00	2744943.9682	336522.1087
0+200.00	2744943.7128	336547.1074
0+225.00	2744943.4575	336572.1061
0+250.00	2744943.2021	336597.1048
0+275.00	2744942.9467	336622.1035
0+300.00	2744942.6914	336647.1022
0+325.00	2744942.4360	336672.1009
0+350.00	2744942.1806	336697.0995
0+375.00	2744941.9252	336722.0982
0+378.01	2744941.8945	336725.1081

ALIGNMENT NAME: CS-01		
Station	**Northing**	**Easting**
0+000.00	2745186.8527	336000.6291
0+025.00	2745187.1080	335975.6304
0+050.00	2745187.3634	335950.6317
0+075.00	2745197.5404	335929.7566
0+100.00	2745218.9129	335937.4684
0+125.00	2745219.5754	335962.0344
0+150.00	2745200.5533	335977.7334
0+175.00	2745187.0458	335997.7129
0+175.33	2745187.0080	335998.0378

ALIGNMENT NAME: CS-02		
Station	**Northing**	**Easting**
0+000.00	2744945.7558	336347.1178
0+025.00	2744934.9072	336325.6438
0+050.00	2744915.1734	336310.4530
0+075.00	2744913.8359	336285.9969
0+100.00	2744933.7614	336275.0777
0+125.00	2744946.2964	336294.1965
0+150.00	2744946.0410	336319.1951
0+175.00	2744945.7856	336344.1938
0+176.39	2744945.7715	336345.5811

ALIGNMENT NAME: CS-03		
Station	**Northing**	**Easting**
0+000.00	2744545.3861	336725.1095
0+025.00	2744520.3861	336725.1095
0+050.00	2744495.3861	336725.1095
0+075.00	2744472.8026	336717.8684
0+100.00	2744476.1737	336695.3986
0+125.00	2744500.3409	336691.9496
0+150.00	2744517.4488	336709.0845
0+175.00	2744536.2772	336724.4143
0+177.96	2744539.1906	336724.9280

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN.2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	FAHAD	SCALE	N.T.S
DESIGN	SAIM	DATE	JUN.2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

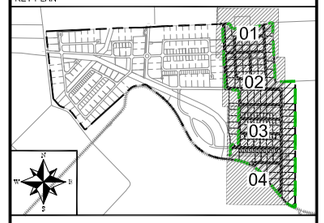
ALIGNMENT COORDINATES DATA SHEET - 02

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-H-0501	00

LAYOUT PLAN



KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN.2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	FAHAD	SCALE	N.T.S
DESIGN	SAIM	DATE	JUN.2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

ROAD LAYOUT
SHEET INDEX PLAN

PROJ CODE	DRAWING NO.	REV.
01098	**EA-01098-KIP-H-1000**	00

MATCH WITH EXISTING ROAD

RD-40-1
BOP: 0+000.000
E:335805.626
N:2747185.478

GATE 1

PIPE CULVERT

WELL

SEWER PIPE LINE

KERB STONE

Project Office

RD-40-1

0+100

0+200

0+300

0+400

0+500

PC: 1+892.758

1+900

1+800

1+700

RD-30-1
BOP: 0+000.000
E:335824.772
N:2746702.060

RD-30-2

PT: 2+010.564

2+000

2+100

2+200

2+300

2+400

RD-30-2
PI Sta:1+967.75
E:335975.2380
N:2746958.5868
R:75.000
L:117.807
89.9976
C:106.064
T:74.997
M:21.966

RD-30-3
BOP: 0+000.000
E:336225.307
N:2746717.941

RD-30-1

RD-30-3

RD-30-2

MATCH WITH EXISTING ROAD

EMERGENCY GATE

RD-30-2
BOP: 0+000.000
E:336447.209
N:2747154.226

BARRIER

WALL

PILLAR

WATER TANK

DRAIN

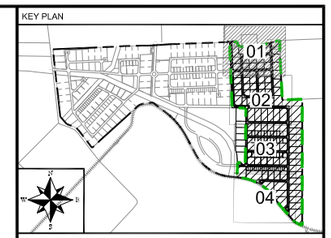
RD-30-2
EOP: 2+414.911
E:336454.205
N:2746977.577

RD-30-1
EOP: 0+639.844
E:336464.114
N:2746727.409

0+600

MATCH LINE SHEET NO.02

KEY PLAN



SHEET INDEX

NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN.2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	FAHAD	SCALE	1:1500 (A1)
DESIGN	SAIM	DATE	JUN.2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

ROAD LAYOUT PLAN
SHEET - 01

PROJ CODE	DRAWING NO.	REV.
01098	EA-1098-KIP-H-1001	00

MATCH LINE SHEET NO.01

RD-40-1
PI Sta:1+054.84
E:335847.3714
N:2746131.4678
R:45.000
L:68.444
87.1462
C:62.035
T:42.813
M:12.398

PC: 1+012.024

RD-30-3
PI Sta:0+430.34
E:336242.3382
N:2746287.9411
R:500.000
L:24.900
2.8534
C:24.898
T:12.453
M:0.155

RD-30-2
PI Sta:0+869.41
E:336481.6162
N:2746285.4968
R:45.000
L:72.927
92.8534
C:65.204
T:47.299
M:13.982

PC: 0+417.884

PT: 1+370.398

PC: 0+822.112

PT: 1+256.324

PT: 0+442.785

PT: 0+895.039

RD-30-4
PI Sta:0+085.67
E:336725.1095
N:2746122.5011
R:45.000
L:70.226
89.4147
C:63.314
T:44.543
M:13.018

PC: 0+041.131

RD-30-3
EOP: 0+590.832
E:336240.699
N:2746127.449

RD-40-1
EOP: 1+829.766
E:336639.441
N:2746123.376

PT: 1+080.468

RD-30-5
BOP: 0+000.000
E:336063.469
N:2746129.260

RD-30-4
BOP: 0+000.000
E:336639.441
N:2746123.376

PT: 0+111.357

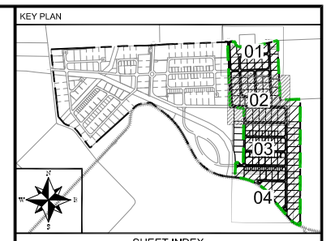
RD-30-6
BOP: 0+000.000
E:336060.946
N:2745882.273

RD-30-6
EOP: 0+664.198
E:336725.110
N:2745875.488

RD-40-1 RD-30-2 RD-30-3 RD-30-4 RD-30-5 RD-30-6

MATCH LINE SHEET NO.03

KEY PLAN



SHEET INDEX

NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	FAHAD	SCALE	1:1500 (A1)
DESIGN	SAIM	DATE	JUN,2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

ROAD LAYOUT PLAN
SHEET - 02

PROJ CODE	DRAWING NO.	REV.
01098	EA-1098-KIP-H-1002	00

MATCH LINE SHEET NO.02

RD-30-5

RD-30-4

RD-30-7

RD-30-8

RD-30-9

RD-30-7
BOP: 0+000.000
E:336058.577
N:2745650.285

RD-30-7
EOP: 0+666.568
E:336725.110
N:2745643.476

RD-30-8
BOP: 0+000.000
E:336056.207
N:2745418.297

RD-30-8
EOP: 0+668.938
E:336725.110
N:2745411.464

RD-30-5
EOP: 0+943.000
E:336053.837
N:2745186.309

RD-30-9
EOP: 0+724.518
E:336725.110
N:2745179.452

RD-30-9
BOP: 0+000.000
E:336000.629
N:2745186.853

CS-01
BOP: 0+000.000
E:336000.629
N:2745186.853

CS-01
EOP: 0+175.327
E:335998.038
N:2745187.008

CS-01
PI Sta:0+164.80
E:335986.0728
N:2745188.3237
R:26.150
L:22.562
49.4344
C:21.869
T:12.037
M:2.396

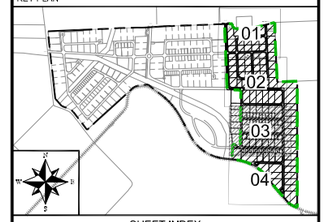
CS-01
PI Sta:0+126.92
E:335964.0901
N:2745220.5610
R:13.850
L:13.325
55.1245
C:12.817
T:7.229
M:1.572

CS-01
R:16.667
L:52.360
180.0000
C:33.333
M:16.667

PT: 0+108.079
PC: 0+119.687
PT: 0+133.012
PC: 0+152.765
PC: 0+055.719

MATCH LINE SHEET NO.04

KEY PLAN



SHEET INDEX

NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

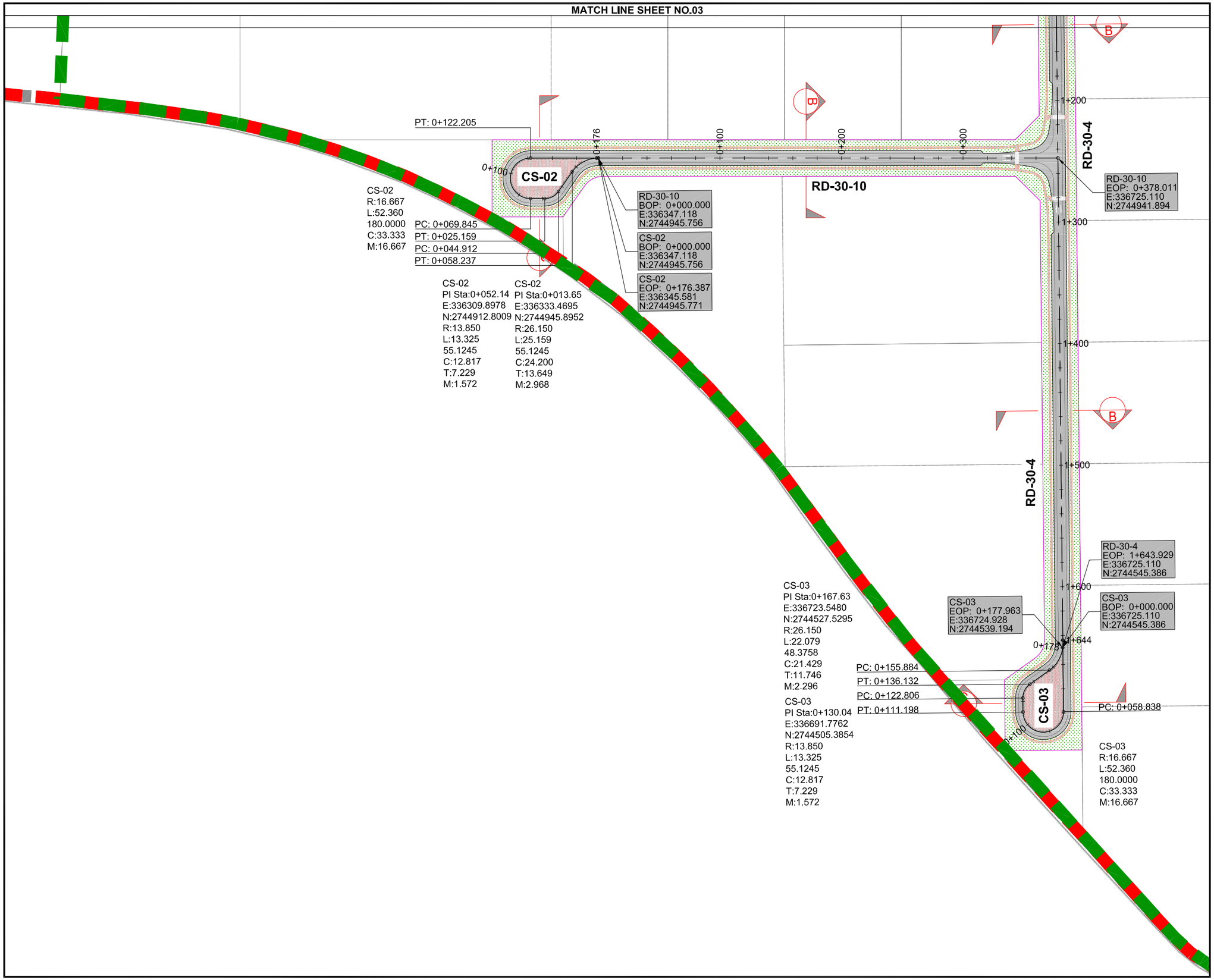
DRAWN	FAHAD	SCALE	1:1500 (A1)
DESIGN	SAIM	DATE	JUN,2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

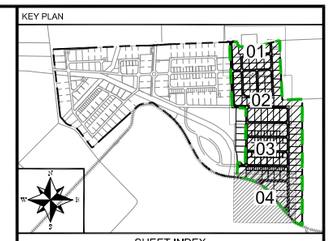
ROAD LAYOUT PLAN
SHEET - 03

PROJ CODE	DRAWING NO.	REV.
01098	EA-1098-KIP-H-1003	00

MATCH LINE SHEET NO.03



KEY PLAN



SHEET INDEX

NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

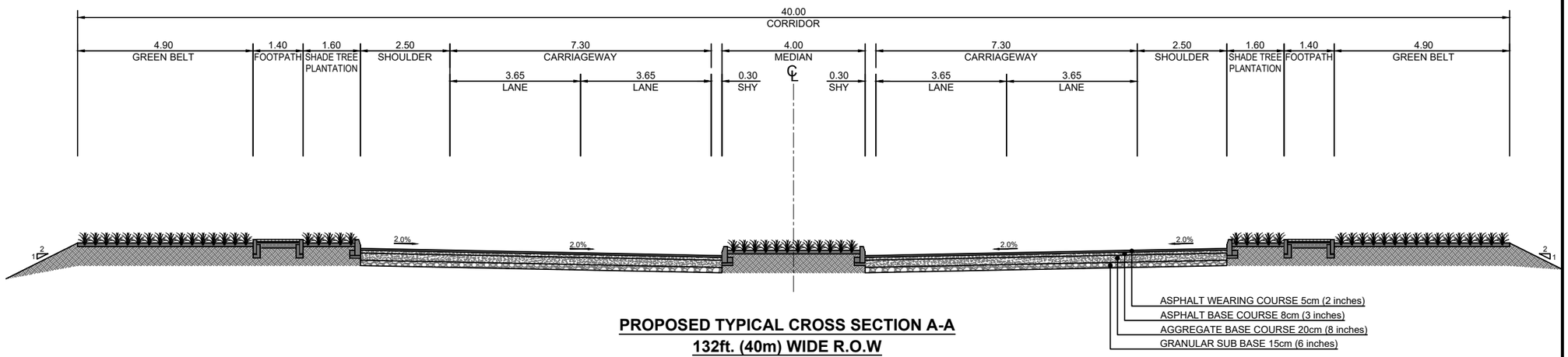
KARACHI INDUSTRIAL PARK SEZ

DRAWN	FAHAD	SCALE	1:1500 (A1)
DESIGN	SAIM	DATE	JUN,2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

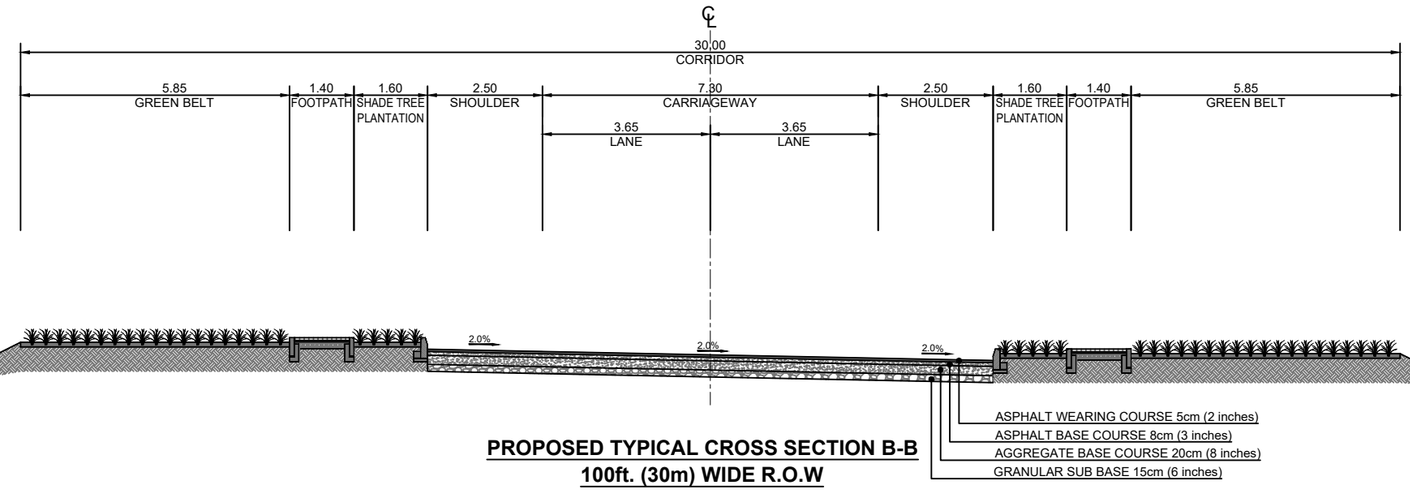
DRAWING TITLE:

ROAD LAYOUT PLAN SHEET - 04

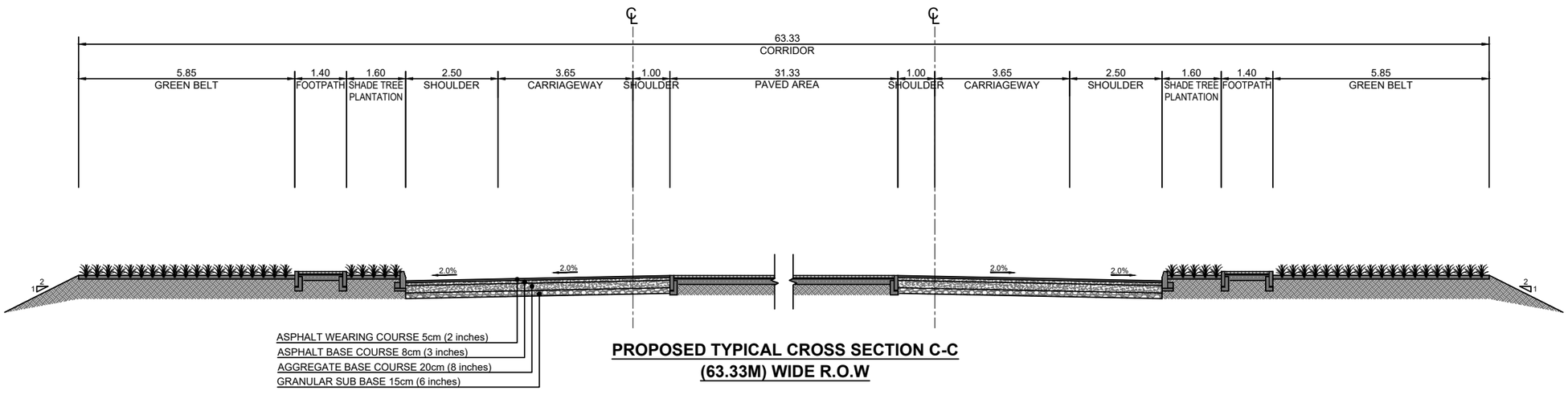
PROJ CODE	DRAWING NO.	REV.
01098	EA-1098-KIP-H-1004	00



PROPOSED TYPICAL CROSS SECTION A-A
132ft. (40m) WIDE R.O.W



PROPOSED TYPICAL CROSS SECTION B-B
100ft. (30m) WIDE R.O.W



PROPOSED TYPICAL CROSS SECTION C-C
(63.33M) WIDE R.O.W

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	FAHAD	SCALE	N.T.S
DESIGN	SAIM	DATE	JUN.2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

PROPOSED CROSS SECTION

PROJ CODE	DRAWING NO.	REV.
01098	**EA-01098-KIP-H-1200**	00

TRAFFIC SIGNS & PAVEMENT MARKING LAYOUT

MATCH WITH EXISTING ROAD

GATE 1

MATCH WITH EXISTING ROAD

EMERGENCY GATE

PIPE CULVERT

PIPE CULVERT

WELL

LP

LP

MH

SEWER PIPE LINE

MH

MH

KERB STONE

KERB STONE

PIPE CULVERT

DRAIN

KERB STONE

BARRIER

BQ1

WALL

WALL

PILLAR

WATER TANK

PILLAR

Project Office

50

30

RD-40-1

RD-30-2

RD-30-1

RD-30-1

RD-30-2

RD-30-2

RD-40-1

RD-30-2

RD-30-2

RD-30-1

RD-30-1

RD-30-2

MATCH LINE SHEET NO.02

KEY PLAN

01

02

03

04

SHEET INDEX

NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	FAHAD	SCALE	1:1500 (A1)
DESIGN	SAIM	DATE	JUN,2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

TRAFFIC SIGNS & PAVEMENT MARKING LAYOUT SHEET - 01

PROJ CODE	DRAWING NO.	REV.
01098	EA-1098-KIP-H-1500	00

MATCH LINE SHEET NO.01

RD-30-2

RD-30-3

RD-30-2

RD-40-1

RD-30-2

RD-30-2

RD-40-1

RD-40-1

RD-30-4

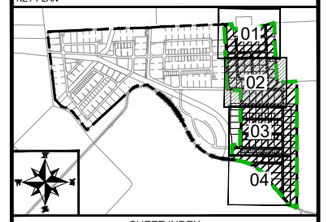
RD-30-5

RD-30-4

RD-30-6

MATCH LINE SHEET NO.03

KEY PLAN



SHEET INDEX

NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

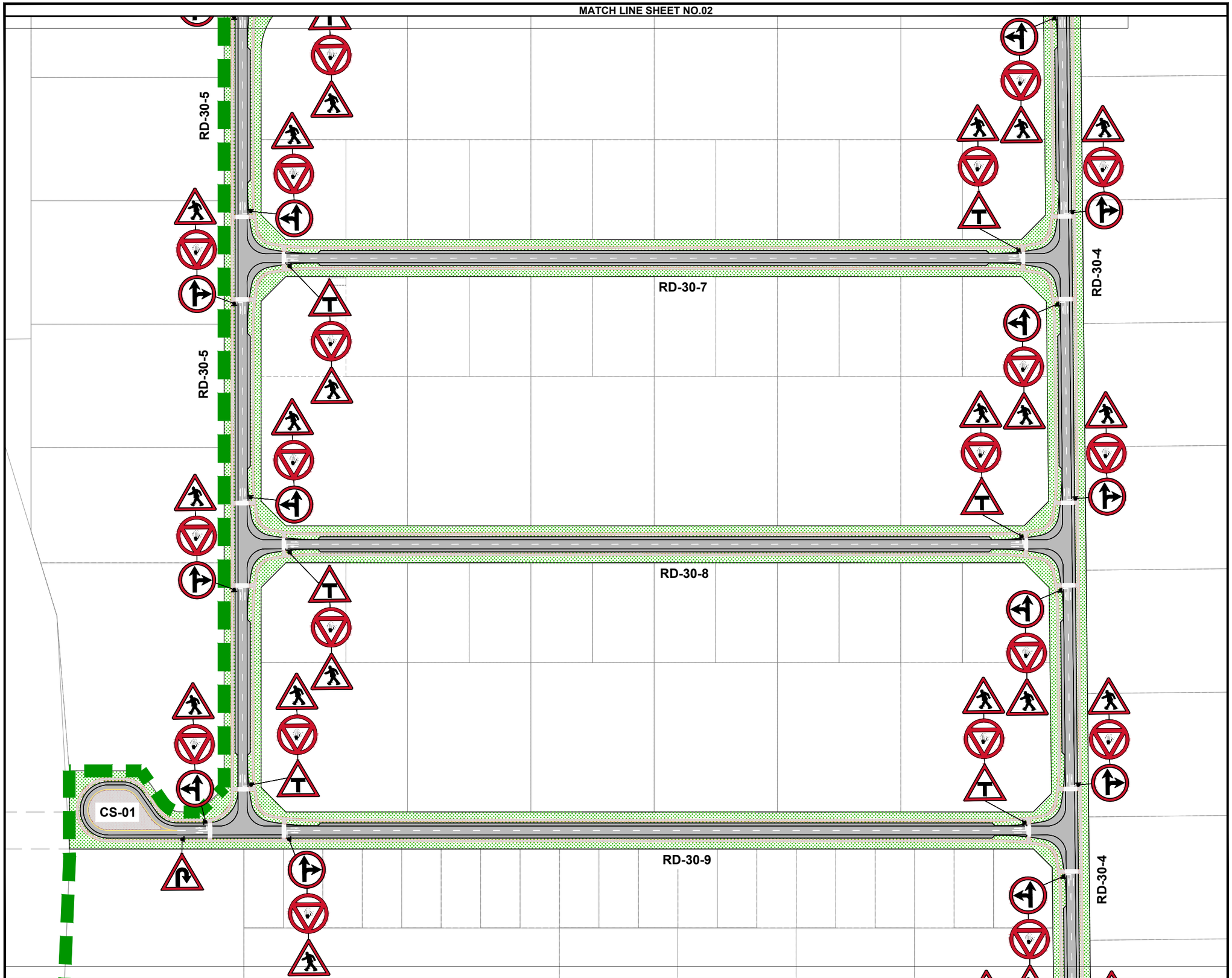
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DESIGN	SAIM	DATE	JUN,2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

TRAFFIC SIGNS & PAVEMENT MARKING LAYOUT SHEET - 02

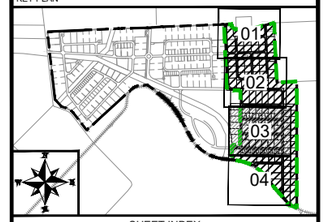
PROJ CODE	DRAWING NO.	REV.
01098	EA-1098-KIP-H-1501	00

MATCH LINE SHEET NO.02



MATCH LINE SHEET NO.04

KEY PLAN



SHEET INDEX

NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

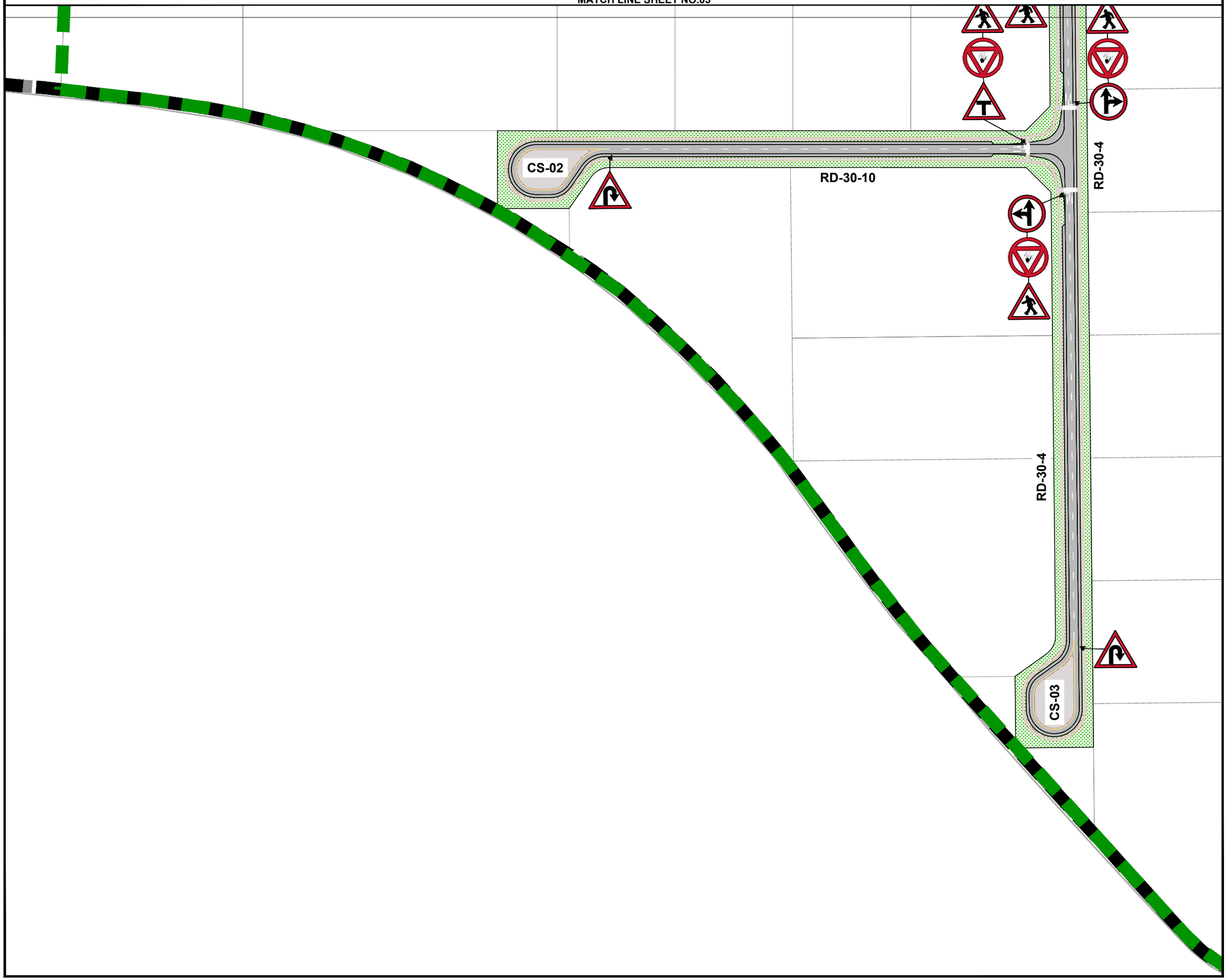
DRAWN	FAHAD	SCALE	1:1500 (A1)
DESIGN	SAIM	DATE	JUN,2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

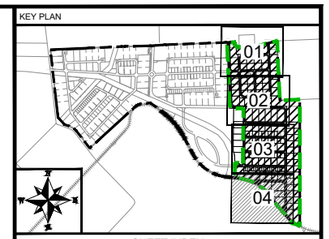
TRAFFIC SIGNS & PAVEMENT MARKING LAYOUT SHEET - 03

PROJ CODE	DRAWING NO.	REV.
01098	EA-1098-KIP-H-1502	00

MATCH LINE SHEET NO.03



KEY PLAN



SHEET INDEX

NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

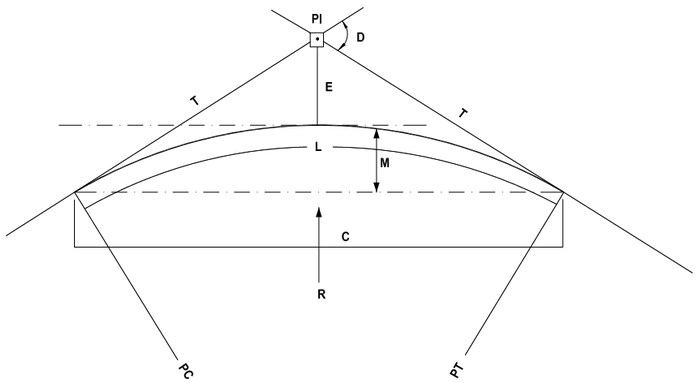
KARACHI INDUSTRIAL PARK SEZ

DRAWN	FAHAD	SCALE	1:1500 (A1)
DESIGN	SAIM	DATE	JUN,2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

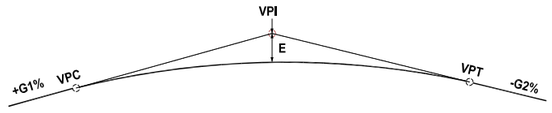
TRAFFIC SIGNS & PAVEMENT MARKING LAYOUT SHEET - 04

PROJ CODE	DRAWING NO.	REV.
01098	**EA-1098-KIP-H-1503**	00



PI = Point Of Intersection
I = Angle Of Deflection
R = Radius Of Curvature (meter)
D = Degree Of Curve (degree)
T = Tangent Length (metre)
E = External Distance (meter)
PC = Point Of Curvature
PT = Point Of Tangency
L = Length Of Curve
C = Chord Length (meter)
M = Mid Ordinate(meter)

DETAILS OF HORIZONTAL CURVE

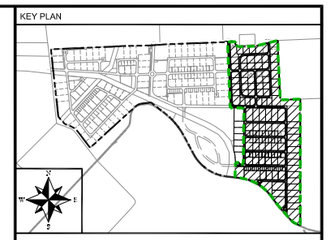


VPI = Vertical point of Intersection
VPC = Vertical point of Curvature
VPT = Vertical point of Tangency
E = Vertical offset
G1,G2 = Grade (+%)
LVC = Length of Vertical Curve

DETAILS OF VERTICAL CURVE

Item	Design Parameter	40m Wide Corridor	30m Wide Corridor	AAHSHTO POLICY 2011 PAGE NO.
1	Design Speed	50 Km / hr	30 Km / hr	
2	Design Vehicle	WB-20	WB-20	2-1
CROSS SECTIONAL ELEMENTS				
3	Number of Lanes	4	2	
4	Lane Width	3.65 m	3.65 m	
5	Shoulder Width	2.5 m	2.5 m	
6	Cross Slope	2.0%	2.0%	
HORIZONTAL ALIGNMENT				
7	Min. Stopping Sight Distance	65	35	3-4
8	Max. Rate of Superelevation	4.0%	4.0%	3-30
9	Min. Radius of Curve	86	22	3-32
VERTICAL ALIGNMENT				
10	Max. Allowable Grade	4.0%	4.0%	
11	Min. Allowable Grade	0.2%	0.2%	
12	K value (crest)	7	2	3-155
13	K value (sag)	13	6	3-161

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN.2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	FAHAD	SCALE	N.T.S
DESIGN	SAIM	DATE	JUN.2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

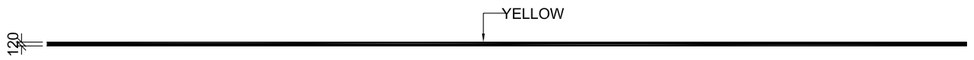
DRAWING TITLE:

GEOMETRIC STANDARDS

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-H-2000	00



STOP LINE MARKING



EDGE LINE MARKING



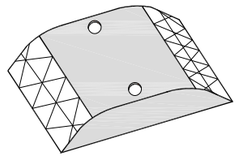
CHANNELIZING LINE MARKING

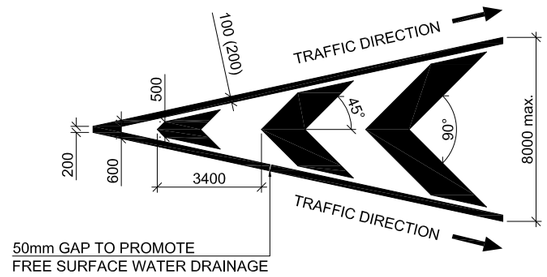


LANE LINE MARKING



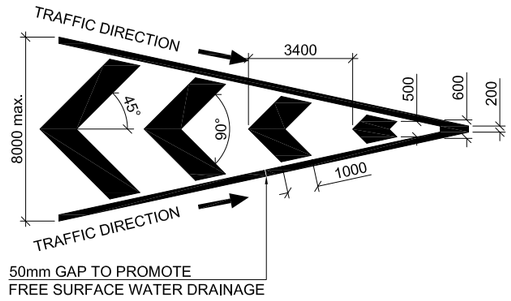
GUIDE LINE MARKING



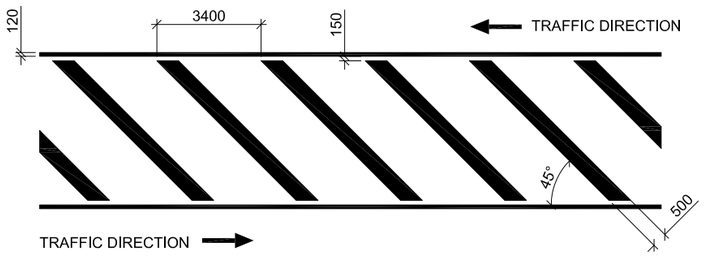


CATEYE SPACING:

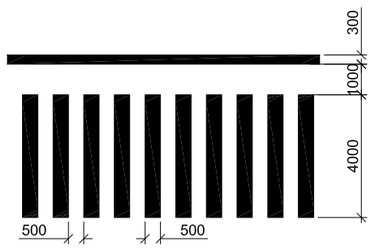
1. STRAIGHT ROAD = 9m
2. CURVED ROAD = 6m



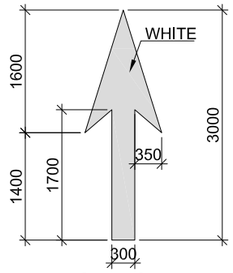
CHEVRON MARKING



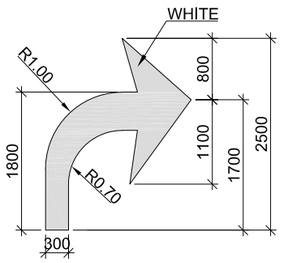
HATCH MARKING



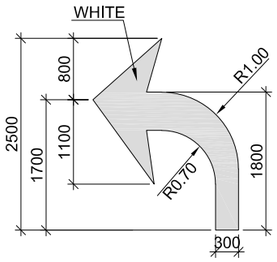
PEDESTRIAN CROSSING



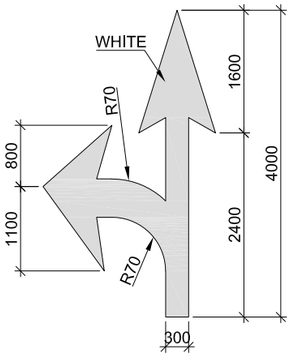
STRAIGHT ARROW



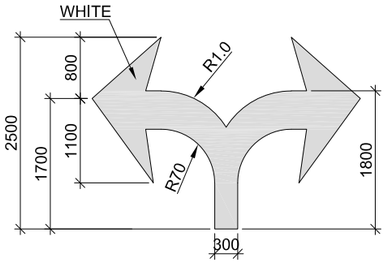
RIGHT TURN ARROW



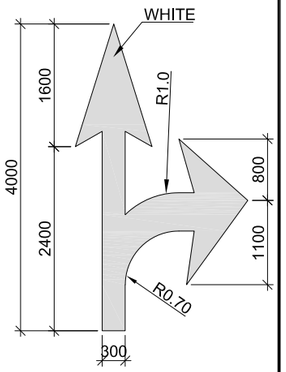
LEFT TURN ARROW



STRAIGHT / LEFT ARROW



LEFT & RIGHT TURN ARROW



STRAIGHT / RIGHT ARROW

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

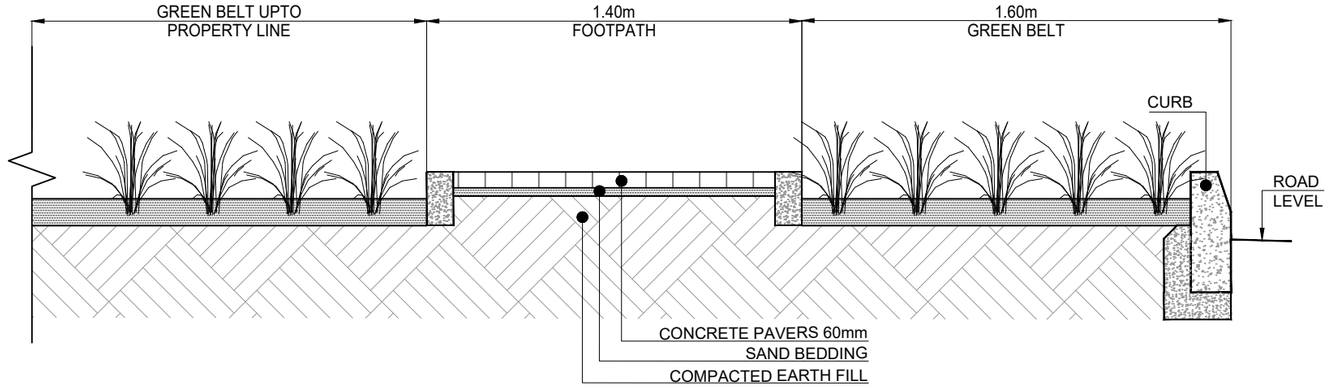
KARACHI INDUSTRIAL PARK SEZ

DRAWN	FAHAD	SCALE	N.T.S
DESIGN	SAIM	DATE	JUN,2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

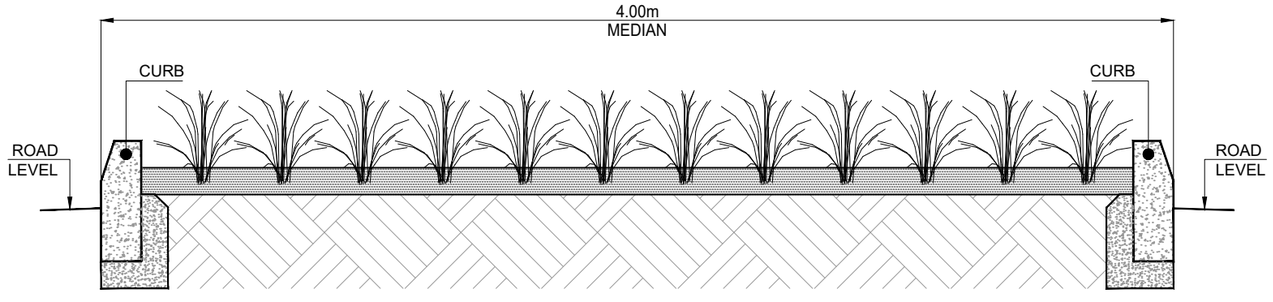
DRAWING TITLE:

PAVEMENT MARKING DETAILS

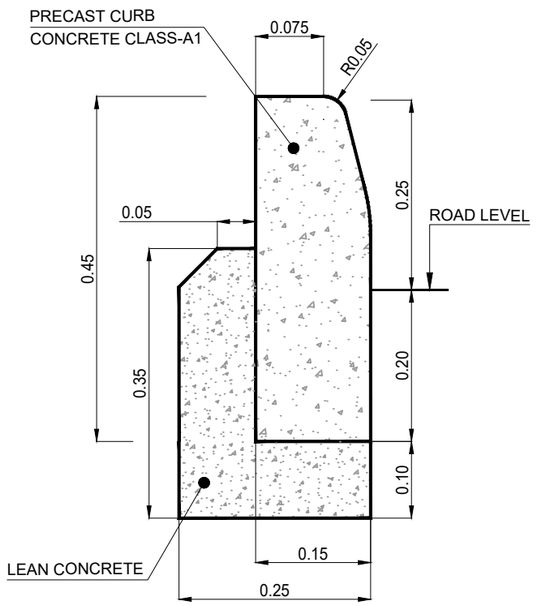
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-H-2001	00



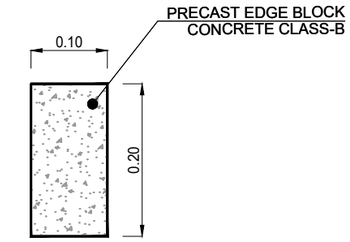
FOOTPATH DETAIL



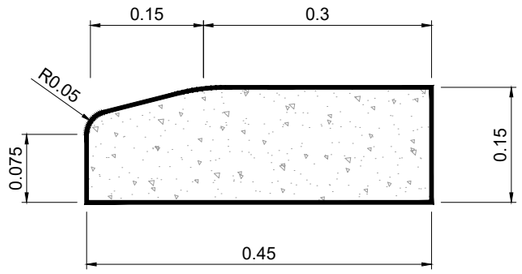
MEDIAN DETAIL



CURB DETAIL



EDGE BLOCK DETAIL



DROP CURB DETAIL

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	FAHAD	SCALE	N.T.S
DESIGN	SAIM	DATE	JUN,2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

MISCELLENEOUS DETAIL

PROJ CODE	DRAWING NO.	REV.
01098	**EA-01098-KIP-H-2002**	00

WARNING SIGNS
SIGN # 01 TO SIGN # 33



1 LEFT BEND
2 RIGHT BEND
3 DOUBLE BEND TO THE RIGHT
4 DOUBLE BEND TO THE LEFT
5 LANE MERGING
6 HUMP/SPEED BREAKER
7 ROAD DIPS
8 DANGEROUS DESCENT
9 STEEP ASCENT
10 LOOSE GRAVEL
11 FALLING ROCK
12 PEDESTRIAN CROSSING
13 CHILDREN CROSSING
14 CYCLISTS
15 CATTLE CROSSING



16 TWO WAY TRAFFIC
17 OTHER RANGERS
18 YIELD TO THE TRAFFIC APPROACHING FROM THE RIGHT ON THE CROSS ROAD
19 YIELD TO THE TRAFFIC APPROACHING FROM THE RIGHT ON ANY LEG OF THE INTERSECTION
20 MINOR CROSS ROAD
21 MINOR CROSS ROAD FROM LEFT
22 MINOR CROSS ROAD FROM RIGHT
23 MINOR CROSS ROAD FROM RIGHT & LEFT RESPECTFULLY
24 MINOR CROSS ROAD FROM LEFT & RIGHT RESPECTFULLY
25 MINOR CROSS ROAD JOINING FROM LEFT
26 MINOR CROSS ROAD JOINING FROM RIGHT
27 MINOR CROSS ROAD ON THE RIGHT
28 MINOR CROSS ROAD ON THE LEFT
29 MAJOR CROSS ROAD
30 NARROW BRIDGE

REGULATORY SIGNS
SIGN # 34 TO SIGN # 49



31 LEVEL CROSSING (NO GATE)
32 LEVEL CROSSING (WITH GATE)
33 ADVANCED DANGER SIGN
34 GIVE WAY SIGN
35 STOP SIGN
36 SLOW SIGN
37 NO ENTRY
38 NO LEFT TURN
39 NO RIGHT TURN
40 NO U - TURN
41 NO OVERTAKING GOODS VEHICLES PROHIBITED
42 OVERTAKING PROHIBITED
43 MAX. SPEED LIMIT Km.
43 MAX. SPEED LIMIT Km.
43 MAX. SPEED LIMIT Km.



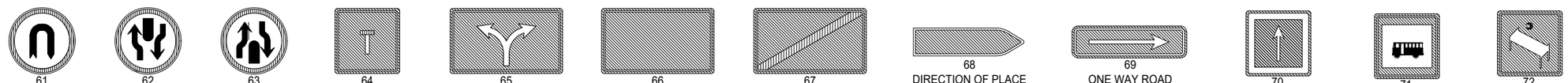
44 AUDIBLE WARNING DEVICES PROHIBITED
45 RAMP AHEAD

MANDATORY SIGNS
SIGN # 50 TO SIGN # 64

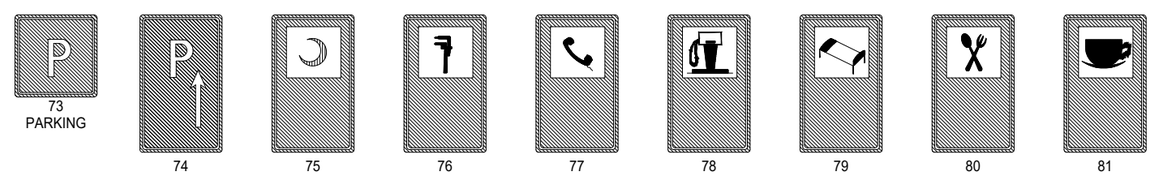


46 PARKING PROHIBITED
47 END OF PROHIBITIONS OF OVERTAKING
48 END OF SPEED LIMIT IMPOSED
49 END OF ALL PROHIBITION IMPOSED
50 GO STRAIGHT AHEAD
51 LANE DIVERGING
52 TURN TO THE LEFT
53 TURN TO THE RIGHT
54 TURN TO HE LEFT
55 GO STRAIGHT OR RIGHT
56 GO STRAIGHT OR LEFT
57 KEEP TO HE RIGHT
58 KEEP TO LEFT
59 COMPULSORY ROUNDABOUT
60 LANE CONTROL SIGN

INFORMATIVE SIGNS
SIGN # 65 TO SIGN # 81



61 PERMISSIBLE U-TURN
62 DUAL CARRIAGEWAY AHEAD
63 DUAL CARRIAGEWAY END
64 DEAD END ROAD
65 ADVANCED DIRECTION SIGN
66 BEGINNING OF BUILT UP AREA
67 END OF BUILT AREA
68 DIRECTION OF PLACE
69 ONE WAY ROAD
70 ONE WAY ROAD
71 BUS STOP
72 HOSPITAL



73 PARKING
74 PARKING PLACE INDICATED
75 FIRST AID STATION
76 BREAKDOWN SERVICE
77 TELEPHONE
78 FILLING STATION
79 HOTEL OR MOTEL
80 RESTAURANT
81 CAFETERIA

KEY PLAN



NOTE:

LEGEND:

CLIENT:
PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm JV-Team

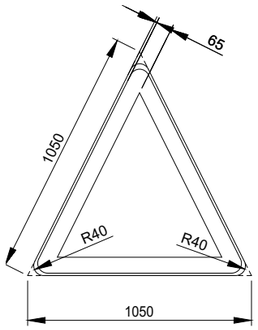
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00	ISSUED FOR TENDER	JUN,2025

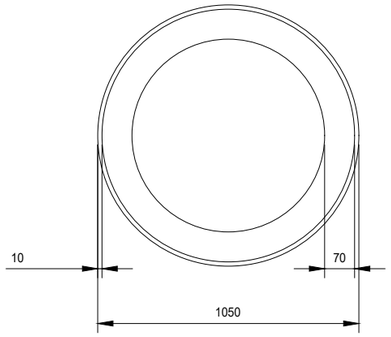
PROJECT:
KARACHI INDUSTRIAL PARK SEZ

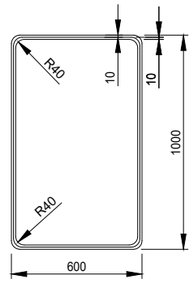
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DESIGN	SAIM	DATE	JUN,2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
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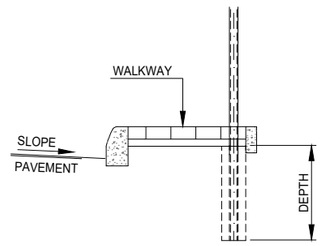
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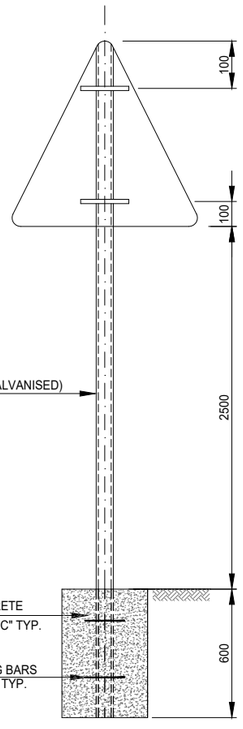
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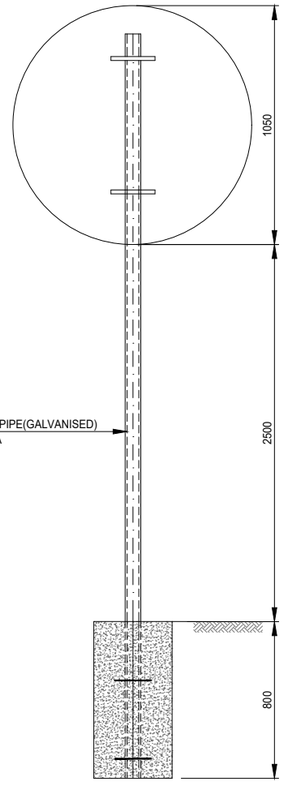


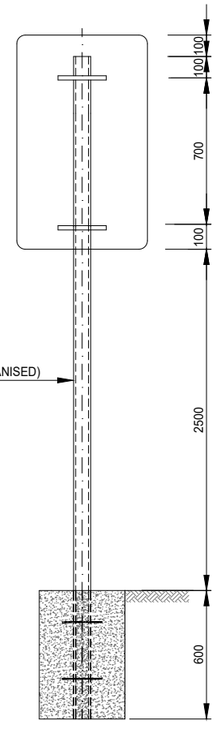


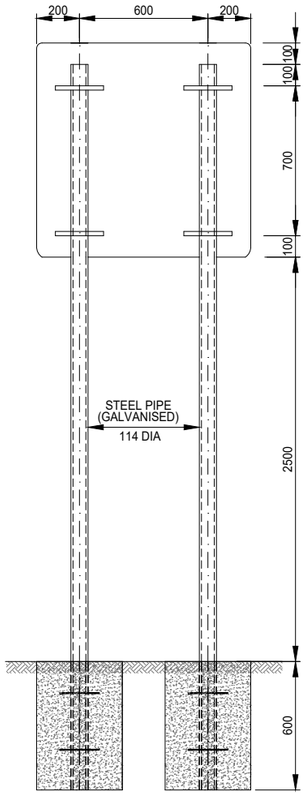


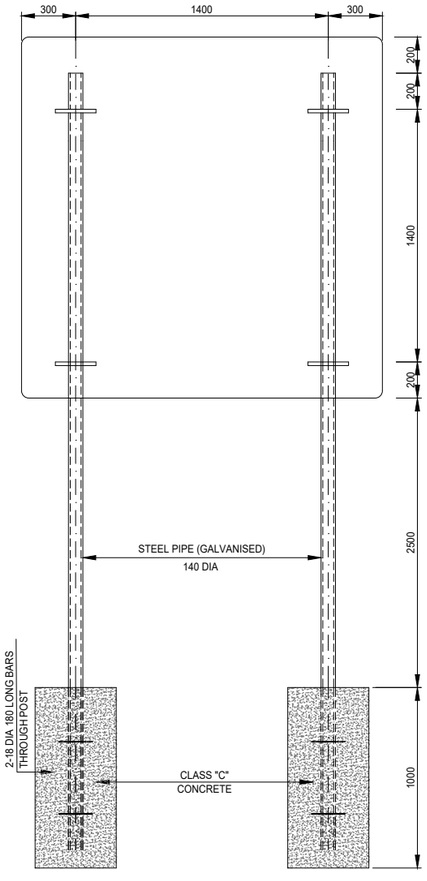


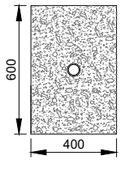


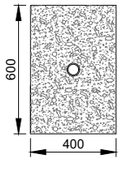


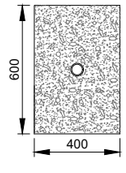


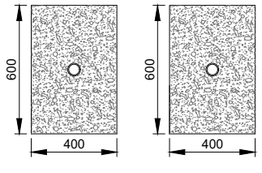


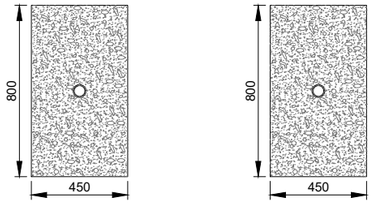












CATEGORY - 1

CATEGORY - 2

CATEGORY - 3a

CATEGORY - 3b

CATEGORY - 3c

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	FAHAD	SCALE	N.T.S
DESIGN	SAIM	DATE	JUN,2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

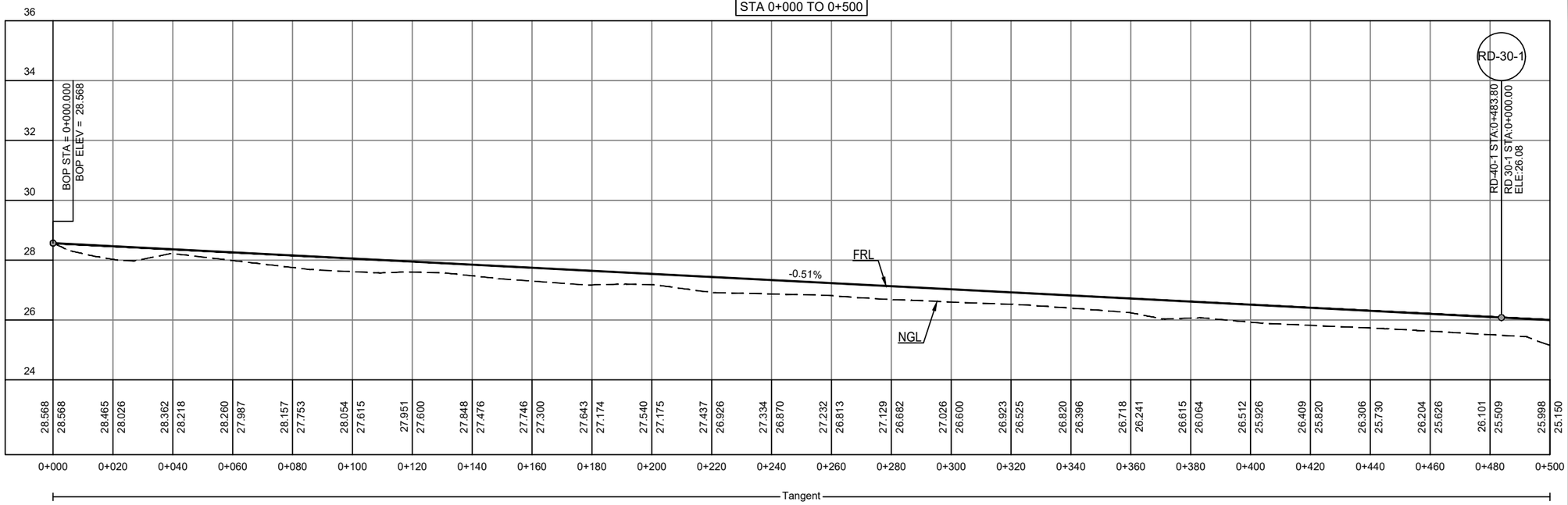
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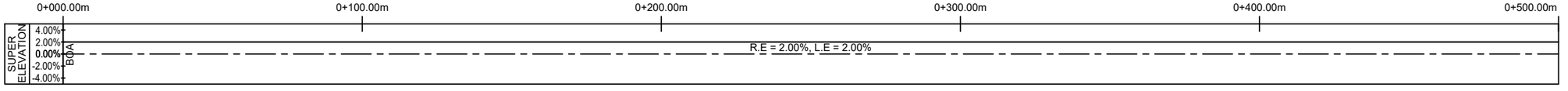
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PROJ CODE	DRAWING NO.	REV.
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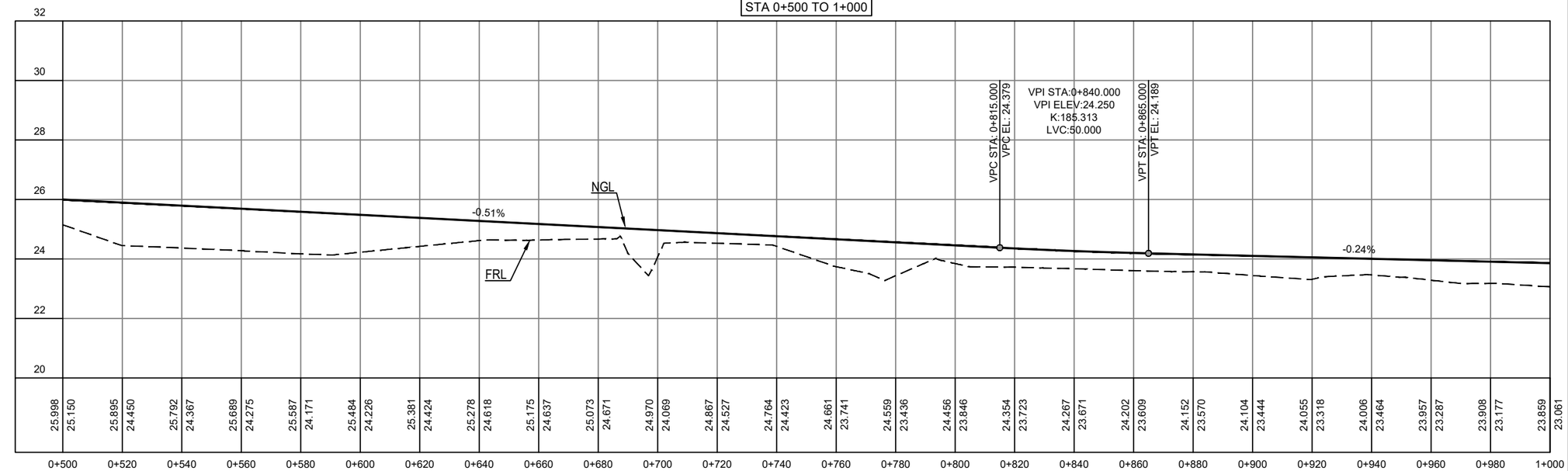
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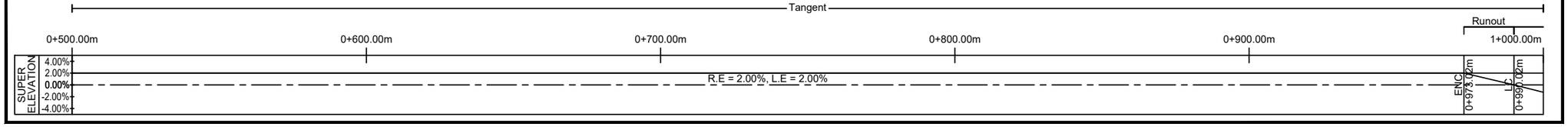
RD-40-1
STA 0+000 TO 0+500



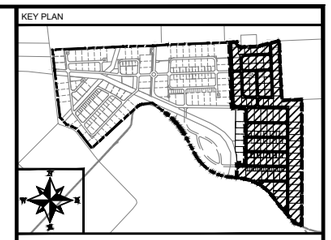


RD-40-1
STA 0+500 TO 1+000





KEY PLAN



NOTE:

LEGEND:

NGL

FRL

FRL / NGL

CHAINAGE

ABBREVIATIONS

FRL = FINISHED GROUND LEVEL
NGL = NATURAL GROUND LEVEL

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

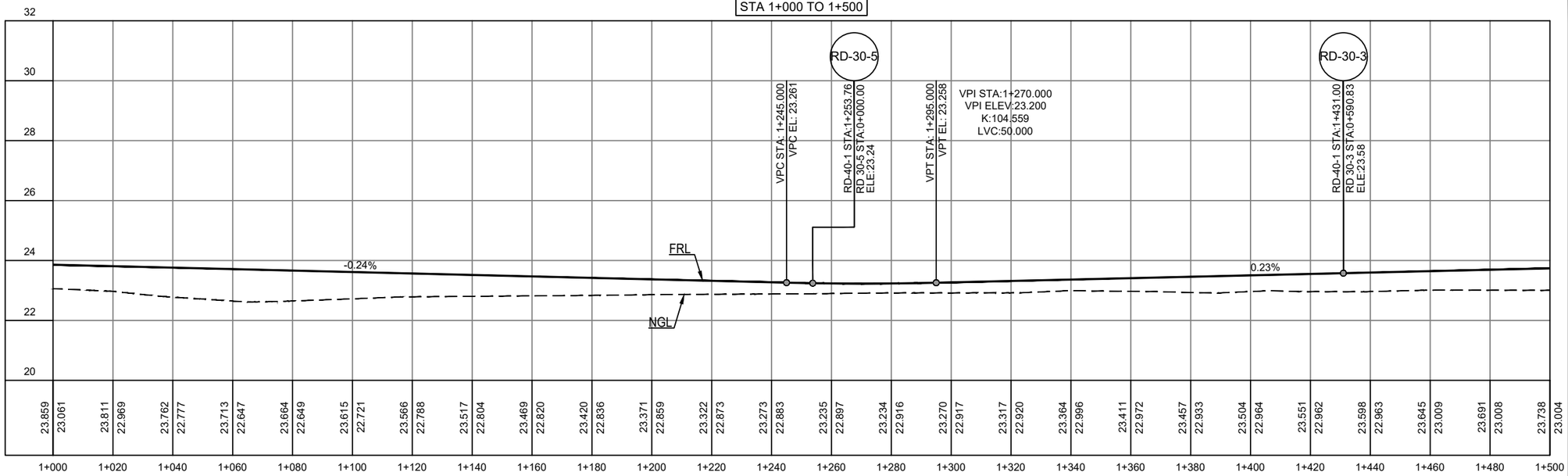
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DESIGN	SAIM	DATE	JUN,2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

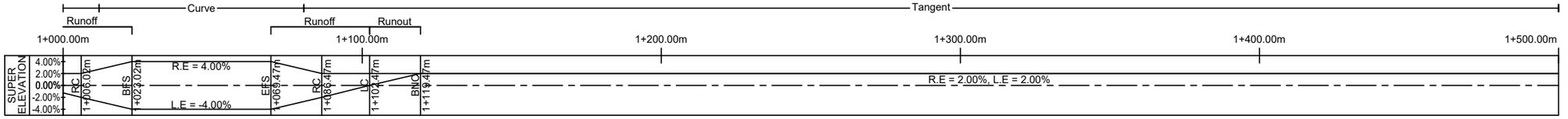
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PROFILES SHEET - 01
RD 40-1 STA: 0+000 TO 1+000

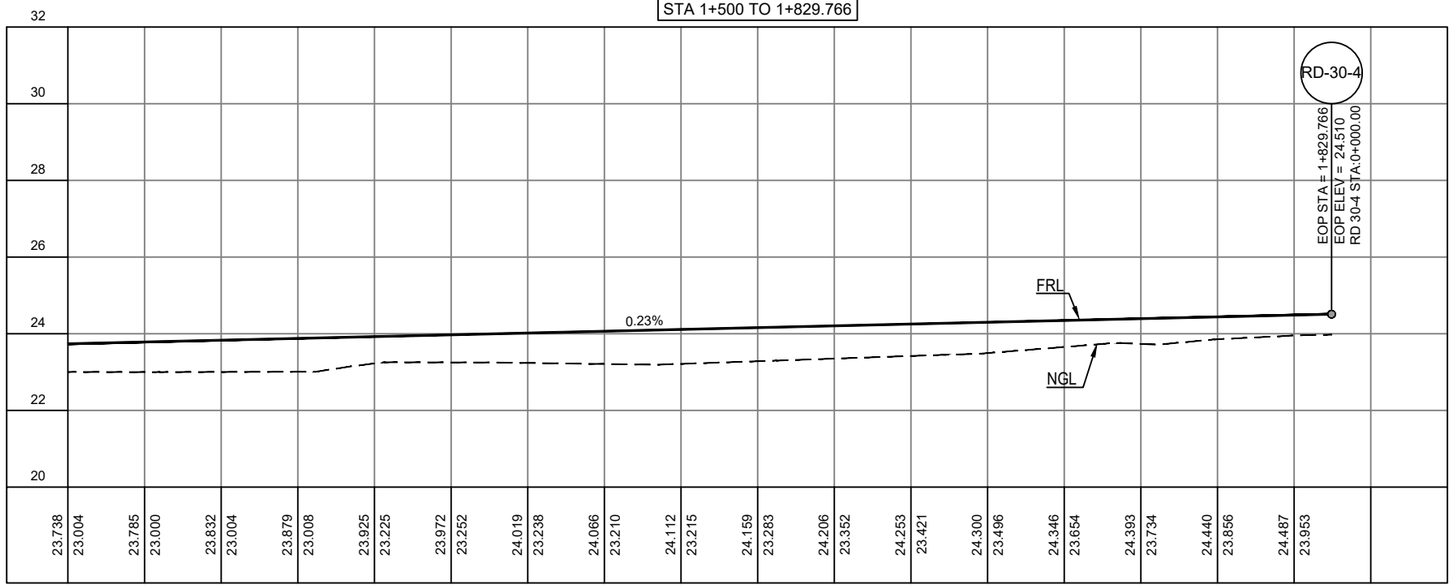
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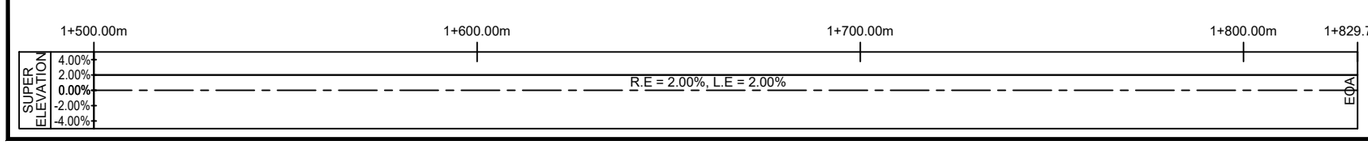
RD-40-1
STA 1+000 TO 1+500



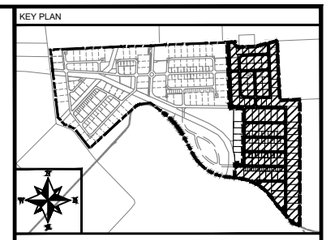


RD-40-1
STA 1+500 TO 1+829.766





KEY PLAN



NOTE:

LEGEND:

NGL

FRL

FRL / NGL

CHAINAGE

ABBREVIATIONS

FRL = FINISHED GROUND LEVEL
NGL = NATURAL GROUND LEVEL

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

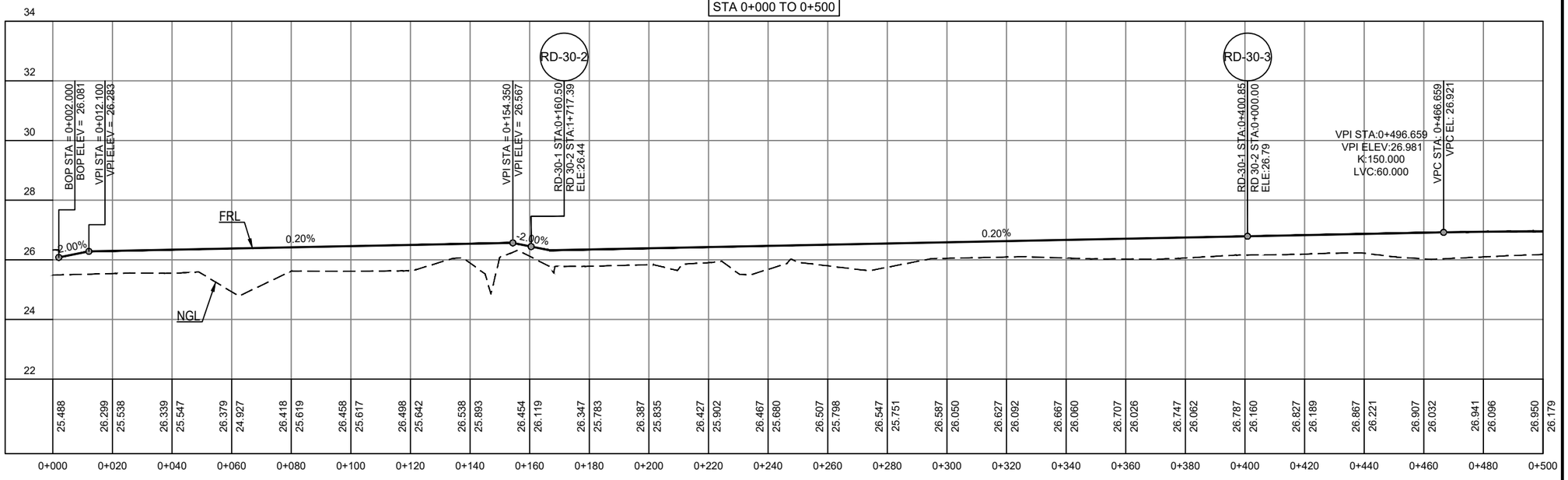
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DESIGN	SAIM	DATE	JUN,2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

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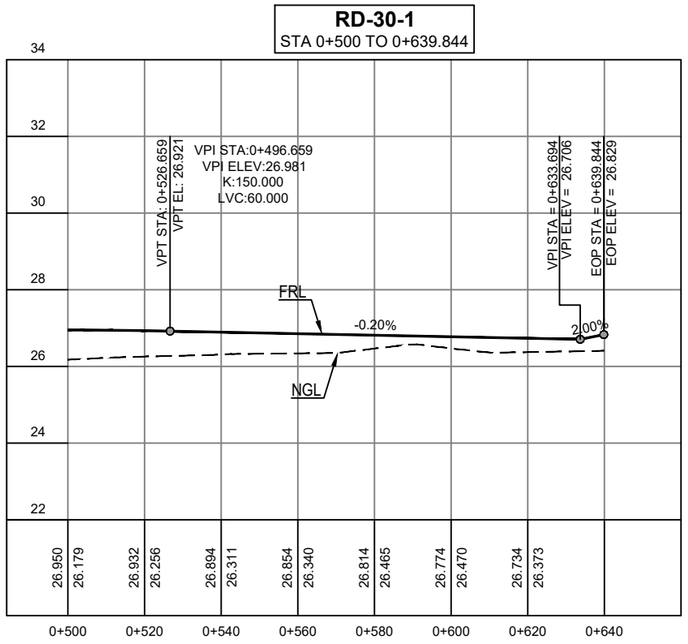
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RD 40-1 STA: 1+000 TO 1+829.766

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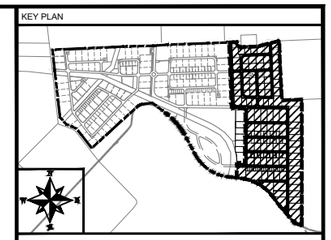
RD-30-1
STA 0+000 TO 0+500



RD-30-1
STA 0+500 TO 0+639.844



KEY PLAN



NOTE:

LEGEND:

NGL

FRL

FRL / NGL
CHAINAGE

ABBREVIATIONS

FRL = FINISHED GROUND LEVEL
NGL = NATURAL GROUND LEVEL

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

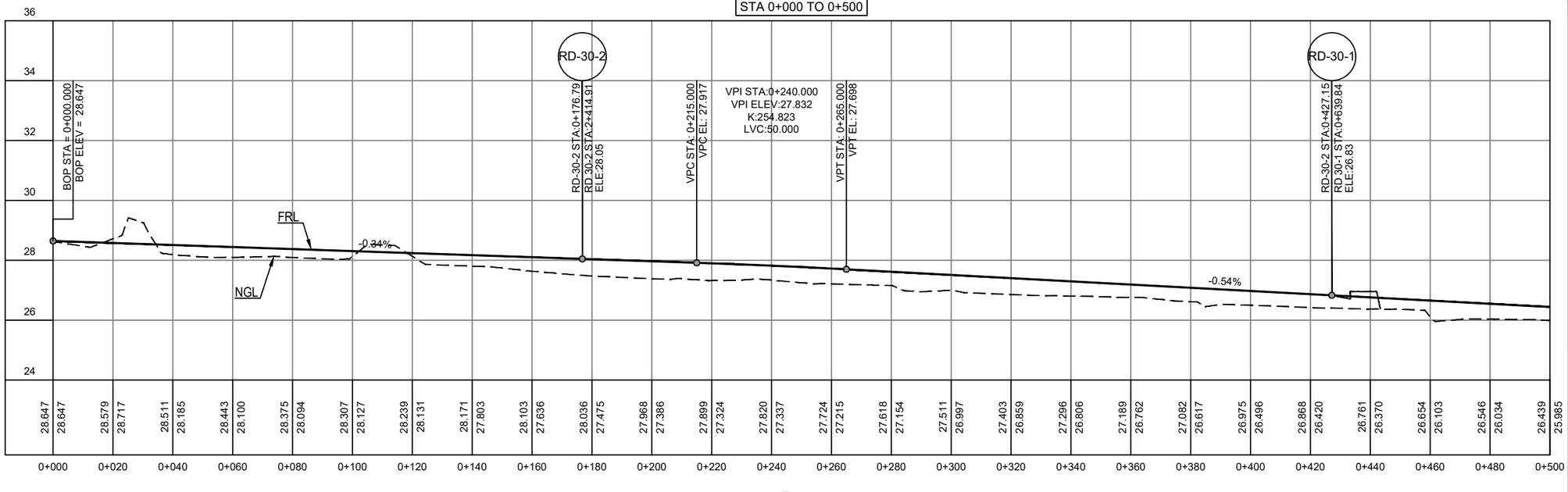
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CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

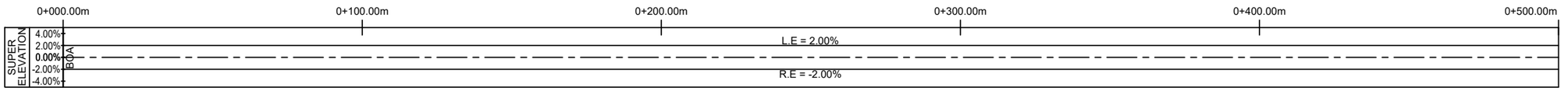
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RD 30-1 STA: 0+000 TO 0+639.844

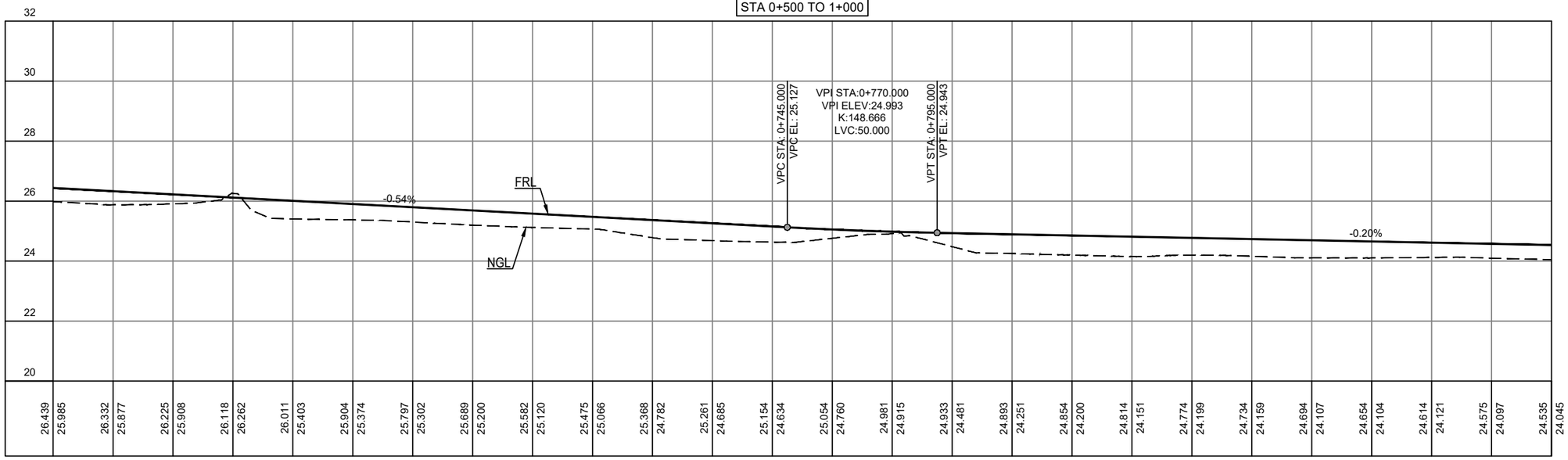
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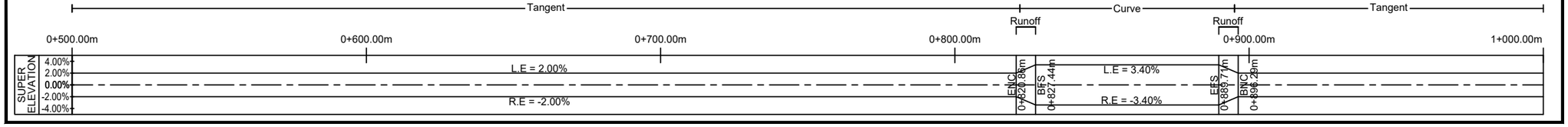
RD-30-2
STA 0+000 TO 0+500



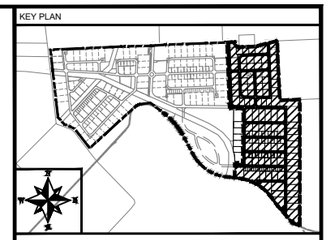


RD-30-2
STA 0+500 TO 1+000





KEY PLAN



NOTE:

LEGEND:

NGL

FRL

FRL / NGL

CHAINAGE

ABBREVIATIONS

FRL = FINISHED GROUND LEVEL
NGL = NATURAL GROUND LEVEL

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — SURBANA JURONG — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

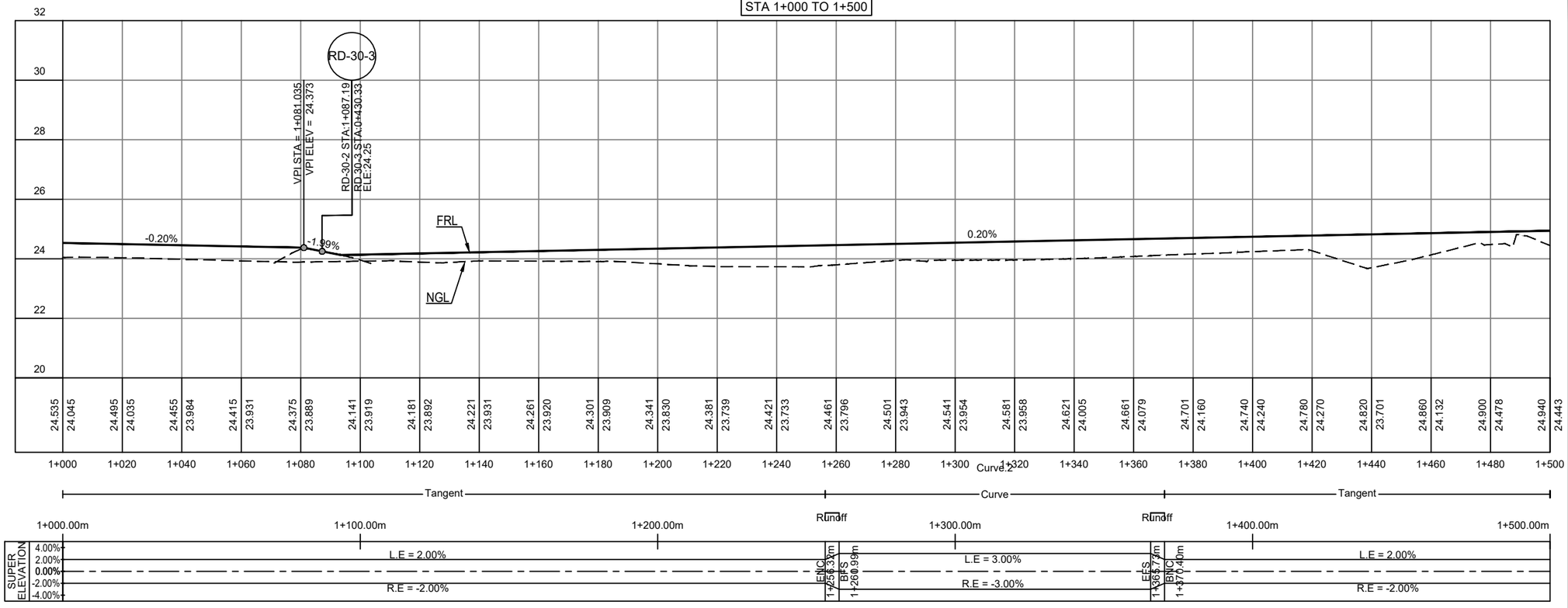
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DESIGN	SAIM	DATE	JUN,2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

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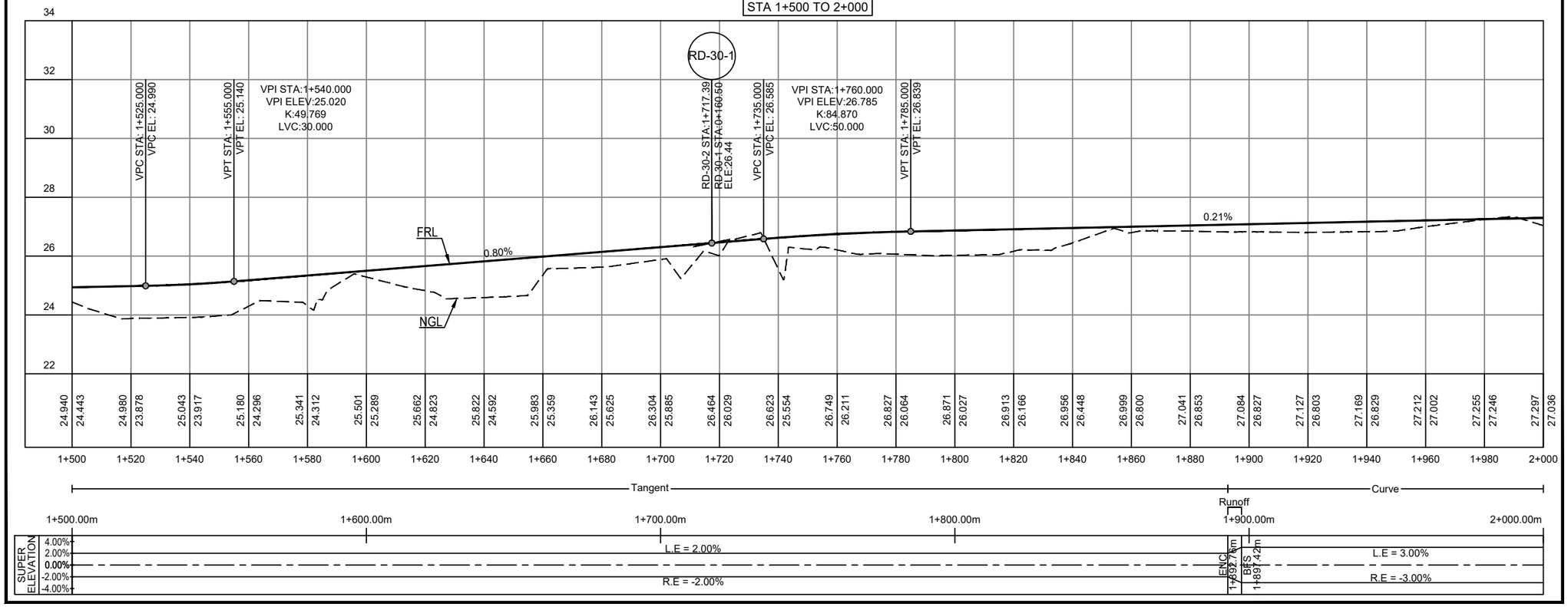
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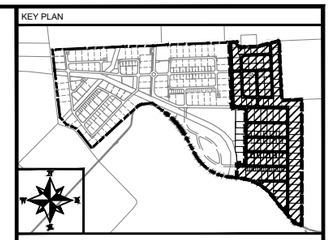
RD-30-2
STA 1+000 TO 1+500



RD-30-2
STA 1+500 TO 2+000



KEY PLAN



NOTE:

LEGEND:

NGL

FRL

FRL / NGL

CHAINAGE

ABBREVIATIONS

FRL = FINISHED GROUND LEVEL
NGL = NATURAL GROUND LEVEL

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

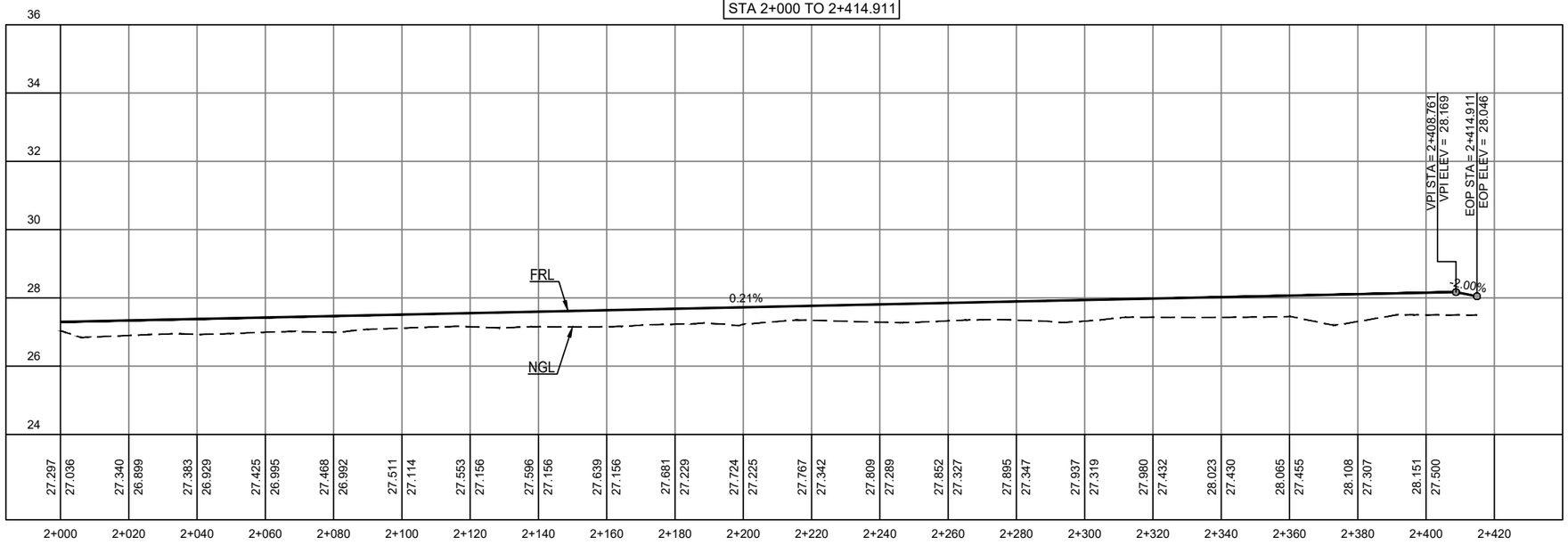
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APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

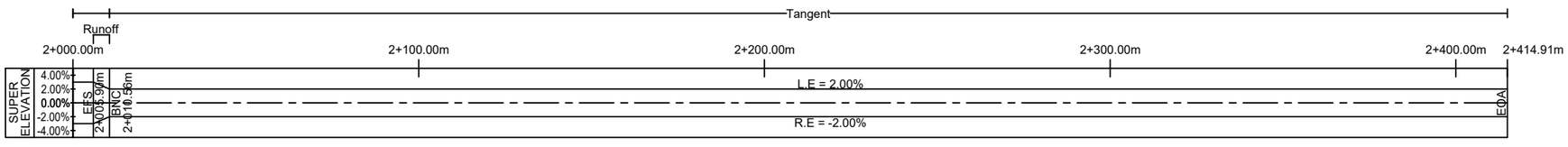
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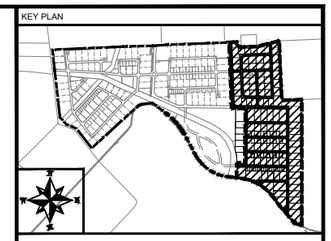
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01098	EA-1098-KIP-H-PP-3004	00

RD-30-2
STA 2+000 TO 2+414.911





KEY PLAN



NOTE:

LEGEND:

NGL

FRL

FRL / NGL

CHAINAGE

ABBREVIATIONS

FRL = FINISHED GROUND LEVEL
NGL = NATURAL GROUND LEVEL

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

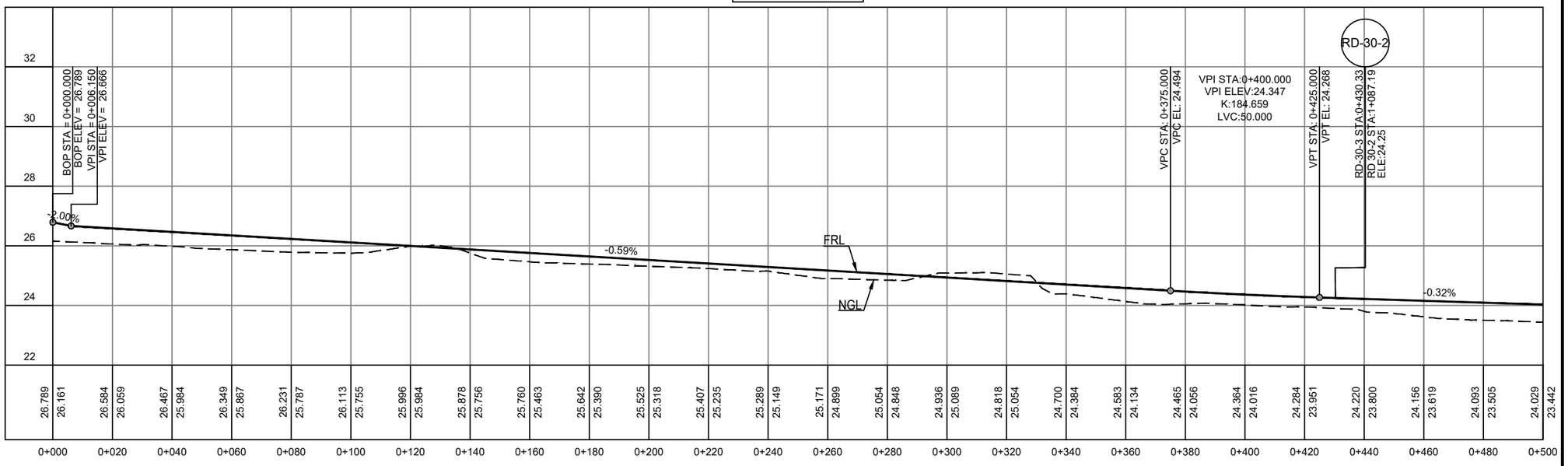
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DESIGN	SAIM	DATE	JUN,2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

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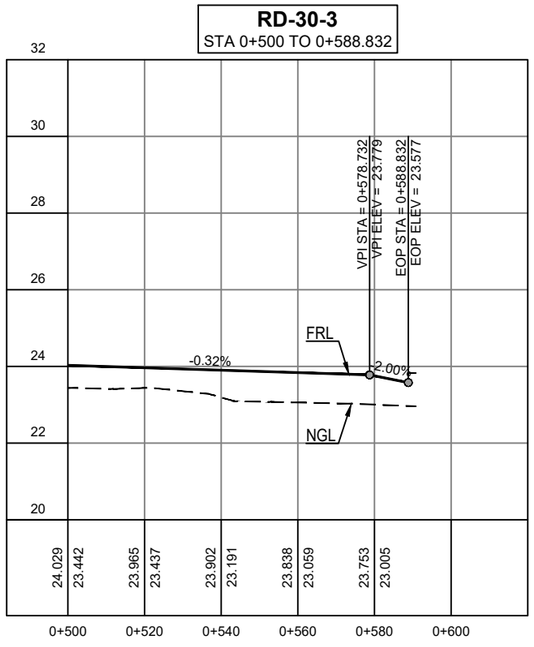
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RD 30-2 STA: 2+000 TO 2+414.911

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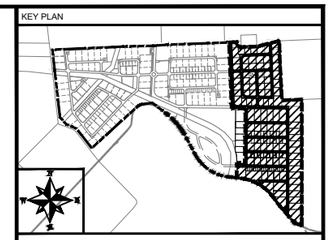
RD-30-3
STA 0+000 TO 0+500



RD-30-3
STA 0+500 TO 0+588.832



KEY PLAN



NOTE:

LEGEND:

NGL

FRL

FRL / NGL

CHAINAGE

ABBREVIATIONS

FRL = FINISHED GROUND LEVEL
NGL = NATURAL GROUND LEVEL

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

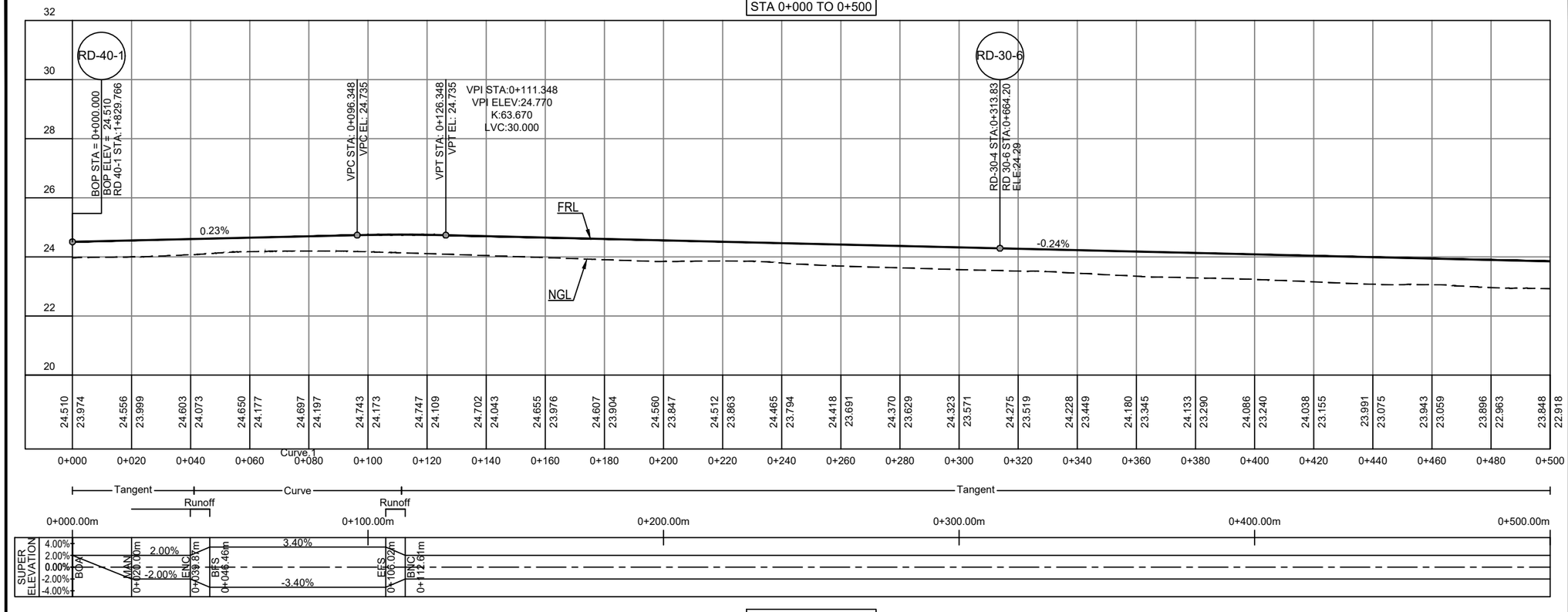
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DESIGN	SAIM	DATE	JUN,2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

PROFILES SHEET - 07
RD 30-3 STA: 0+000 TO 0+588.832

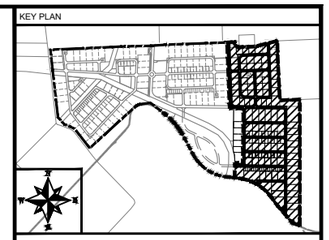
PROJ CODE	DRAWING NO.	REV.
01098	**EA-1098-KIP-H-PP-3006**	00

RD-30-4
STA 0+000 TO 0+500



RD-30-4
STA 0+500 TO 1+000

KEY PLAN



NOTE:

LEGEND:

NGL

FRL

FRL / NGL

CHAINAGE

ABBREVIATIONS

FRL = FINISHED GROUND LEVEL
NGL = NATURAL GROUND LEVEL

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

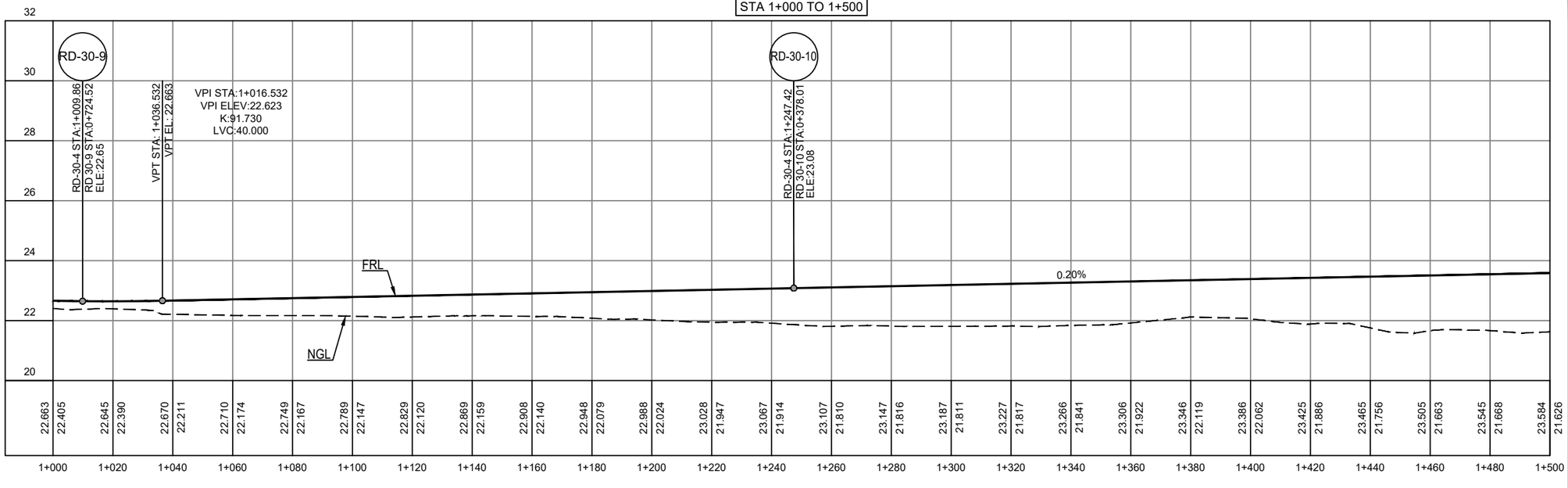
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CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

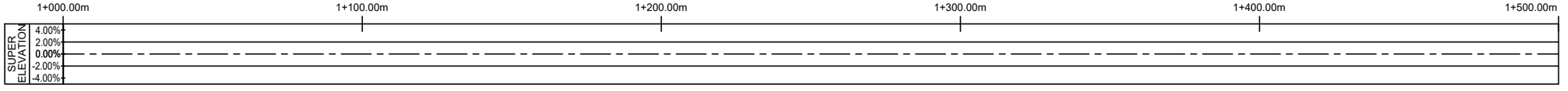
DRAWING TITLE:

PROFILES SHEET - 08
RD 30-4 STA: 0+000 TO 1+000

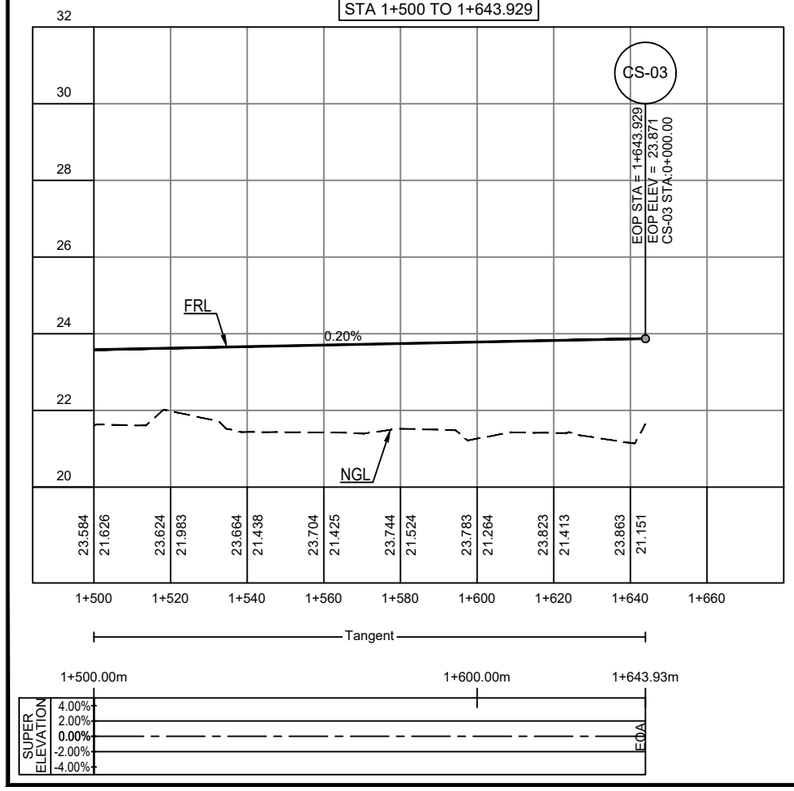
PROJ CODE	DRAWING NO.	REV.
01098	**EA-1098-KIP-H-PP-3007**	00

RD-30-4
STA 1+000 TO 1+500

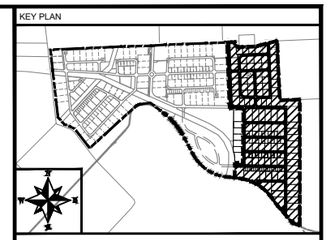




RD-30-4
STA 1+500 TO 1+643.929



KEY PLAN



NOTE:

LEGEND:

NGL

FRL

FRL / NGL
CHAINAGE

ABBREVIATIONS

FRL = FINISHED GROUND LEVEL
NGL = NATURAL GROUND LEVEL

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

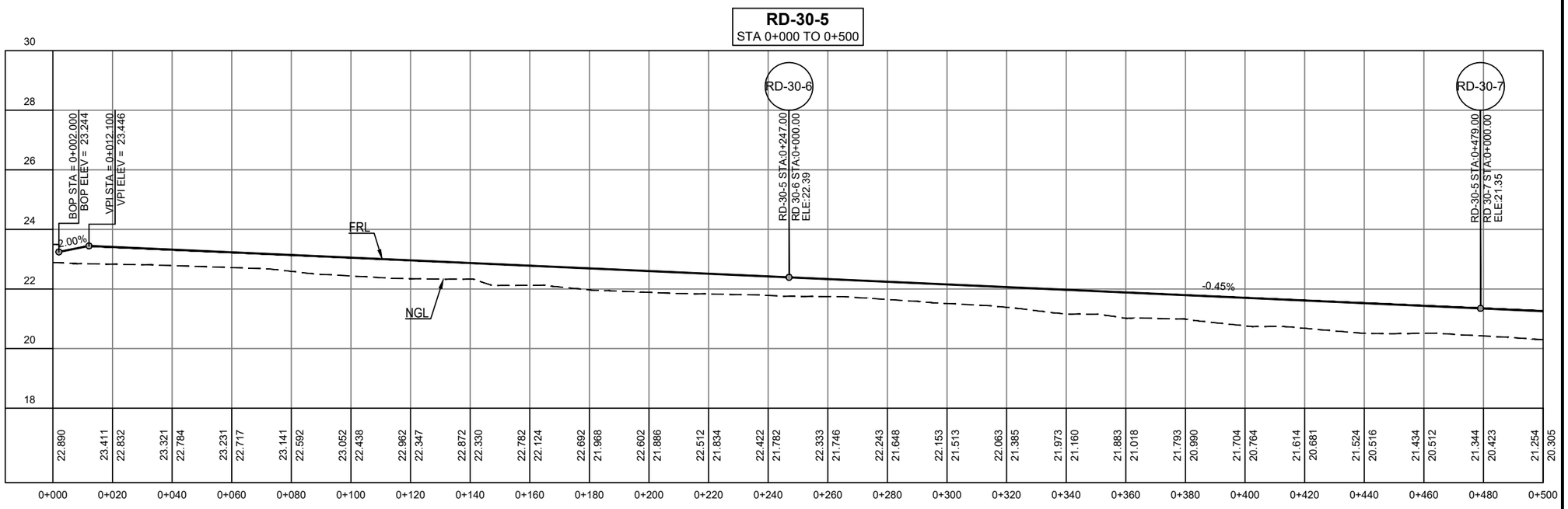
KARACHI INDUSTRIAL PARK SEZ

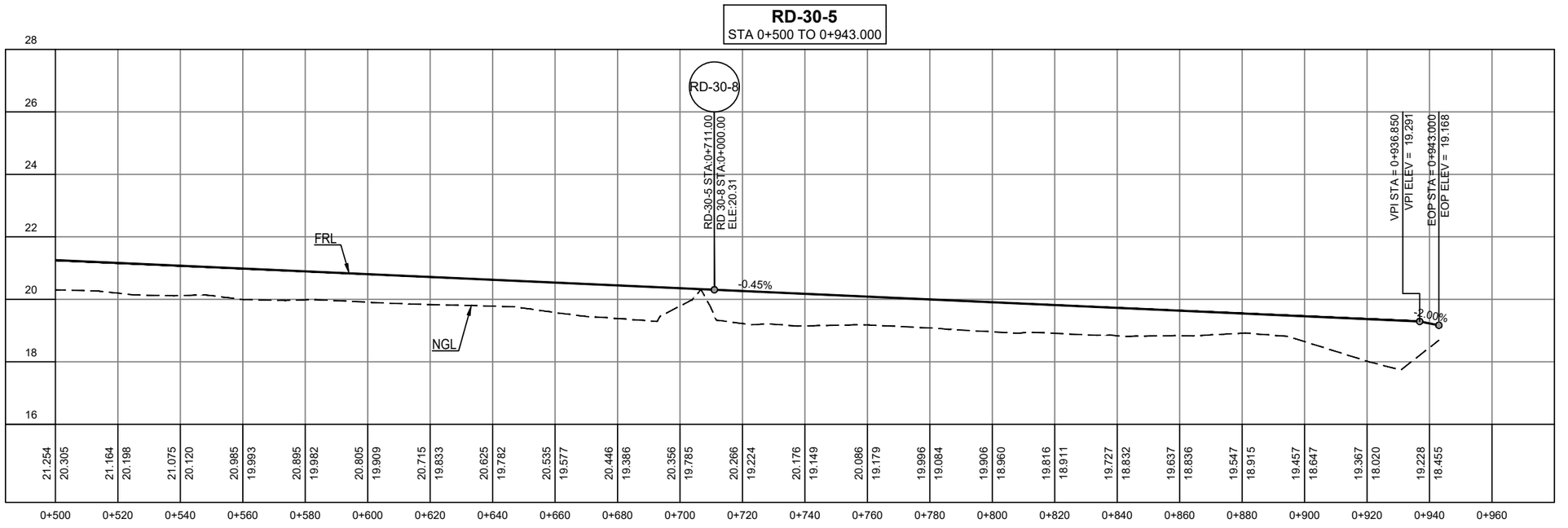
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DESIGN	SAIM	DATE	JUN,2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

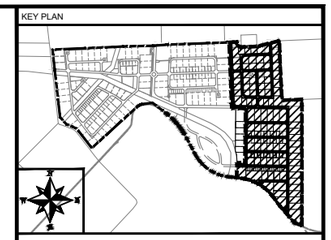
PROFILES SHEET - 09
RD 30-4 STA: 1+000 TO 1+643.929

PROJ CODE	DRAWING NO.	REV.
01098	**EA-1098-KIP-H-PP-3008**	00





KEY PLAN



NOTE:

LEGEND:

NGL

FRL

FRL / NGL
CHAINAGE

ABBREVIATIONS

FRL = FINISHED GROUND LEVEL
NGL = NATURAL GROUND LEVEL

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

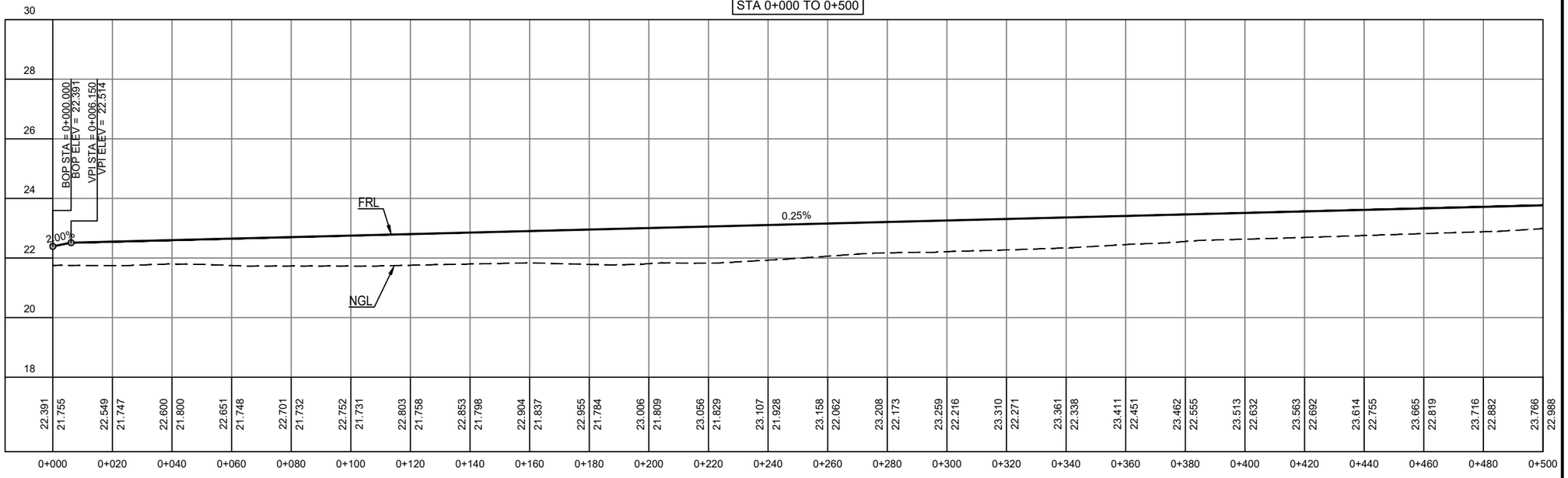
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DESIGN	SAIM	DATE	JUN,2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

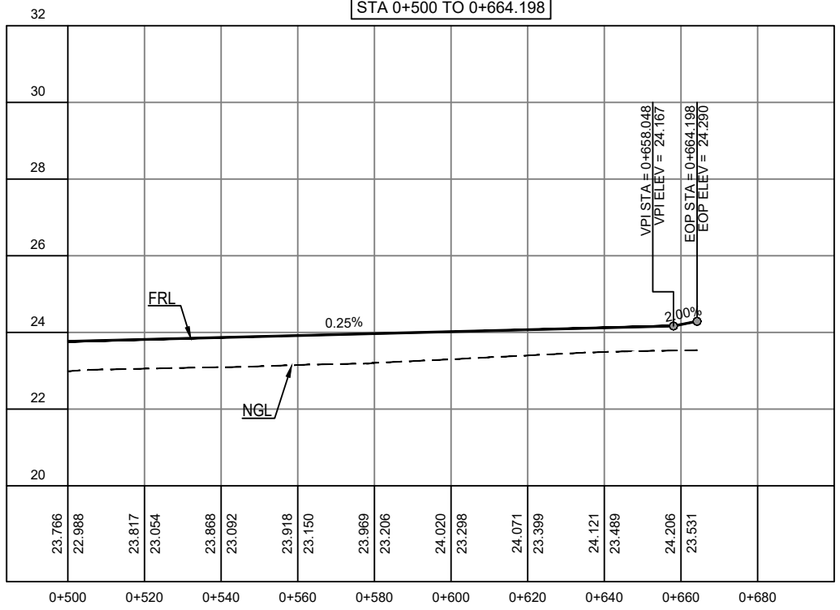
PROFILES SHEET - 10
RD 30-5 STA: 0+000 TO 0+943.000

PROJ CODE	DRAWING NO.	REV.
01098	**EA-1098-KIP-H-PP-3009**	00

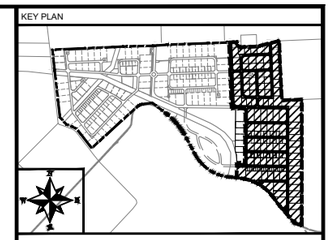
RD-30-6
STA 0+000 TO 0+500



RD-30-6
STA 0+500 TO 0+664.198



KEY PLAN



NOTE:

LEGEND:

NGL

FRL

FRL / NGL
CHAINAGE

ABBREVIATIONS

FRL = FINISHED GROUND LEVEL
NGL = NATURAL GROUND LEVEL

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

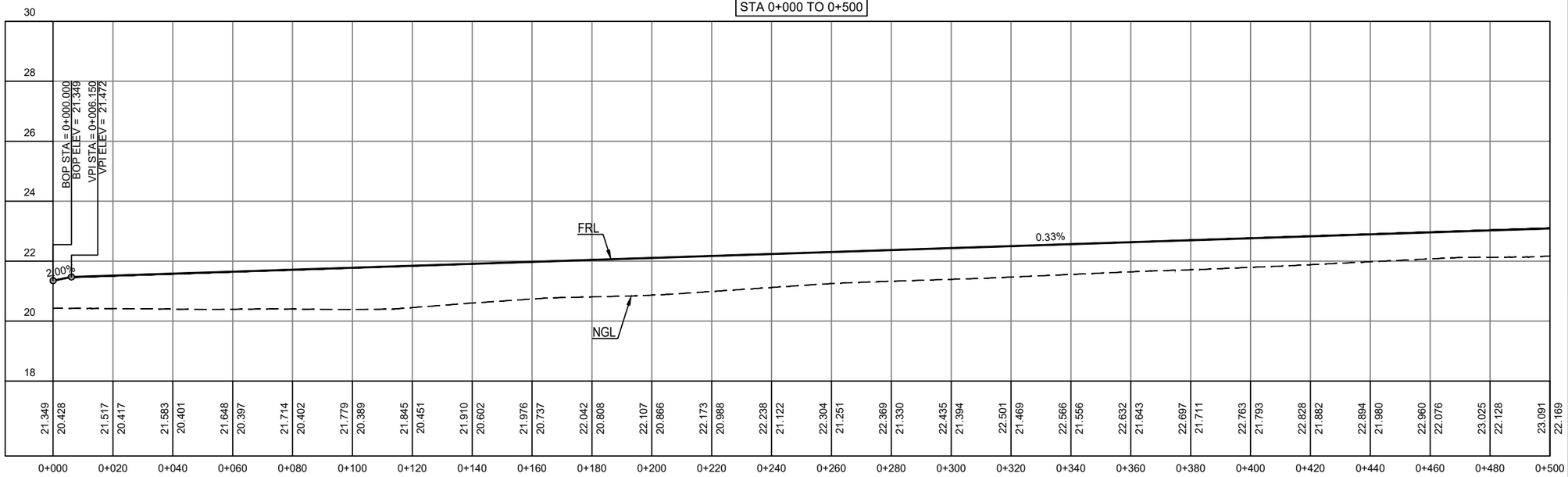
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DESIGN	SAIM	DATE	JUN,2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

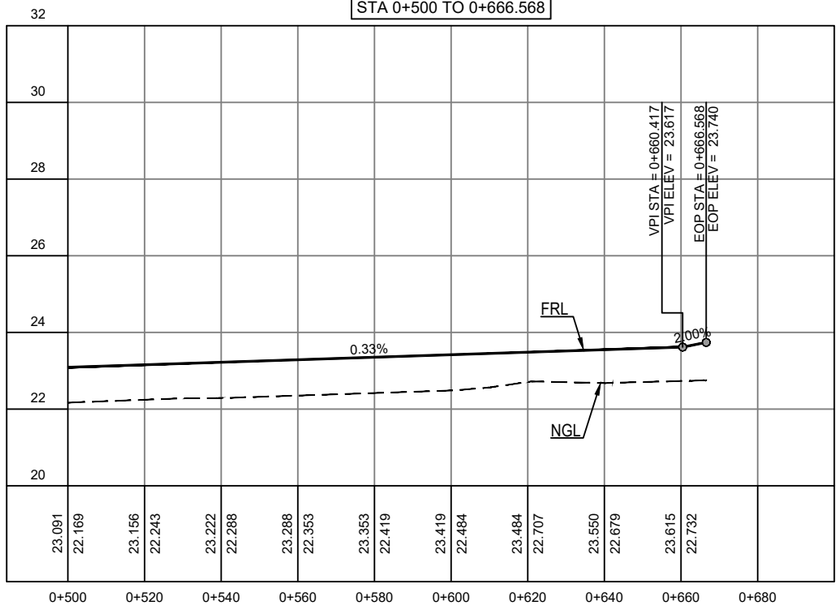
PROFILES SHEET - 11
RD 30-6 STA: 0+000 TO 0+664.198

PROJ CODE	DRAWING NO.	REV.
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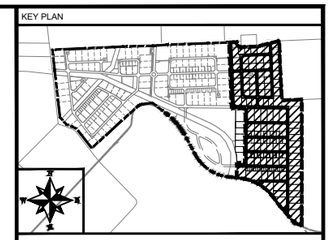
RD-30-7
STA 0+000 TO 0+500



RD-30-7
STA 0+500 TO 0+666.568



KEY PLAN



NOTE:

LEGEND:

NGL

FRL

FRL / NGL
CHAINAGE

ABBREVIATIONS

FRL = FINISHED GROUND LEVEL
NGL = NATURAL GROUND LEVEL

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

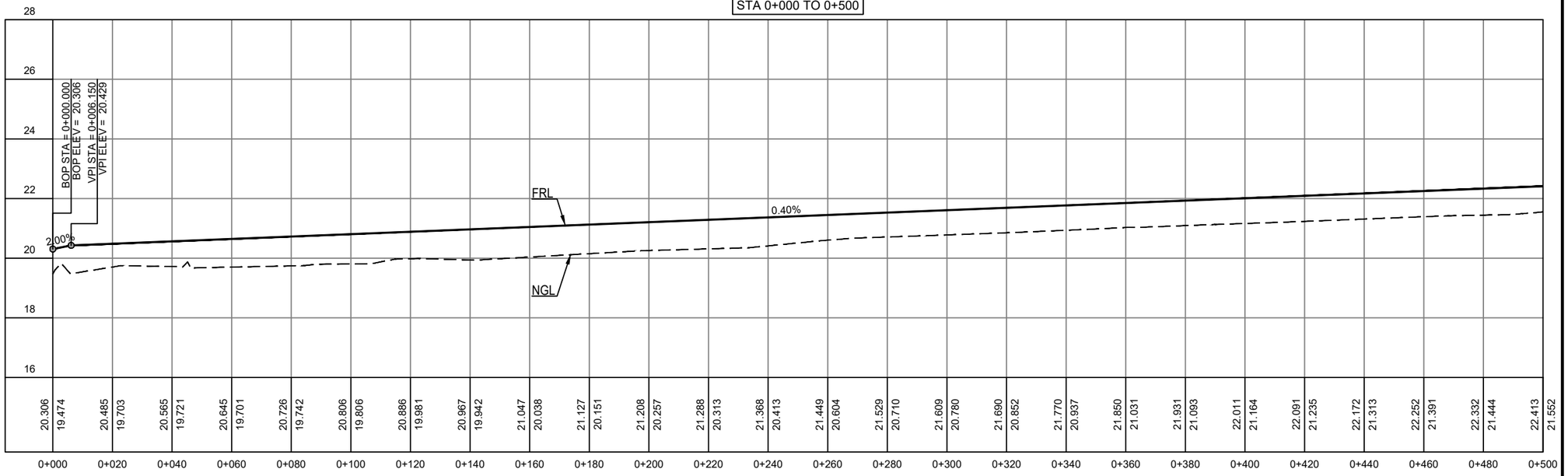
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DESIGN	SAIM	DATE	JUN,2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

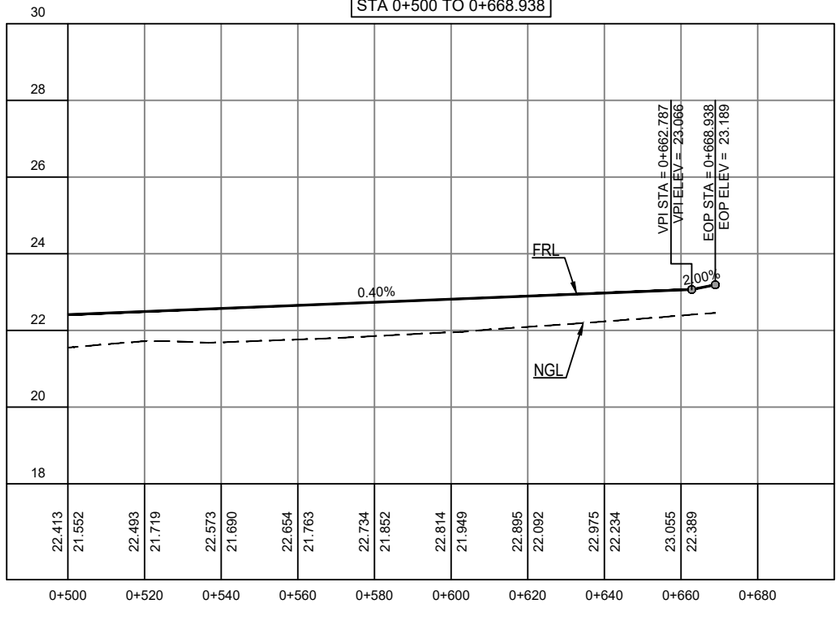
PROFILES SHEET - 12
RD 30-7 STA: 0+000 TO 0+666.568

PROJ CODE	DRAWING NO.	REV.
01098	**EA-1098-KIP-H-PP-3011**	00

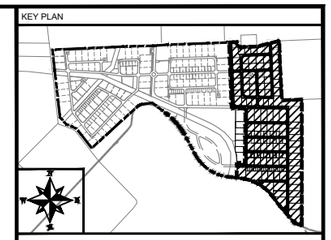
RD-30-8
STA 0+000 TO 0+500



RD-30-8
STA 0+500 TO 0+668.938



KEY PLAN



NOTE:

LEGEND:

NGL

FRL

FRL / NGL
CHAINAGE

ABBREVIATIONS

FRL = FINISHED GROUND LEVEL
NGL = NATURAL GROUND LEVEL

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

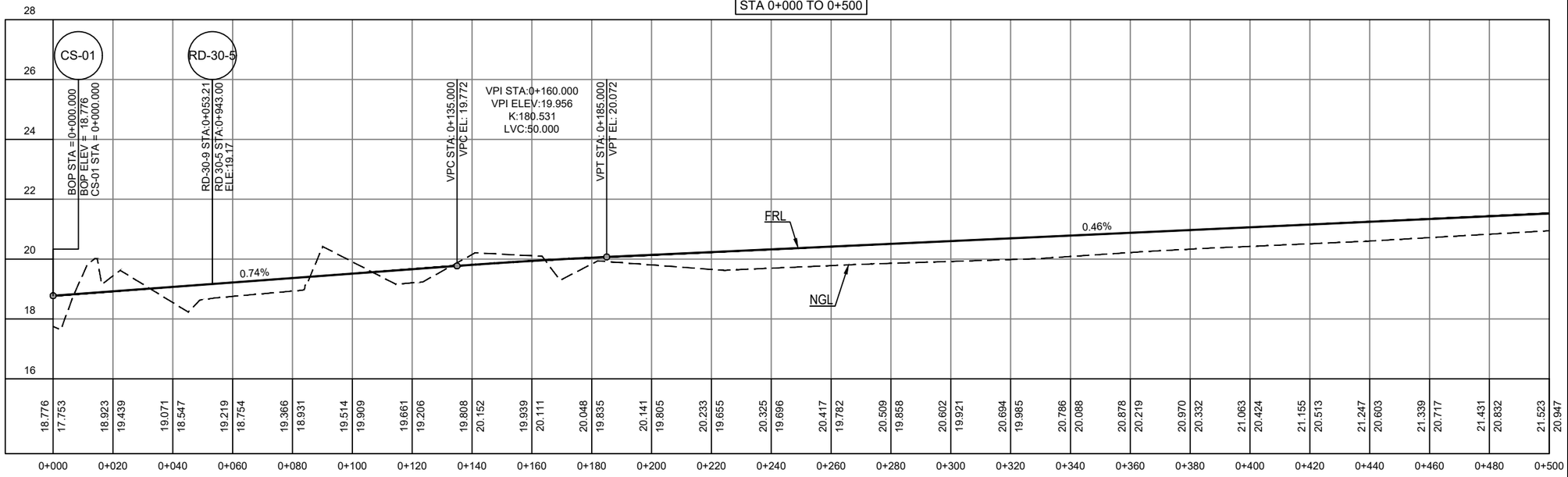
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DESIGN	SAIM	DATE	JUN,2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

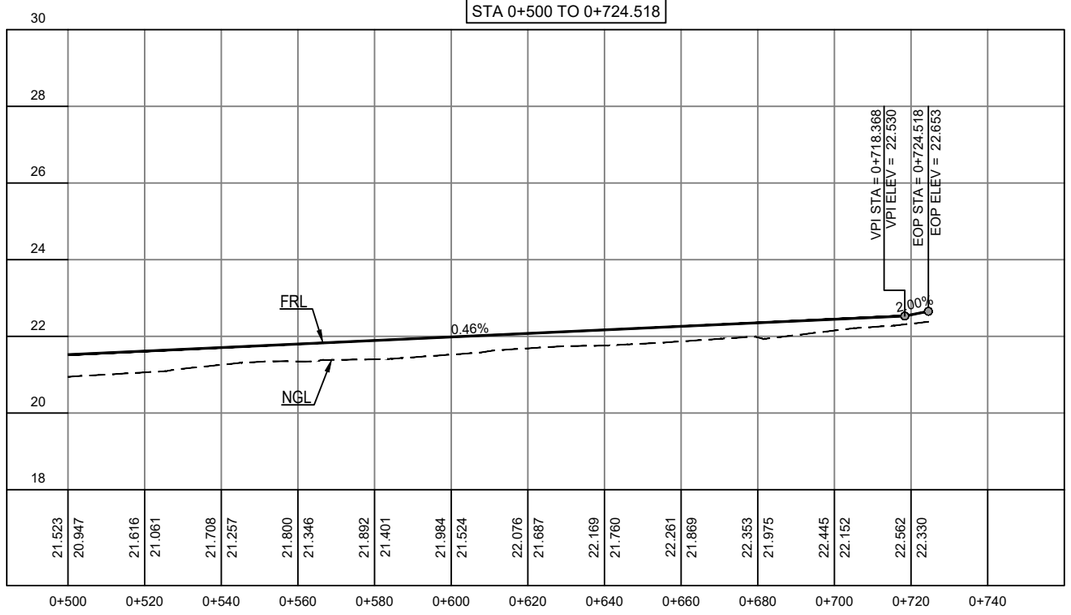
PROFILES SHEET - 13
RD 30-8 STA: 0+000 TO 0+668.938

PROJ CODE	DRAWING NO.	REV.
01098	**EA-1098-KIP-H-PP-3012**	00

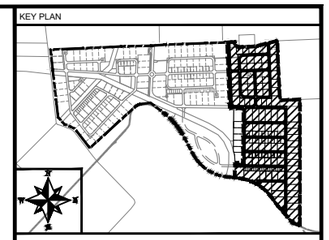
RD-30-9
STA 0+000 TO 0+500



RD-30-9
STA 0+500 TO 0+724.518



KEY PLAN



NOTE:

LEGEND:

NGL
FRL
FRL / NGL
CHAINAGE

ABBREVIATIONS

FRL = FINISHED GROUND LEVEL
NGL = NATURAL GROUND LEVEL

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

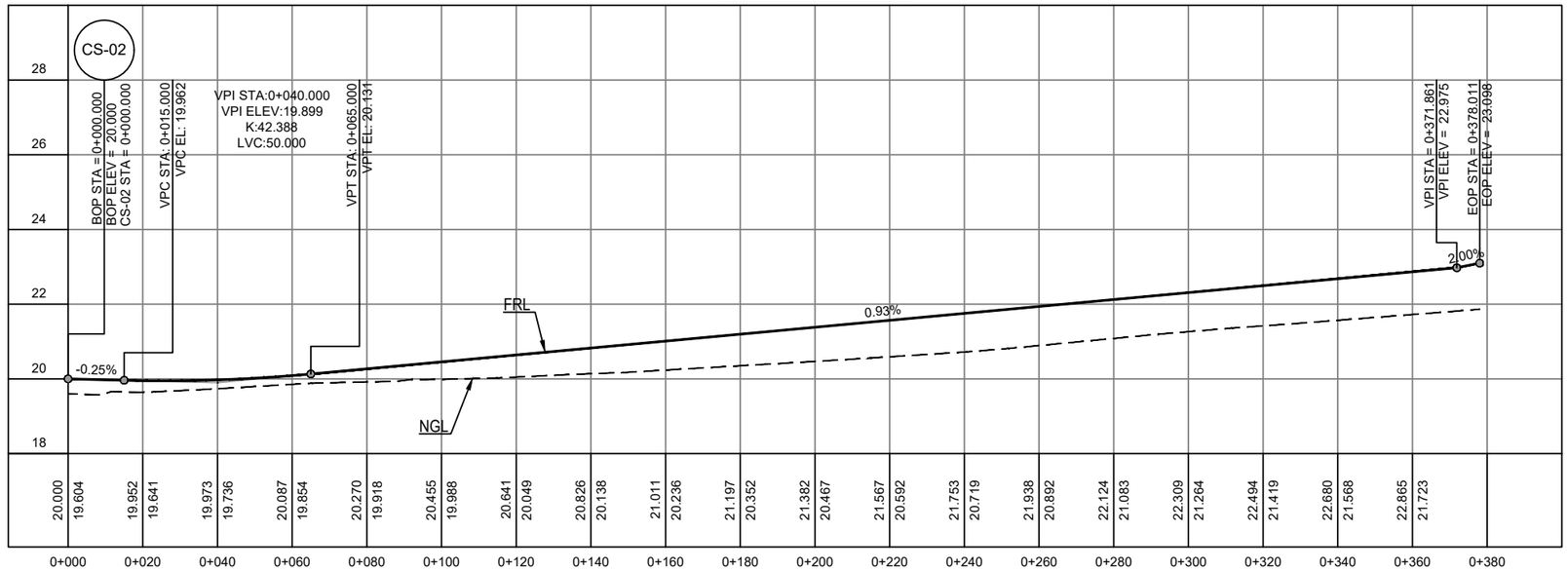
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DESIGN	SAIM	DATE	JUN,2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

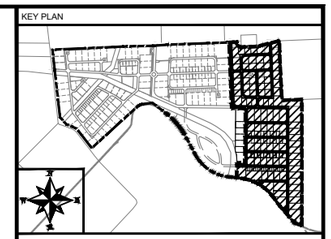
PROFILES SHEET - 14
RD 30-9 STA: 0+000 TO 0+724.518

PROJ CODE	DRAWING NO.	REV.
01098	EA-1098-KIP-H-PP-3013	00

RD-30-10
STA 0+000 TO 0+378.011



KEY PLAN



NOTE:

LEGEND:

NGL
FRL

FRL / NGL
CHAINAGE

ABBREVIATIONS

FRL = FINISHED GROUND LEVEL
NGL = NATURAL GROUND LEVEL

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

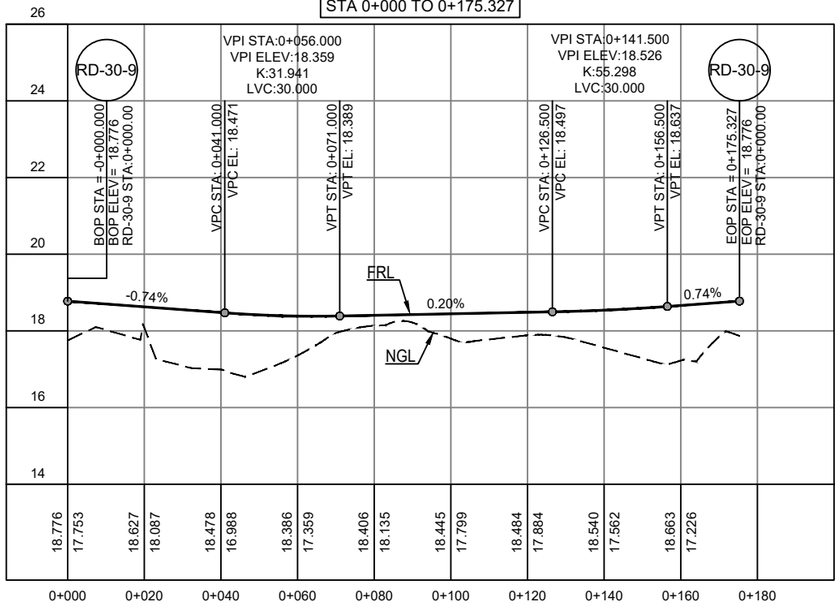
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DESIGN	SAIM	DATE	JUN,2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

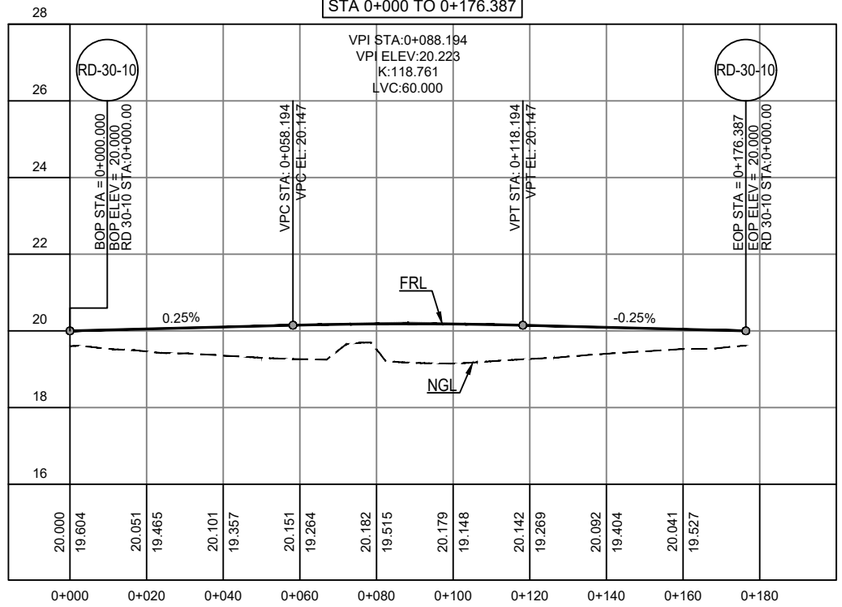
PROFILES SHEET - 15
RD 30-10 STA: 0+000 TO 0+378.011

PROJ CODE	DRAWING NO.	REV.
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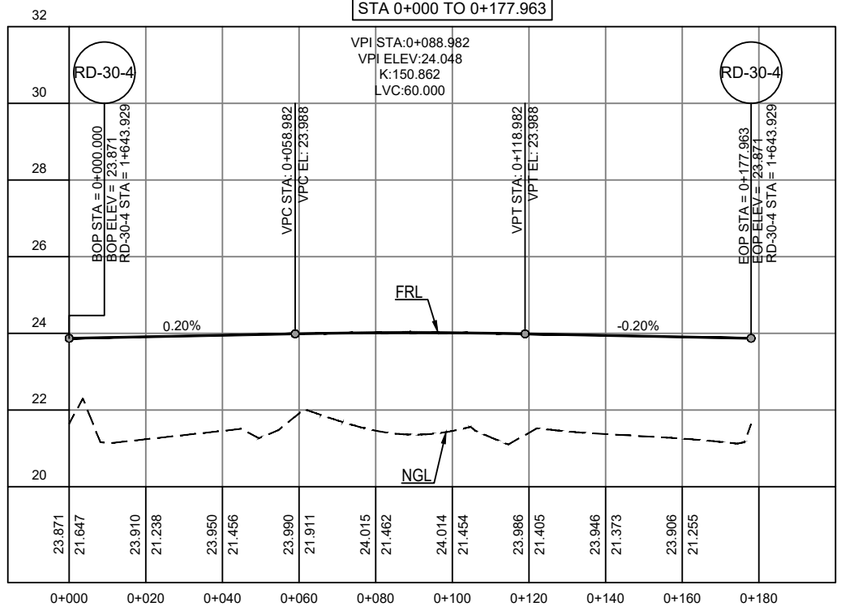
CS-01
STA 0+000 TO 0+175.327



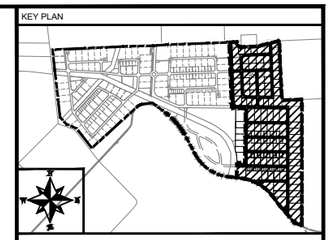
CS-02
STA 0+000 TO 0+176.387



CS-03
STA 0+000 TO 0+177.963



KEY PLAN



NOTE:

LEGEND:

NGL
FRL
FRL / NGL
CHAINAGE

ABBREVIATIONS

FRL = FINISHED GROUND LEVEL
NGL = NATURAL GROUND LEVEL

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	FAHAD	SCALE	H=1:1600 V=1:160
DESIGN	SAIM	DATE	JUN,2025
CHECKED	ATIF	DESIGN STAGE	TENDER
APPROVED	M.S.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE: **PROFILES SHEET-16**
CS-1 STA: 0+000 TO 0+175.327
CS-2 STA: 0+000 TO 0+176.387
CS-3 STA: 0+000 TO 0+177.963

PROJ CODE	DRAWING NO.	REV.
01098	EA-1098-KIP-H-PP-3015	00

Water Supply Network, Sewerage and Strom Water Drainage System for 500 Acres Land (including Sub-Stations, UGWT and Pump Room)

LIST OF DRAWING

S.NO	DRAWING TITLE	DRAWING NO.
1	LIST OF DRAWING	EA-01098-KIP-U-LS01
	" SEWERAGE SYSTEM "	
	MASTER PLAN	
2	MASTER PLAN AND SHEET INDEX (FOR SEWERAGE SYSTEM)	EA-01098-KIP-U-S200
	LAYOUT DRAWINGS	
3	LAYOUT PLAN OF SEWERAGE SYSTEM	EA-01098-KIP-U-S201 TO S235
	DETAIL DRAWINGS	
4	TYPICAL DETAIL OF TRENCH, MANHOLE & HOUSE CONNECTION CHAMBER	EA-01098-KIP-U-S500
5	SEWERAGE MANHOLE REINFORCEMENT DETAIL	EA-01098-KIP-U-S501
	" WATER SUPPLY SYSTEM "	
	MASTER PLAN	
6	MASTER PLAN AND SHEET INDEX (FOR WATER SUPPLY SYSTEM)	EA-01098-KIP-U-W100
	LAYOUT DRAWINGS	
7	LAYOUT PLAN OF WATER SUPPLY SYSTEM	EA-01098-KIP-U-W101A, W101 TO W135
	DETAIL DRAWINGS	
8	TYPICAL VALVE CHAMBERS AND TRENCH DETAIL	EA-01098-KIP-U-W403
9	DETAIL OF THRUST BLOCK	EA-01098-KIP-U-W404
10	FIRE FIGHTING DETAIL	EA-01098-KIP-U-W405
	" STORM WATER DRAINAGE SYSTEM "	
	MASTER PLAN	
11	MASTER PLAN AND SHEET INDEX (FOR STORM WATER DRAINAGE SYSTEM)	EA-01098-KIP-U-D300
	LAYOUT DRAWINGS	
12	LAYOUT PLAN OF STORM WATER DRAINAGE SYSTEM	EA-01098-KIP-U-D301 TO D335
	DETAIL DRAWINGS	
13	TYPICAL DETAIL OF STORM WATER DRAIN	EA-01098-KIP-U-D600 TO D601

	"CROSS SECTIONS ALL UTILITIES "	
14	UTILITIES CORRIDOR CROSS SECTIONS	EA-01098-KIP-U-CS01
	"UNDER GROUND WATER TANK AND PUMP ROOM"	
	PUBLIC HEALTH DRAWINGS	
15	PLAN OF UNDER GROUND WATER TANK AND VALVE CHAMBER DETAIL	EA-01098-KIP-U-W400
16	SECTIONS OF UNDER GROUND WATER TANK AND SUMP PIT DETAIL	EA-01098-KIP-U-W401
17	PLAN OF PUMP ROOM	EA-01098-KIP-U-W402
	ARCHITECTURE DRAWINGS	
18	UNDER GROUND WATER TANK PLAN	EA-1098-KIP-U-WS-PS-A1-0100
19	PUMP ROOM PLAN	EA-1098-KIP-U-WS-PS-A1-0200
20	PP-01 (PART PLAN)-01	EA-1098-KIP-U-WS-PS-A1-0201
21	ROOF	EA-1098-KIP-U-WS-PS-A1-3000
22	SECTION A	EA-1098-KIP-U-WS-PS-A2-0010
23	SECTION B	EA-1098-KIP-U-WS-PS-A2-0020
24	ELEVATIONS	EA-1098-KIP-U-WS-PS-A3-0010
25	FINISHES, DOOR & WINDOW SCHEDULE	EA-1098-KIP-U-WS-PS-A6-0010
	STRUCTURE DRAWINGS	
26	UNDER GROUND TANK RAFT AND COLUMN LAYOUT PLAN (2.0 MGD)	EA-01098-KIP-U-WS-PS-S-101
27	UNDER GROUND TANK GROUND AND RAFT FRAMING PLAN (2.0 MGD)	EA-01098-KIP-U-WS-PS-S-201
28	UNDER GROUND TANK SECTIONS (2.0 MGD)	EA-01098-KIP-U-WS-PS-S-301
	"SUB STATION "	
	ARCHITECTURE DRAWINGS	
29	SUB-STATION GROUND FLOOR & ROOF PLAN	EA-1098-KIP-U-WS-SS-A1-0100
30	SUB-STATION SECTIONS - AA & BB	EA-1098-KIP-U-WS-SS-A2-0010
31	SUB-STATION ELEVATIONS	EA-1098-KIP-U-WS-SS-A3-0010
32	FINISHING SCHEDULE & DETAIL OF DOORS & WINDOWS	EA-1098-KIP-U-WS-SS-A6-0010
	STRUCTURE DRAWINGS	
33	GENERAL NOTES	EA-1098-KIP-U-SS-S-001
34	SUB-STATION COLUMN, FOUNDATION LAYOUT PLAN AND DETAILS	EA-1098-KIP-U-SS-S-101
35	SUB-STATION PLINTH FRAMING PLAN, SECTIONS & REINF. DETAILS	EA-1098-KIP-U-SS-S-201
36	SUB-STATION ROOF FRAMING PLAN AND SECTIONS DETAIL	EA-1098-KIP-U-SS-S-301
37	SUB-STATION ROOF REINFORCEMENT PLAN AND SECTIONS DETAIL	EA-1098-KIP-U-SS-S-104
38	SUB-STATION PLINTH & ROOF BEAM ELEVATIONS	EA-1098-KIP-U-SS-S-105

KEY PLAN

NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	
DESIGN	KISA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LIST OF DRAWING

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-LS01	00

MASTER PLAN



KEY PLAN & SHEET INDEX

NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

SURBANA JURONG — OMS — iCONSULT (INNOVATION THROUGH EXCELLENCE)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

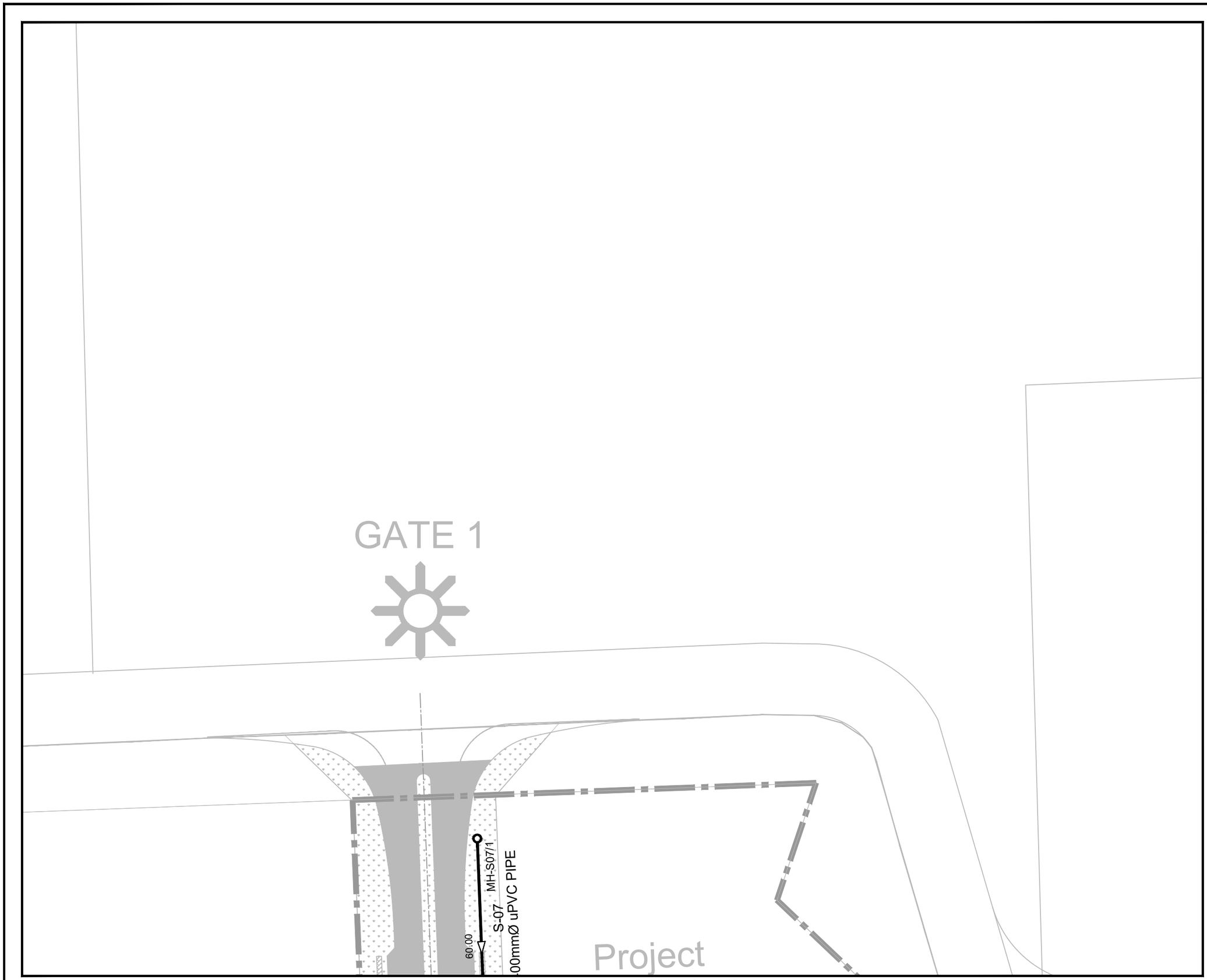
DRAWN	FURQAN	SCALE	N.T.S
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

KEY PLAN
AND SHEET INDEX

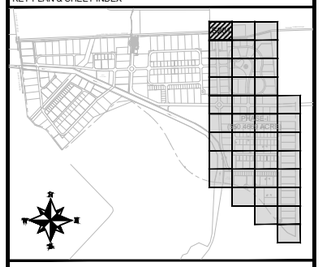
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S200	00

LAYOUT PLAN



MATCH LINE DWG NO:EA-01098-KIP-U-S202

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF SEWERAGE SYSTEM

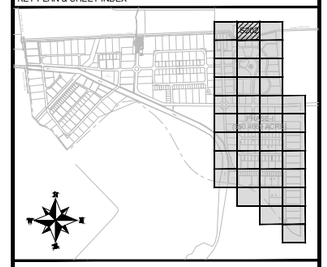
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S201	00

MATCH LINE DWG NO:EA-01098-KIP-U-S201

MATCH LINE DWG NO:EA-01098-KIP-U-S205

MATCH LINE DWG NO:EA-01098-KIP-U-S203

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF SEWERAGE SYSTEM

PROJ CODE	DRAWING NO.	REV.
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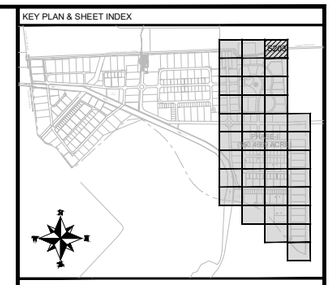
MATCH LINE DWG NO:EA-01098-KIP-U-S202

EMERGENCY GATE

MH-S01/1

MATCH LINE DWG NO:EA-01098-KIP-U-S206

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

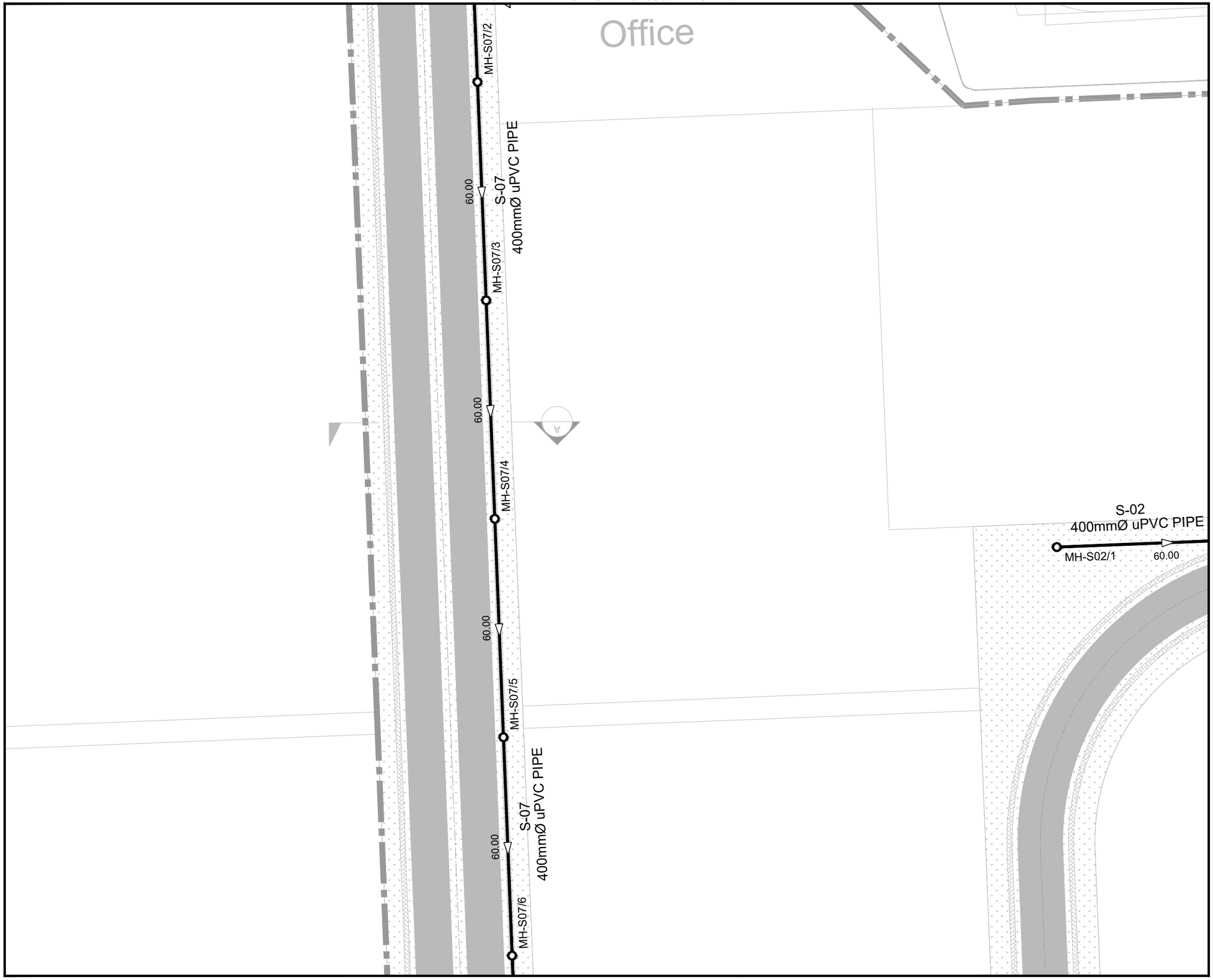
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF SEWERAGE SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S203	00

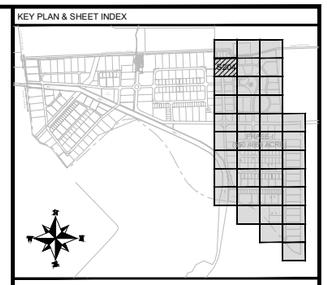
MATCH LINE DWG NO:EA-01098-KIP-U-S201



MATCH LINE DWG NO:EA-01098-KIP-U-S205

MATCH LINE DWG NO:EA-01098-KIP-U-S207

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

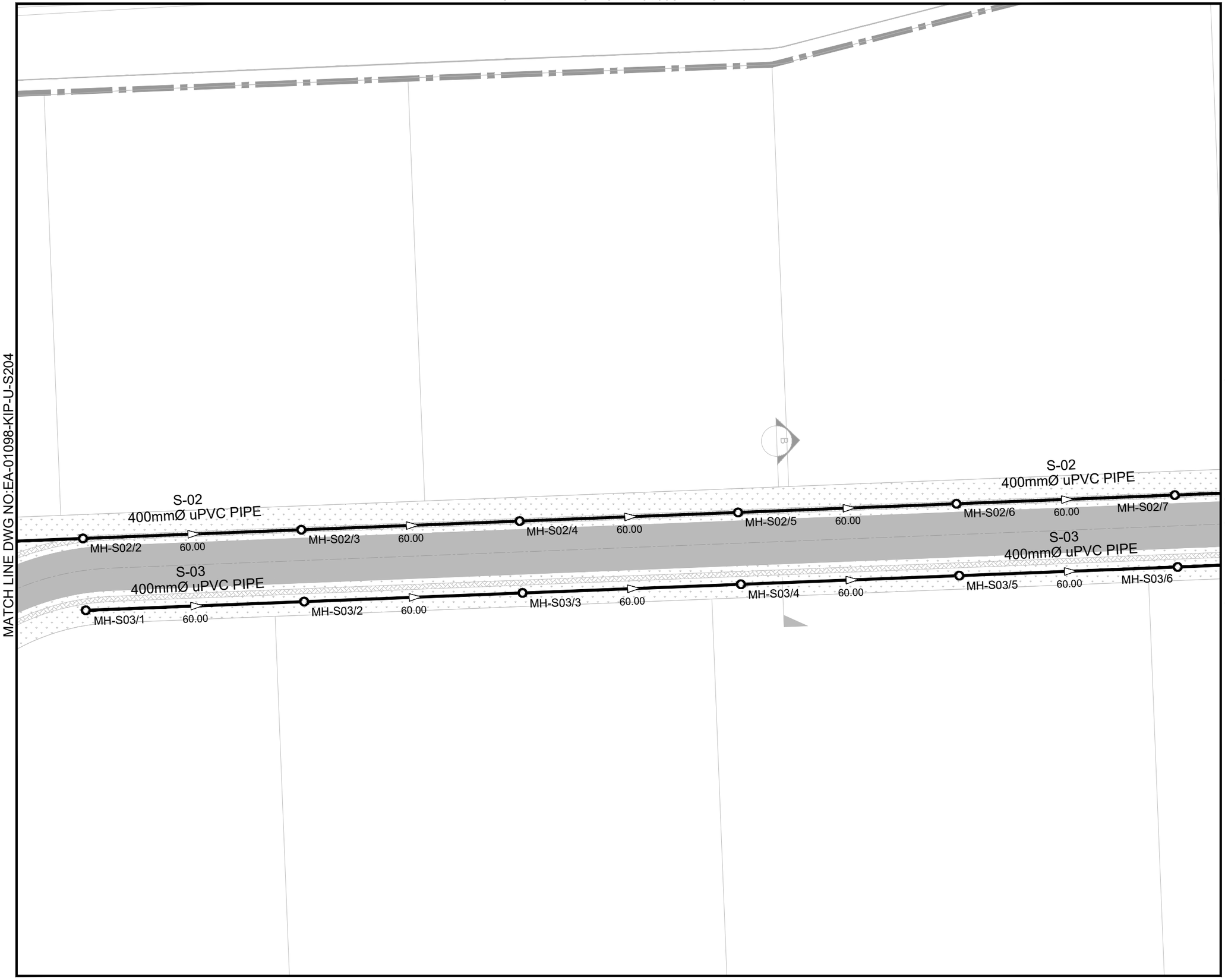
LAYOUT PLAN OF SEWERAGE SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S204	00

MATCH LINE DWG NO:EA-01098-KIP-U-S202

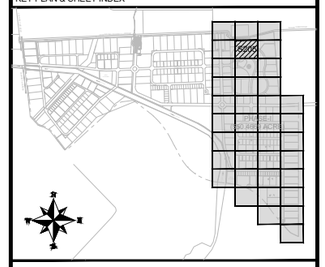
MATCH LINE DWG NO:EA-01098-KIP-U-S204

MATCH LINE DWG NO:EA-01098-KIP-U-S206



MATCH LINE DWG NO:EA-01098-KIP-U-S208

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

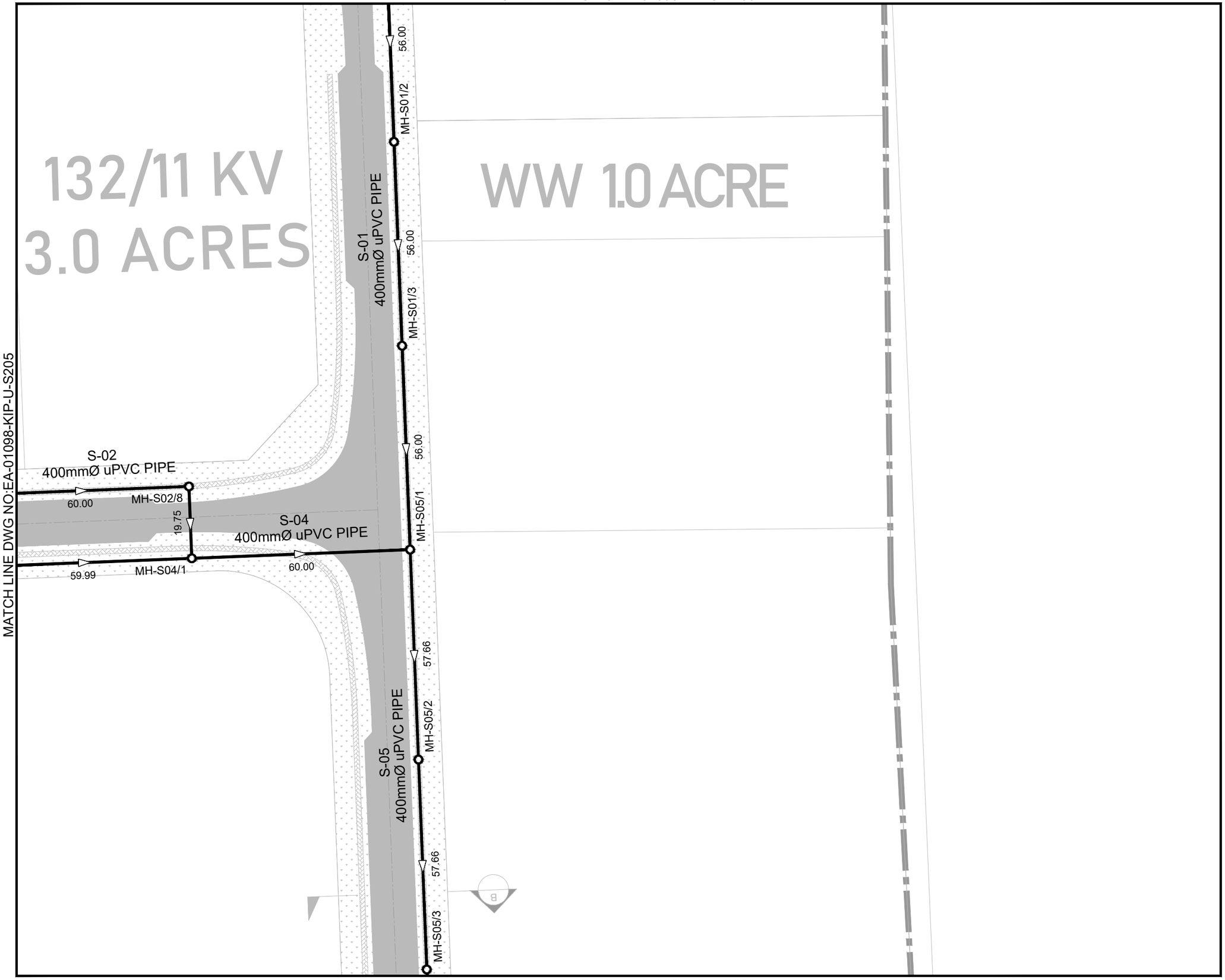
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF SEWERAGE SYSTEM

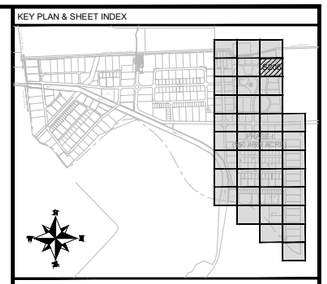
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S205	00

MATCH LINE DWG NO:EA-01098-KIP-U-S203



MATCH LINE DWG NO:EA-01098-KIP-U-S209

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

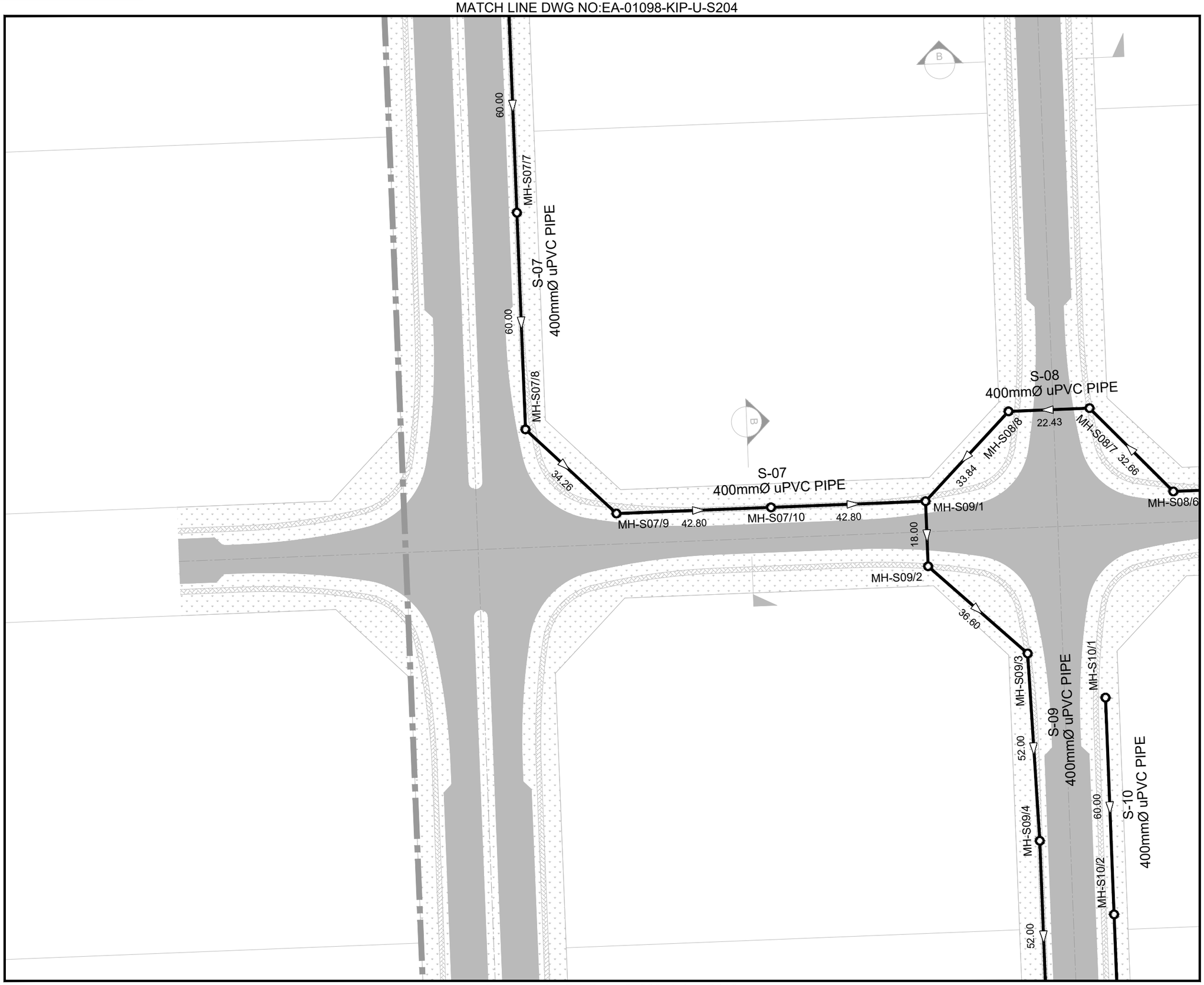
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF SEWERAGE SYSTEM

PROJ CODE	DRAWING NO.	REV.
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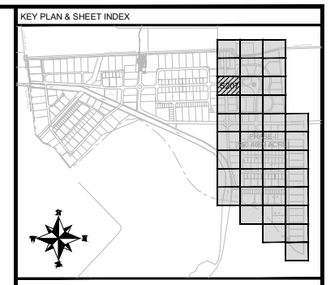
MATCH LINE DWG NO:EA-01098-KIP-U-S204



MATCH LINE DWG NO:EA-01098-KIP-U-S208

MATCH LINE DWG NO:EA-01098-KIP-U-S210

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

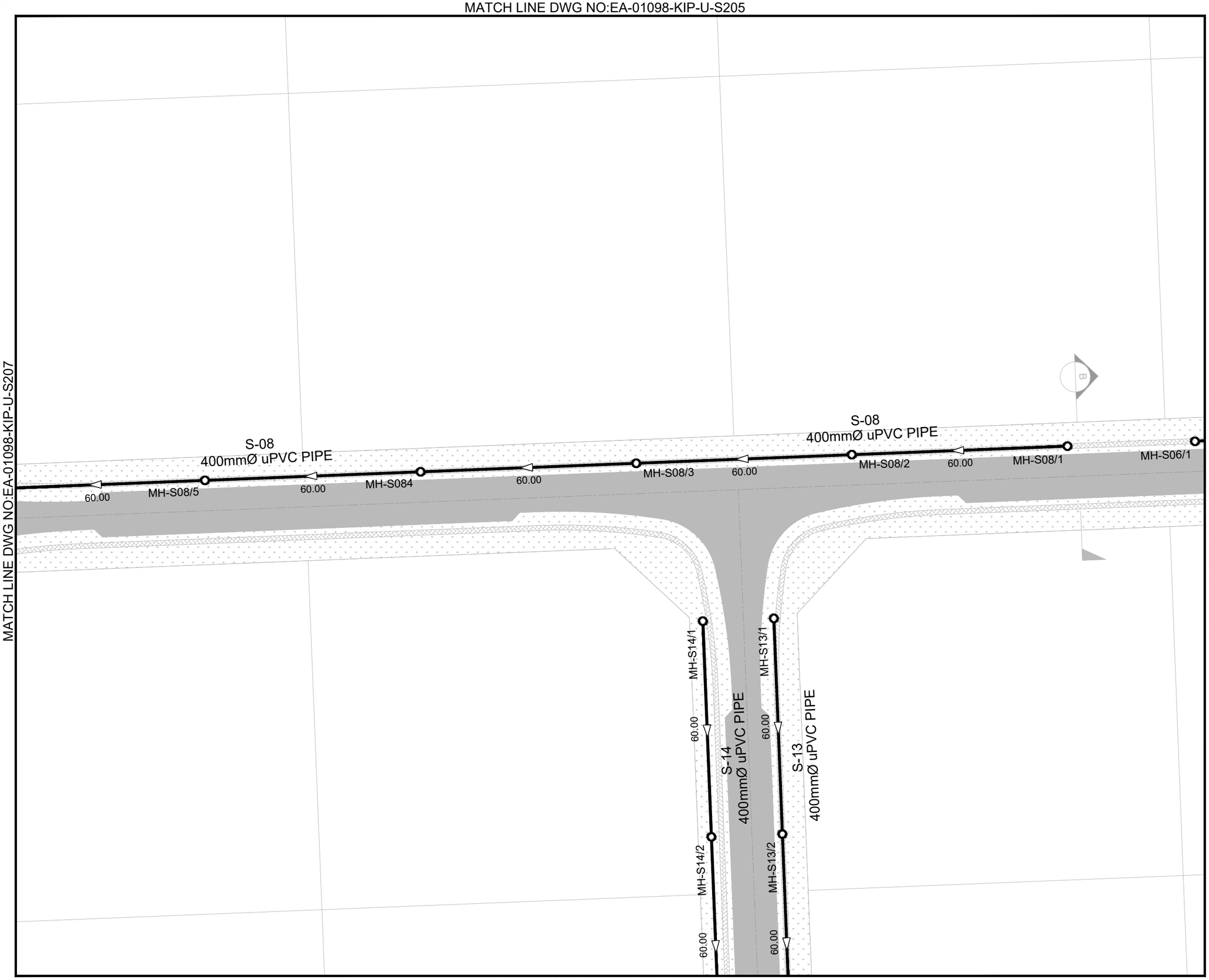
LAYOUT PLAN OF SEWERAGE SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S207	00

MATCH LINE DWG NO:EA-01098-KIP-U-S205

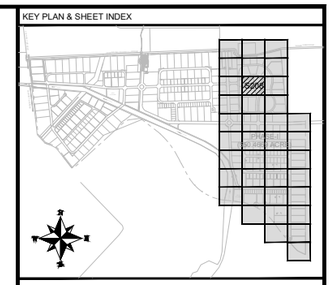
MATCH LINE DWG NO:EA-01098-KIP-U-S207

MATCH LINE DWG NO:EA-01098-KIP-U-S209



MATCH LINE DWG NO:EA-01098-KIP-U-S211

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

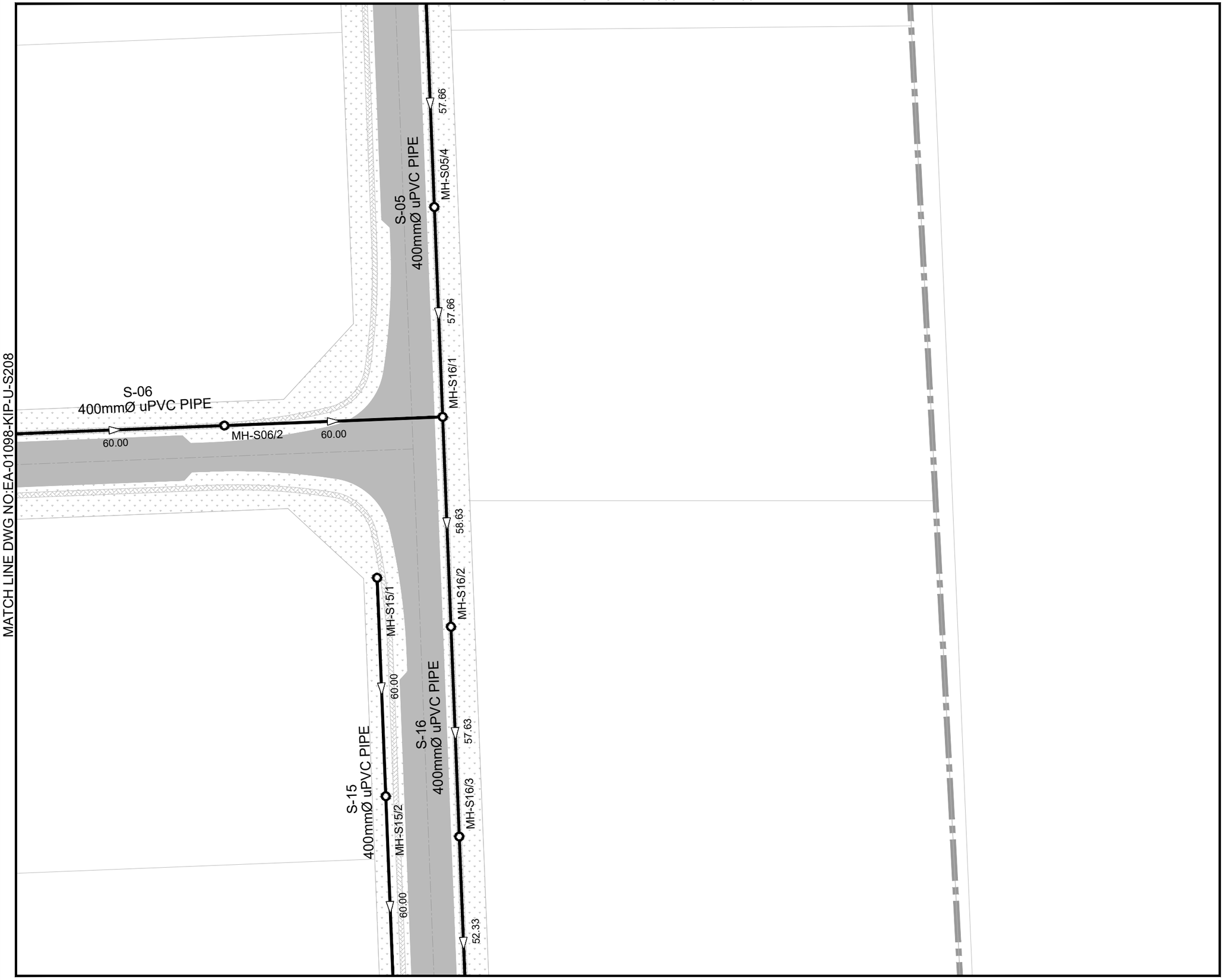
DRAWING TITLE:

LAYOUT PLAN OF SEWERAGE SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S208	00

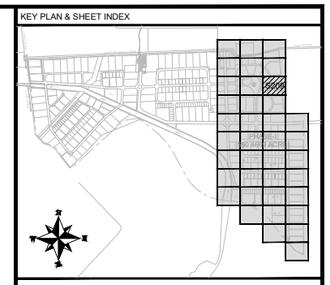
MATCH LINE DWG NO:EA-01098-KIP-U-S206

MATCH LINE DWG NO:EA-01098-KIP-U-S208



MATCH LINE DWG NO:EA-01098-KIP-U-S212

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

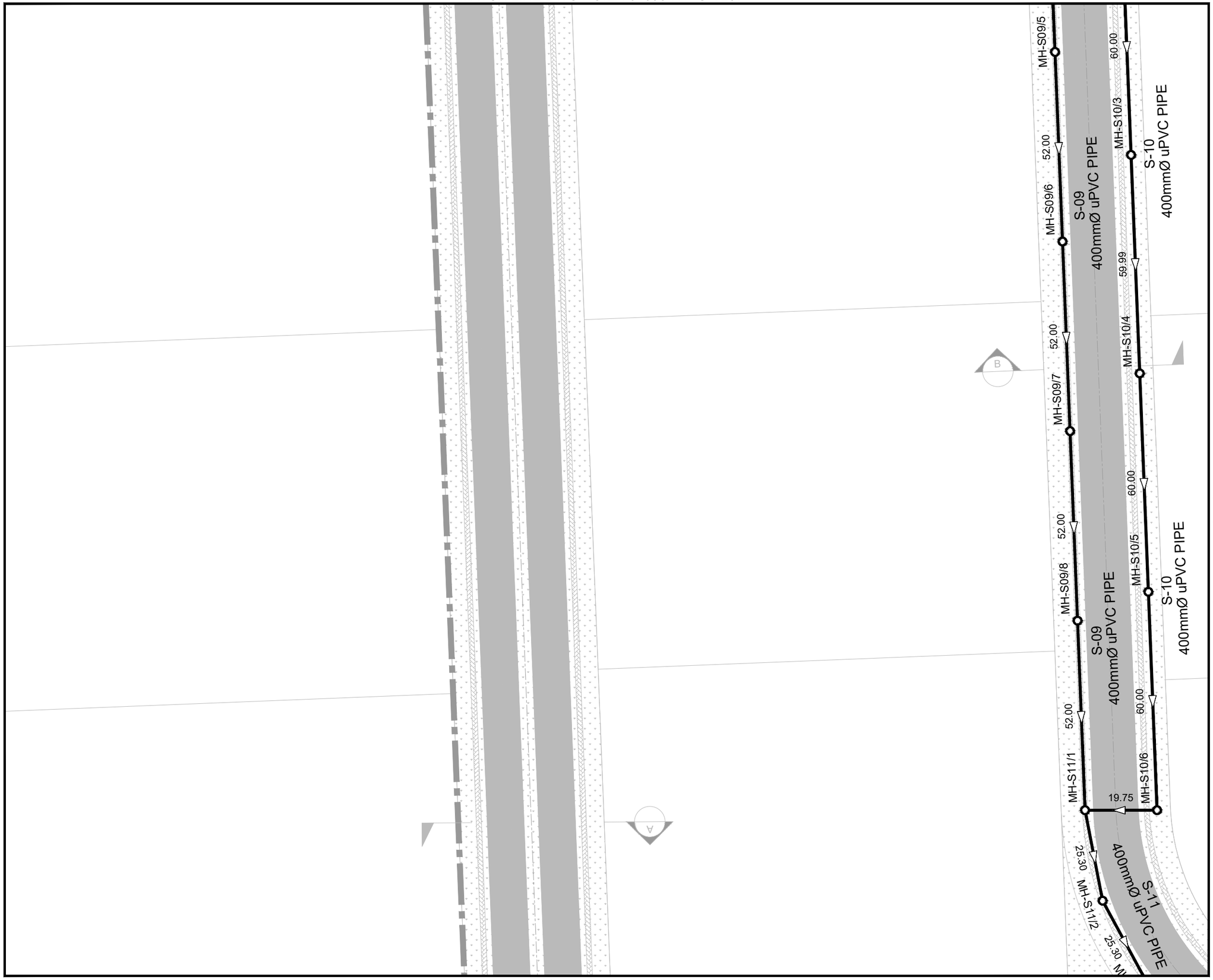
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF SEWERAGE SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S209	00

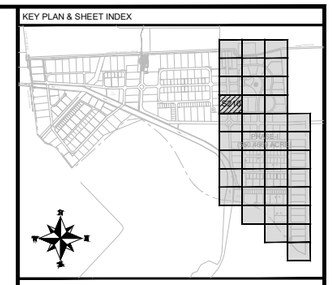
MATCH LINE DWG NO:EA-01098-KIP-U-S207



MATCH LINE DWG NO:EA-01098-KIP-U-S213

MATCH LINE DWG NO:EA-01098-KIP-U-S211

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF SEWERAGE SYSTEM

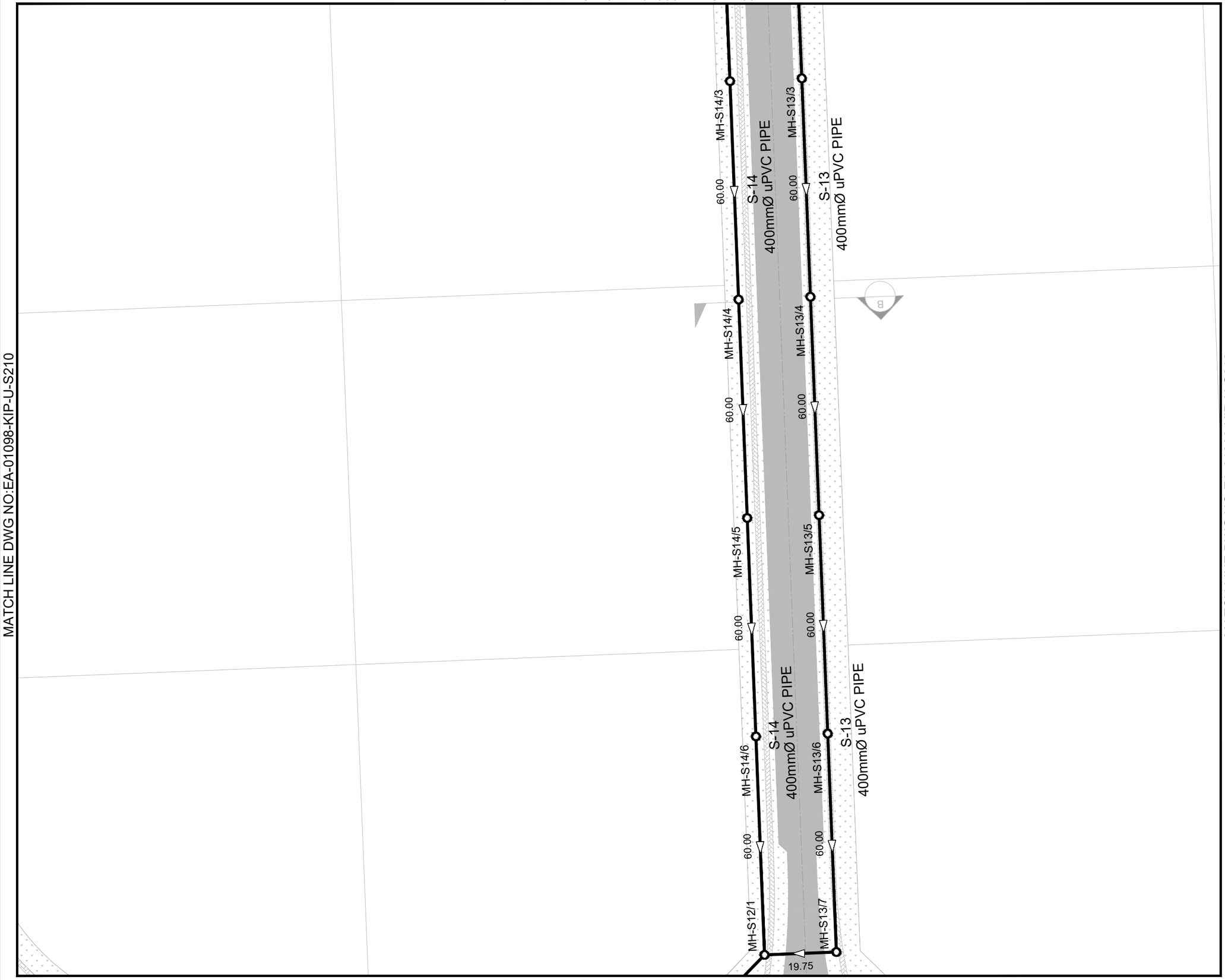
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S210	00

MATCH LINE DWG NO:EA-01098-KIP-U-S208

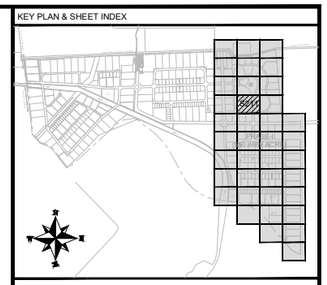
MATCH LINE DWG NO:EA-01098-KIP-U-S210

MATCH LINE DWG NO:EA-01098-KIP-U-S212

MATCH LINE DWG NO:EA-01098-KIP-U-S214



KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

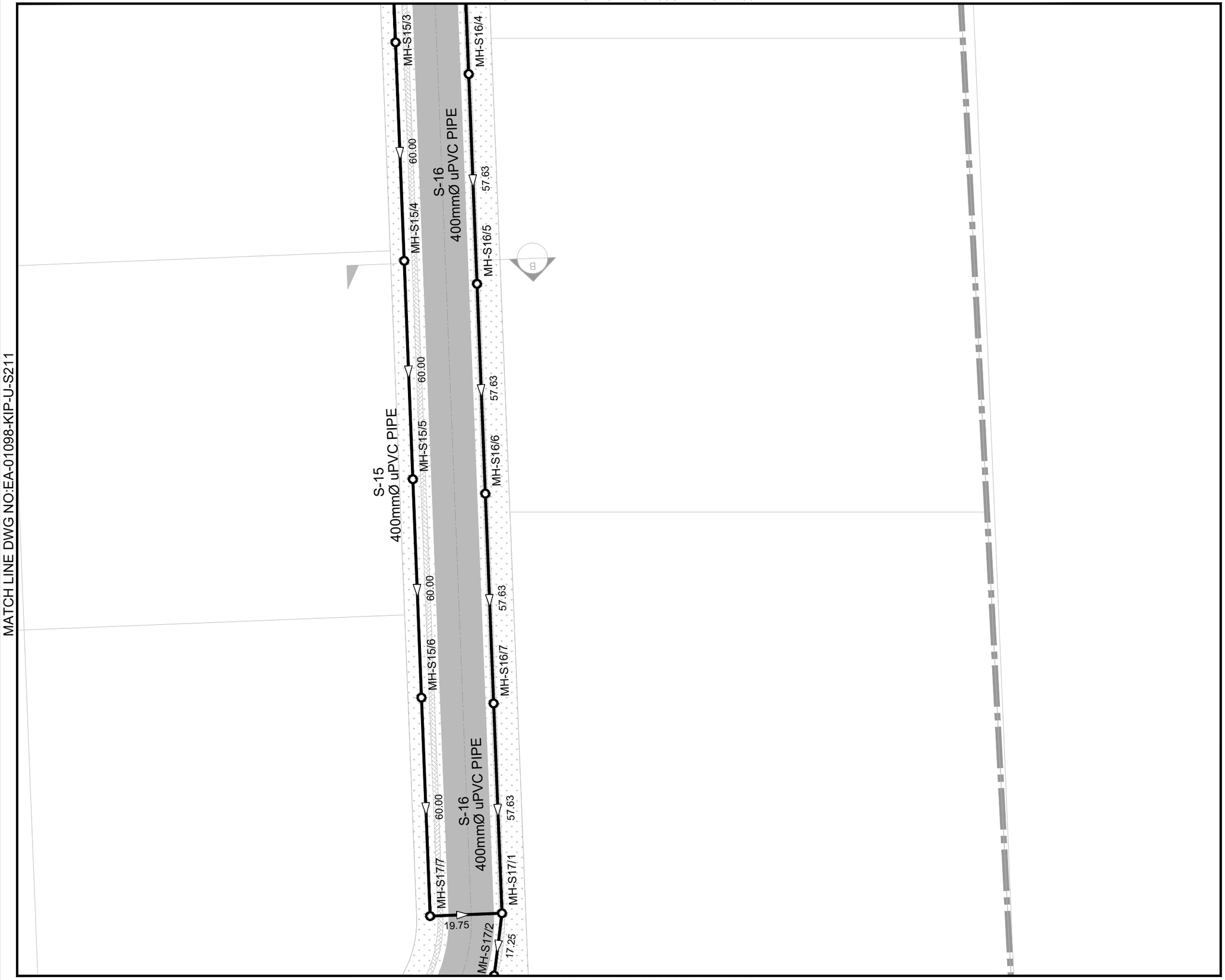
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LAYOUT PLAN OF SEWERAGE SYSTEM

PROJ CODE	DRAWING NO.	REV.
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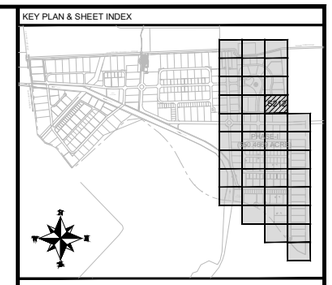
MATCH LINE DWG NO:EA-01098-KIP-U-S209

MATCH LINE DWG NO:EA-01098-KIP-U-S211



MATCH LINE DWG NO:EA-01098-KIP-U-S215

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

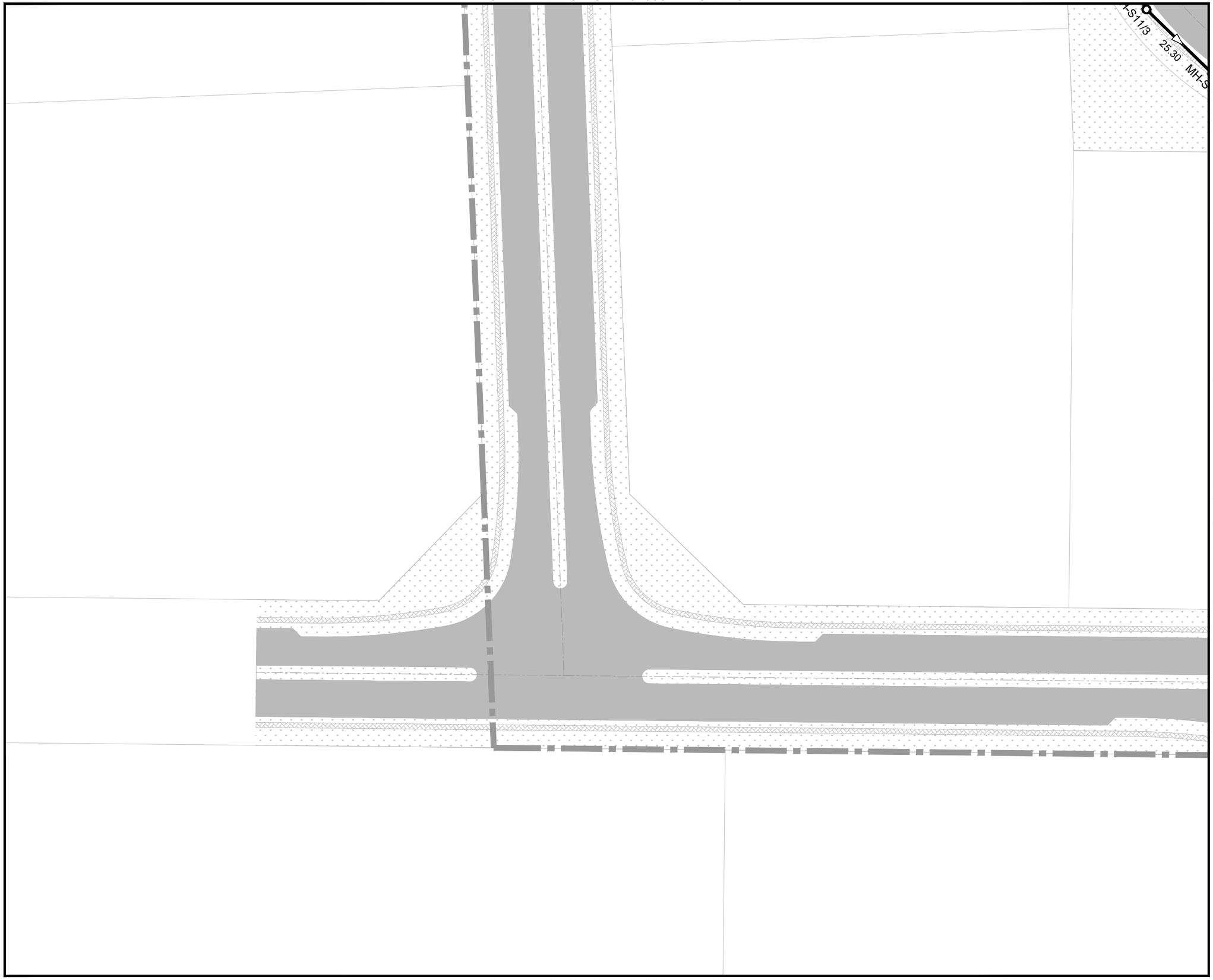
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF SEWERAGE SYSTEM

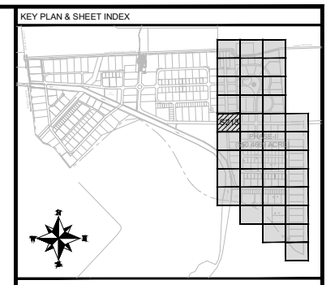
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S212	00

MATCH LINE DWG NO:EA-01098-KIP-U-S210



MATCH LINE DWG NO:EA-01098-KIP-U-S214

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF SEWERAGE SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S213	00

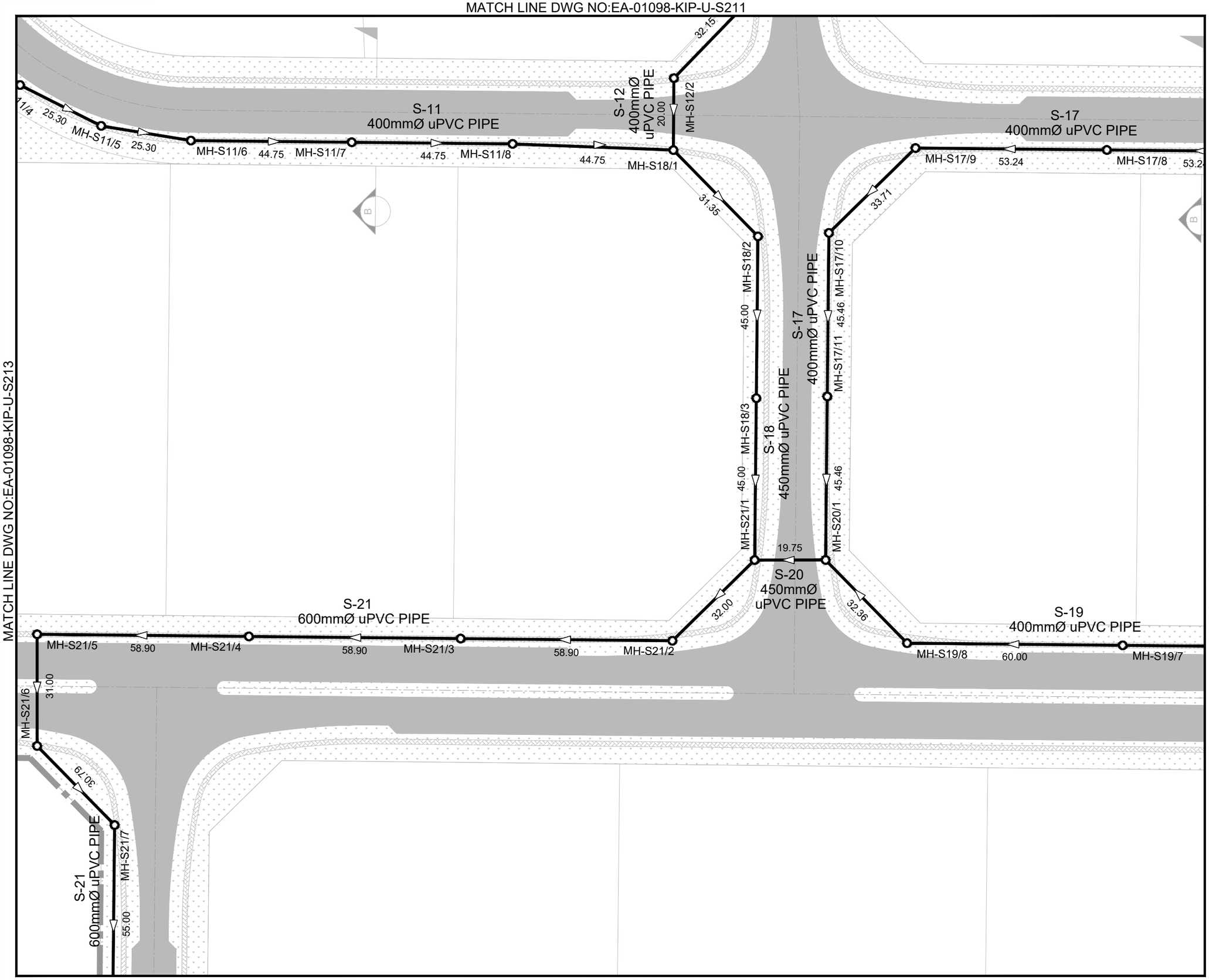
MATCH LINE DWG NO:EA-01098-KIP-U-S217

MATCH LINE DWG NO:EA-01098-KIP-U-S211

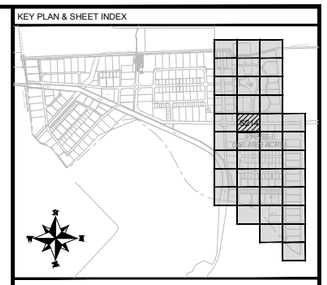
MATCH LINE DWG NO:EA-01098-KIP-U-S213

MATCH LINE DWG NO:EA-01098-KIP-U-S215

MATCH LINE DWG NO:EA-01098-KIP-U-S218



KEY PLAN & SHEET INDEX



NOTE:

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2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

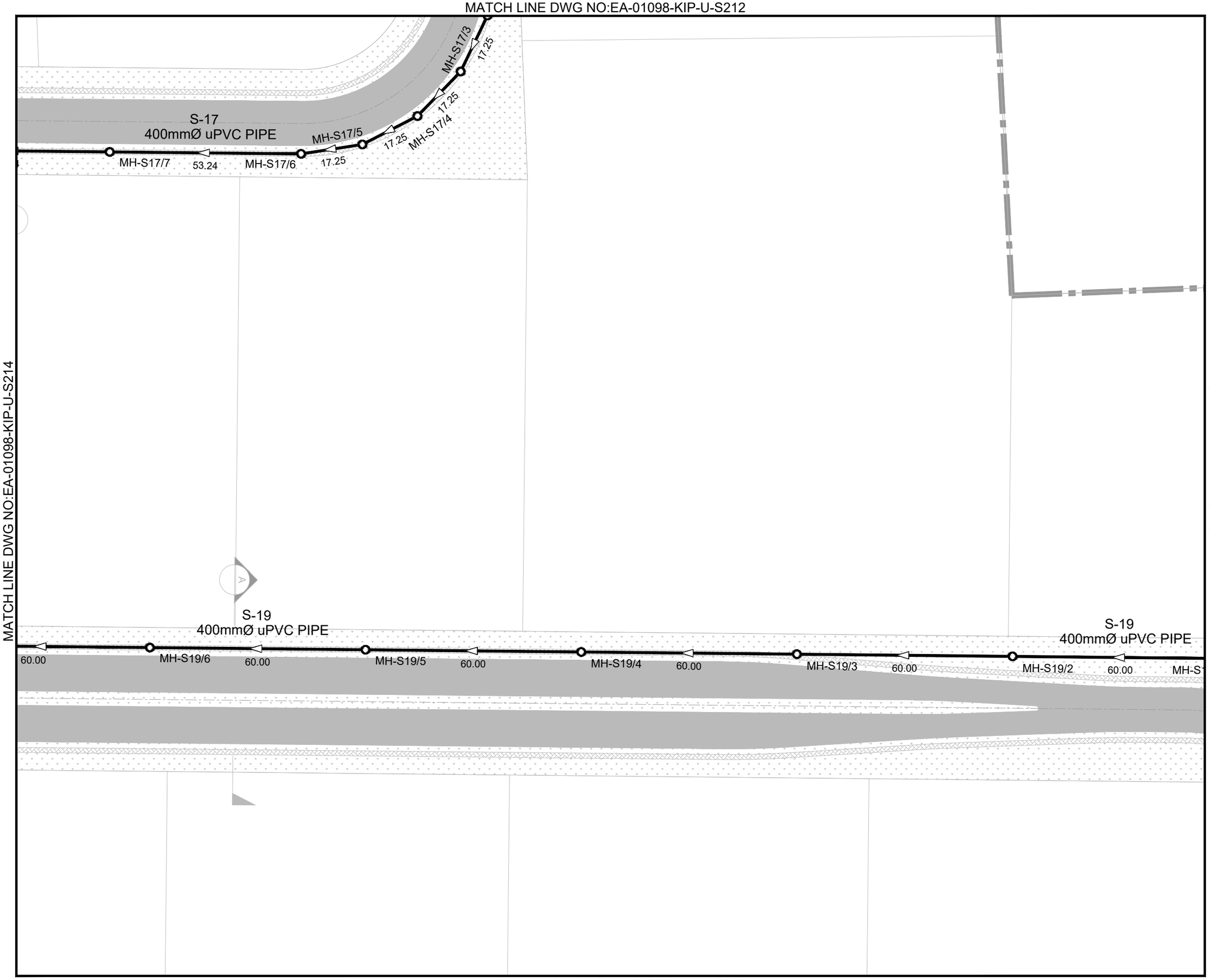
LAYOUT PLAN OF SEWERAGE SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S214	00

MATCH LINE DWG NO:EA-01098-KIP-U-S212

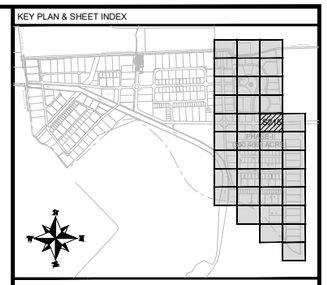
MATCH LINE DWG NO:EA-01098-KIP-U-S214

MATCH LINE DWG NO:EA-01098-KIP-U-S216



MATCH LINE DWG NO:EA-01098-KIP-U-S219

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF SEWERAGE SYSTEM

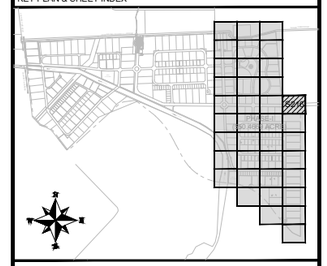
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S215	00

MATCH LINE DWG NO:EA-01098-KIP-U-S215

9/1

MATCH LINE DWG NO:EA-01098-KIP-U-S220

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF SEWERAGE SYSTEM

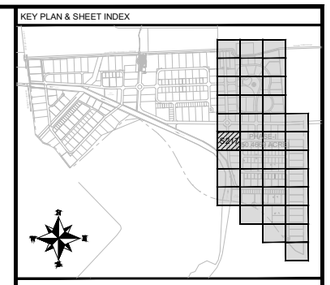
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S216	00

MATCH LINE DWG NO:EA-01098-KIP-U-S213

MATCH LINE DWG NO:EA-01098-KIP-U-S218

MATCH LINE DWG NO:EA-01098-KIP-U-S221

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

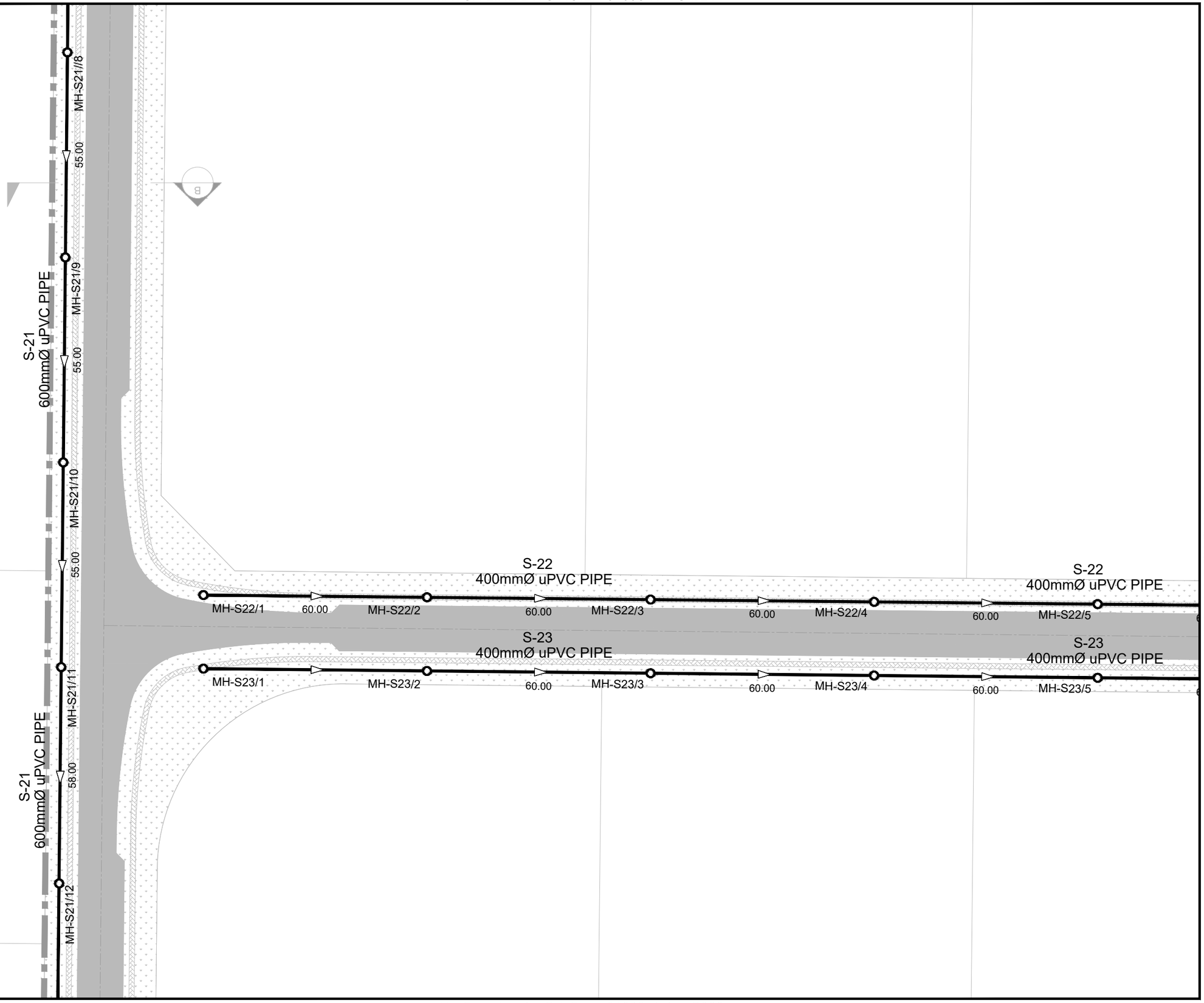
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF SEWERAGE SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S217	00

MATCH LINE DWG NO:EA-01098-KIP-U-S214

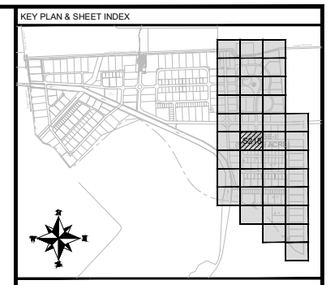


MATCH LINE DWG NO:EA-01098-KIP-U-S217

MATCH LINE DWG NO:EA-01098-KIP-U-S217

MATCH LINE DWG NO:EA-01098-KIP-U-S222

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

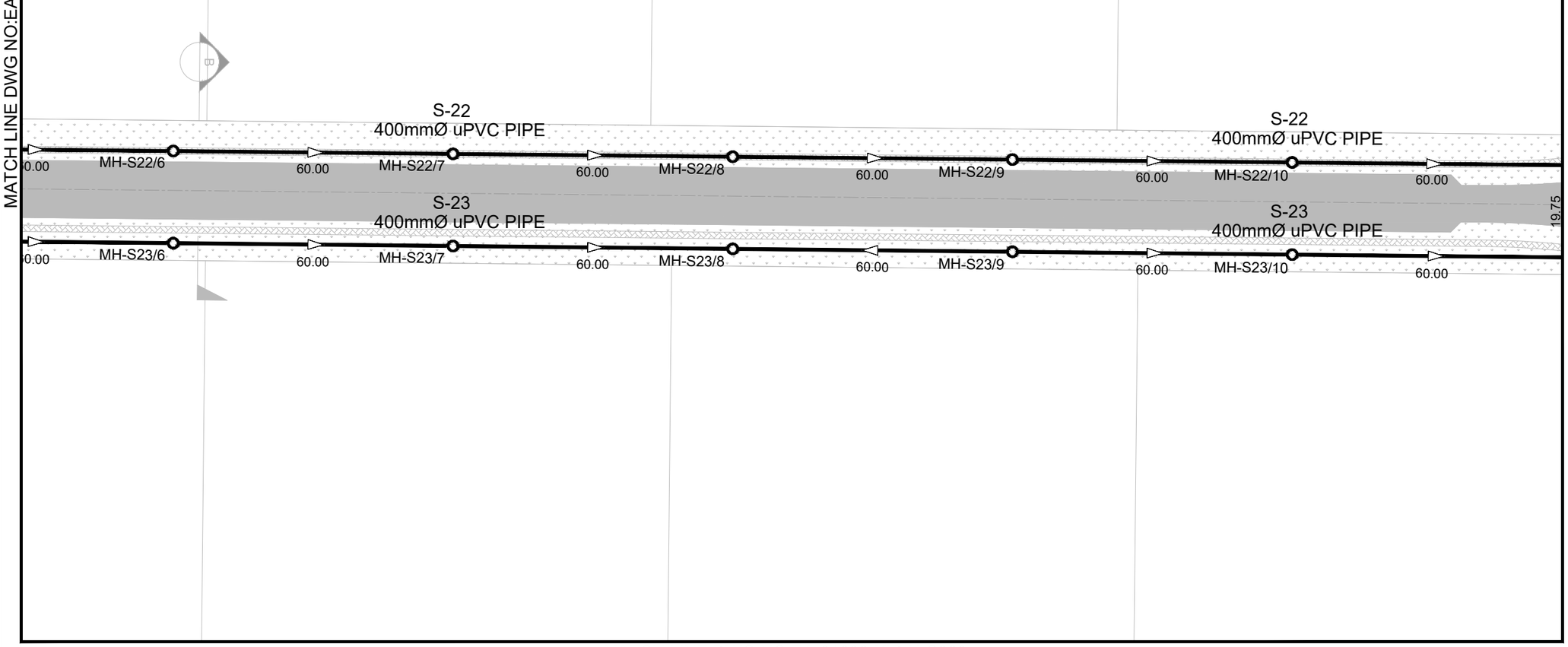
DRAWING TITLE:

LAYOUT PLAN OF SEWERAGE SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S218	00

MATCH LINE DWG NO:EA-01098-KIP-U-S215

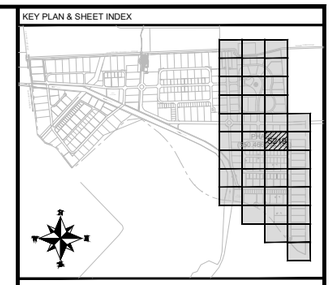
MATCH LINE DWG NO:EA-01098-KIP-U-S218



MATCH LINE DWG NO:EA-01098-KIP-U-S220

MATCH LINE DWG NO:EA-01098-KIP-U-S223

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

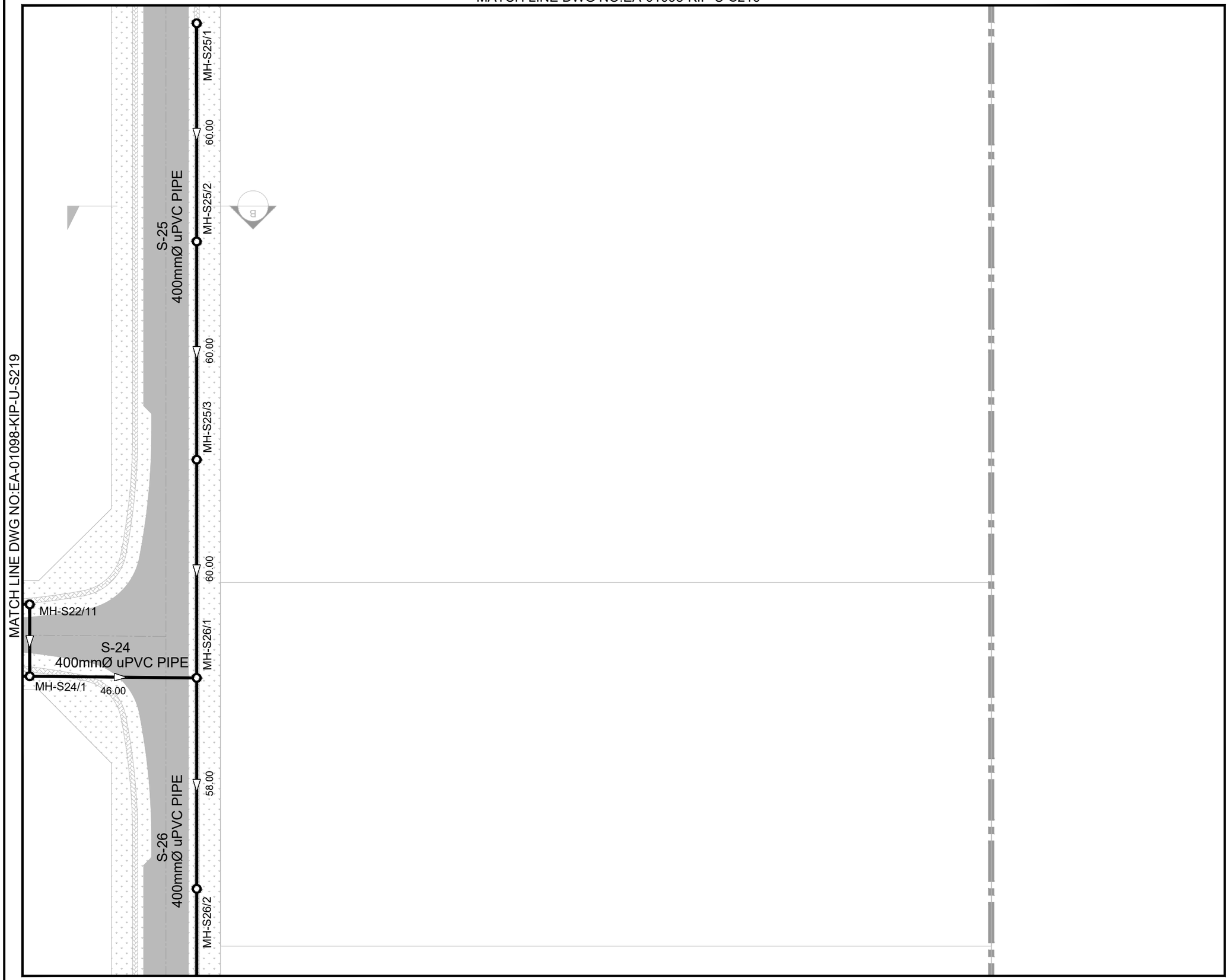
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF SEWERAGE SYSTEM

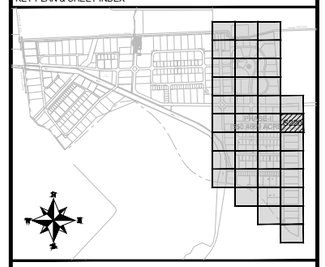
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S219	00

MATCH LINE DWG NO:EA-01098-KIP-U-S216



MATCH LINE DWG NO:EA-01098-KIP-U-S224

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF SEWERAGE SYSTEM

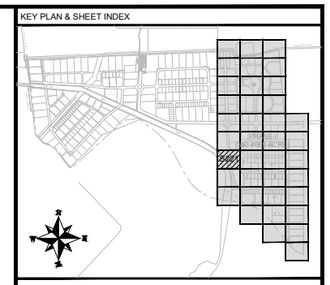
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S220	00

MATCH LINE DWG NO:EA-01098-KIP-U-S217

MATCH LINE DWG NO:EA-01098-KIP-U-S222

MATCH LINE DWG NO:EA-01098-KIP-U-S225

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF SEWERAGE SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S221	00

MATCH LINE DWG NO:EA-01098-KIP-U-S218

MATCH LINE DWG NO:EA-01098-KIP-U-S221

MATCH LINE DWG NO:EA-01098-KIP-U-S223

MATCH LINE DWG NO:EA-01098-KIP-U-S226

S-21
600mmØ uPVC PIPE

MH-S21/13 — 58.00 — MH-S21/14 — 58.00 — MH-S21/15 — 58.00 — MH-S21/16 — 58.00 — MH-S21/17

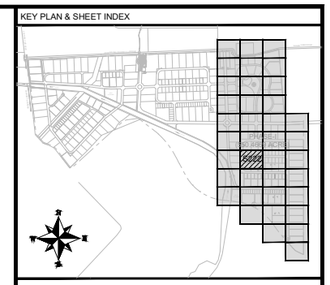
S-27
400mmØ uPVC PIPE

MH-S27/1 — 47.54 — MH-S27/2 — 50.00 — MH-S27/3 — 50.00 — MH-S27/4 — 50.00 — MH-S27/5 — 50.00 — MH-S27/6

S-28
400mmØ uPVC PIPE

MH-S28/1 — 47.54 — MH-S28/2 — 50.00 — MH-S28/3 — 50.00 — MH-S28/4 — 50.00 — MH-S28/5 — 50.00 — MH-S28/6

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

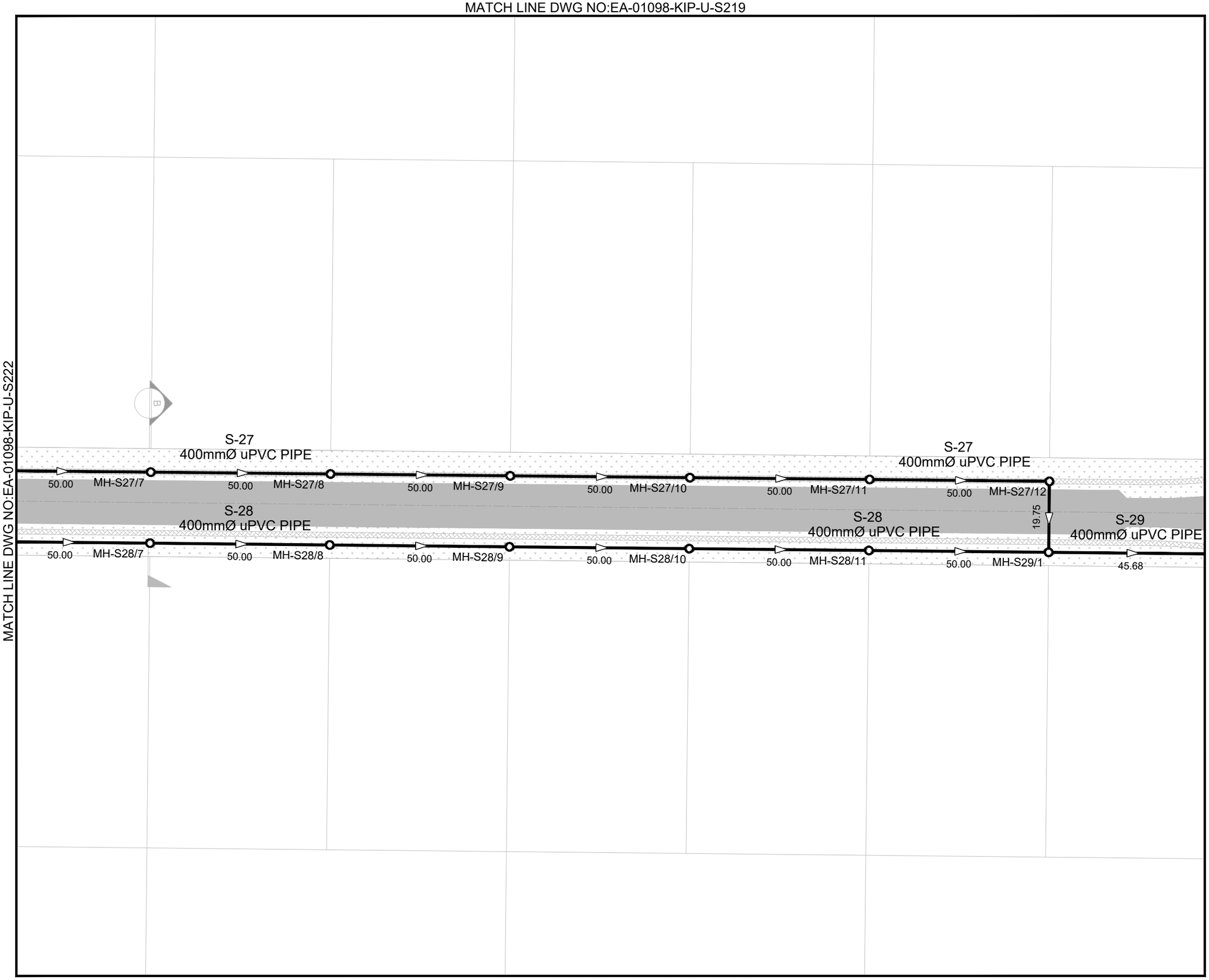
LAYOUT PLAN OF SEWERAGE SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S222	00

MATCH LINE DWG NO:EA-01098-KIP-U-S219

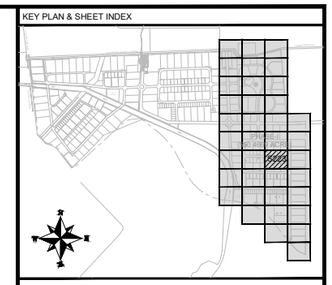
MATCH LINE DWG NO:EA-01098-KIP-U-S222

MATCH LINE DWG NO:EA-01098-KIP-U-S224



MATCH LINE DWG NO:EA-01098-KIP-U-S227

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

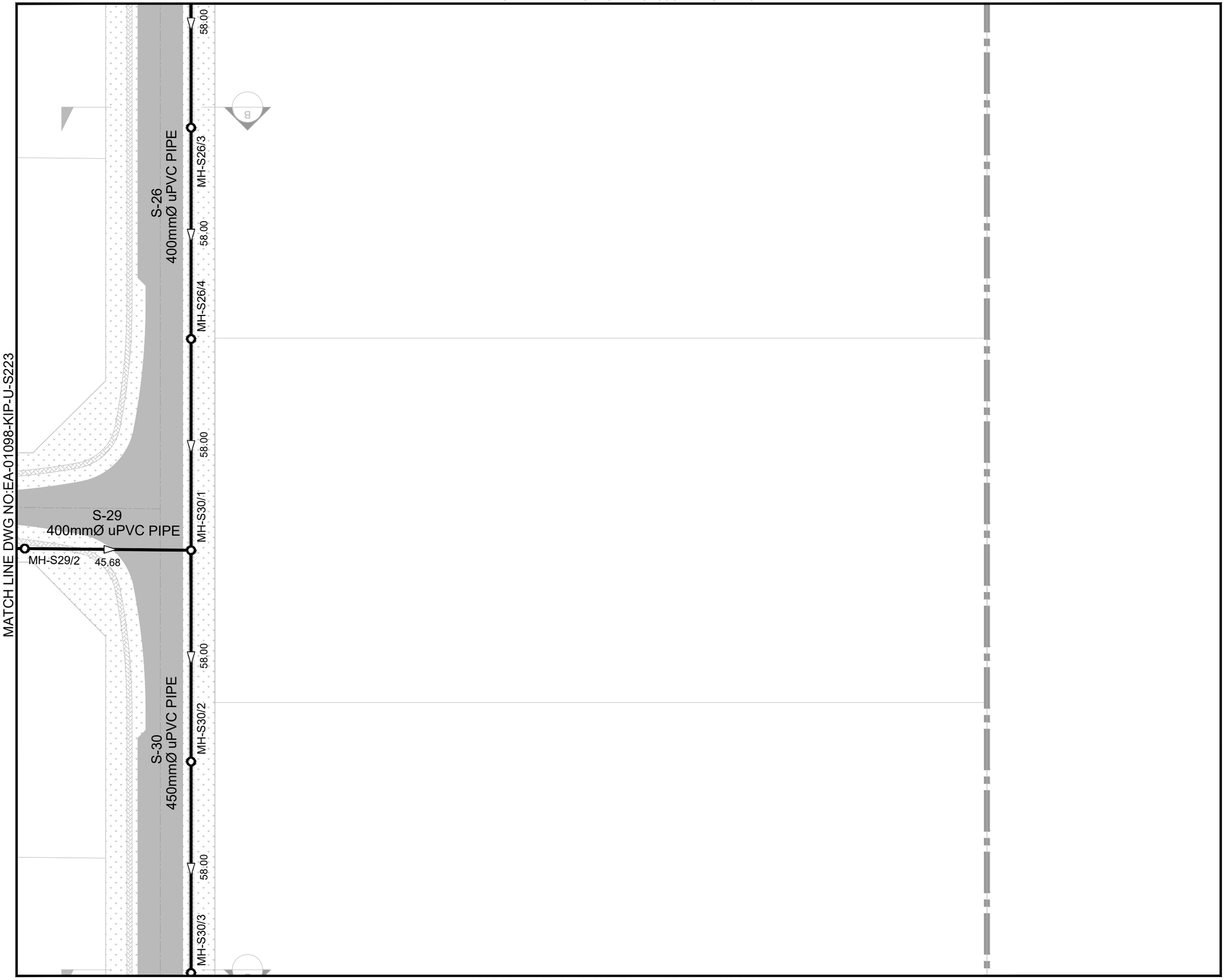
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF SEWERAGE SYSTEM

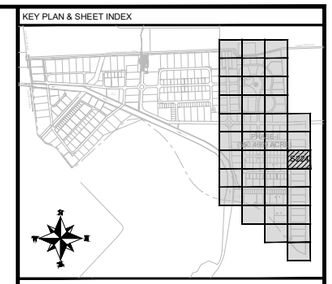
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S223	00

MATCH LINE DWG NO:EA-01098-KIP-U-S220



MATCH LINE DWG NO:EA-01098-KIP-U-S228

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF SEWERAGE SYSTEM

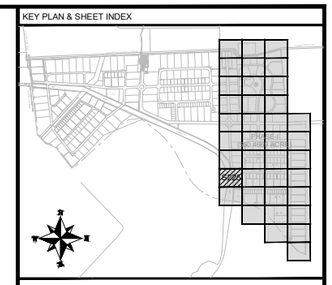
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S224	00

MATCH LINE DWG NO:EA-01098-KIP-U-S221

MATCH LINE DWG NO:EA-01098-KIP-U-S226

MATCH LINE DWG NO:EA-01098-KIP-U-S229

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
SEWERAGE SYSTEM

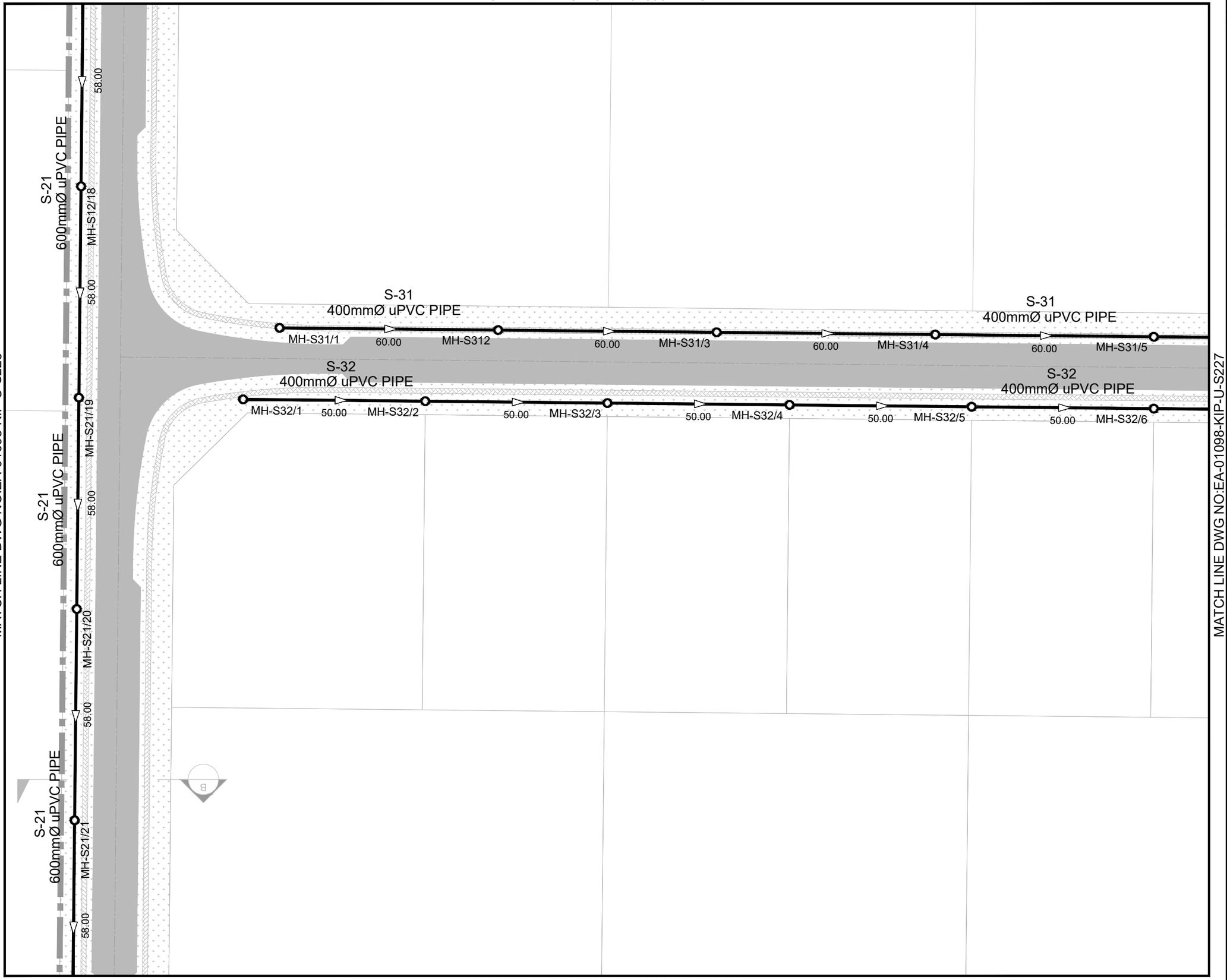
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01098	EA-01098-KIP-U-S225	00

MATCH LINE DWG NO:EA-01098-KIP-U-S222

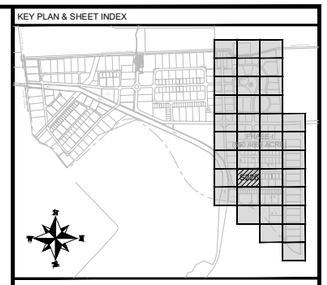
MATCH LINE DWG NO:EA-01098-KIP-U-S225

MATCH LINE DWG NO:EA-01098-KIP-U-S227

MATCH LINE DWG NO:EA-01098-KIP-U-S230



KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

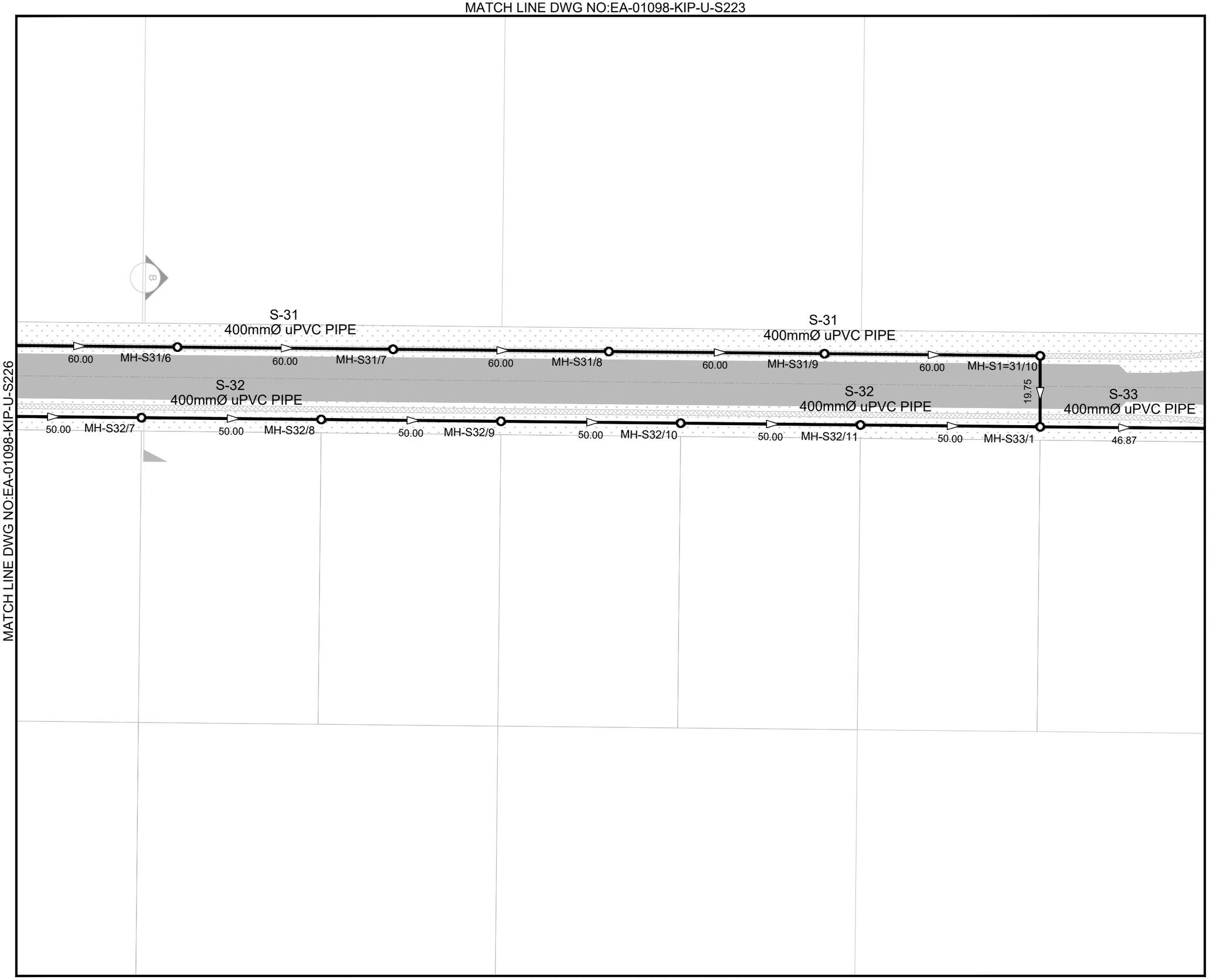
LAYOUT PLAN OF SEWERAGE SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S226	00

MATCH LINE DWG NO:EA-01098-KIP-U-S223

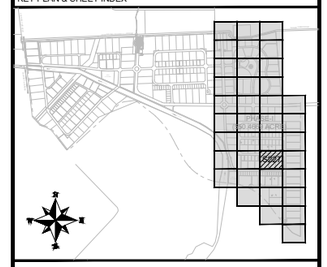
MATCH LINE DWG NO:EA-01098-KIP-U-S226

MATCH LINE DWG NO:EA-01098-KIP-U-S228



MATCH LINE DWG NO:EA-01098-KIP-U-S231

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/##

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

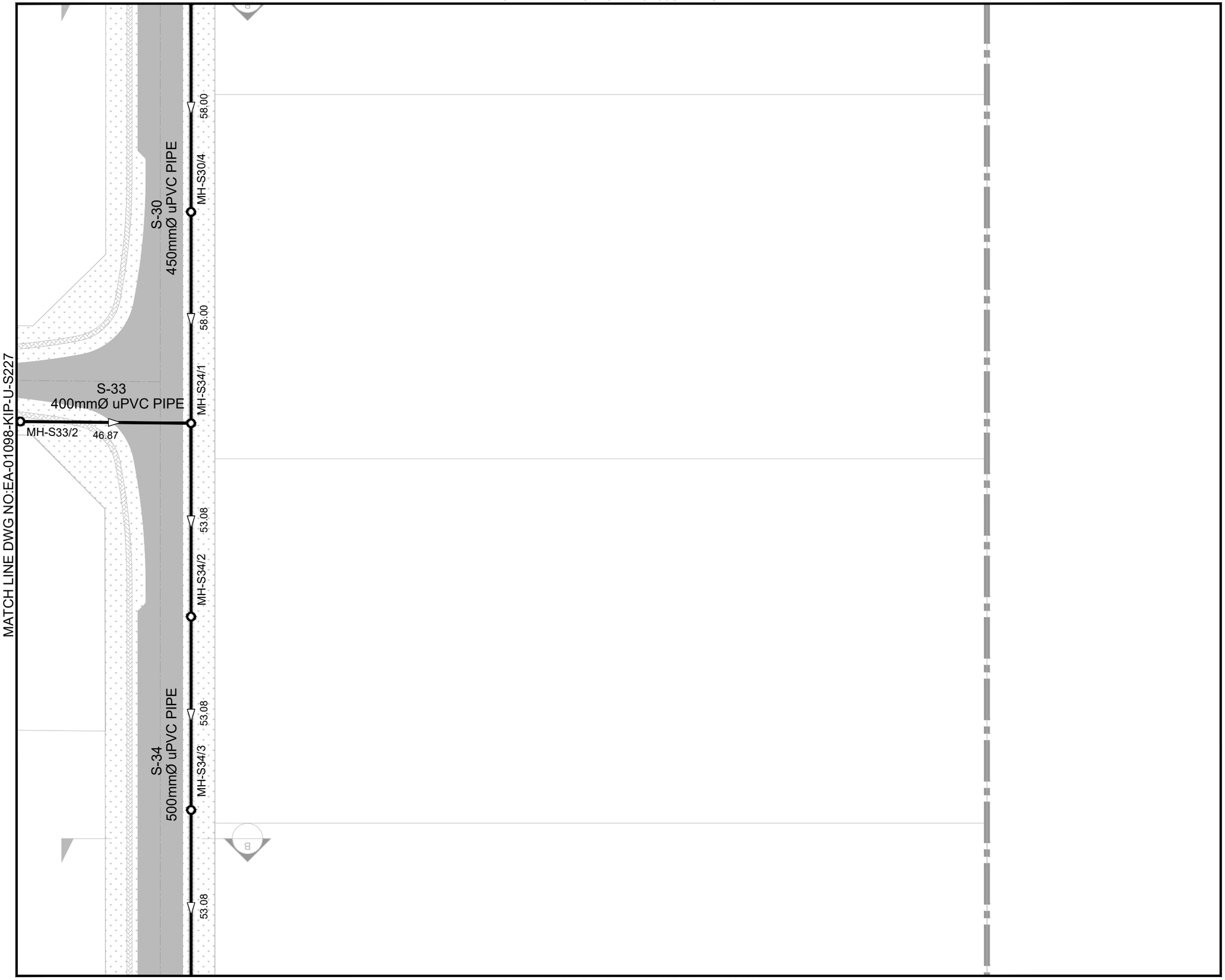
DRAWING TITLE:

LAYOUT PLAN OF SEWERAGE SYSTEM

PROJ CODE	DRAWING NO.	REV.
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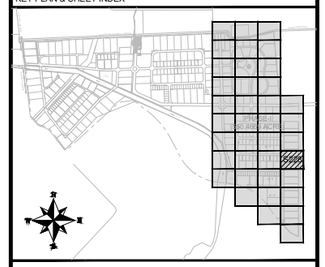
MATCH LINE DWG NO:EA-01098-KIP-U-S224

MATCH LINE DWG NO:EA-01098-KIP-U-S227



MATCH LINE DWG NO:EA-01098-KIP-U-S232

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF SEWERAGE SYSTEM

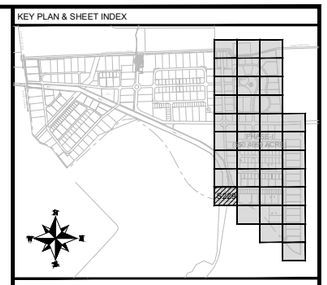
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S228	00

MATCH LINE DWG NO:EA-01098-KIP-U-S225



MATCH LINE DWG NO:EA-01098-KIP-U-S230

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF SEWERAGE SYSTEM

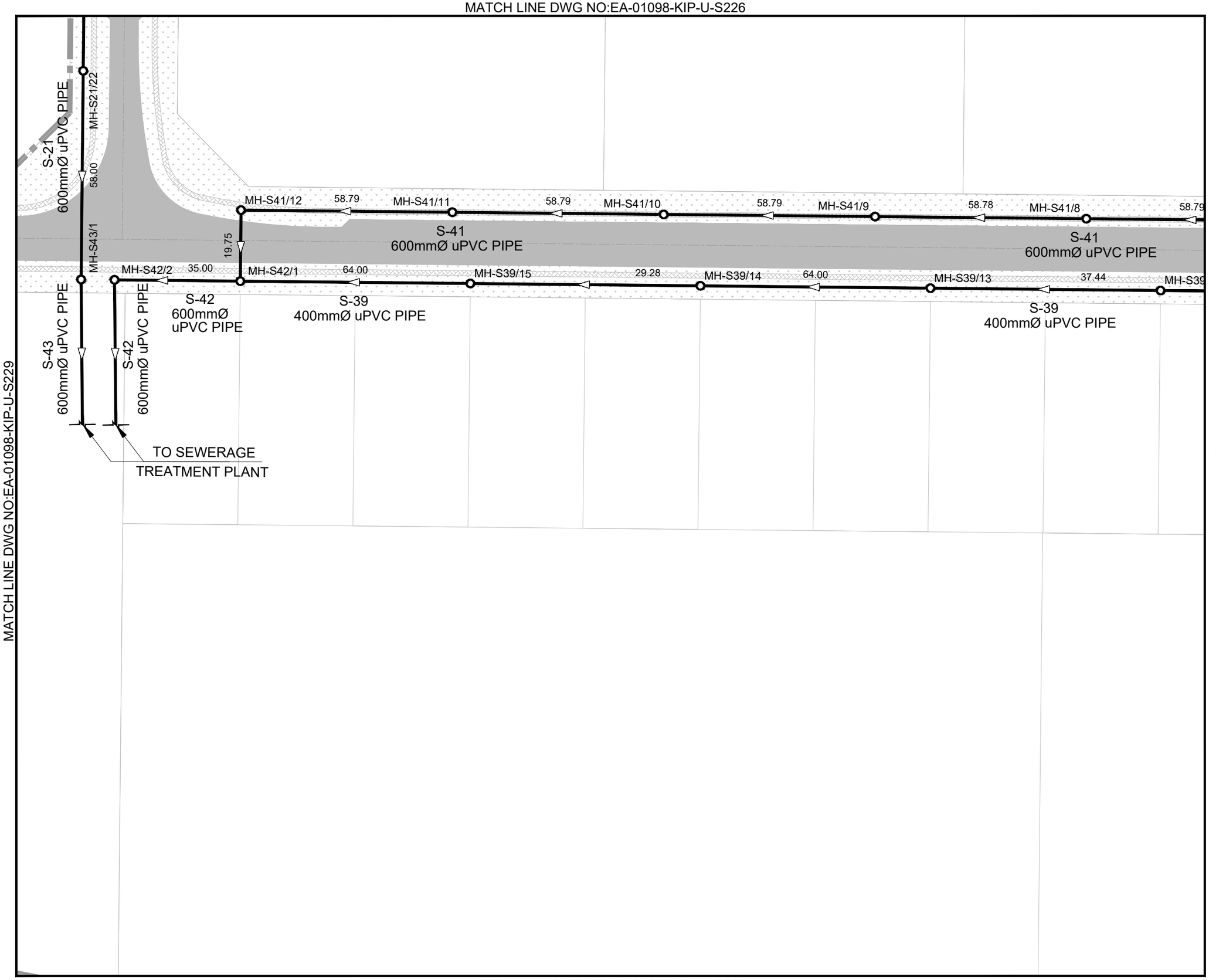
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S229	00

MATCH LINE DWG NO:EA-01098-KIP-U-S226

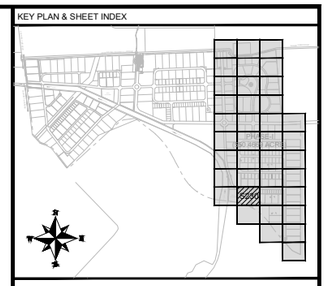
MATCH LINE DWG NO:EA-01098-KIP-U-S229

MATCH LINE DWG NO:EA-01098-KIP-U-S231

MATCH LINE DWG NO:EA-01098-KIP-U-S233



KEY PLAN & SHEET INDEX



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1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

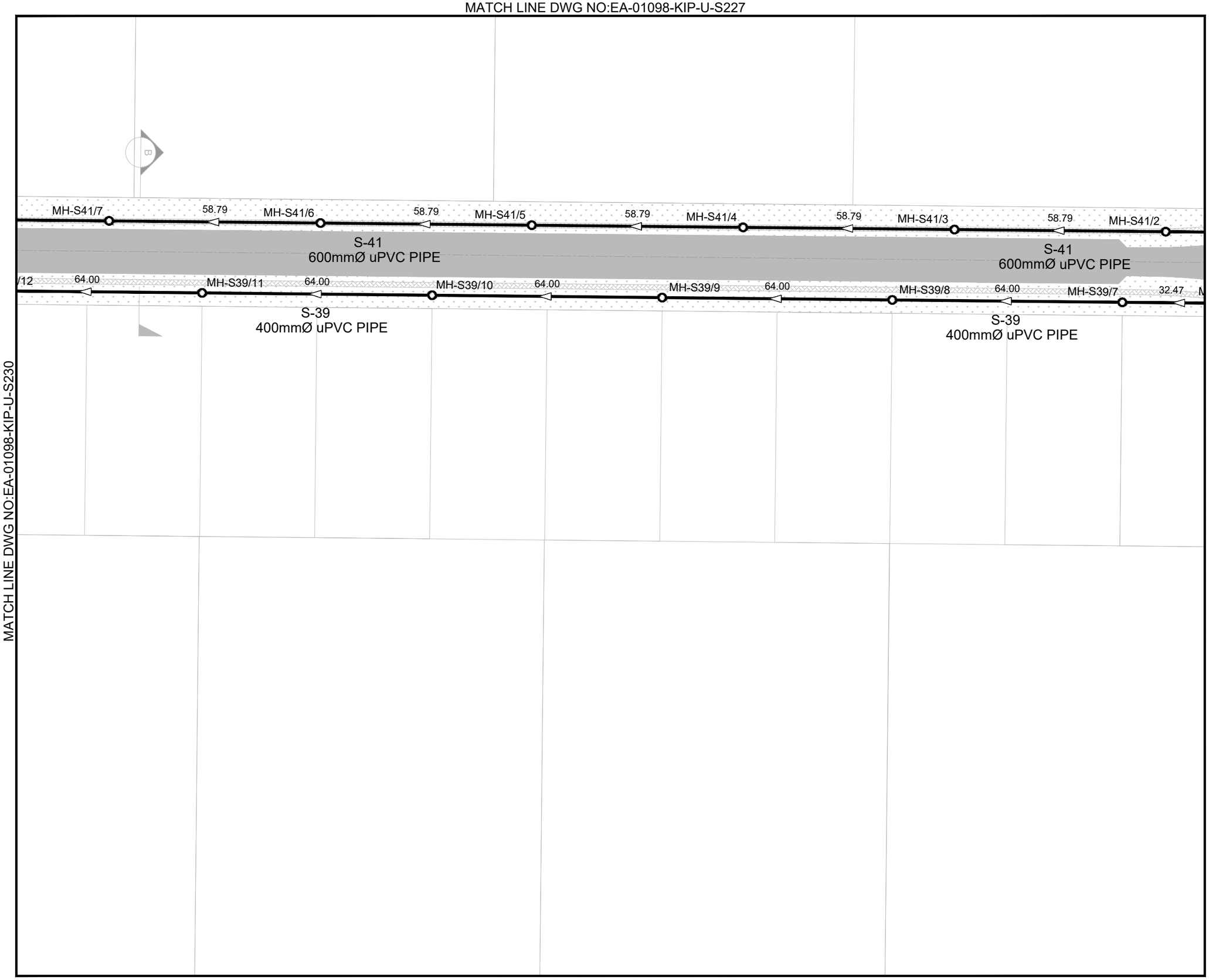
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
SEWERAGE SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S230	00

MATCH LINE DWG NO:EA-01098-KIP-U-S227

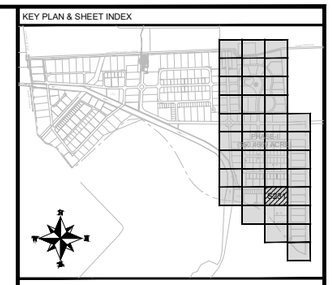


MATCH LINE DWG NO:EA-01098-KIP-U-S230

MATCH LINE DWG NO:EA-01098-KIP-U-S232

MATCH LINE DWG NO:EA-01098-KIP-U-S234

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

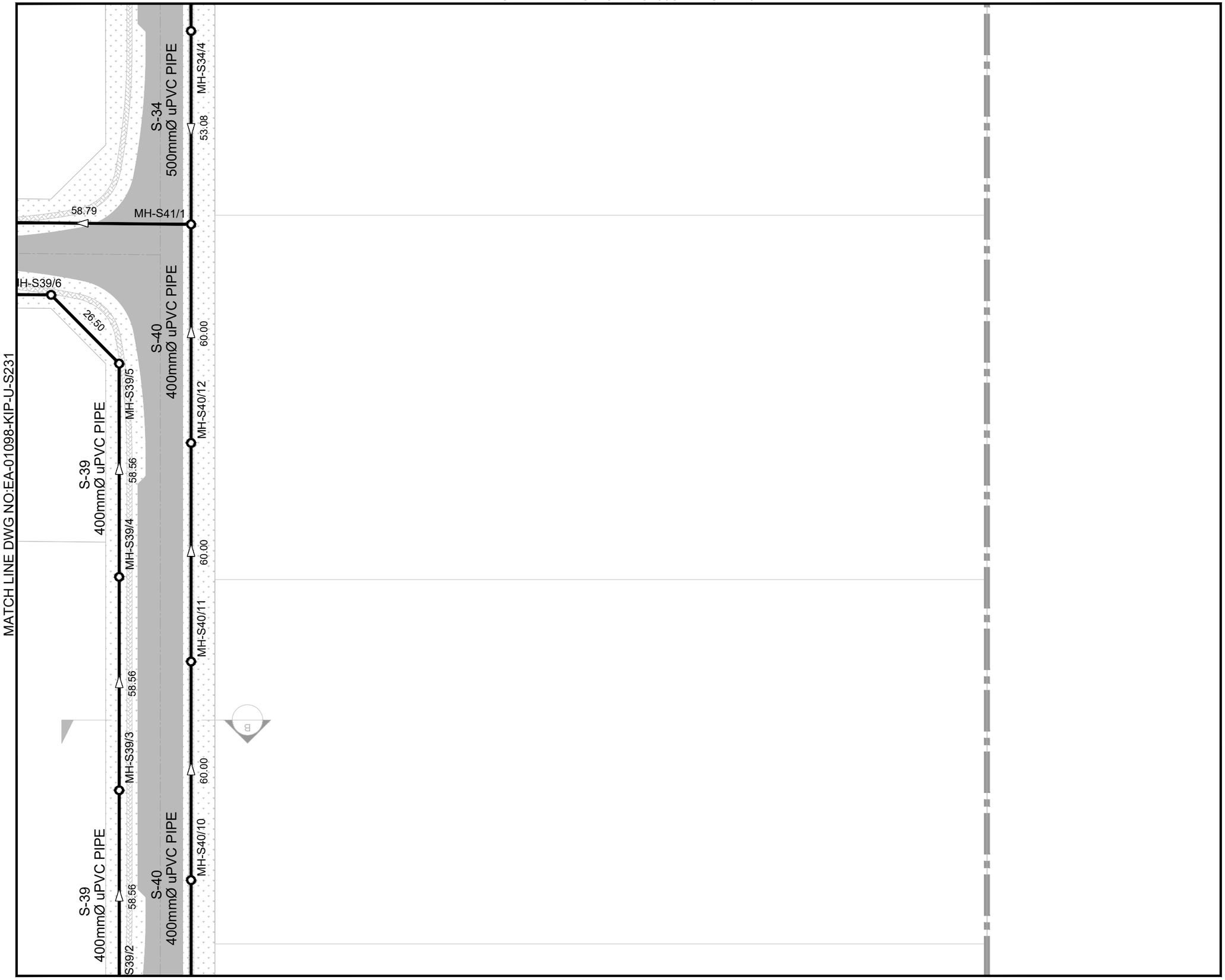
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
SEWERAGE SYSTEM

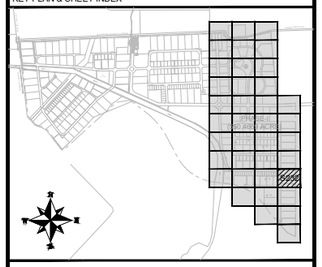
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S231	00

MATCH LINE DWG NO:EA-01098-KIP-U-S228



MATCH LINE DWG NO:EA-01098-KIP-U-S235

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

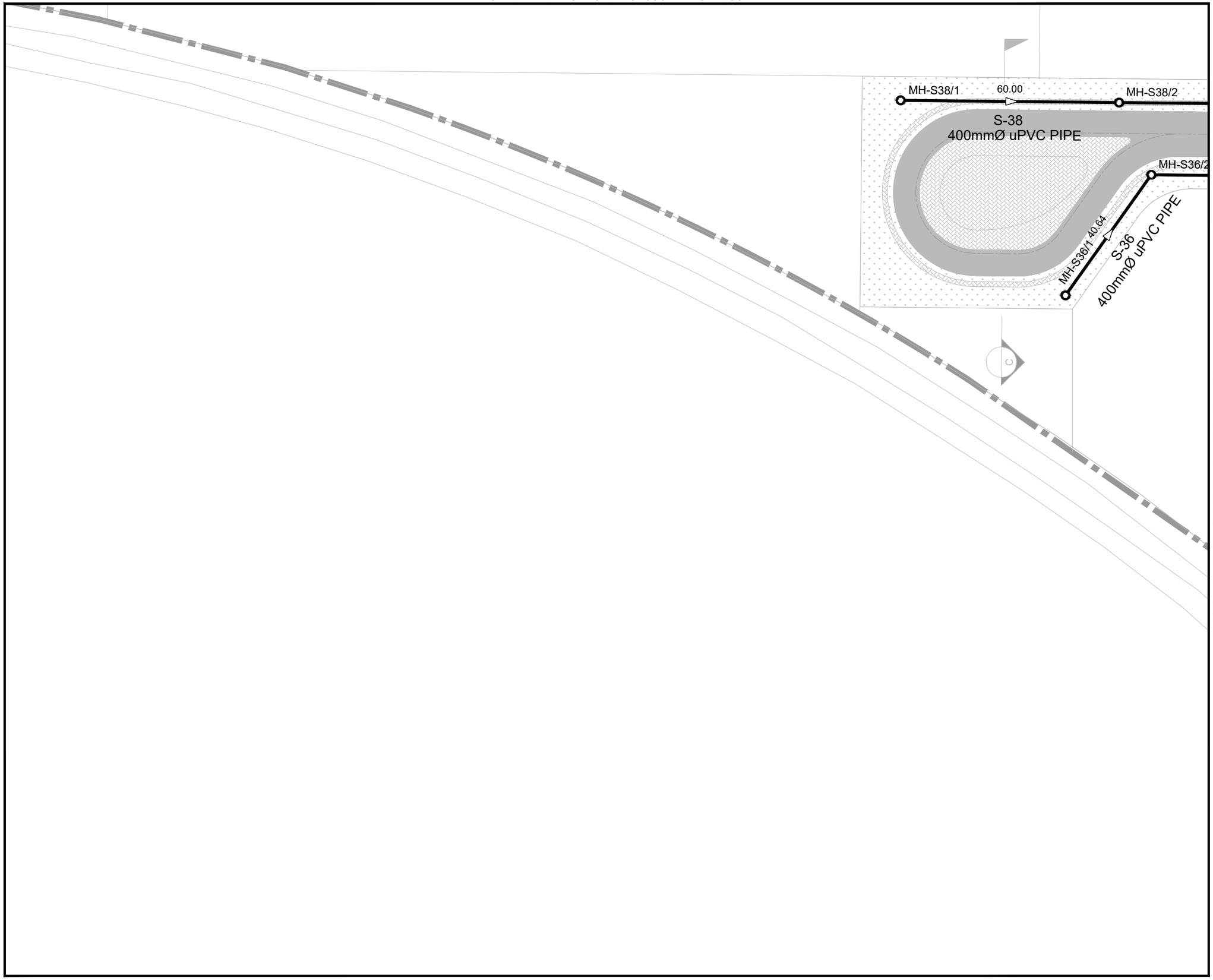
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF SEWERAGE SYSTEM

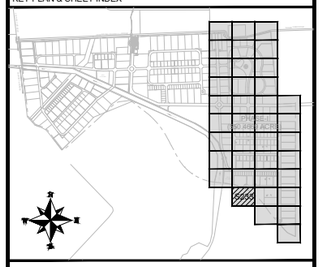
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S232	00

MATCH LINE DWG NO:EA-01098-KIP-U-S230



MATCH LINE DWG NO:EA-01098-KIP-U-S234

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

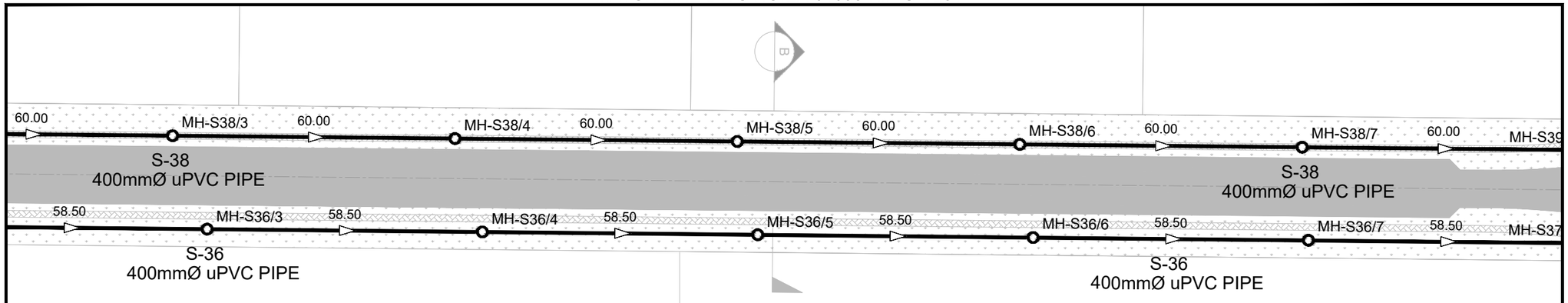
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF SEWERAGE SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S233	00

MATCH LINE DWG NO:EA-01098-KIP-U-S231

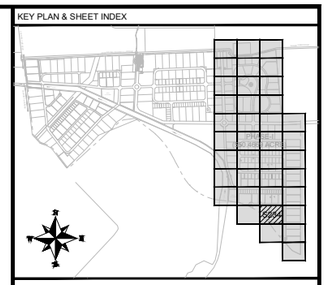


MATCH LINE DWG NO:EA-01098-KIP-U-S233

MATCH LINE DWG NO:EA-01098-KIP-U-S235

MATCH LINE DWG NO:EA-01098-KIP-U-S236

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

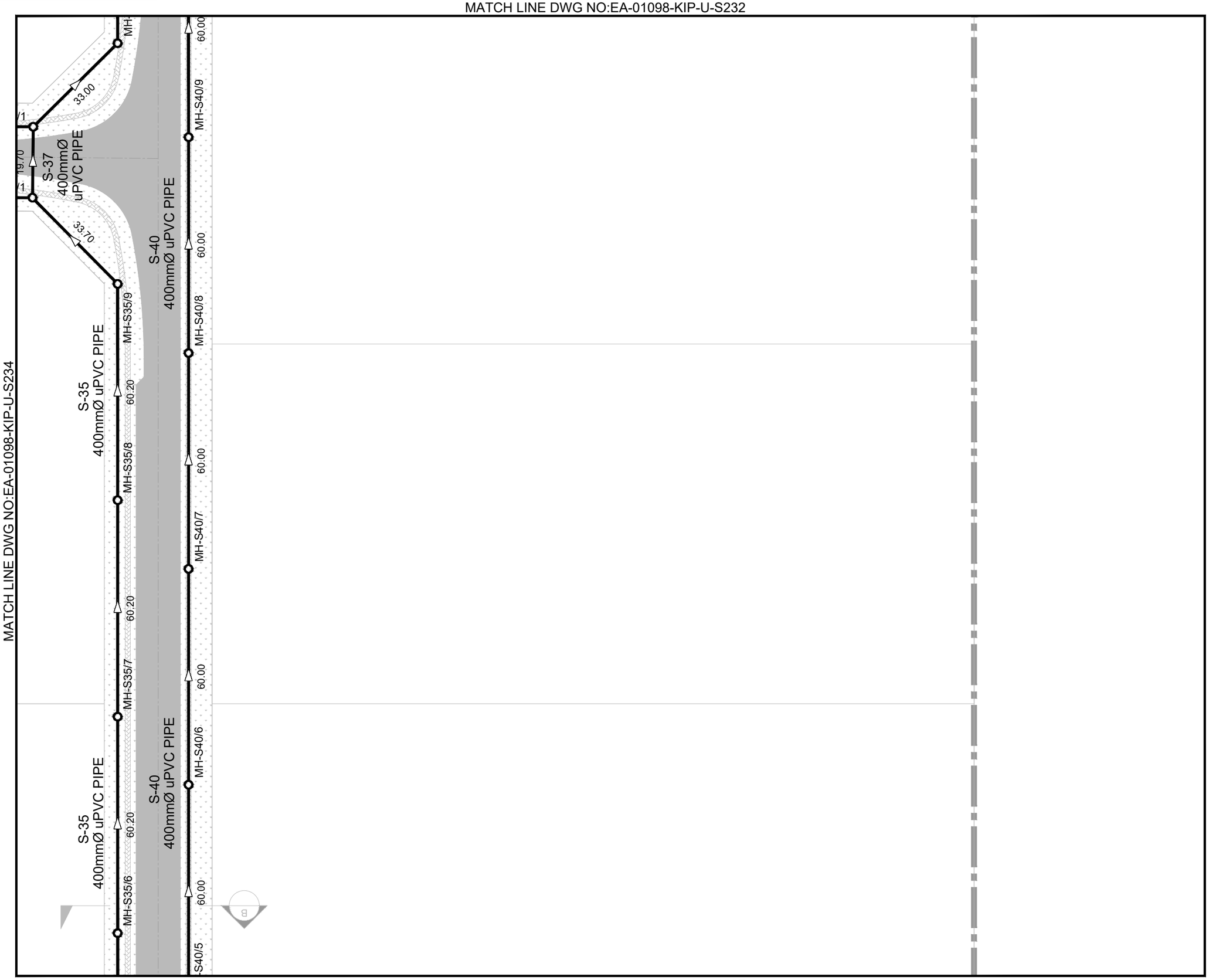
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF SEWERAGE SYSTEM

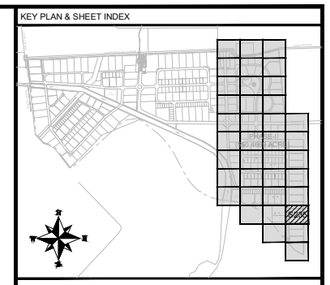
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S234	00

MATCH LINE DWG NO:EA-01098-KIP-U-S232



MATCH LINE DWG NO:EA-01098-KIP-U-S237

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

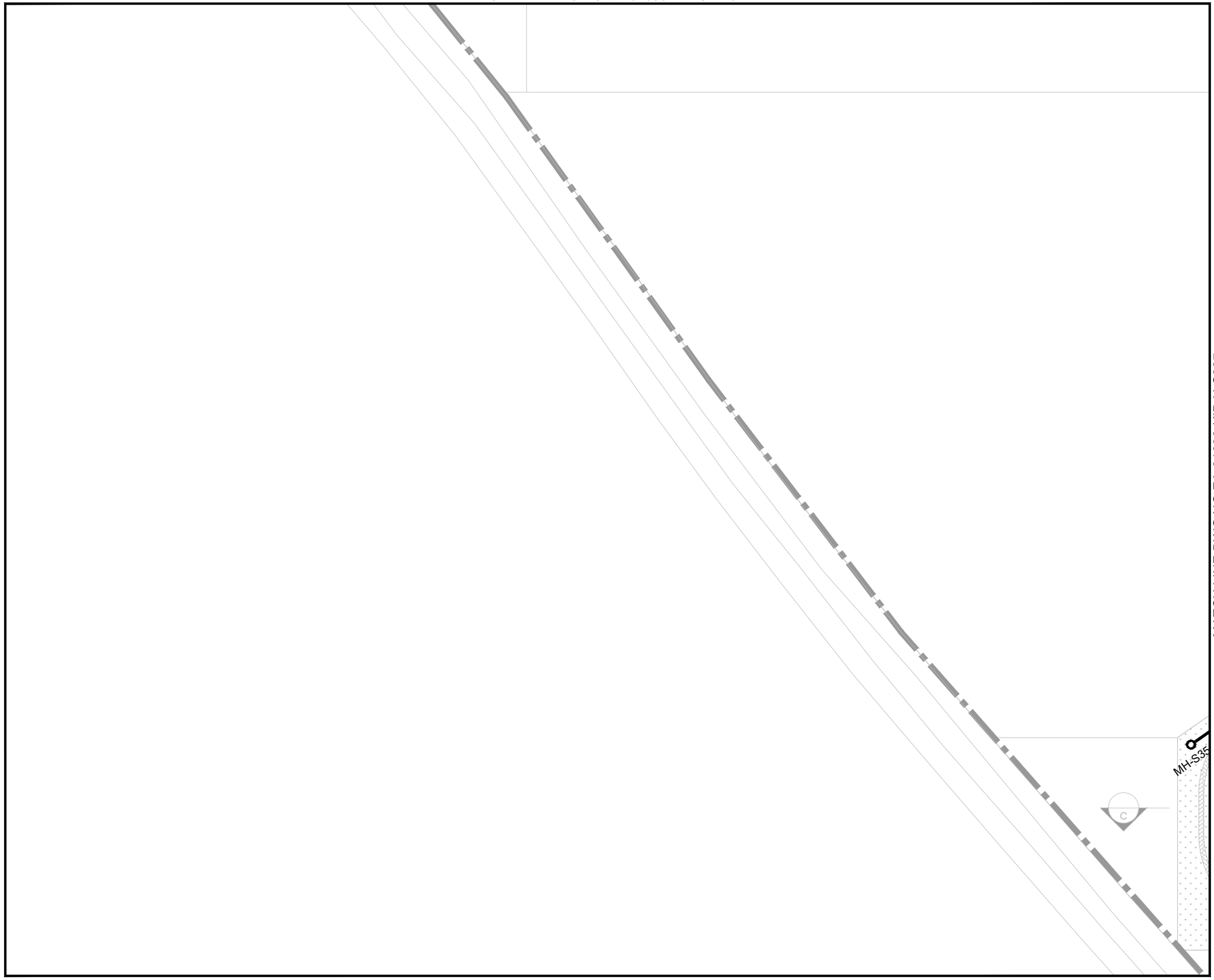
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF SEWERAGE SYSTEM

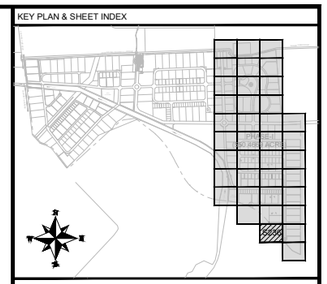
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S235	00

MATCH LINE DWG NO:EA-01098-KIP-U-S234



MATCH LINE DWG NO:EA-01098-KIP-U-S237

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

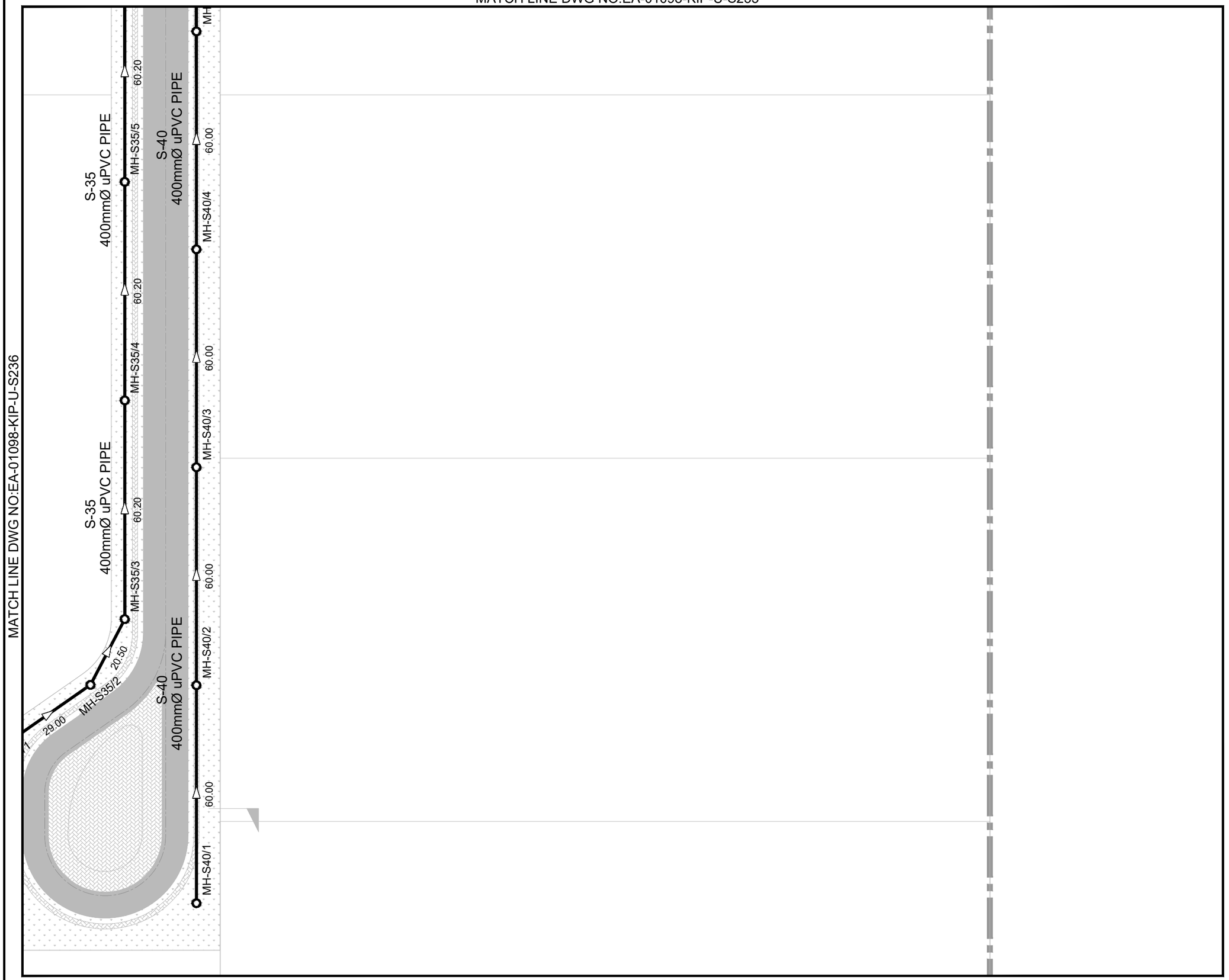
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF SEWERAGE SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S236	00

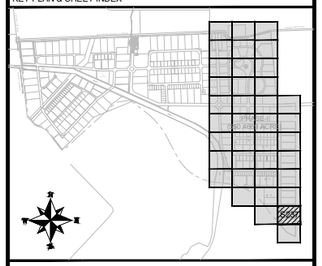
MATCH LINE DWG NO:EA-01098-KIP-U-S235



MATCH LINE DWG NO:EA-01098-KIP-U-S236

MATCH LINE DWG NO:EA-01098-KIP-U-S238

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

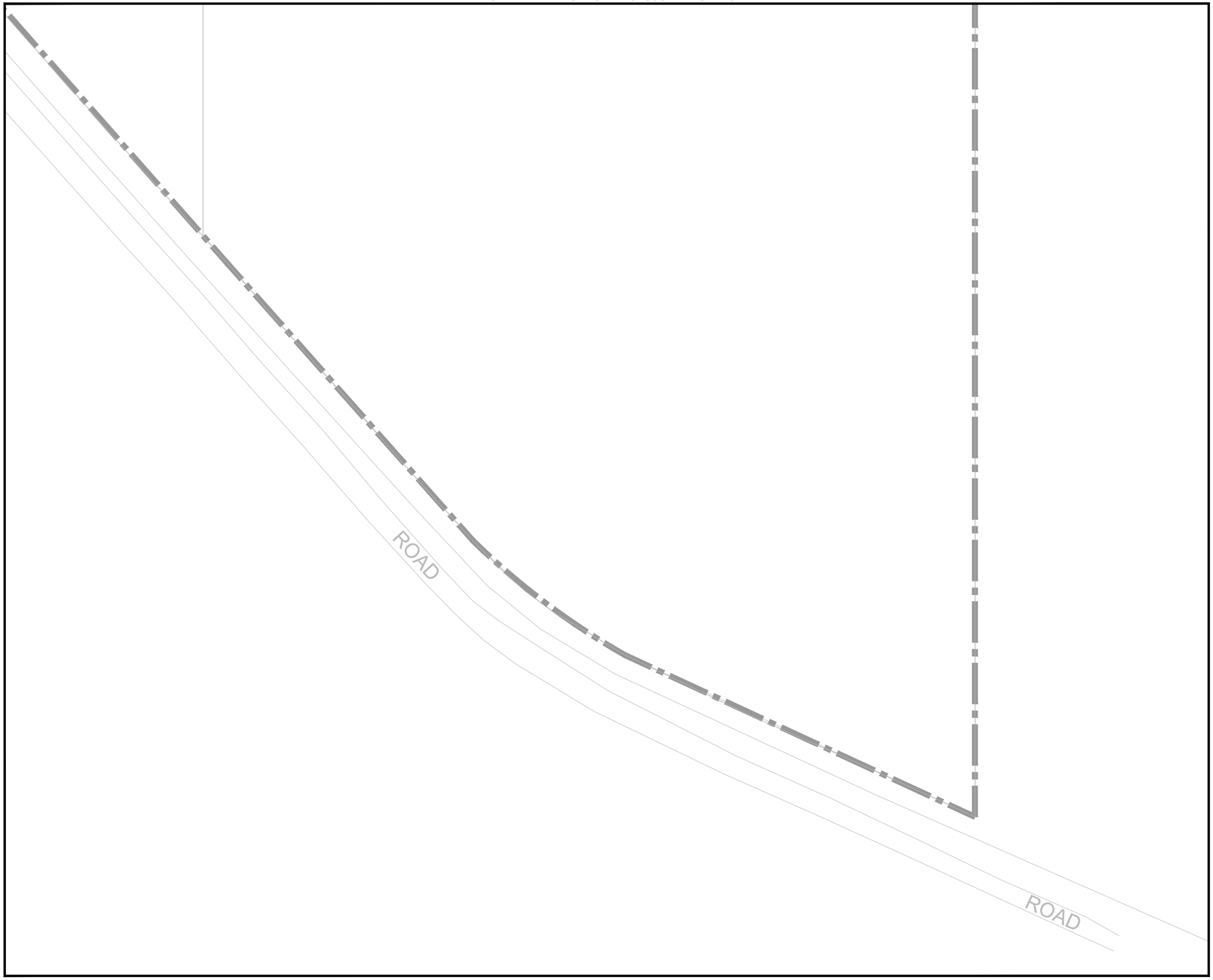
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

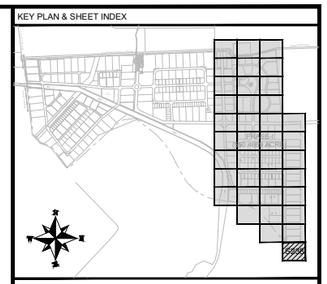
LAYOUT PLAN OF SEWERAGE SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S237	00

MATCH LINE DWG NO:EA-01098-KIP-U-S237



KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR DETAIL OF SEWERAGE MANHOLE AND TRENCH REFER DWG. EA-01098-KIP-U-S500.
3. FOR STRUCTURE DETAIL OF SEWERAGE MANHOLE REFER DWG.EA-01098-KIP-U-S501.
3. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED SEWERAGE LINE	
PROPOSED SEWERAGE MANHOLE	
PROPOSED SEWERAGE FLOW	
PROPOSED SEWERAGE LINE #	S-#
PROPOSED SEWERAGE MANHOLE #	MH-S#/#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

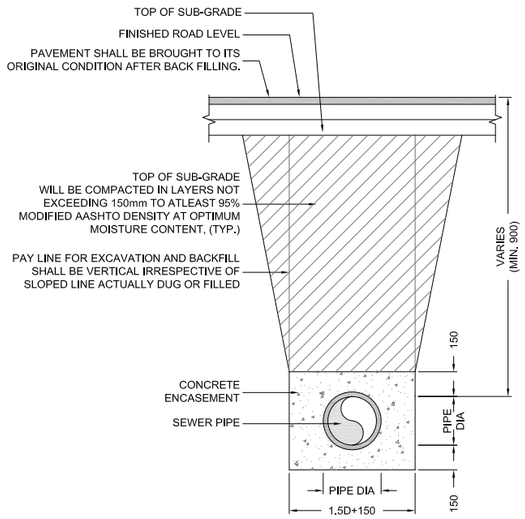
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

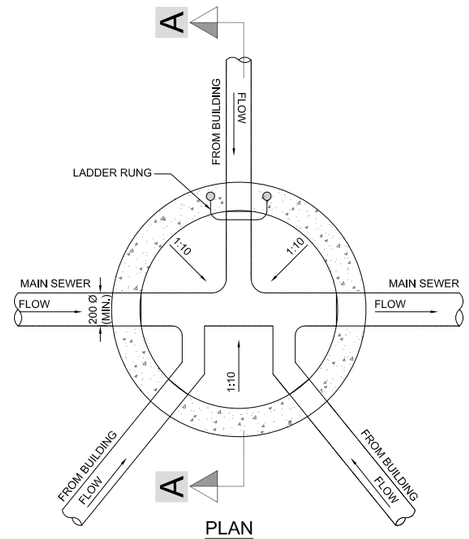
LAYOUT PLAN OF SEWERAGE SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S238	00

DETAIL DRAWING



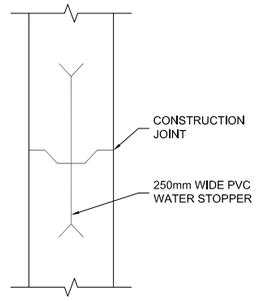
SEWER PIPE IN TRENCH
IN TRAFFIC AREA
WHERE COVER OVER PIPE
IS LESS THAN 1.2m



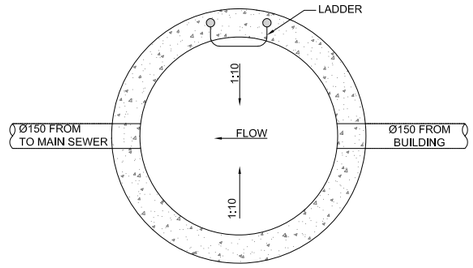
PLAN
MAIN LINE MANHOLE

VARIABLE DIMENSIONS FOR SEWER MANHOLES

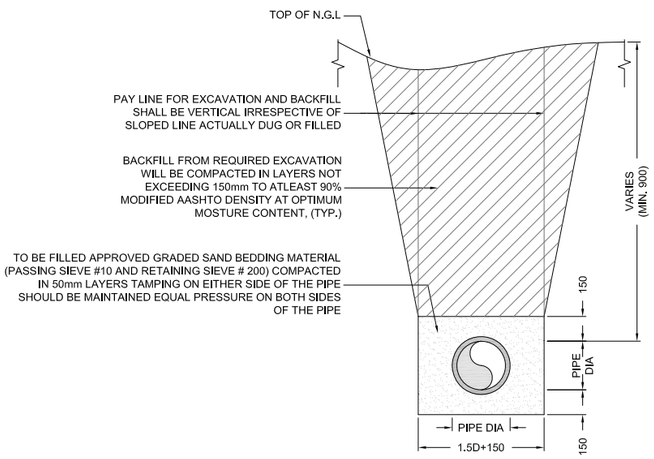
S.NO.	DIA OF MANHOLE (A)	PIPE DIAMETERS (mm)
1.	1200	PIPE DIAMETER UPTO 900mm
2.	1500	PIPE DIAMETER > 900MM & UPTO 1200mm
3.	2100	PIPE DIAMETER > 1200mm



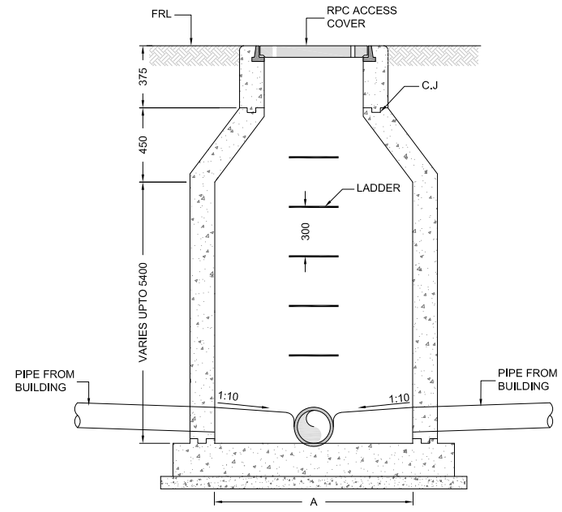
WATER STOPPER DETAIL



PLAN
BUILDING CONNECTION MANHOLE
TYPICAL DETAIL



SEWER PIPE IN TRENCH
IN NON TRAFFIC AREA



SECTION-A

KEY PLAN & SHEET INDEX

NOTE:
1. ALL DIMENSIONS ARE IN MILLIMETER UNLESS OTHERWISE STATED
2. FOR SEWERAGE SYSTEM LAYOUT REFER DWG. EA-01098-KIP-U-S200 TO S238.

LEGEND:

CLIENT:
PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm
JV-Team

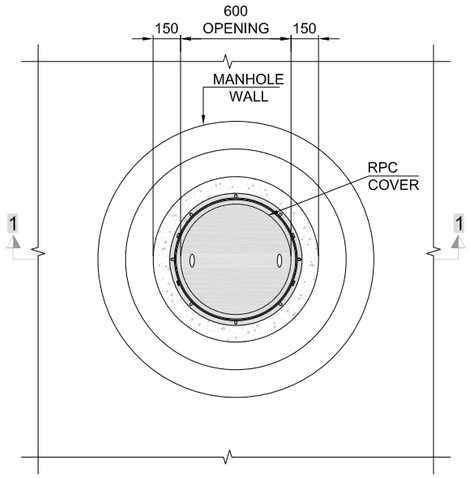
REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:
KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

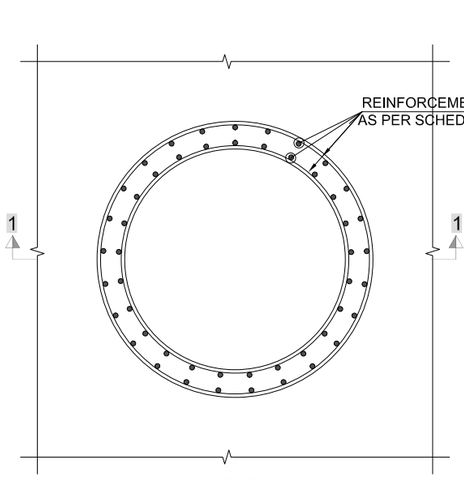
DRAWN	FURQAN	SCALE	N.T.S
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:
TYPICAL DETAIL
OF TRENCH, MANHOLE & HOUSE
CONNECTION CHAMBER

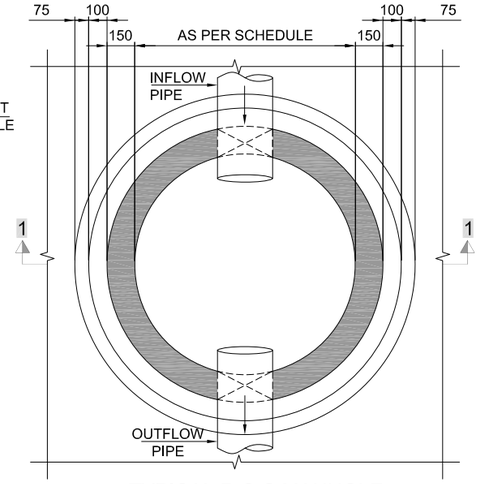
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S500	00



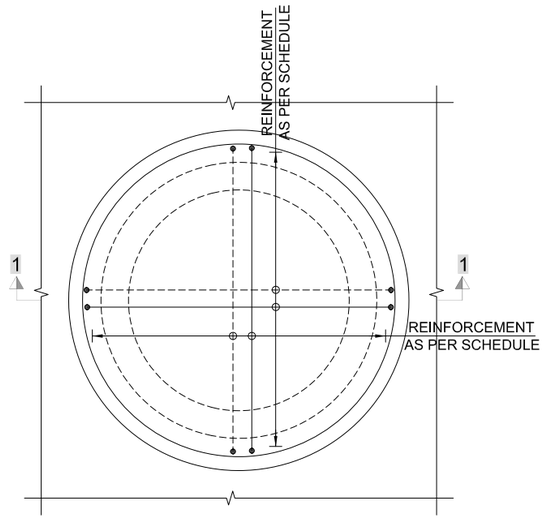
TYPICAL R.C.C.MANHOLE
PLAN TOP LEVEL



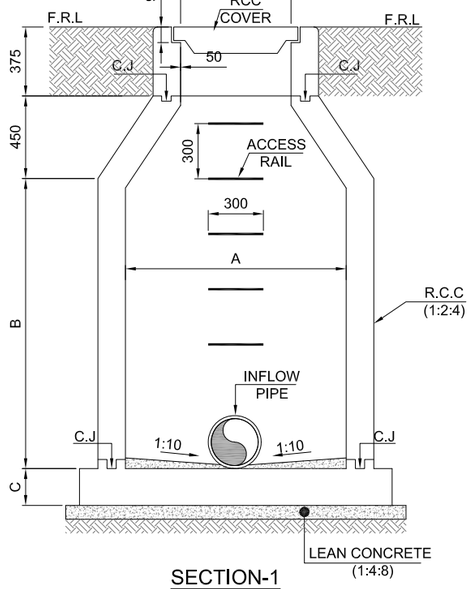
MANHOLE WALL
REINFORCEMENT PLAN



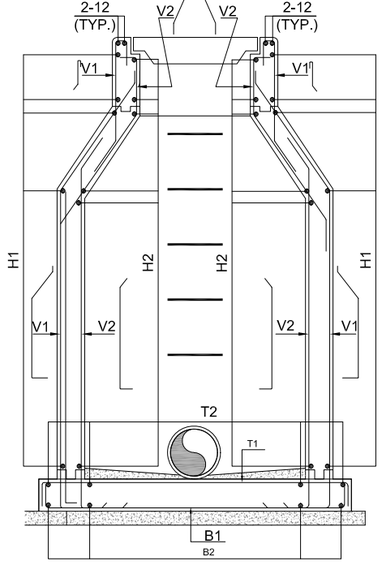
TYPICAL R.C.C.MANHOLE
PLAN ABOVE 900 LEVEL



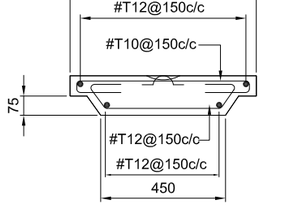
MANHOLE BOTTOM
REINFORCEMENT PLAN



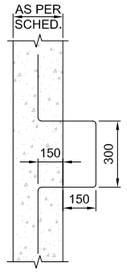
SECTION-1



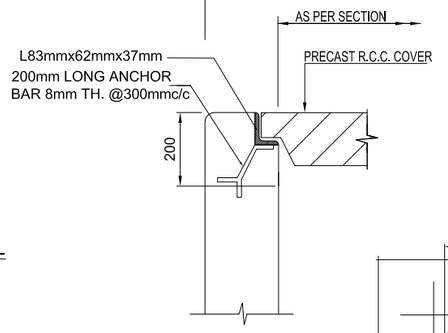
SECTION-1
REINFORCEMENT DETAIL



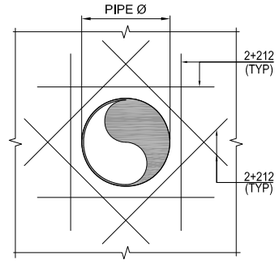
SECTION-1
COVER REINFORCEMENT DETAIL



STEEL LADDER TYPICAL PLAN



DETAIL 'A' (TYP.)



TYP. OPENING REINFORCEMENT
DETAIL IN SLAB & WALL

MANHOLE SCHEDULE

S.NO.	MANHOLE DIA (A)	MANHOLE INTERNAL DEPTH (B)		THICKNESS OF FOOTING (C)	THICKNESS OF WALL	REINFORCEMENT OF FOUNDATIONS				REINFORCEMENT OF WALLS				REMARKS
		MINIMUM	MAXIMUM			B1	B2	T1	T2	(VERTICAL =V1)	(VERTICAL =V2)	(HORIZOTAL=H1)	(HORIZOTAL =H2)	
01	900 TO 2100	1100	1800	200	150	10@200c/c	10@200c/c	-	-	10@150c/c	-	10@250c/c	-	
02	900 TO 2100	1800	3600	225	200	10@150c/c	10@150c/c	-	-	12@200c/c	-	10@250c/c	-	
03	900 TO 2100	3600	6400	300	300	10@150c/c	10@150c/c	10@150c/c	10@150c/c	12@150c/c	10@150c/c	10@200c/c	10@250c/c	

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED.
1. ALL DRAWINGS MUST BE READ IN CONJUNCTION WITH RELEVANT ARCHITECTURAL DRAWINGS.
2. FOR SLEEVES, OPENING AND OTHER DETAILS ETC.REFER RELEVANT MEP/PH. DRAWINGS.
3. f'c FOR FOUNDATION SLABS ARE TAKEN AS 4000 Psi.
4. f'c FOR COLUMNS AND WALLS ARE TAKEN AS 4000 Psi.
5. ALL FOUNDATIONS ARE DESIGNED ON A NET BEARING CAPACITY OF 1.0 Tsf AND CONTRACTOR ALSO TO ENSURE THE BEARING CAPACITY PRIOR TO CONSTRUCTION WORKS.
6. BACKFILLING OF WILL BE DONE AFTER CASTING OF TOP SLAB TO ENSURE PROPPED CANTILEVER ACTION ON WALL.
7. THE SELECT FILL MATERIAL SHALL CONSIST OF WELL GRADED FINE TO COARSE SAND BELONGING TO AASHTO CLASSIFICATION SYSTEM. IT SHALL BE PLACED IN LAYERS OF 150/200 INCHES THICKNESS AND COMPACTED TO MINIMUM 95% OF THE MAXIMUM DENSITY OBTAINED IN ACCORDANCE WITH ASTM DESIGNATION D-1557 THE MOISTURE CONTENT OF FILL MATERIAL SHALL BE CONTROLLED WITHIN ± 2% OF OPTIMUM VALUES.FIELD DENSITY TESTS (ASTM D-1556) SHALL BE PERFORMED ON EACH LAYER TO CONTROL THE DEGREE OF COMPACTION. THE LAYING OF ENGINEERED FILL AND COMPACTION PROCESS MUST BE SUPERVISED BY COMPETENT SITE ENGINEER.
8. PIPE AND SLEEVE INVERT LEVEL SHALL FOLLOW MEP/PH DRAWINGS.

KEY PLAN & SHEET INDEX

NOTE:

1. ALL DIMENSIONS ARE IN MILLIMETER UNLESS OTHERWISE STATED
2. FOR SEWERAGE SYSTEM LAYOUT REFER DWG. EA-01098-KIP-U-S200 TO S238.

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	N.T.S
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

SEWERAGE MANHOLE
REINFORCEMENT DETAIL

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-S501	00

MASTER PLAN



KEY PLAN & SHEET INDEX

NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

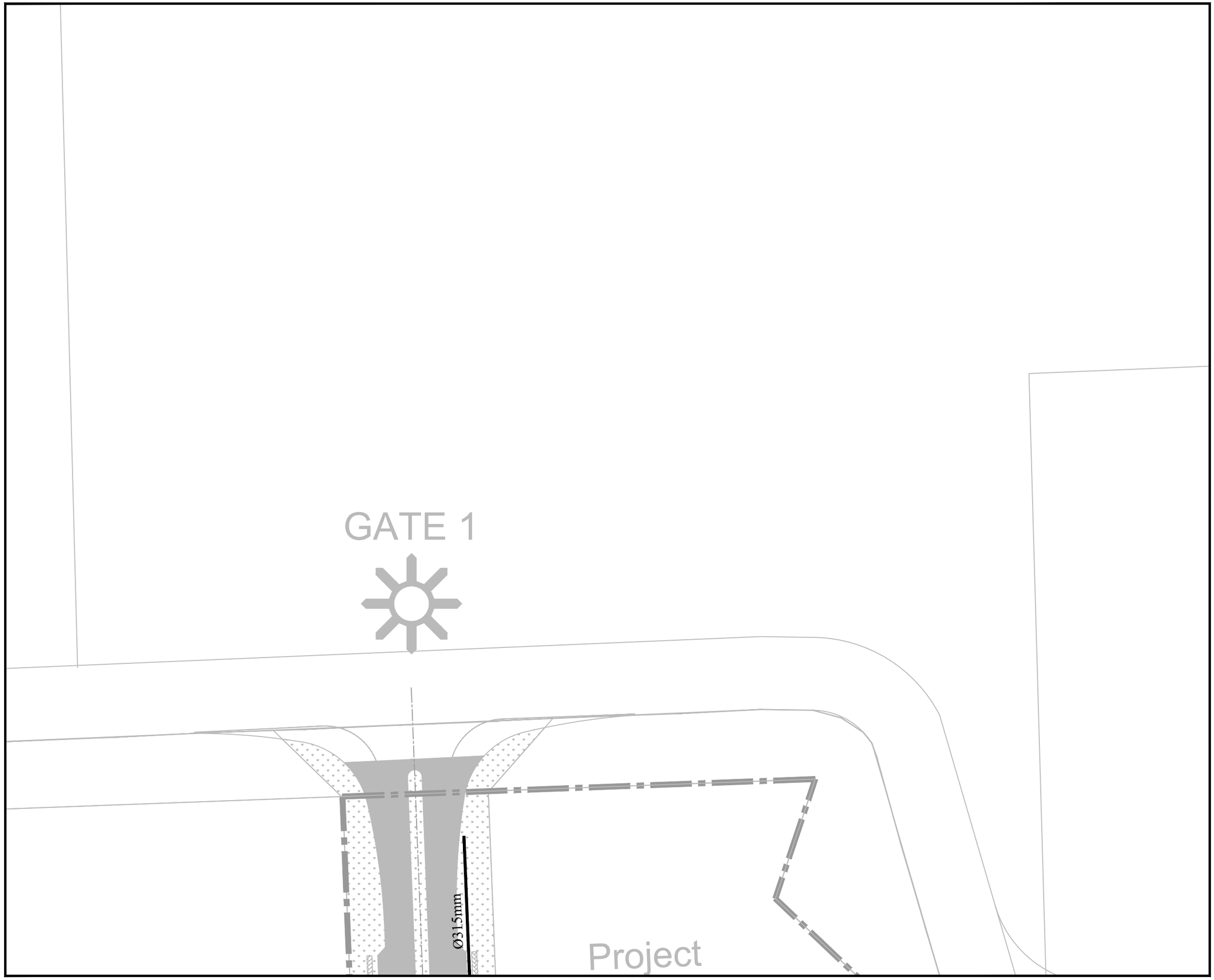
DRAWN	FURQAN	SCALE	N.T.S
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

KEY PLAN
AND SHEET INDEX

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W100	00

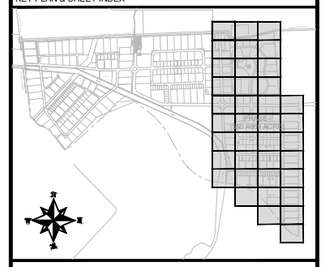
LAYOUT PLAN



MATCH LINE DWG NO:EA-01098-KIP-U-W104

MATCH LINE DWG NO:EA-01098-KIP-U-W102

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED.
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
WATER SUPPLY SYSTEM

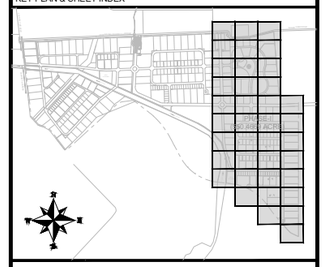
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W101	00

MATCH LINE DWG NO:EA-01098-KIP-U-W101

MATCH LINE DWG NO:EA-01098-KIP-U-W105

MATCH LINE DWG NO:EA-01098-KIP-U-W103

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED.
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
WATER SUPPLY SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W102	00

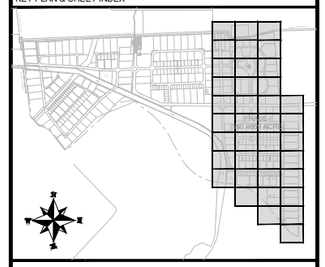
MATCH LINE DWG NO:EA-01098-KIP-U-W102

EMERGENCY
GATE

CONNECTION PIPE
FROM MAIN LINE

MATCH LINE DWG NO:EA-01098-KIP-U-W106

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED.
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
WATER SUPPLY SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W103	00

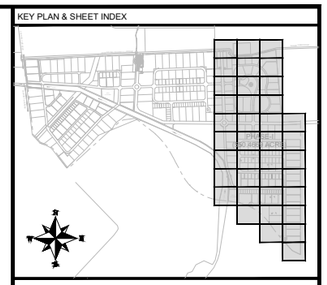
MATCH LINE DWG NO:EA-01098-KIP-U-W101



MATCH LINE DWG NO:EA-01098-KIP-U-W105

MATCH LINE DWG NO:EA-01098-KIP-U-W107

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED.
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

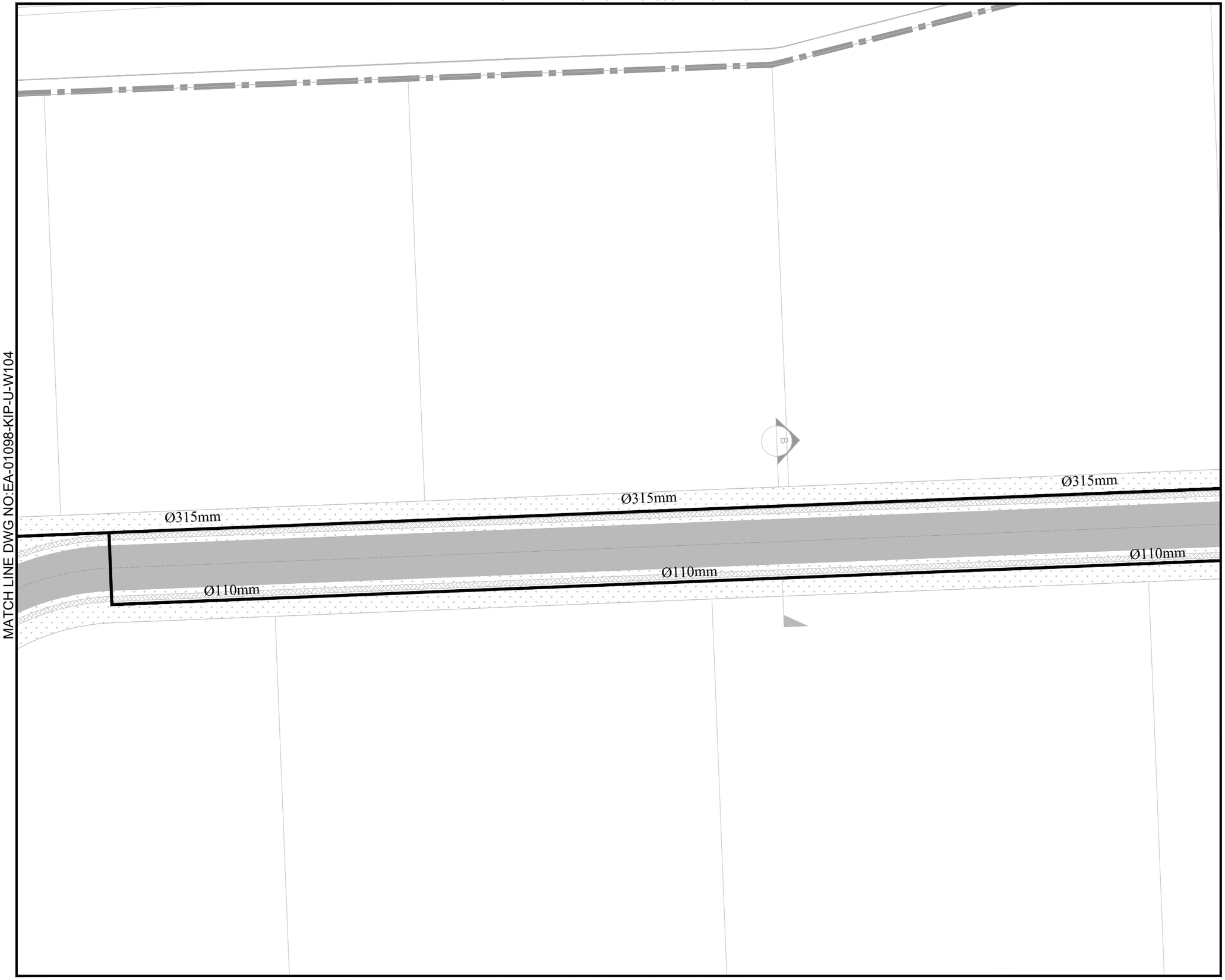
LAYOUT PLAN OF WATER SUPPLY SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W104	00

MATCH LINE DWG NO:EA-01098-KIP-U-W102

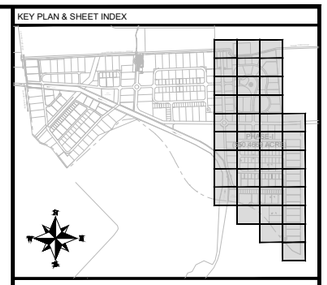
MATCH LINE DWG NO:EA-01098-KIP-U-W104

MATCH LINE DWG NO:EA-01098-KIP-U-W106



MATCH LINE DWG NO:EA-01098-KIP-U-W108

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED.
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

PIDC

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

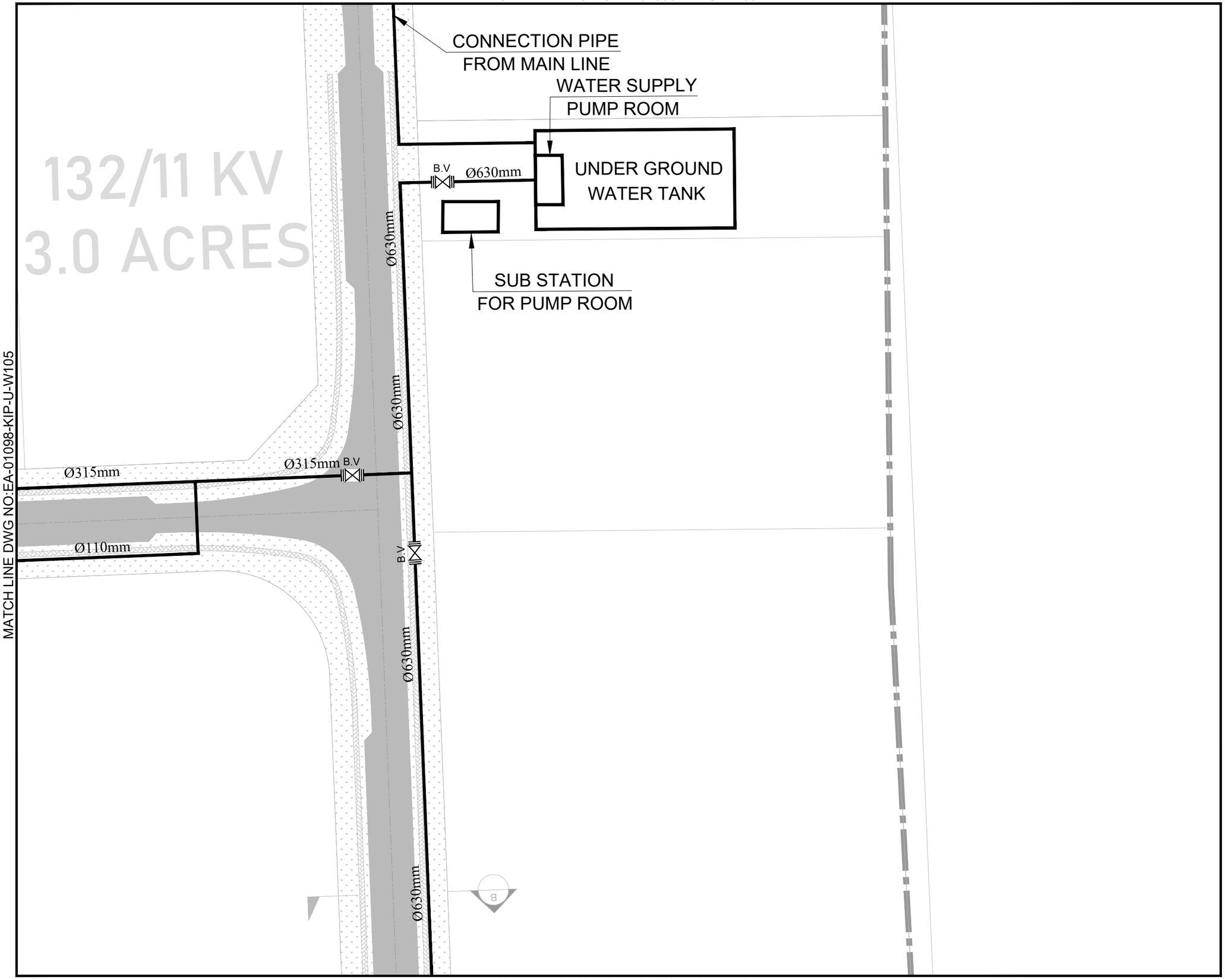
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
WATER SUPPLY SYSTEM

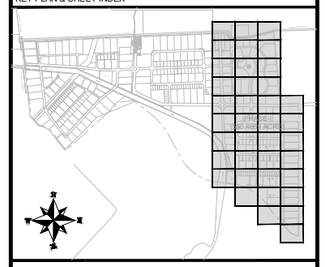
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W105	00

MATCH LINE DWG NO:EA-01098-KIP-U-W103



MATCH LINE DWG NO:EA-01098-KIP-U-W109

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

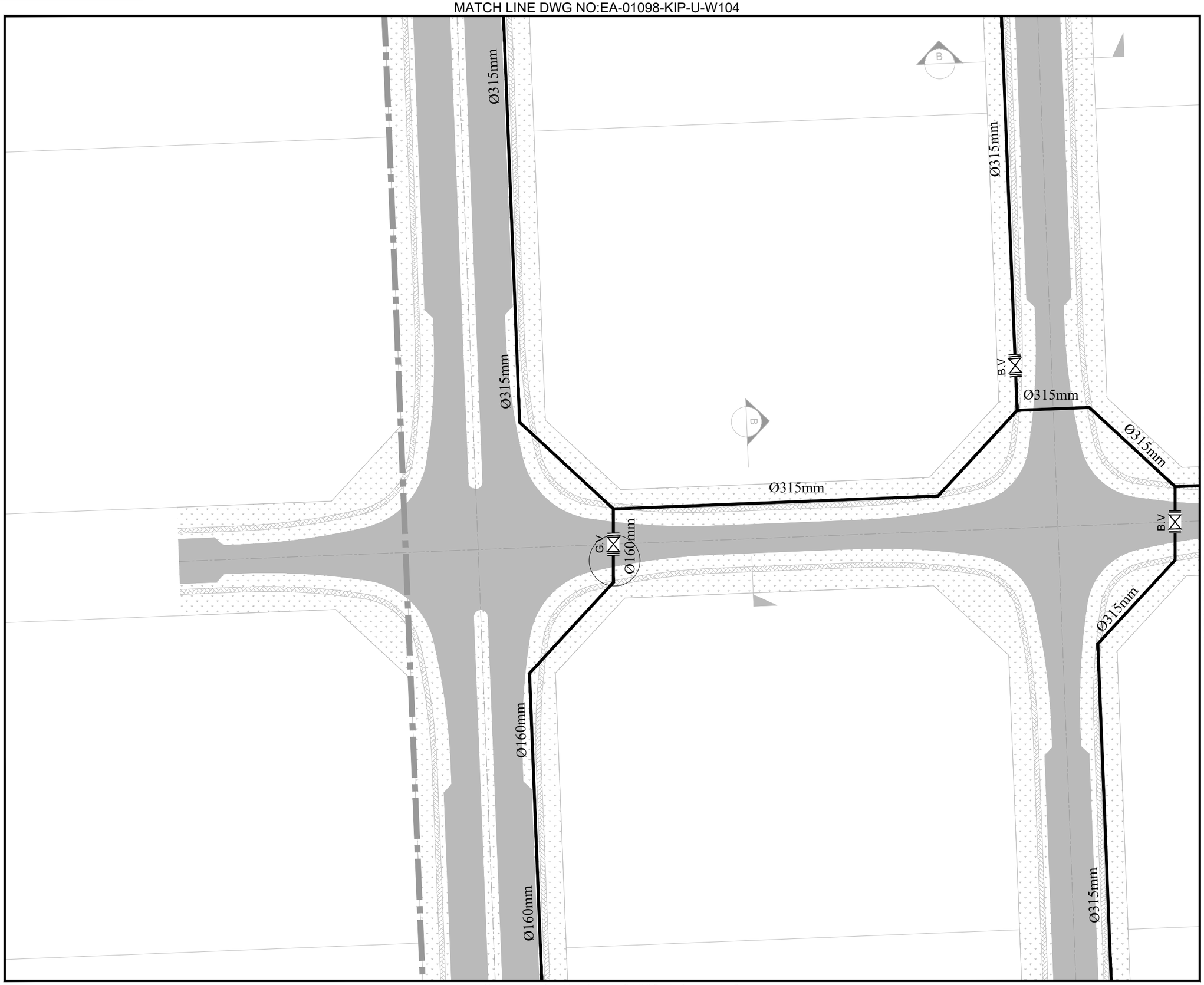
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
WATER SUPPLY SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W106	00

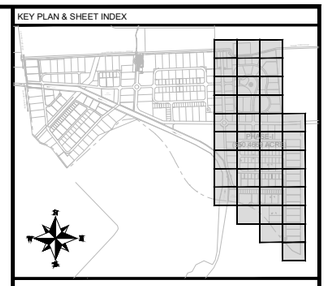
MATCH LINE DWG NO:EA-01098-KIP-U-W104



MATCH LINE DWG NO:EA-01098-KIP-U-W108

MATCH LINE DWG NO:EA-01098-KIP-U-W110

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

- PROPOSED WATER LINE Ø 110mm
- PROPOSED WATER LINE Ø 160mm
- PROPOSED WATER LINE Ø 180mm
- PROPOSED WATER LINE Ø 315mm
- PROPOSED WATER LINE Ø 355mm
- PROPOSED WATER LINE Ø 450mm
- PROPOSED WATER LINE Ø 630mm
- END CAP
- BUTTERFLY VALVE (B.V)
- GATE VALVE (G.V)
- AIR VALVE (V.A)
- WASHOUT VALVE (W.O)
- FIRE HYDRANT (F.H)

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

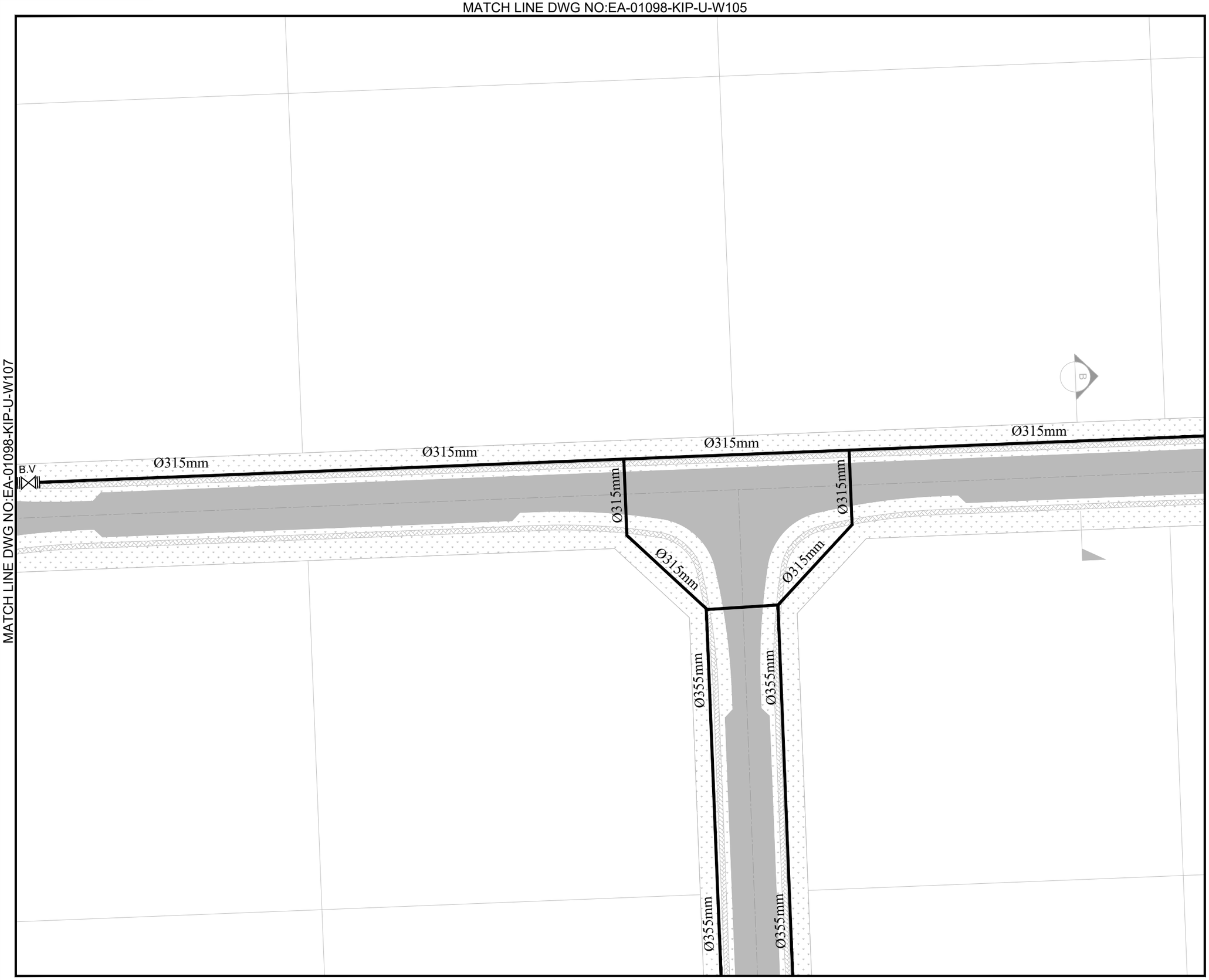
LAYOUT PLAN OF WATER SUPPLY SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W107	00

MATCH LINE DWG NO:EA-01098-KIP-U-W105

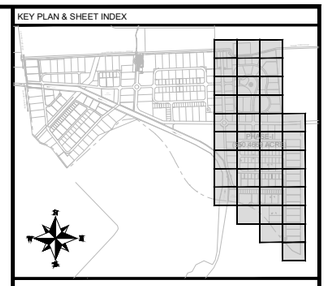
MATCH LINE DWG NO:EA-01098-KIP-U-W107

MATCH LINE DWG NO:EA-01098-KIP-U-W109



MATCH LINE DWG NO:EA-01098-KIP-U-W111

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

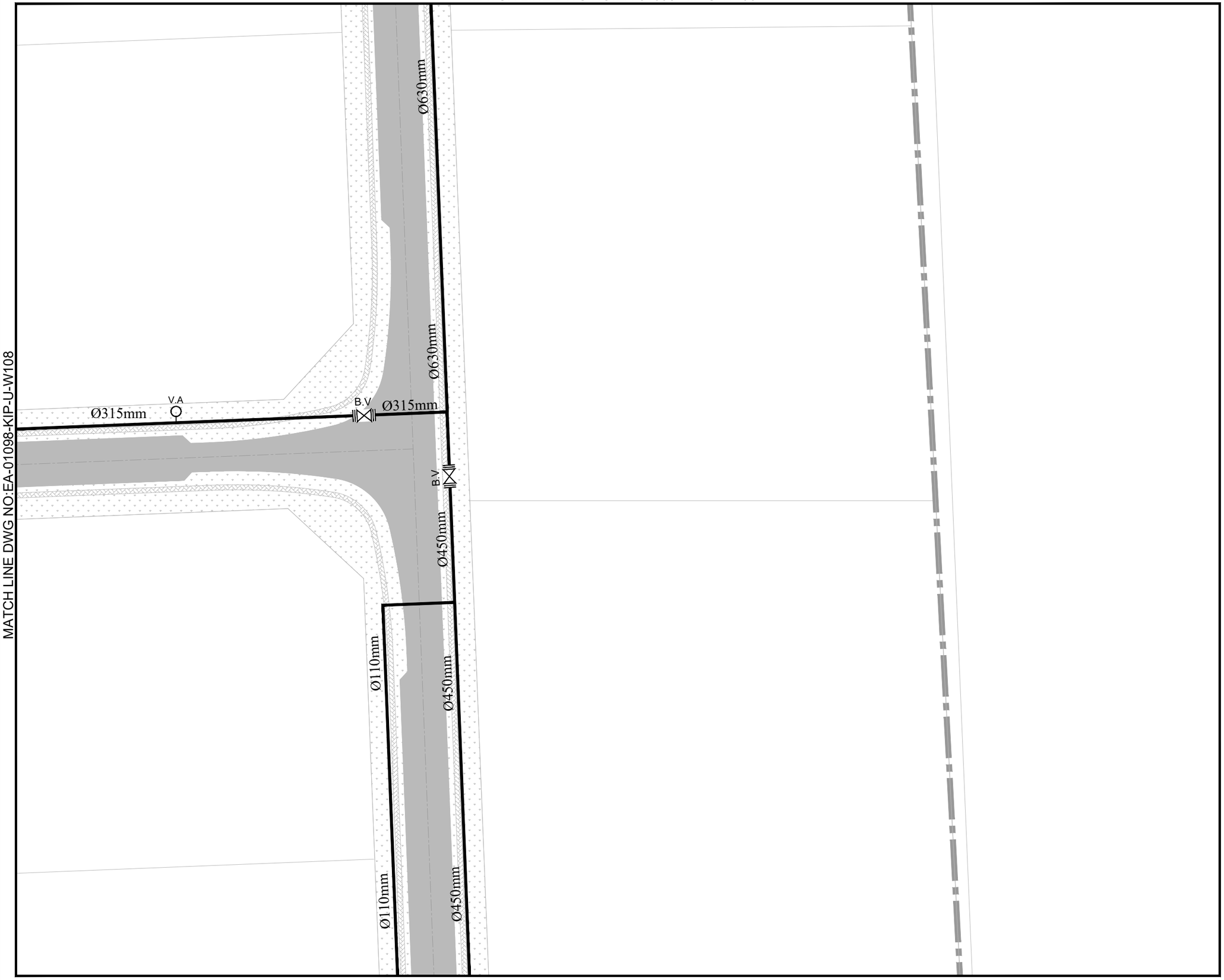
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF WATER SUPPLY SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W108	00

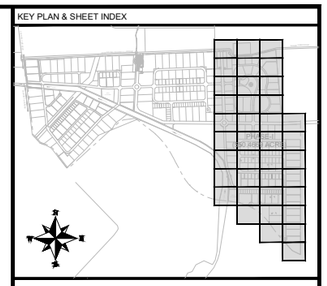
MATCH LINE DWG NO:EA-01098-KIP-U-W106



MATCH LINE DWG NO:EA-01098-KIP-U-W108

MATCH LINE DWG NO:EA-01098-KIP-U-W112

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED.
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

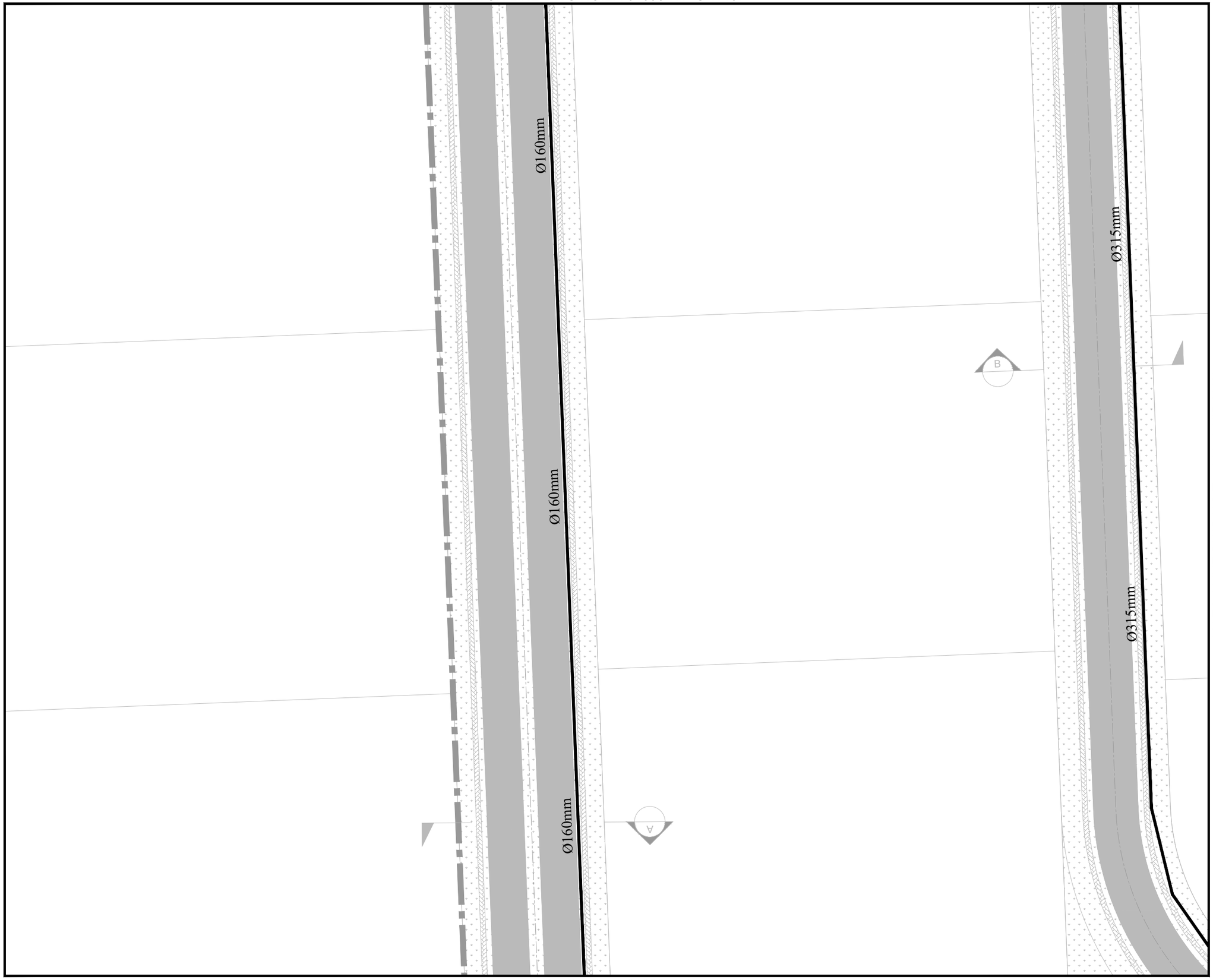
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
WATER SUPPLY SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W109	00

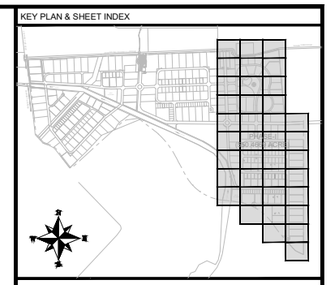
MATCH LINE DWG NO:EA-01098-KIP-U-W107



MATCH LINE DWG NO:EA-01098-KIP-U-W113

MATCH LINE DWG NO:EA-01098-KIP-U-W111

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED.
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
WATER SUPPLY SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W110	00

MATCH LINE DWG NO:EA-01098-KIP-U-W108

MATCH LINE DWG NO:EA-01098-KIP-U-W110

MATCH LINE DWG NO:EA-01098-KIP-U-W112

MATCH LINE DWG NO:EA-01098-KIP-U-W114

Ø355mm

Ø355mm

Ø355mm

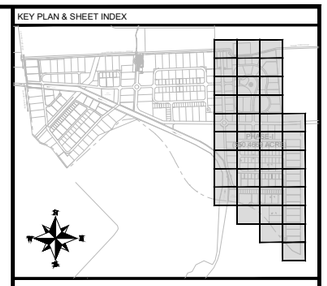
Ø355mm

Ø355mm

Ø355mm

B

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED.
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
WATER SUPPLY SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W111	00

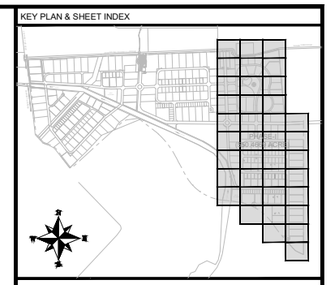
MATCH LINE DWG NO:EA-01098-KIP-U-W109

MATCH LINE DWG NO:EA-01098-KIP-U-W111



MATCH LINE DWG NO:EA-01098-KIP-U-W115

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED.
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — **JV-Team**

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

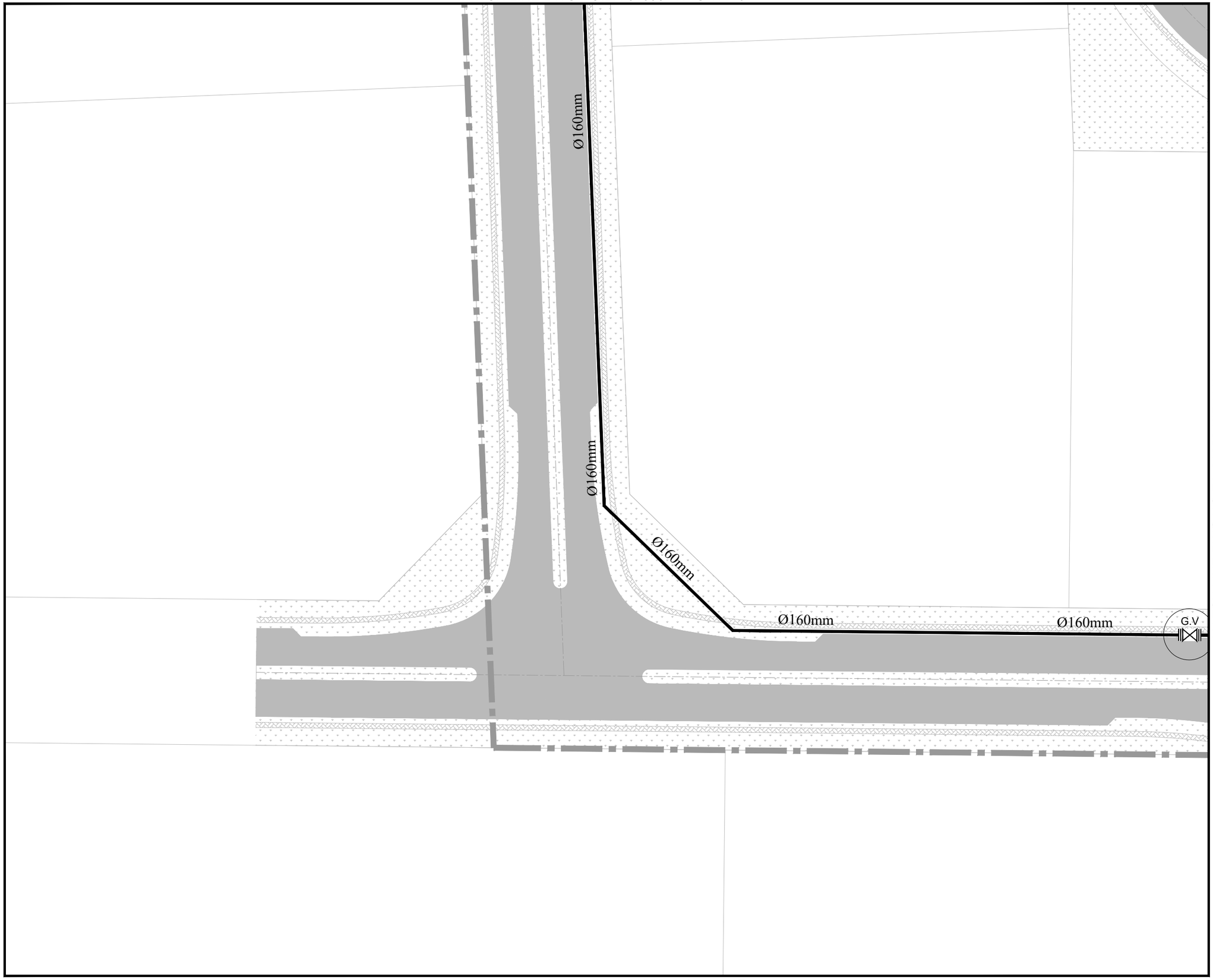
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
WATER SUPPLY SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W112	00

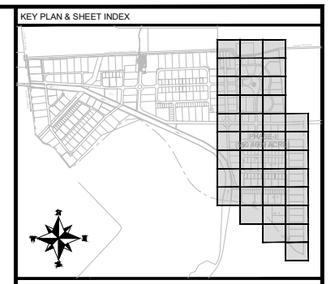
MATCH LINE DWG NO:EA-01098-KIP-U-W110



MATCH LINE DWG NO:EA-01098-KIP-U-W114

MATCH LINE DWG NO:EA-01098-KIP-U-W117

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

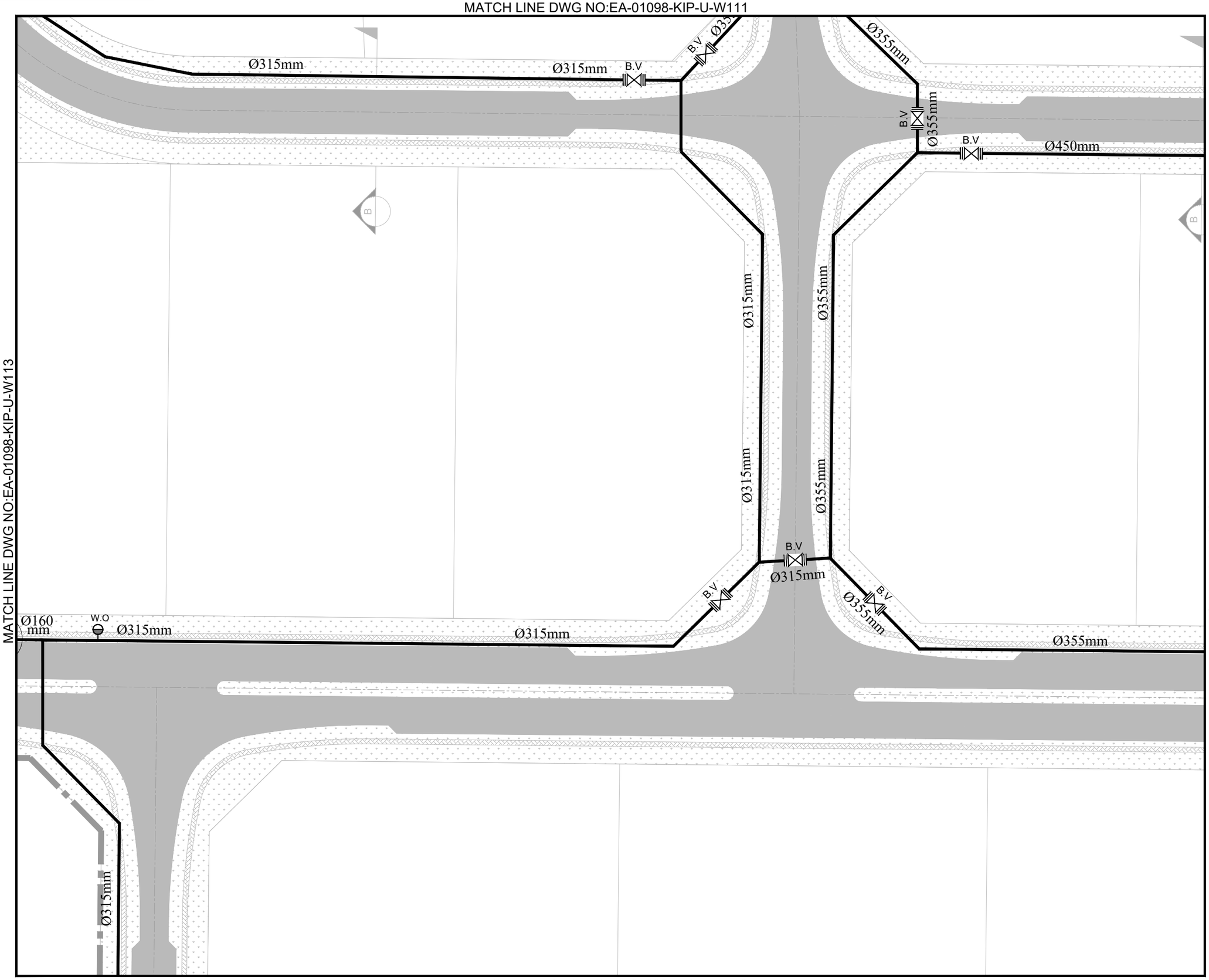
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
WATER SUPPLY SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W113	00

MATCH LINE DWG NO:EA-01098-KIP-U-W111

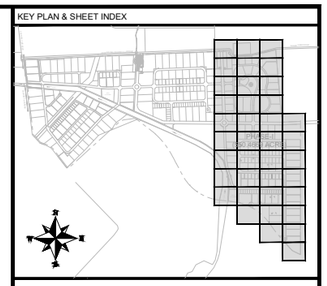


MATCH LINE DWG NO:EA-01098-KIP-U-W113

MATCH LINE DWG NO:EA-01098-KIP-U-W115

MATCH LINE DWG NO:EA-01098-KIP-U-W118

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

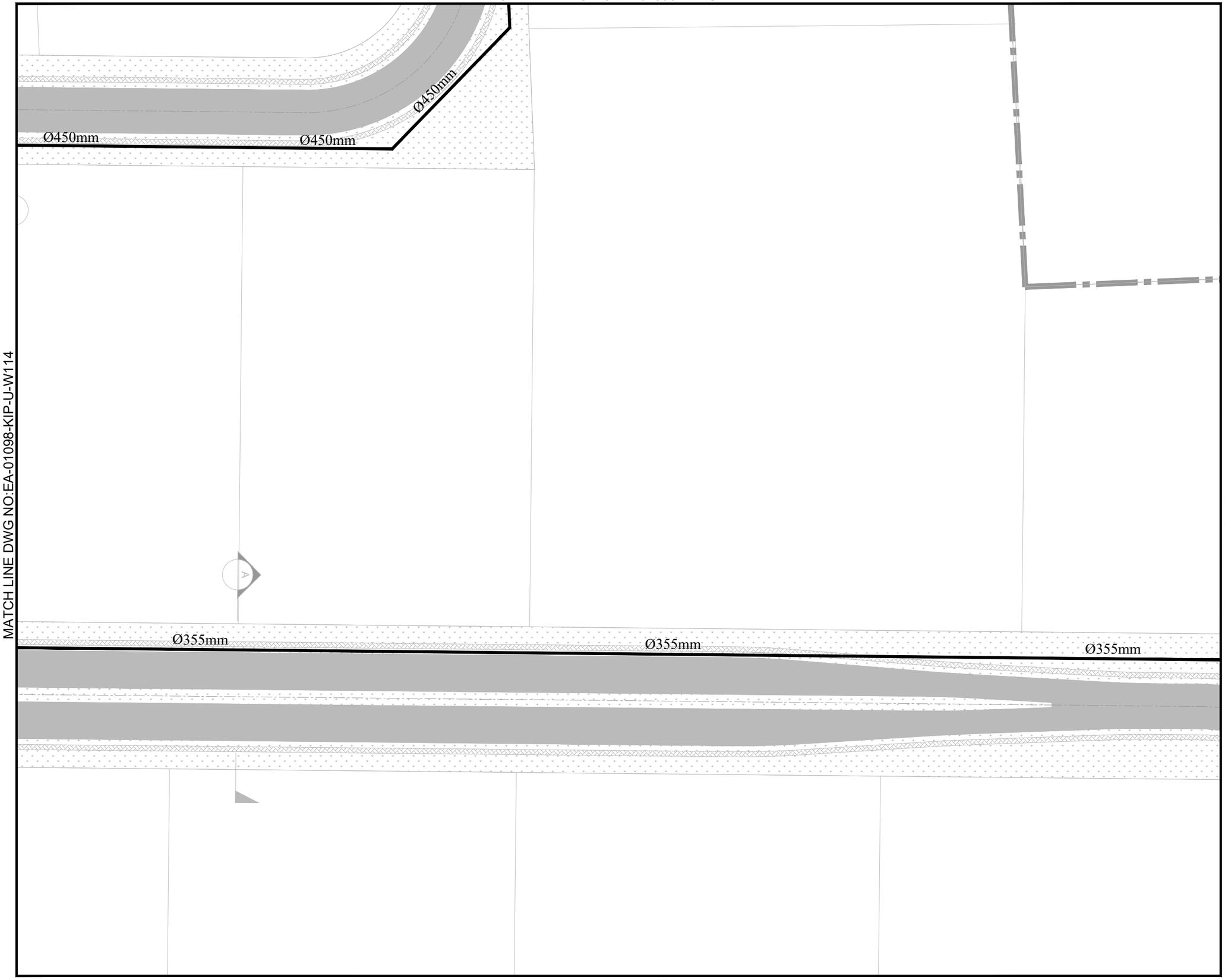
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF WATER SUPPLY SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W114	00

MATCH LINE DWG NO:EA-01098-KIP-U-W112

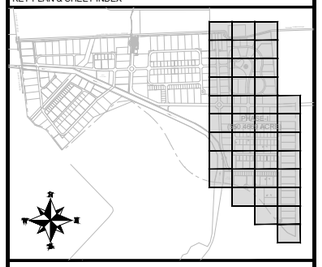


MATCH LINE DWG NO:EA-01098-KIP-U-W114

MATCH LINE DWG NO:EA-01098-KIP-U-W116

MATCH LINE DWG NO:EA-01098-KIP-U-W119

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

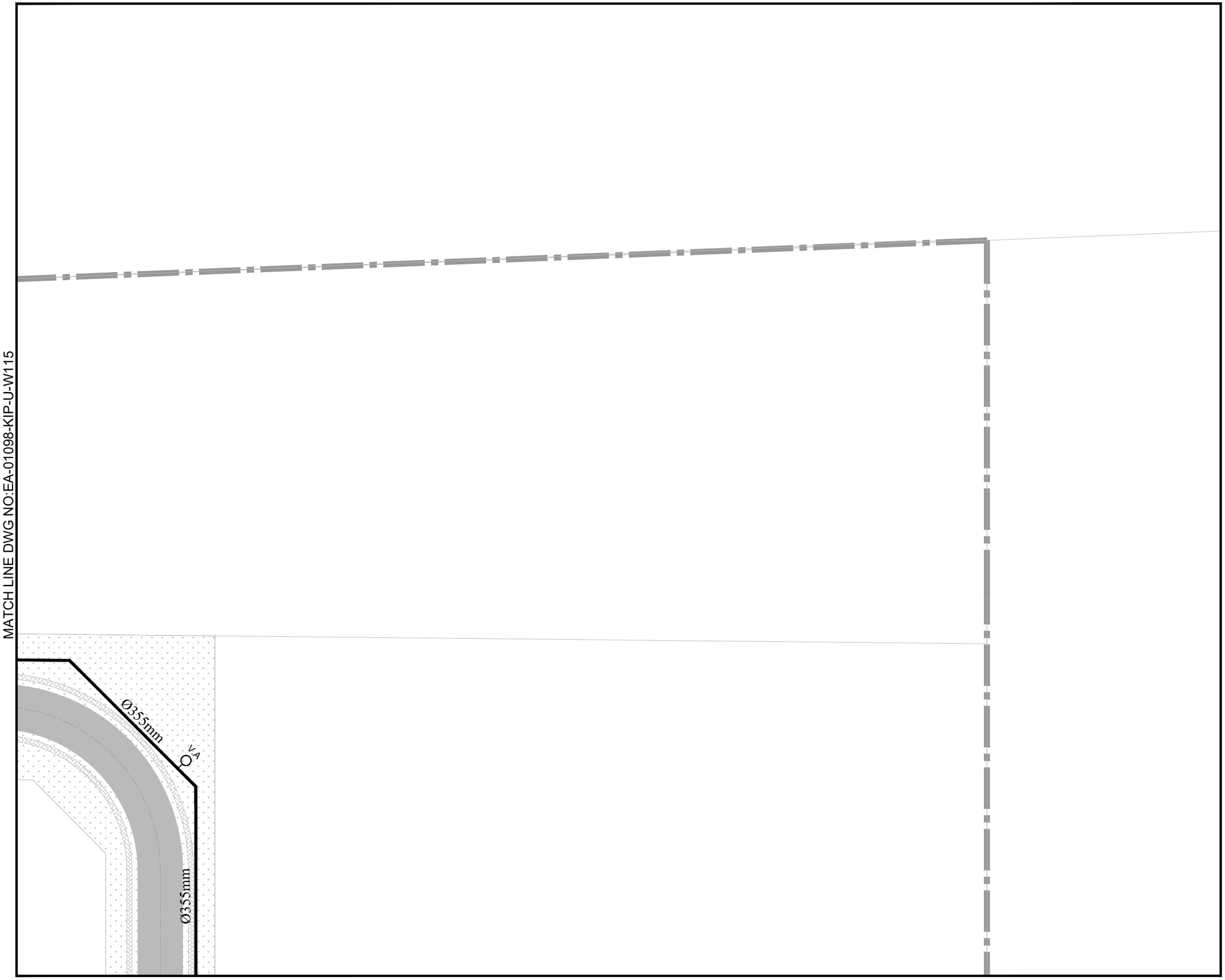
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
WATER SUPPLY SYSTEM

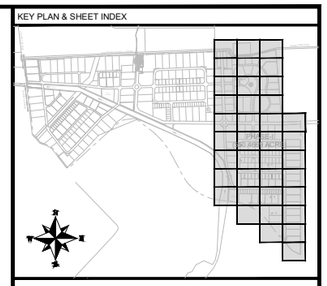
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W115	00

MATCH LINE DWG NO:EA-01098-KIP-U-W115



MATCH LINE DWG NO:EA-01098-KIP-U-W120

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED.
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
WATER SUPPLY SYSTEM

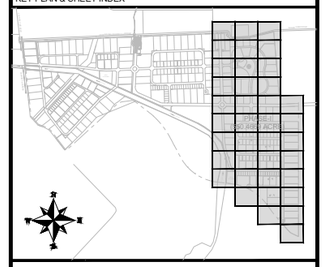
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W116	00

MATCH LINE DWG NO:EA-01098-KIP-U-W113

MATCH LINE DWG NO:EA-01098-KIP-U-W118

MATCH LINE DWG NO:EA-01098-KIP-U-W121

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED.
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

PIDC

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

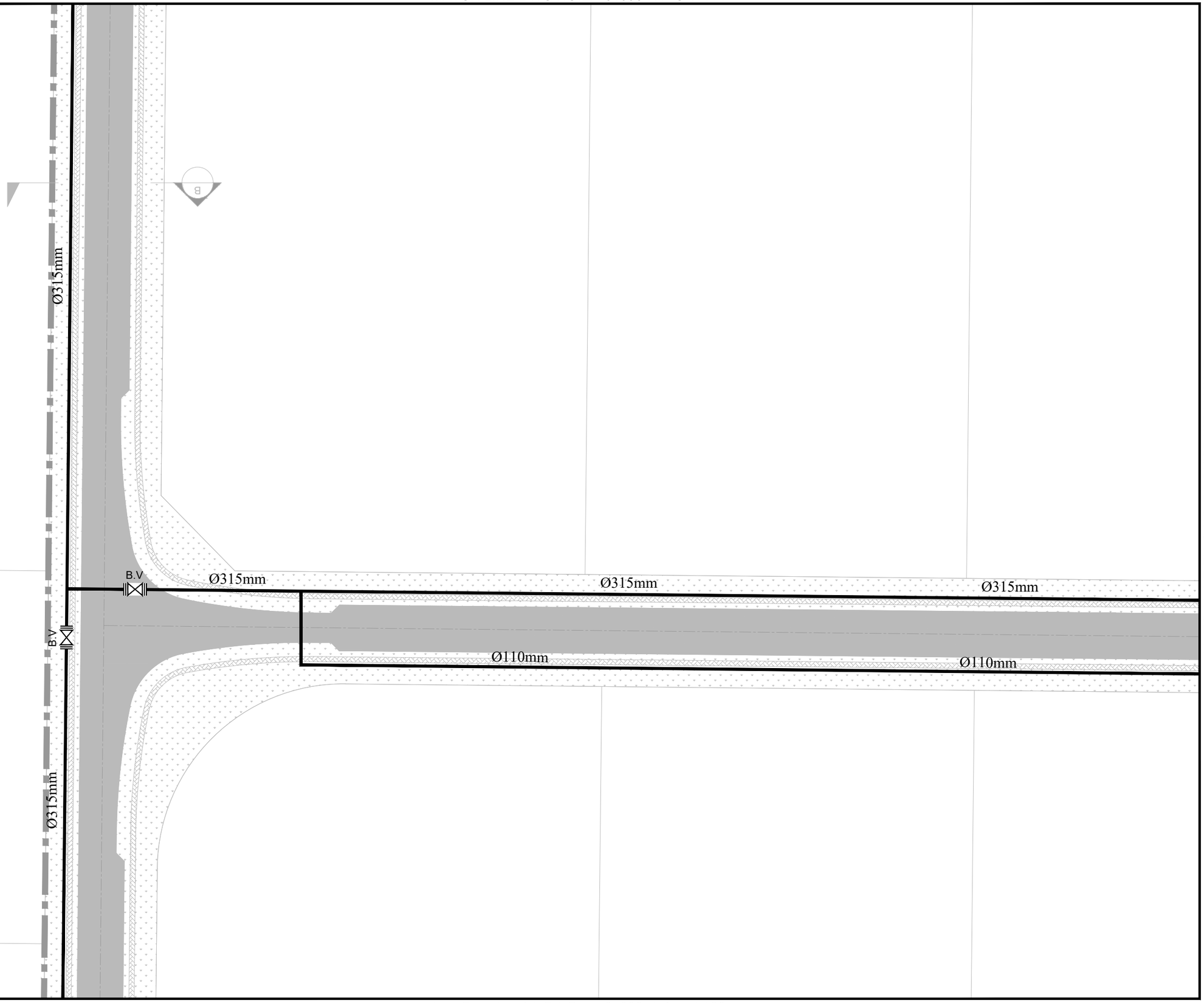
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
WATER SUPPLY SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W117	00

MATCH LINE DWG NO:EA-01098-KIP-U-W114

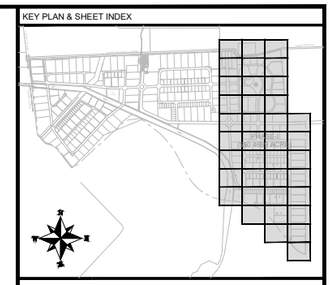


MATCH LINE DWG NO:EA-01098-KIP-U-W117

MATCH LINE DWG NO:EA-01098-KIP-U-W117

MATCH LINE DWG NO:EA-01098-KIP-U-W122

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

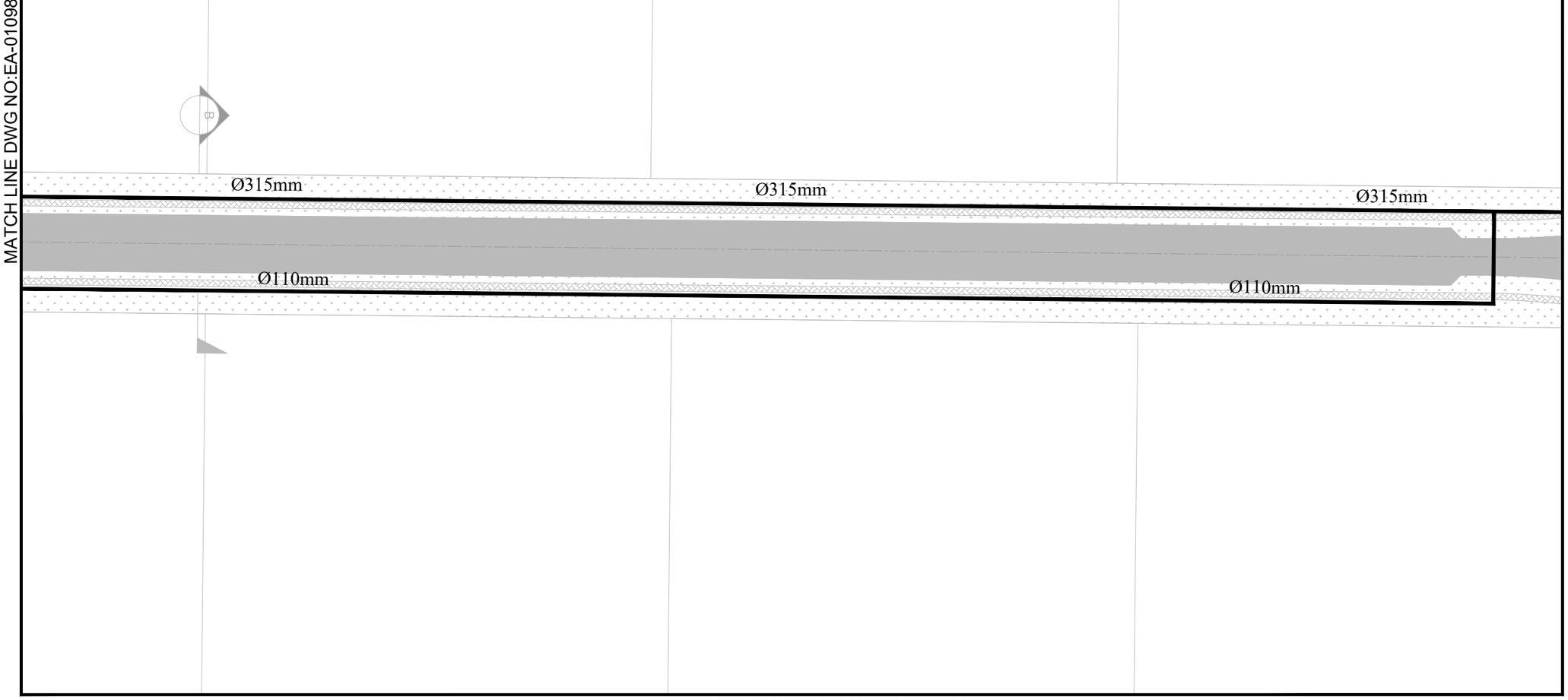
DRAWING TITLE:

LAYOUT PLAN OF
WATER SUPPLY SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W118	00

MATCH LINE DWG NO:EA-01098-KIP-U-W115

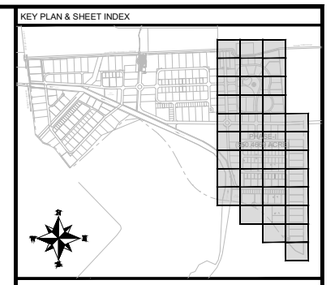
MATCH LINE DWG NO:EA-01098-KIP-U-W118



MATCH LINE DWG NO:EA-01098-KIP-U-W120

MATCH LINE DWG NO:EA-01098-KIP-U-W123

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED.
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

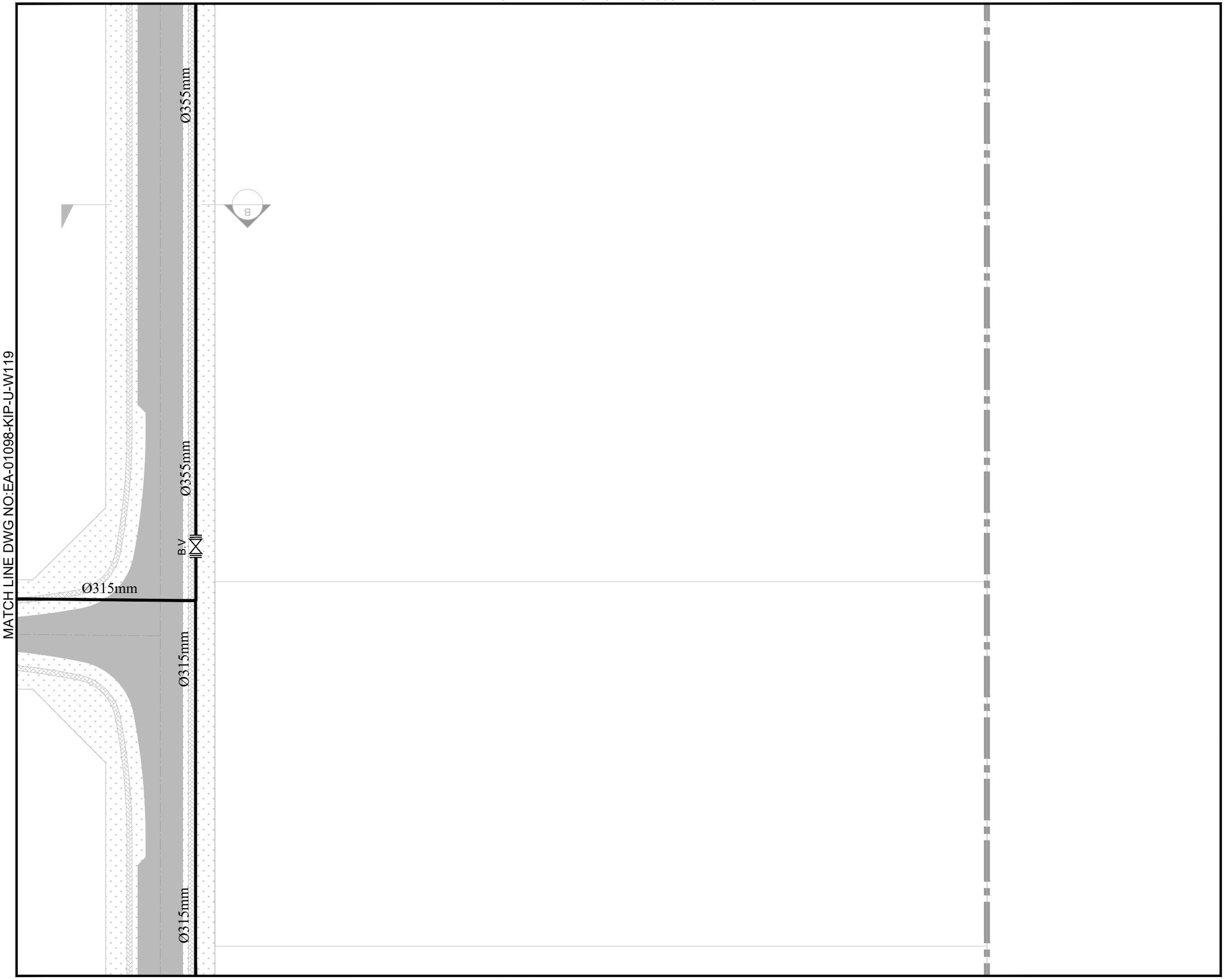
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
WATER SUPPLY SYSTEM

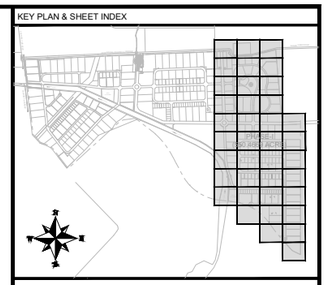
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W119	00

MATCH LINE DWG NO:EA-01098-KIP-U-W116



MATCH LINE DWG NO:EA-01098-KIP-U-W124

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
WATER SUPPLY SYSTEM

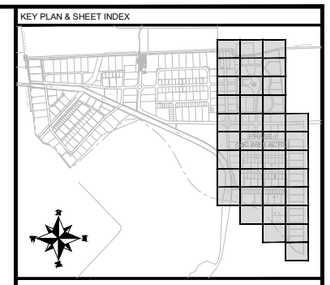
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W120	00

MATCH LINE DWG NO:EA-01098-KIP-U-W117

MATCH LINE DWG NO:EA-01098-KIP-U-W122

MATCH LINE DWG NO:EA-01098-KIP-U-W125

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED.
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

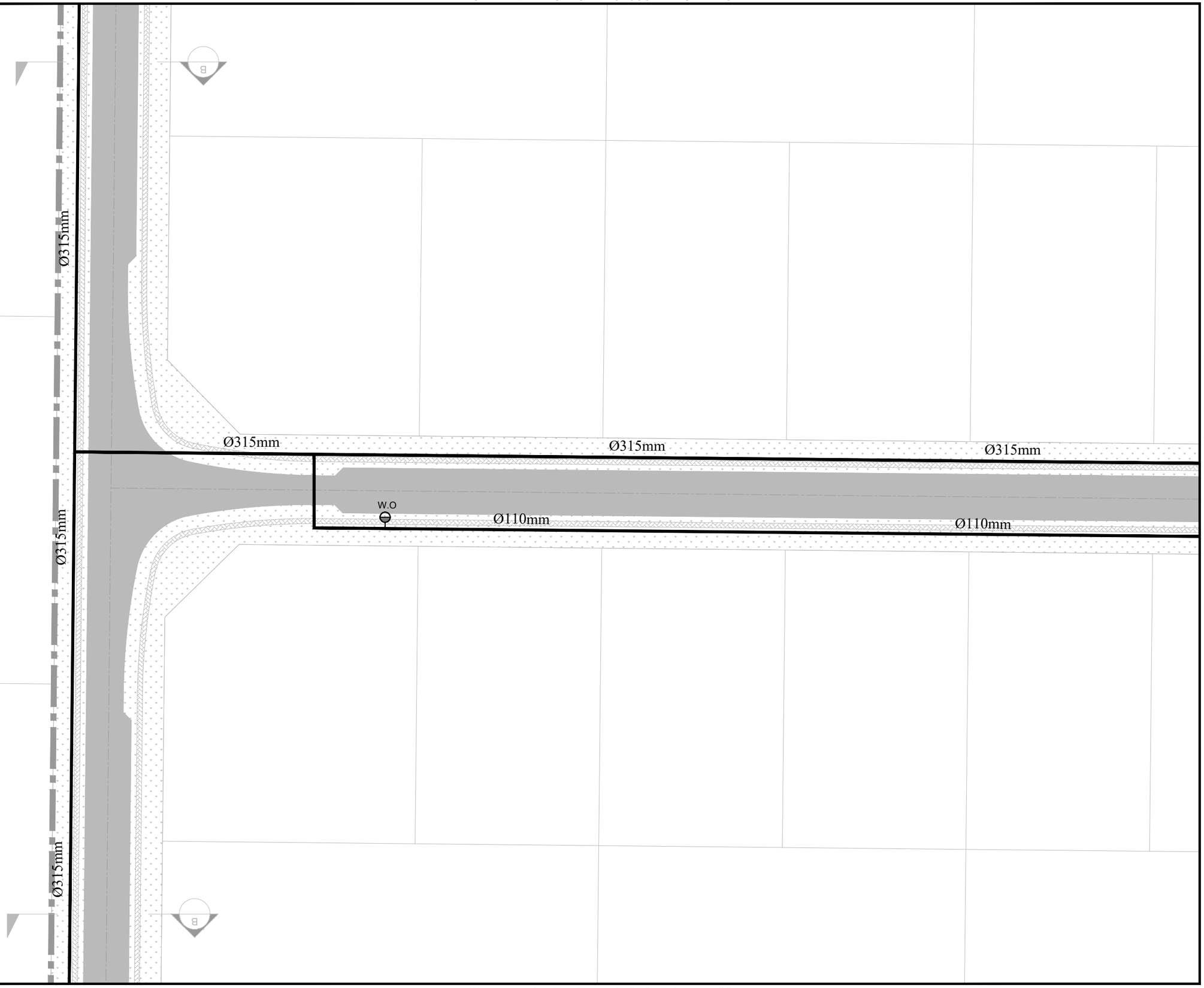
LAYOUT PLAN OF
WATER SUPPLY SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W121	00

MATCH LINE DWG NO:EA-01098-KIP-U-W118

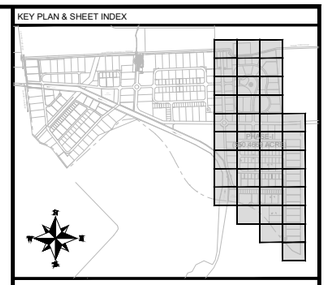
MATCH LINE DWG NO:EA-01098-KIP-U-W121

MATCH LINE DWG NO:EA-01098-KIP-U-W123



MATCH LINE DWG NO:EA-01098-KIP-U-W126

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

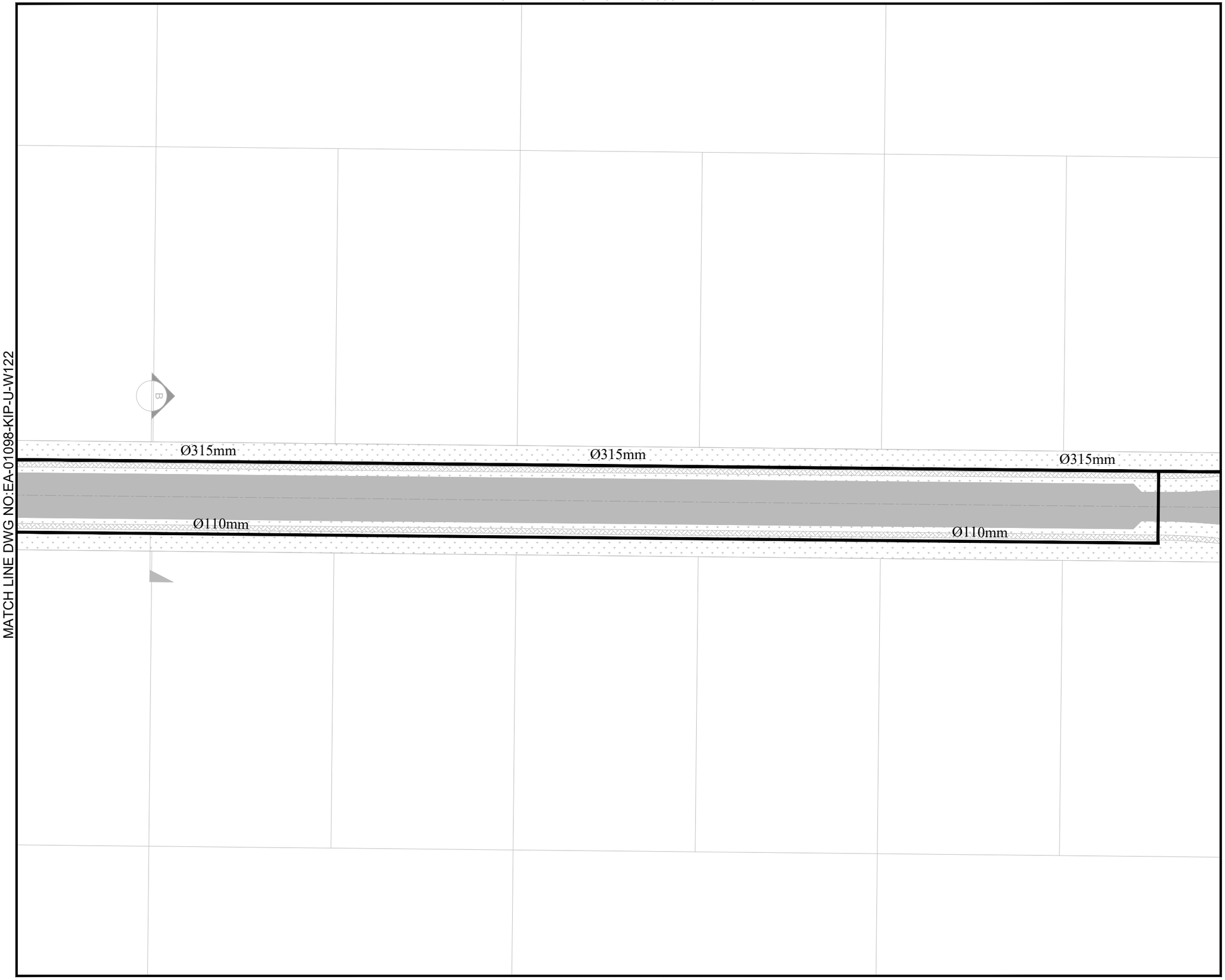
LAYOUT PLAN OF
WATER SUPPLY SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W122	00

MATCH LINE DWG NO:EA-01098-KIP-U-W119

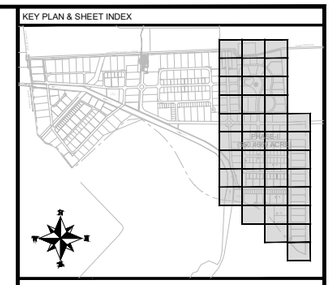
MATCH LINE DWG NO:EA-01098-KIP-U-W122

MATCH LINE DWG NO:EA-01098-KIP-U-W124



MATCH LINE DWG NO:EA-01098-KIP-U-W127

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED.
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

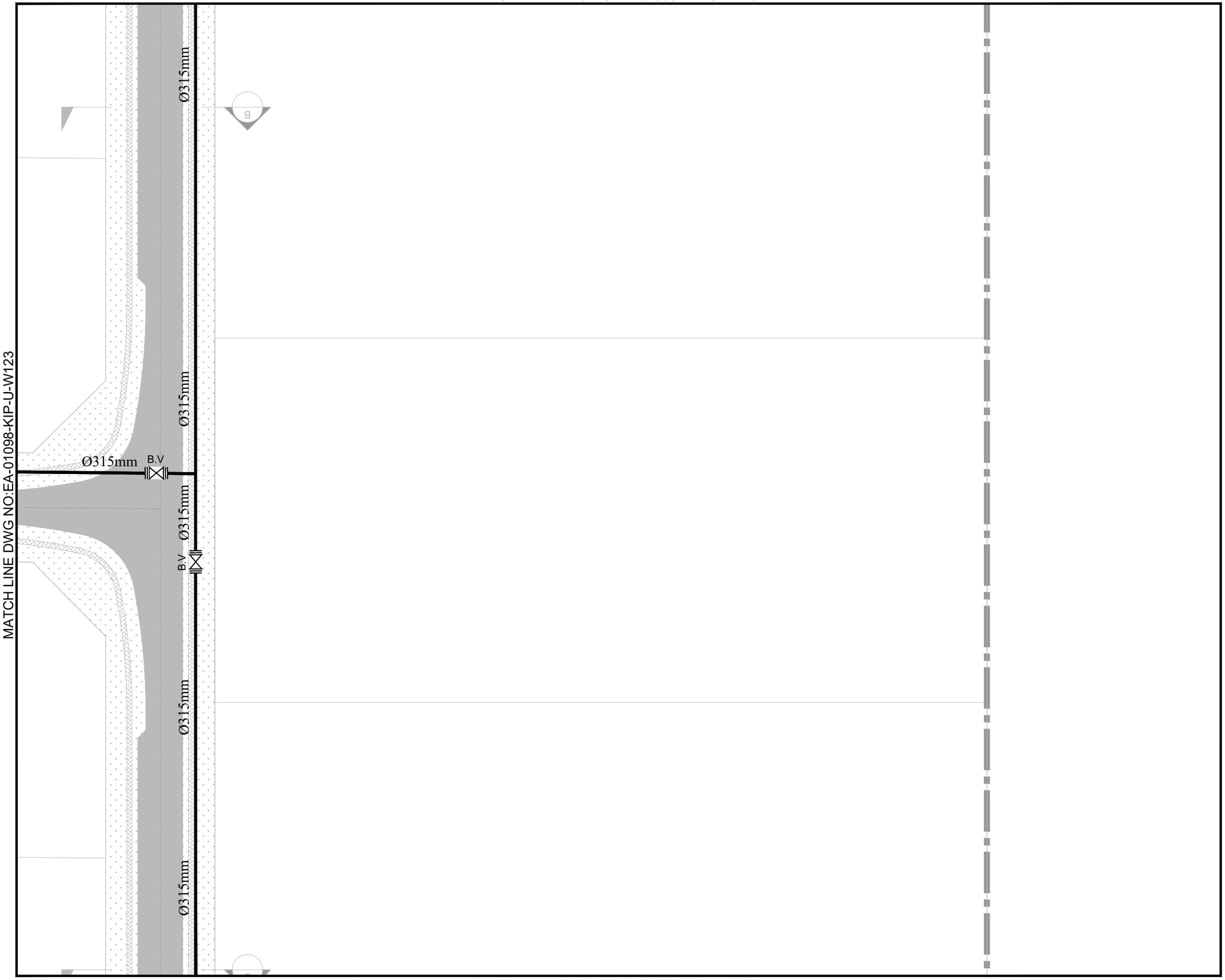
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
WATER SUPPLY SYSTEM

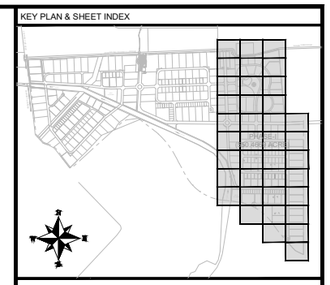
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W123	00

MATCH LINE DWG NO:EA-01098-KIP-U-W120



MATCH LINE DWG NO:EA-01098-KIP-U-W128

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
WATER SUPPLY SYSTEM

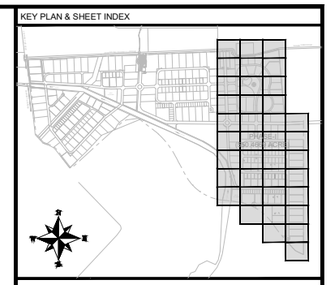
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W124	00

MATCH LINE DWG NO:EA-01098-KIP-U-W121

MATCH LINE DWG NO:EA-01098-KIP-U-W126

MATCH LINE DWG NO:EA-01098-KIP-U-W129

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED.
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

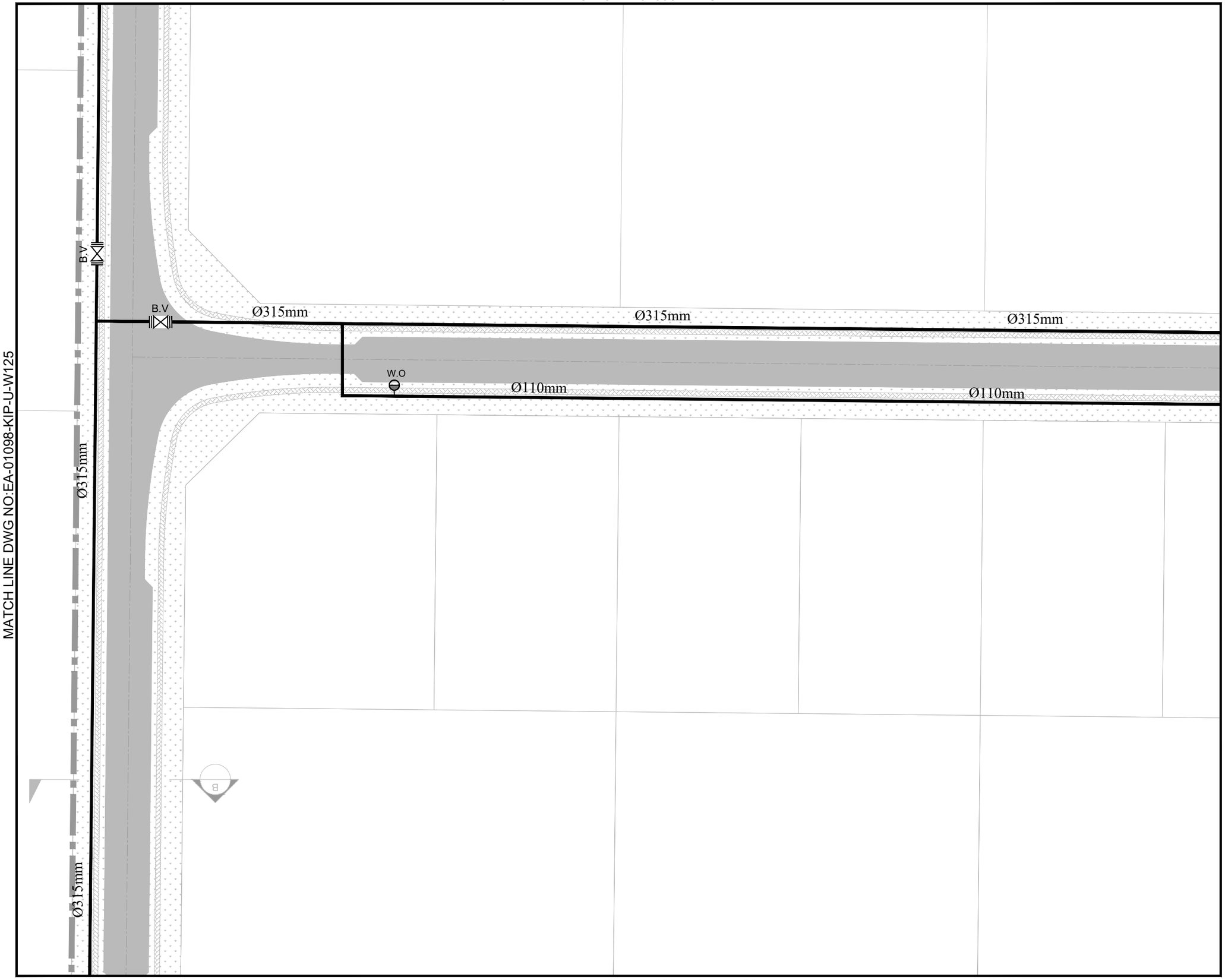
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
WATER SUPPLY SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W125	00

MATCH LINE DWG NO:EA-01098-KIP-U-W122

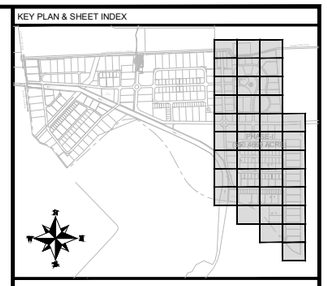


MATCH LINE DWG NO:EA-01098-KIP-U-W125

MATCH LINE DWG NO:EA-01098-KIP-U-W127

MATCH LINE DWG NO:EA-01098-KIP-U-W130

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

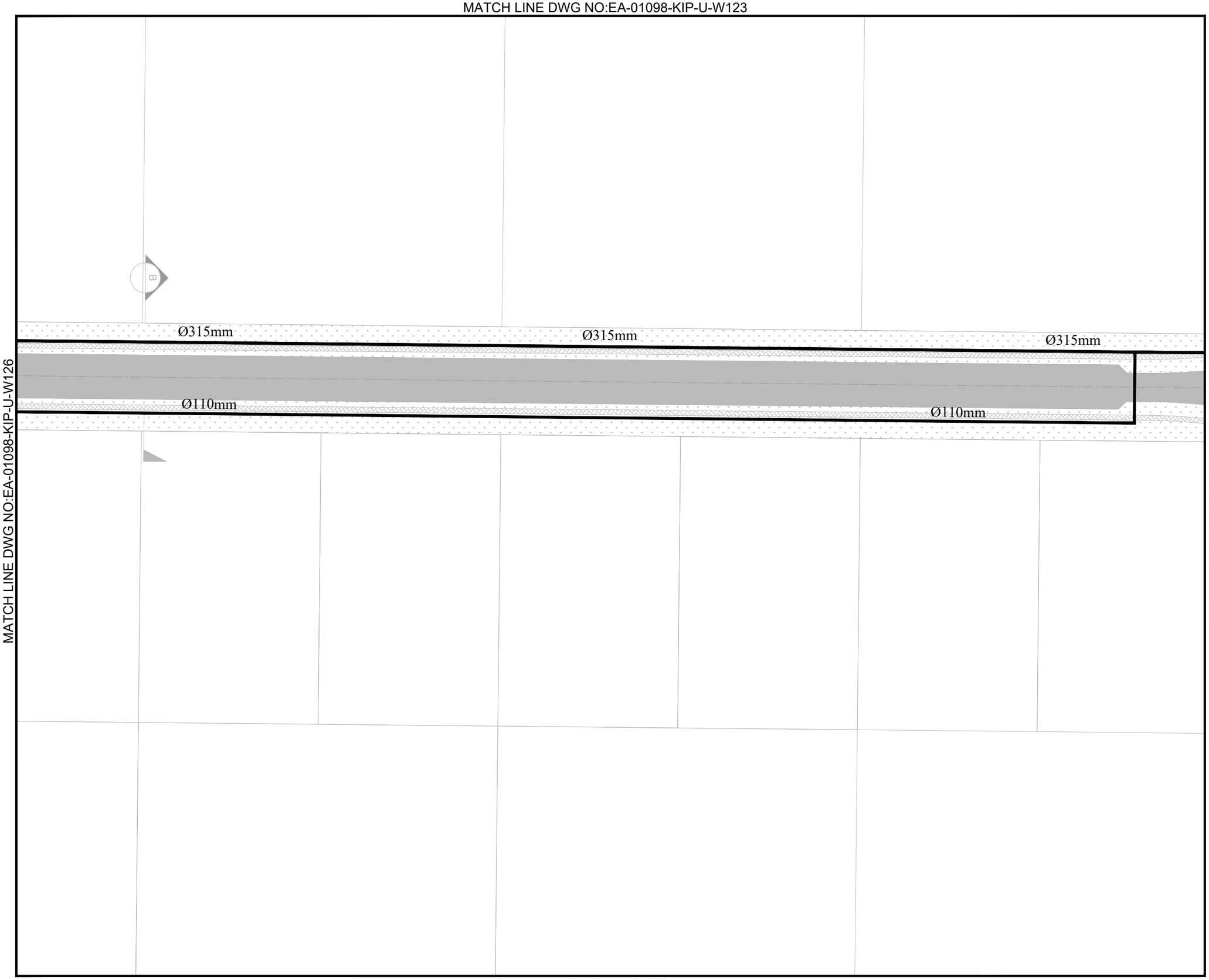
LAYOUT PLAN OF
WATER SUPPLY SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W126	00

MATCH LINE DWG NO:EA-01098-KIP-U-W123

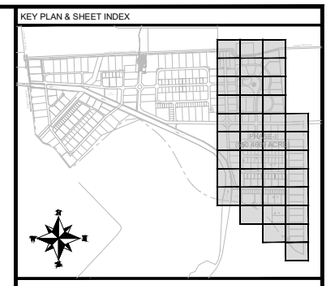
MATCH LINE DWG NO:EA-01098-KIP-U-W126

MATCH LINE DWG NO:EA-01098-KIP-U-W128



MATCH LINE DWG NO:EA-01098-KIP-U-W131

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED.
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

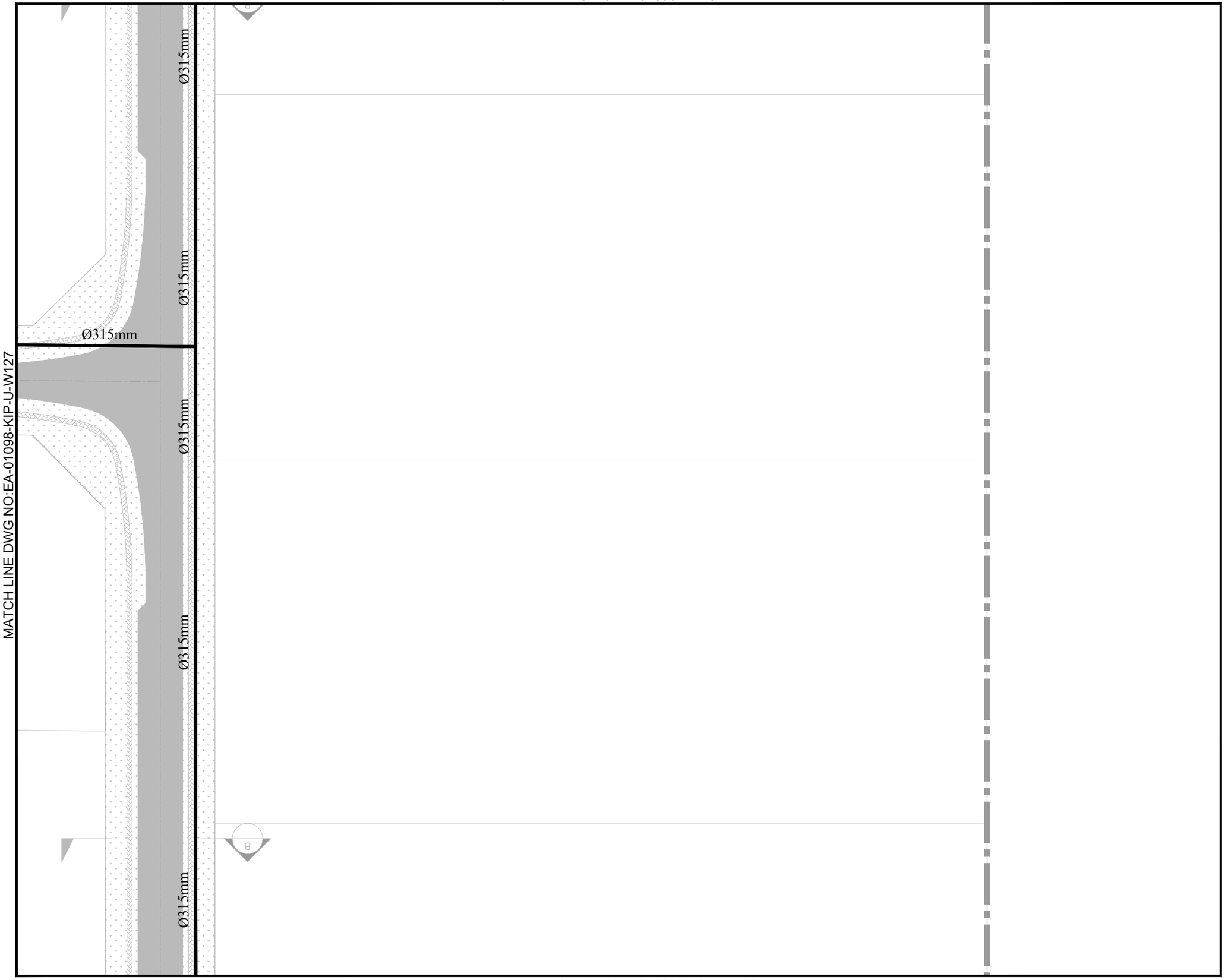
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF WATER SUPPLY SYSTEM

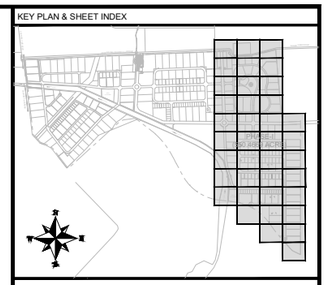
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W127	00

MATCH LINE DWG NO:EA-01098-KIP-U-W124



MATCH LINE DWG NO:EA-01098-KIP-U-W132

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm **JV-Team**

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
WATER SUPPLY SYSTEM

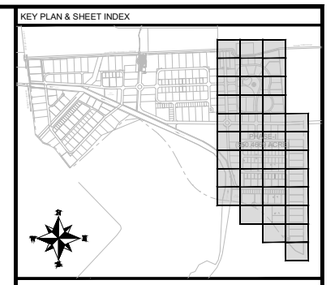
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W128	00

MATCH LINE DWG NO:EA-01098-KIP-U-W125



MATCH LINE DWG NO:EA-01098-KIP-U-W130

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED.
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

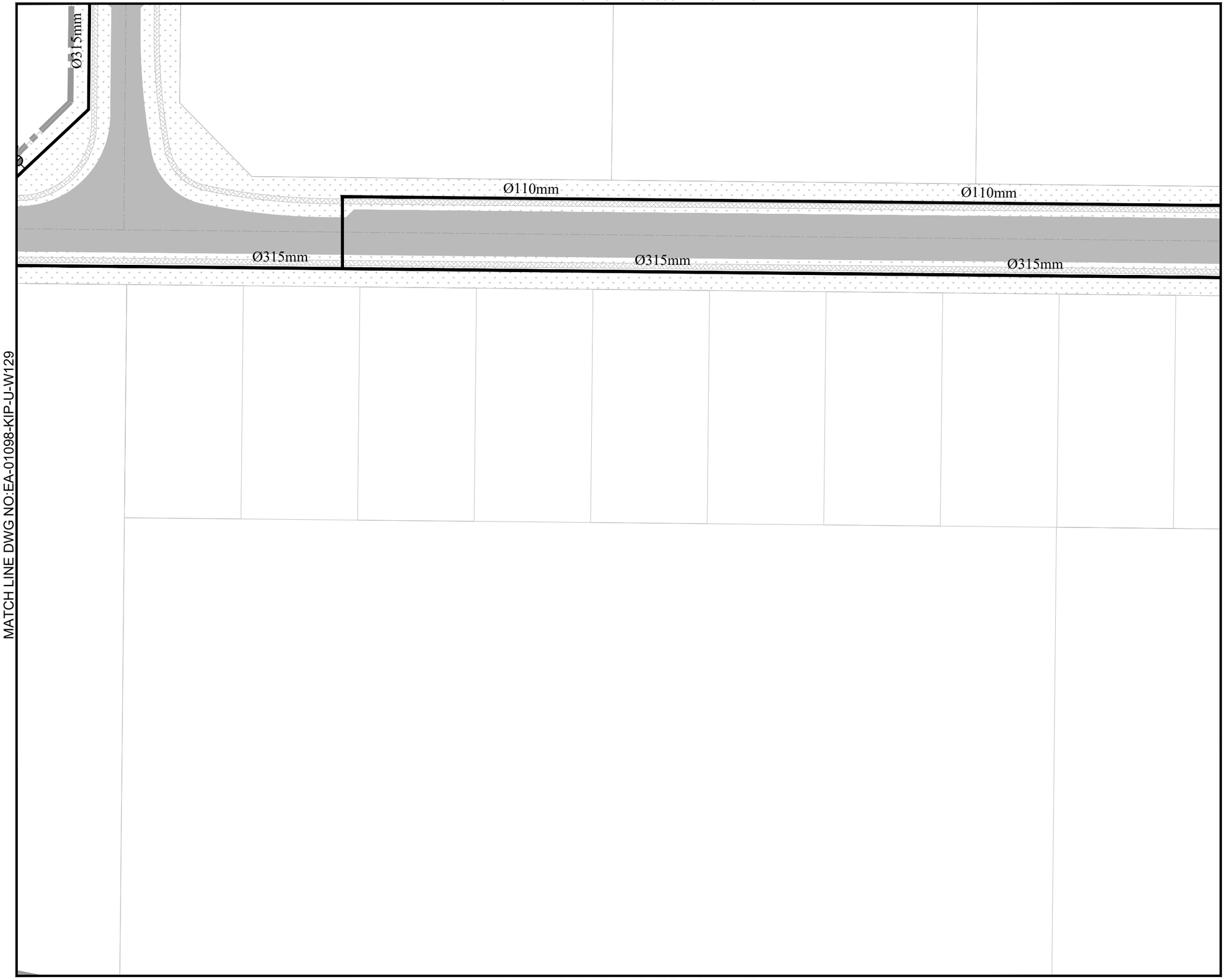
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
WATER SUPPLY SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W129	00

MATCH LINE DWG NO:EA-01098-KIP-U-W126

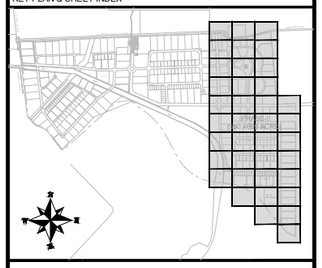


MATCH LINE DWG NO:EA-01098-KIP-U-W129

MATCH LINE DWG NO:EA-01098-KIP-U-W131

MATCH LINE DWG NO:EA-01098-KIP-U-W133

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

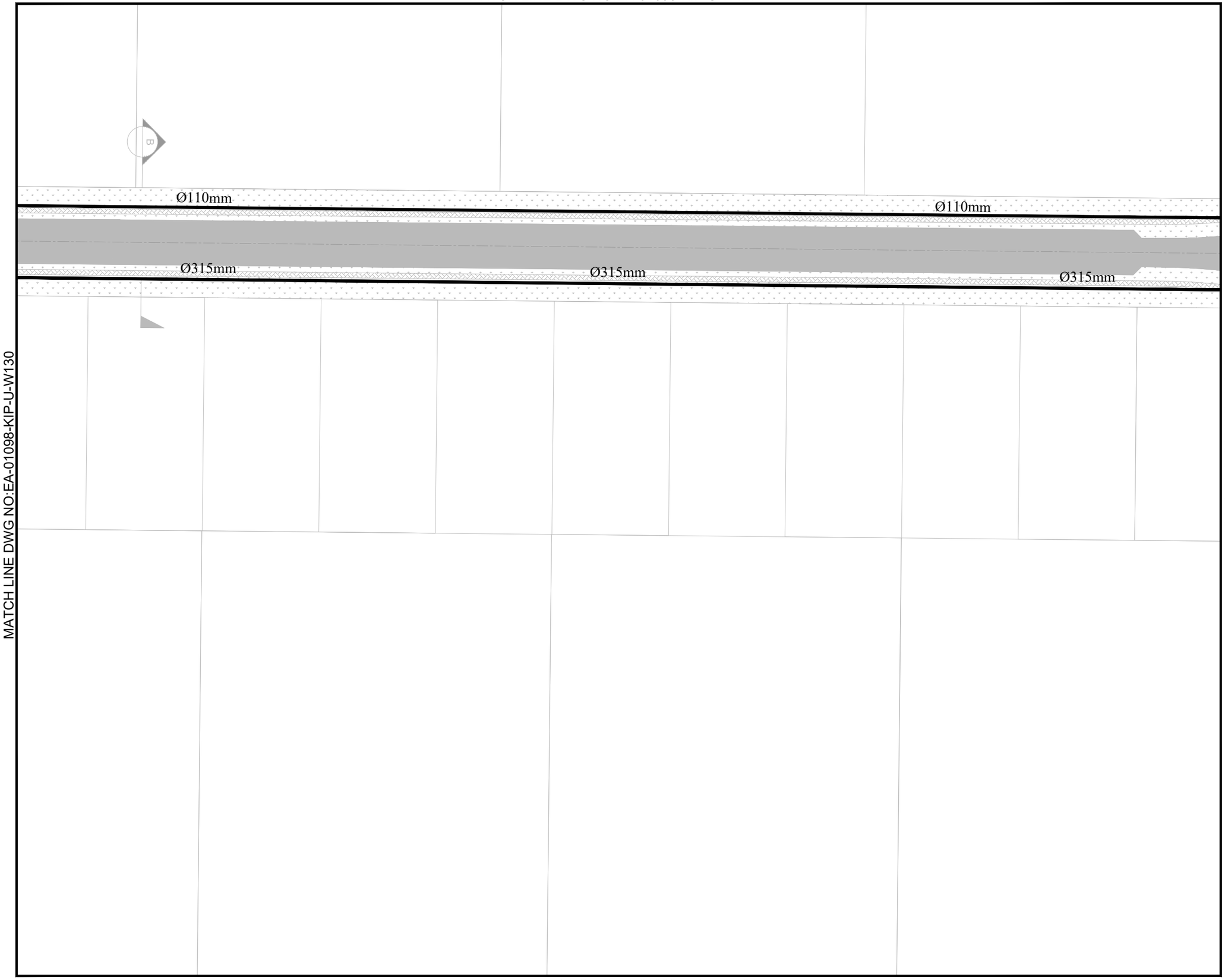
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
WATER SUPPLY SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W130	00

MATCH LINE DWG NO:EA-01098-KIP-U-W127

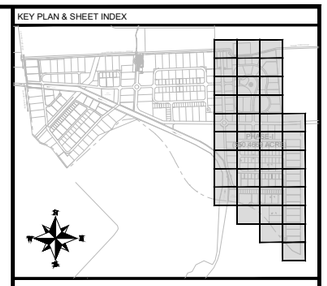


MATCH LINE DWG NO:EA-01098-KIP-U-W130

MATCH LINE DWG NO:EA-01098-KIP-U-W132

MATCH LINE DWG NO:EA-01098-KIP-U-W134

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

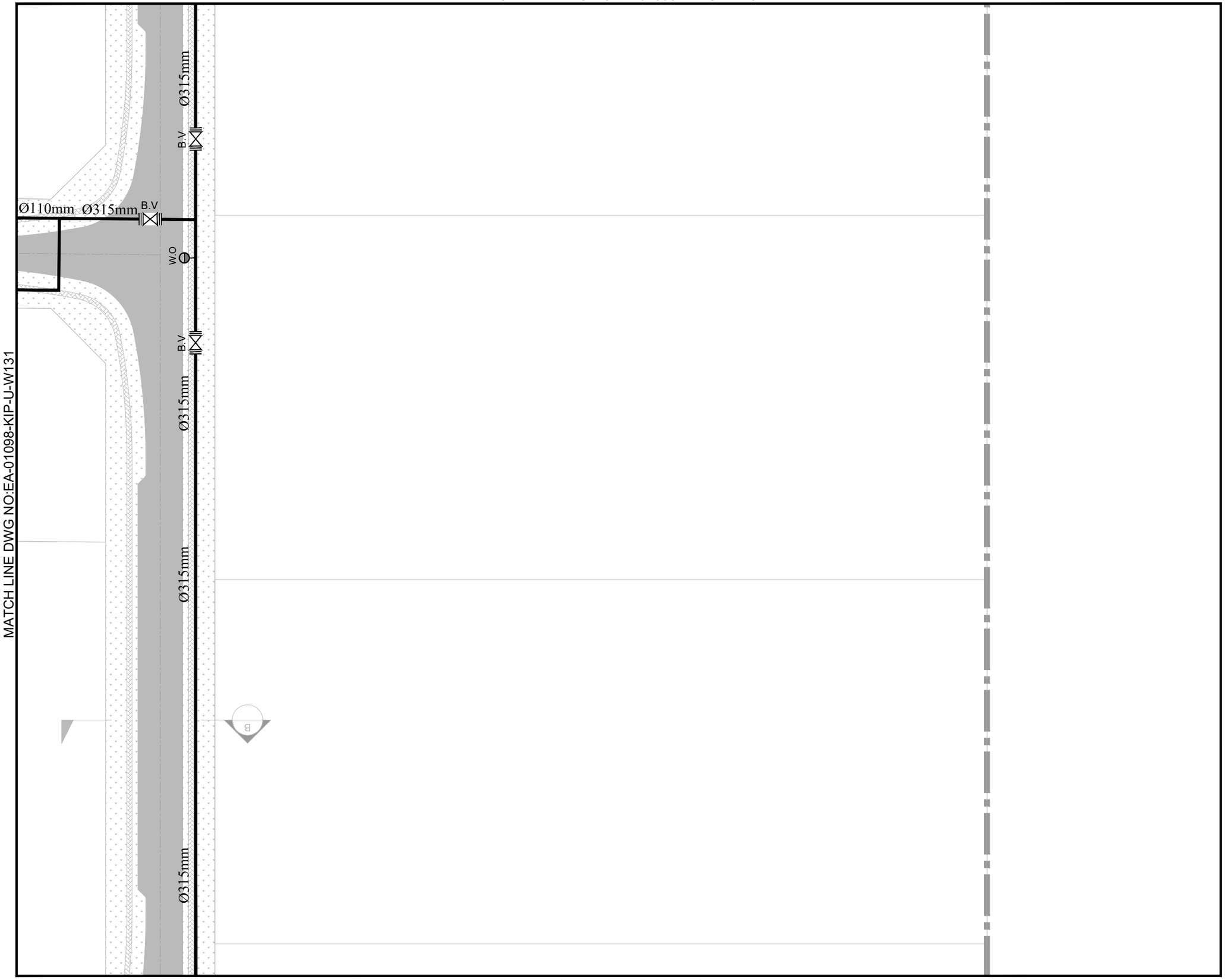
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
WATER SUPPLY SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W131	00

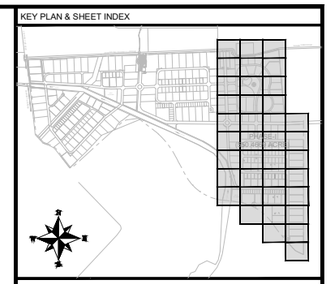
MATCH LINE DWG NO:EA-01098-KIP-U-W128



MATCH LINE DWG NO:EA-01098-KIP-U-W131

MATCH LINE DWG NO:EA-01098-KIP-U-W135

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

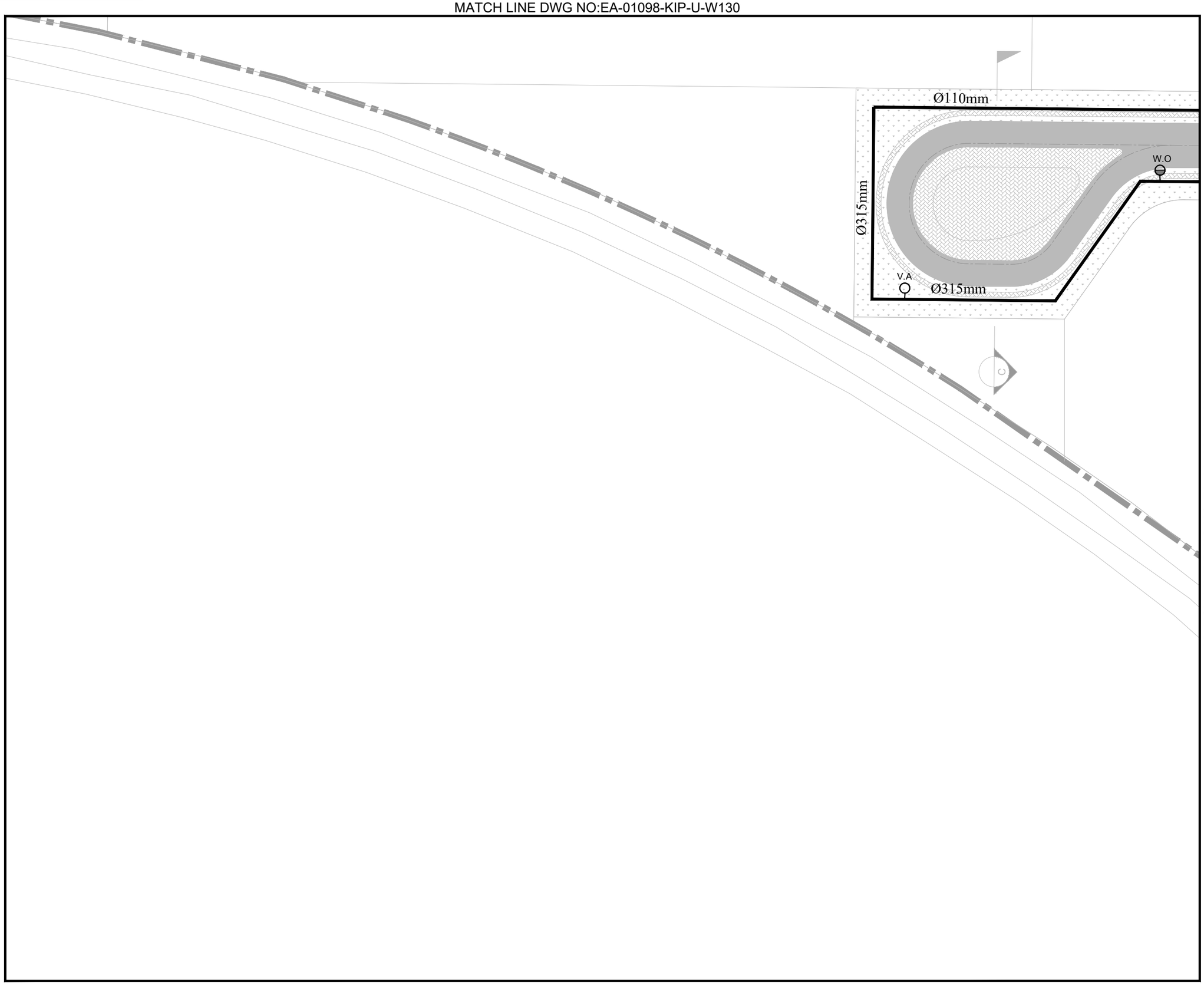
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
WATER SUPPLY SYSTEM

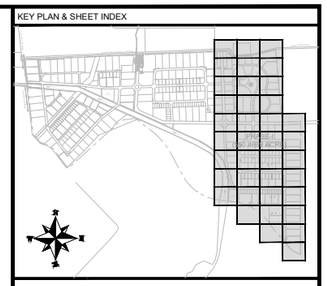
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W132	00

MATCH LINE DWG NO:EA-01098-KIP-U-W130



MATCH LINE DWG NO:EA-01098-KIP-U-W134

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

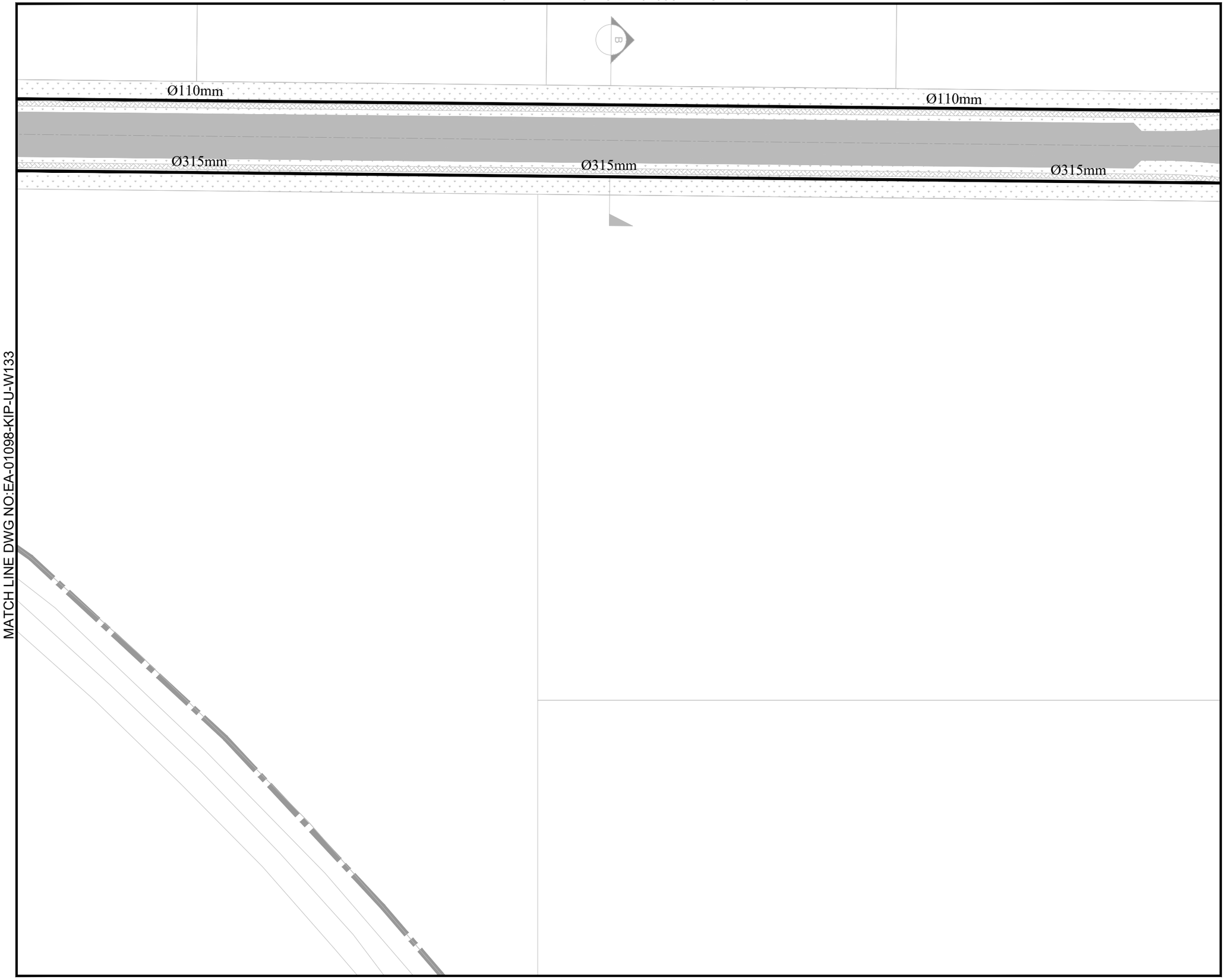
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
WATER SUPPLY SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W133	00

MATCH LINE DWG NO:EA-01098-KIP-U-W131

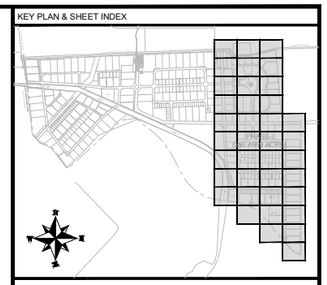


MATCH LINE DWG NO:EA-01098-KIP-U-W133

MATCH LINE DWG NO:EA-01098-KIP-U-W135

MATCH LINE DWG NO:EA-01098-KIP-U-W136

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

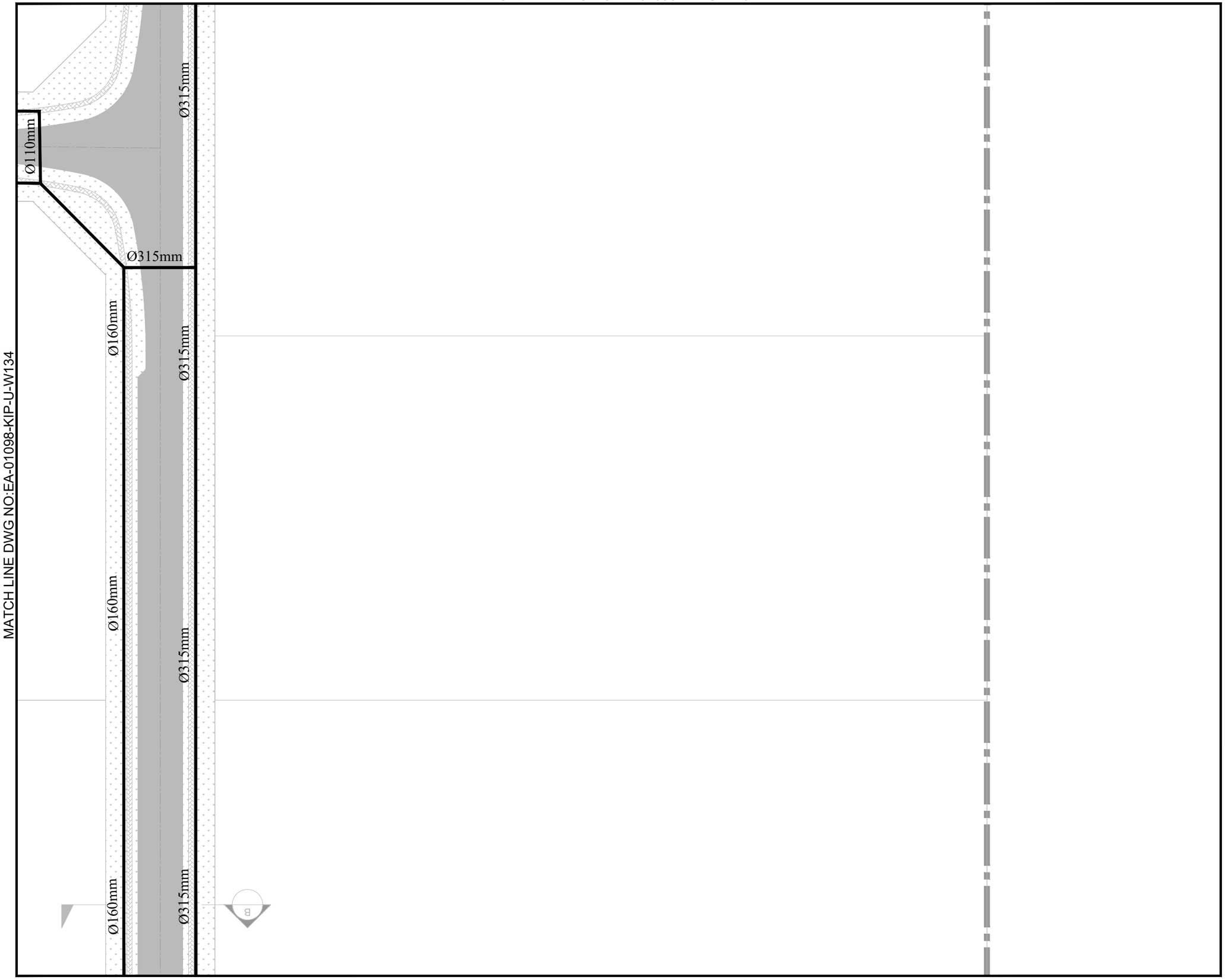
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF WATER SUPPLY SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W134	00

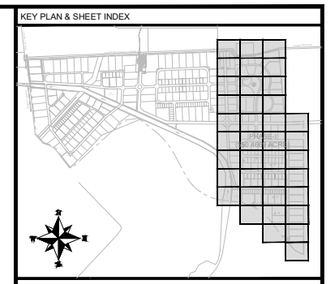
MATCH LINE DWG NO:EA-01098-KIP-U-W132



MATCH LINE DWG NO:EA-01098-KIP-U-W134

MATCH LINE DWG NO:EA-01098-KIP-U-W137

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

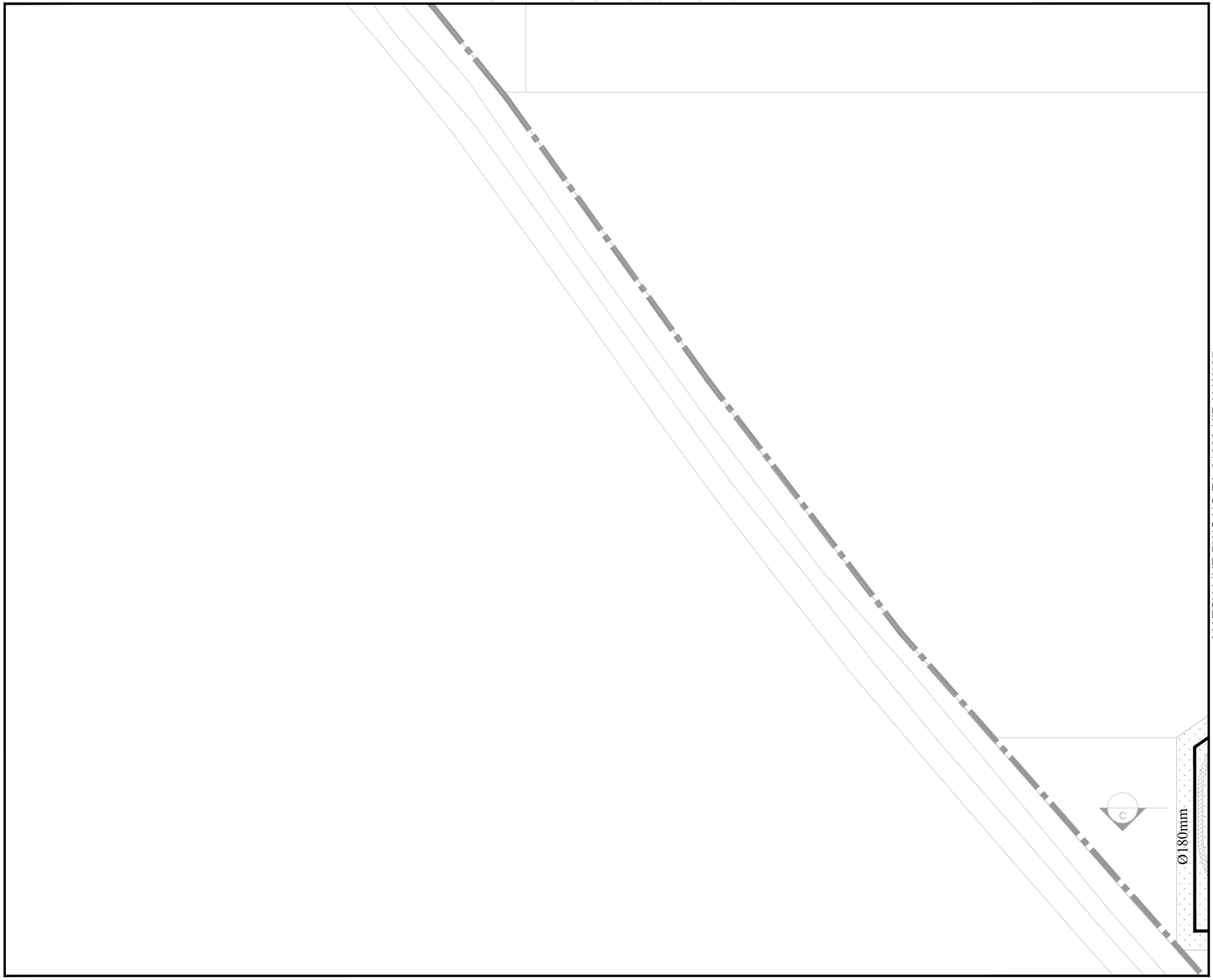
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
WATER SUPPLY SYSTEM

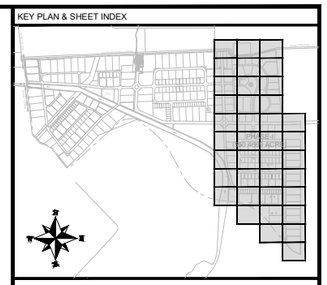
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W135	00

MATCH LINE DWG NO:EA-01098-KIP-U-W134



MATCH LINE DWG NO:EA-01098-KIP-U-W137

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED.
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
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6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

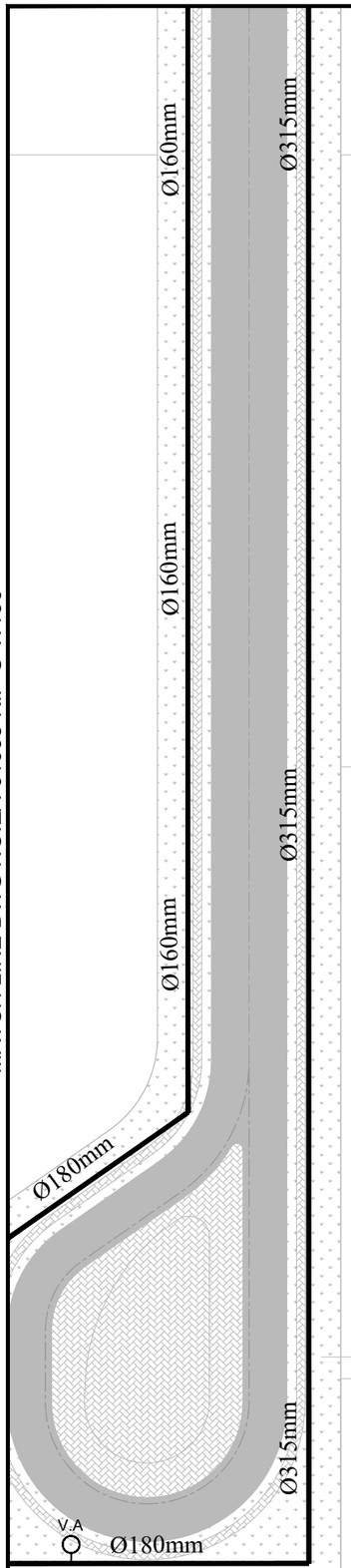
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
WATER SUPPLY SYSTEM

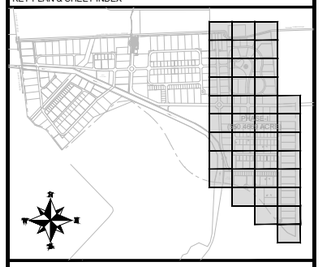
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W136	00

MATCH LINE DWG NO:EA-01098-KIP-U-W135



MATCH LINE DWG NO:EA-01098-KIP-U-W138

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

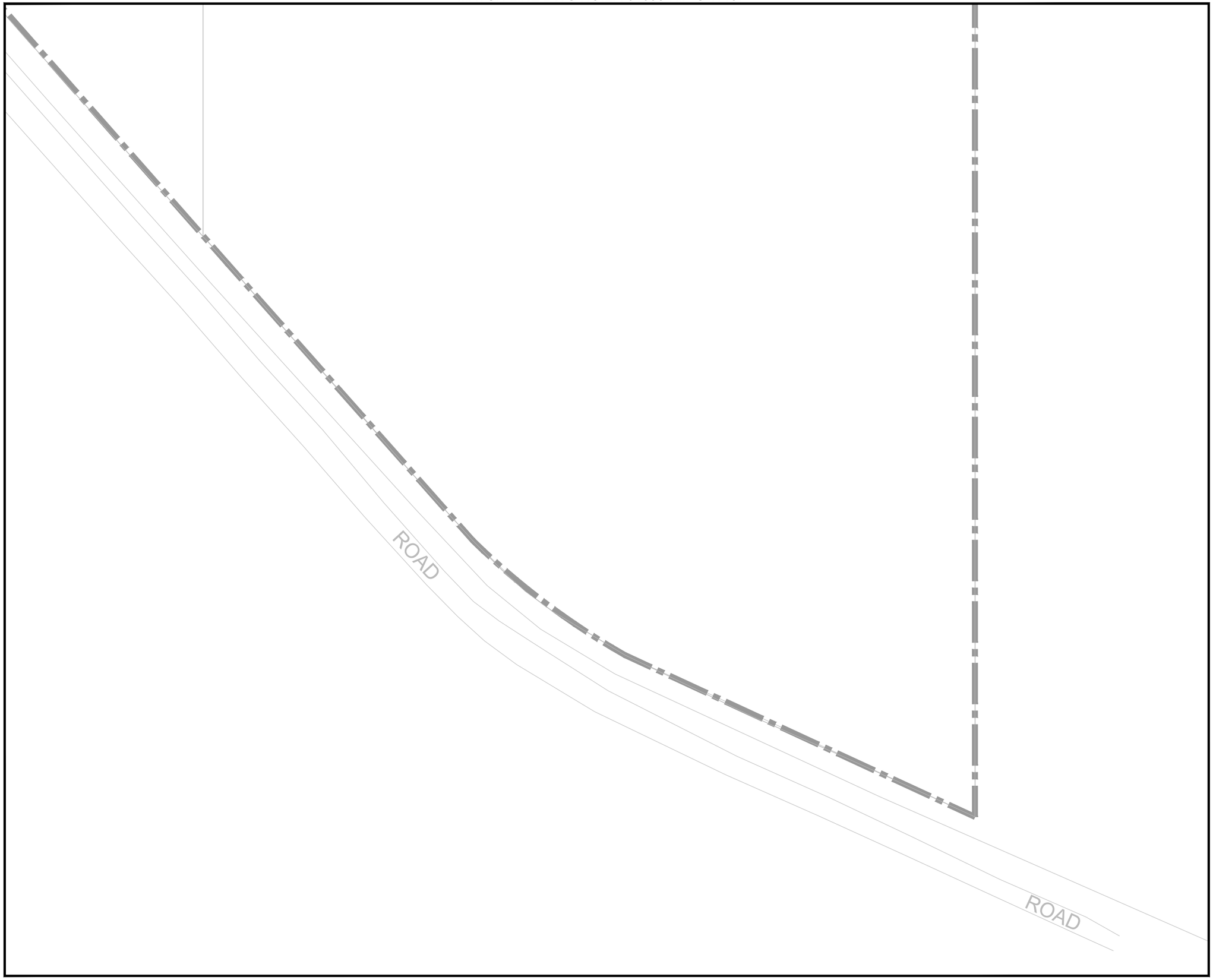
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

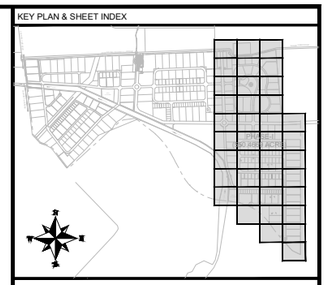
LAYOUT PLAN OF
WATER SUPPLY SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W137	00

MATCH LINE DWG NO:EA-01098-KIP-U-W137



KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. FOR TYPICAL VALVE CHAMBERS DETAIL DETAIL REFER DWG. EA-01098-KIP-U-W403.
3. FOR DETAIL OF THRUST BLOCK REFER DWG. EA-01098-KIP-U-W404.
4. FOR DETAIL OF FAIR HYDRATE REFER DWG. EA-01098-KIP-U-W405.
6. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED WATER LINE Ø 110mm	
PROPOSED WATER LINE Ø 160mm	
PROPOSED WATER LINE Ø 180mm	
PROPOSED WATER LINE Ø 315mm	
PROPOSED WATER LINE Ø 355mm	
PROPOSED WATER LINE Ø 450mm	
PROPOSED WATER LINE Ø 630mm	
END CAP	
BUTTERFLY VALVE	B.V
GATE VALVE	G.V
AIR VALVE	V.A
WASHOUT VALVE	W.O
FIRE HYDRANT	F.H

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

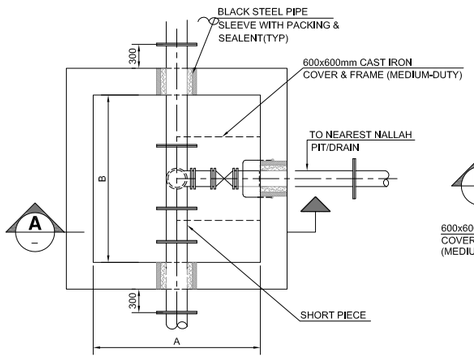
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

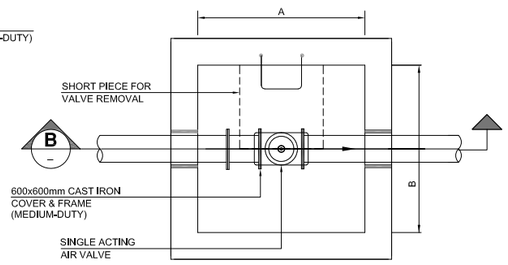
LAYOUT PLAN OF
WATER SUPPLY SYSTEM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W138	00

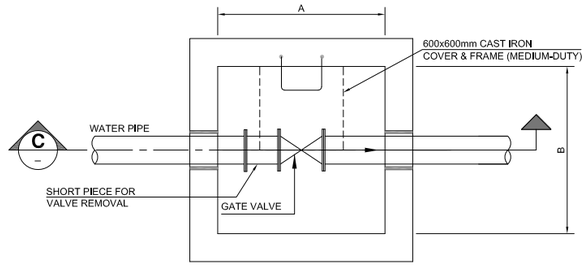
DETAIL DRAWING



PLAN-WASH-OUT CHAMBER

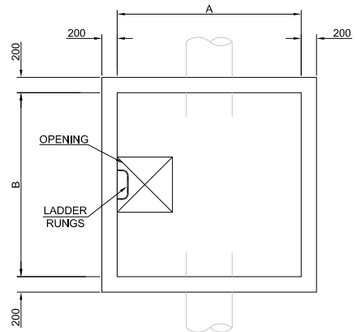


PLAN - AIR VALVE IN CHAMBER

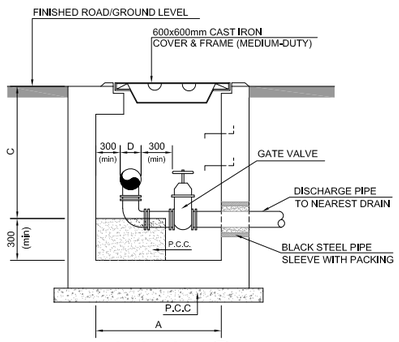


PLAN - GATE VALVE / BUTTERFLY IN CHAMBER

A	B	C
1500	1500	2000
2000	2000	2500
2500	2500	3000
3000	3000	4000

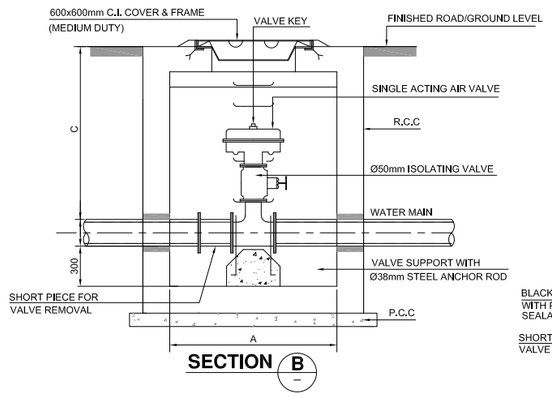


TYPICAL PLAN (-)



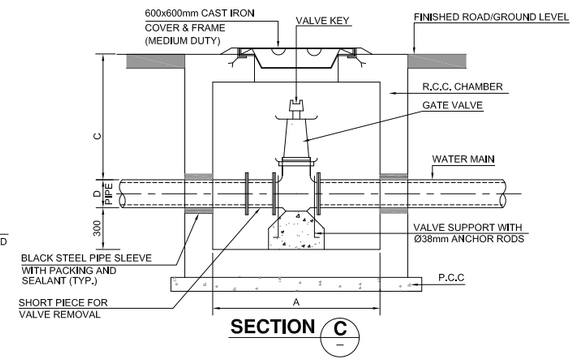
SECTION (A)

DETAIL OF WASH-OUT CHAMBER



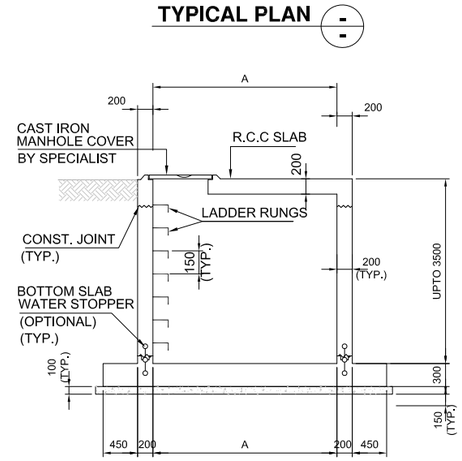
SECTION (B)

DETAIL OF AIR VALVE IN CHAMBER

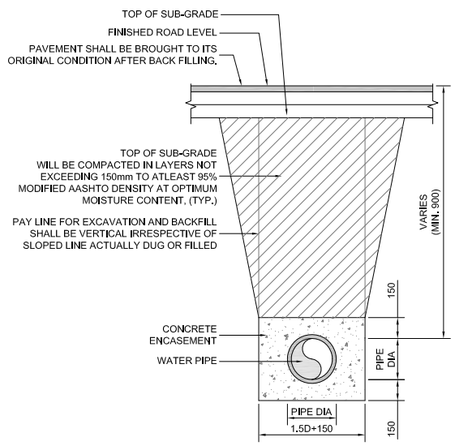


SECTION (C)

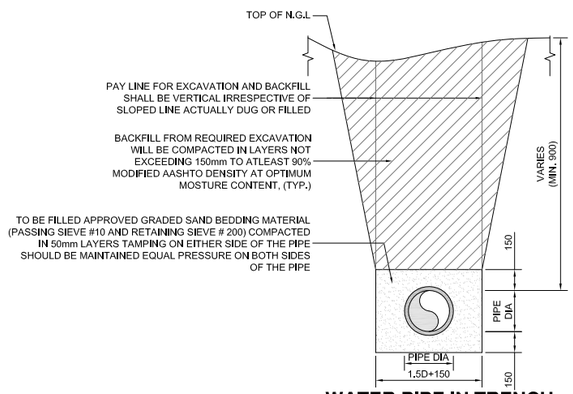
DETAIL OF GATE / BUTTERFLY VALVE IN CHAMBER



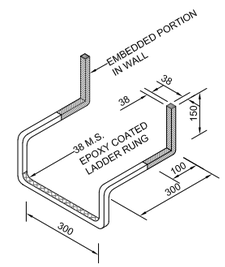
TYPICAL SECTION (-)



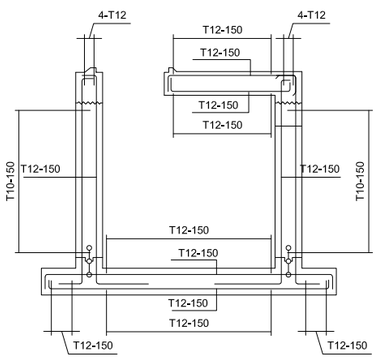
WATER PIPE IN TRENCH IN TRAFFIC AREA WHERE COVER OVER PIPE IS LESS THAN 1.2m



WATER PIPE IN TRENCH IN NON TRAFFIC AREA



LADDER RUNGS DETAIL



TYPICAL REINFORCEMENT DETAIL (-)

KEY PLAN & SHEET INDEX

NOTE:

1. ALL DIMENSIONS ARE IN MILLIMETER UNLESS OTHERWISE STATED
2. FOR WATER SUPPLY SYSTEM LAYOUT REFER DWG. EA-01098-KIP-U-W100 TO W138.

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

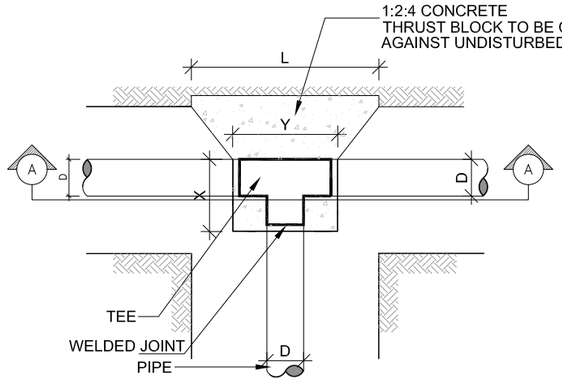
KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	N.T.S
DESIGN	KISA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

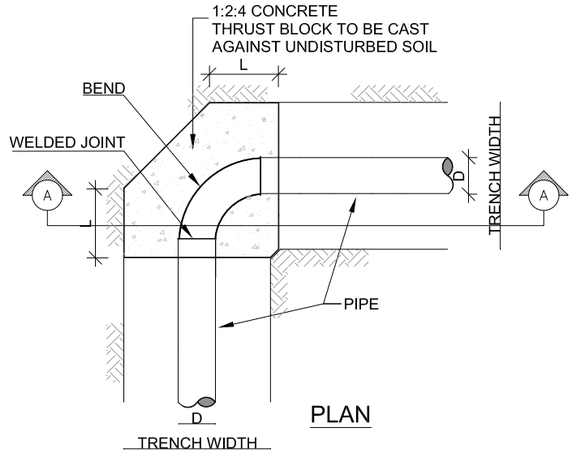
DRAWING TITLE:

TYPICAL VALVE
CHAMBERS AND TRENCH DETAIL

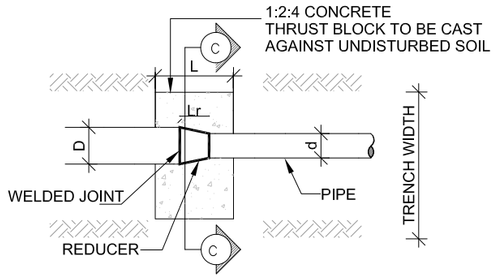
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W403	00



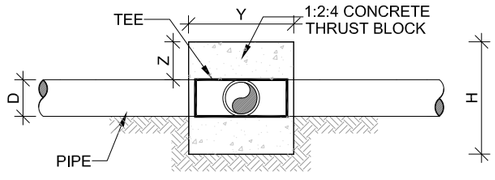
PLAN



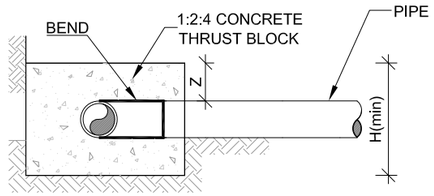
PLAN



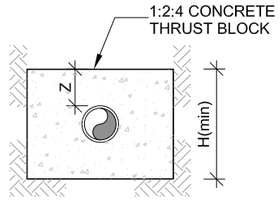
PLAN



SECTION A-A



SECTION B-B



SECTION C-C

DIMENSIONS OF THRUST BLOCKS FOR TEE(S)						
O.D (mm)	Trench Width (mm)	X (mm)	Y(mm)	L (mm)	Z (mm)	H (mm)
75	525.00	175.0	175.0	575.0	40.0	150.0
90	540.00	190.0	190.0	590.0	45.0	180.0
110	560.00	210.0	210.0	610.0	55.0	220.0
125	575.00	225.0	225.0	625.0	70.0	250.0
140	590.00	240.0	240.0	640.0	70.0	280.0
160	610.00	260.0	260.0	660.0	80.0	320.0
180	630.00	280.0	280.0	680.0	90.0	360.0
200	650.00	300.0	300.0	700.0	100.0	400.0

DIMENSIONS OF THRUST BLOCKS FOR BENDS					
O.D (mm)	Trench Width (mm)	L (mm)		Z (mm)	H (mm)
		45	90		
75	525.00	40.0	75.0	40.0	150.0
90	540.00	45.0	90.0	45.0	180.0
110	560.00	55.0	110.0	55.0	220.0
125	575.00	70.0	125.0	70.0	250.0
140	590.00	70.0	140.0	70.0	280.0
160	610.00	80.0	160.0	80.0	320.0
180	630.00	90.0	180.0	90.0	360.0
200	650.00	100.0	200.0	100.0	400.0

DIMENSIONS OF THRUST BLOCKS FOR REDUCERS					
O.D (mm)	Trench Width (mm)	d (mm)	L (mm)	Z (mm)	H (mm)
75	525.00	40.0 90.0	Lr + 150	40.0	150.0
90	540.00	45.0 95.0	Lr + 150	45.0	180.0
110	560.00	55.0 105.0	Lr + 150	55.0	220.0
125	575.00	70.0 120.0	Lr + 150	70.0	250.0
140	590.00	70.0 120.0	Lr + 150	70.0	280.0
160	610.00	80.0 130.0	Lr + 150	80.0	320.0
180	630.00	90.0 140.0	Lr + 150	90.0	360.0
200	650.00	100.0 150.0	Lr + 150	100.0	400.0

KEY PLAN & SHEET INDEX

NOTE:

1. ALL DIMENSIONS ARE IN MILLIMETER UNLESS OTHERWISE STATED
2. FOR WATER SUPPLY SYSTEM LAYOUT REFER DWG. EA-01098-KIP-U-W100 TO W138.

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

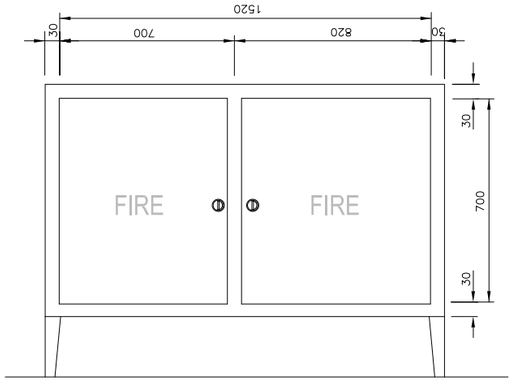
KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

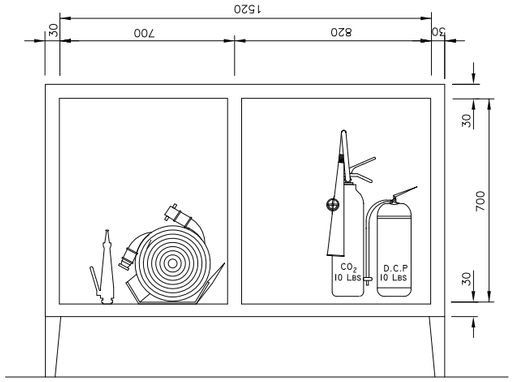
DRAWN	FURQAN	SCALE	N.T.S
DESIGN	KISA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

THRUST BLOCK DETAIL

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W404	00





EXTERNAL HOSE HOUSE DETAIL

SPECIFICATION :

1.	TYPE	SURFACE MOUNTED FIRE HOSE HOUSE
2.	MATERIAL FOR CONSTRUCTION	
a.	DOOR & ARCHITRAVE	M.S WITH 70 MICRONS RED–OXIDE COATING WITH GLASS
b.	BACK BOX	M.S WITH 70 MICRONS RED–OXIDE COATING
3.	DOOR	SOLID (OR WITH GLASS AS REQUESTED BY CLIENT)
4.	FINISH	RED
5.	HANDLE	NAFFCO STANDARD OR SIMILAR
6.	HINGE	PIANO
7.	SWING TYPE HOSE REEL	
8.	DOOR LABELING	TO LOCAL AUTHORITY STANDARD

OPERATING NUT

CAST BRONZE NUT DIRECTLY ACTUATES HYDRANT ROD. GREASE GROOVE ENSURES COMPLETE LUBRICATION AND LONG LIFE.

O RINGS

USED TO SEAL LUBRICATION CHAMBER AND PREVENT WATER ENTERING OPERATING MECHANISM REPACKING ELIMINATED.

BOLTS AND NUTS

ALL CADMIUM PLATED STEEL.

DRAIN LEVER

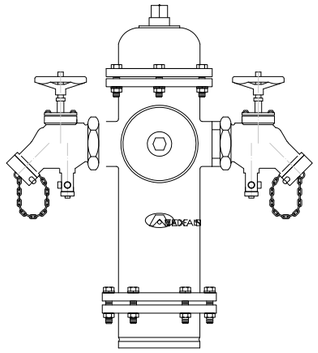
RUGGED THREE PART DRAIN CARRYING DRAIN LEVER WASHERS.

VALVE

INCORPORATES TOP AND BOTTOM VALVE SUPPORT IN CAST IRON

STANDARD

BS 4504



HYDRANT ROD

NORMALLY MADE IN STEEL. A TWO PART CONSTRUCTION HELD TOGETHER BY A ROD COUPLING WITH BRONZE PINS. WHERE REQUIRED LENGTH OF THE ROD CAN BE EXTENDED.

UPPER BARREL

BEST QUALITY CAST IRON TO OUTLIVE STEEL CONSTRUCTIONS.

LOWER BARREL

DUCTILE IRON FOR EXTRA STRENGTH.

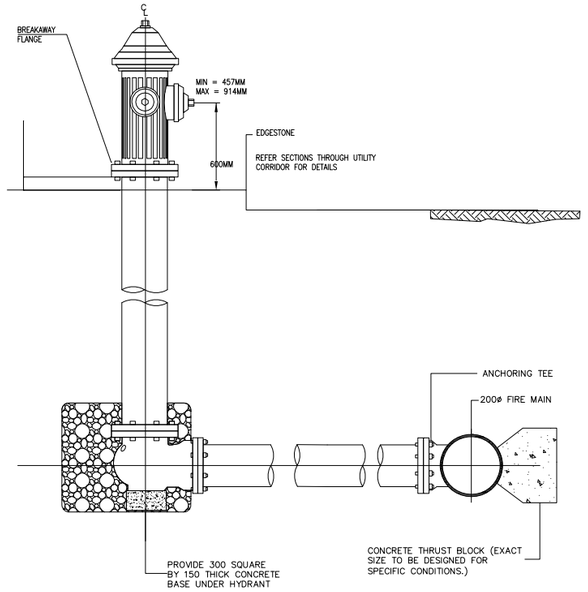
DRAIN RING

MADE OF BRONZE, PROVIDES BRONZE TO BRONZE QUICK COUPLINGS CONNECTION FOR THE HYDRANT SEAT.

HYDRANT SEAT

MADE OF BRONZE ACCURATELY MACHINED.

DETAILS



FIRE HYDRANT INSTALLATION DETAIL

KEY PLAN & SHEET INDEX

NOTE:

1. ALL DIMENSIONS ARE IN MILLIMETER UNLESS OTHERWISE STATED
2. FOR WATER SUPPLY SYSTEM LAYOUT REFER DWG. EA-01098-KIP-U-W100 TO W138.

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

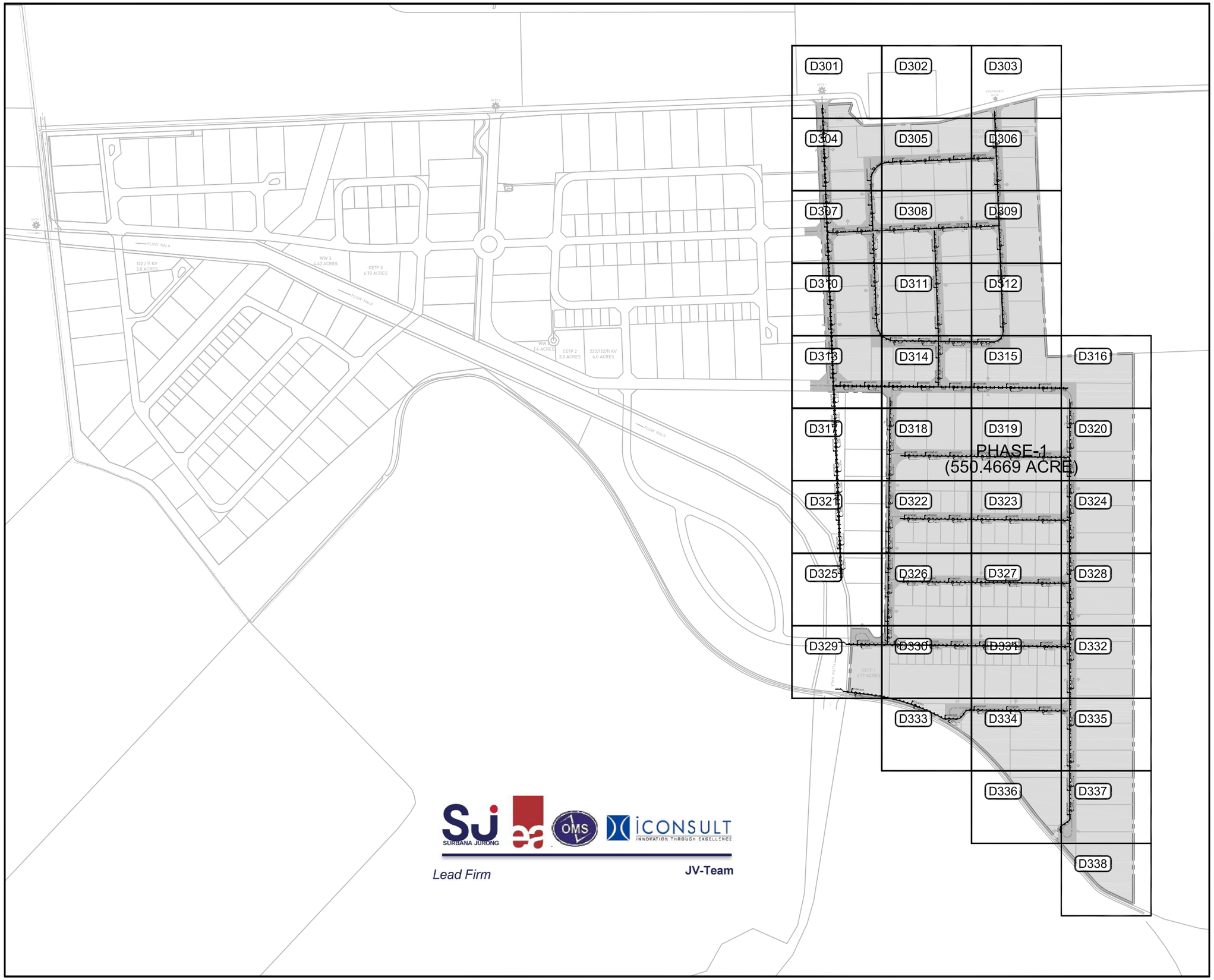
DRAWN	FURQAN	SCALE	N.T.S
DESIGN	KISA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

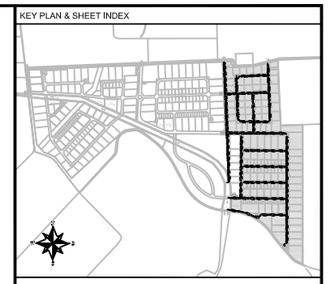
FIRE FIGHTING DETAIL

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W405	00

MASTER PLAN



KEY PLAN & SHEET INDEX



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

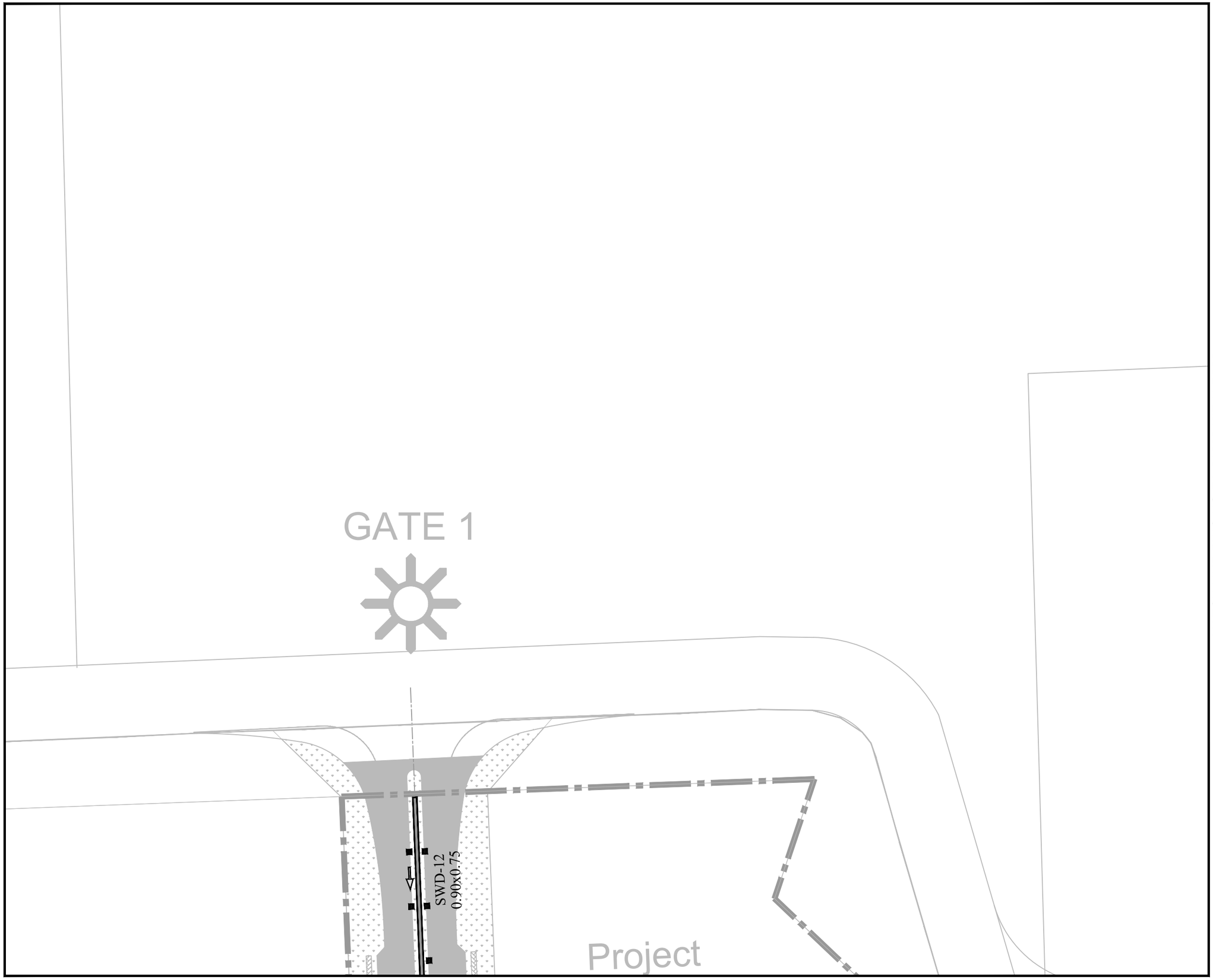
DRAWN	FURQAN	SCALE	N.T.S
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

KEY PLAN
AND SHEET INDEX

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-D300	00

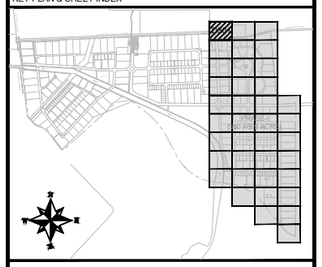
LAYOUT PLAN



MATCH LINE DWG NO:EA-01098-KIP-U-D304

MATCH LINE DWG NO:EA-01098-KIP-U-D302

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. ACCESS COVER AND COLLECTION CHAMBER ARE PROVIDED AT 15M INTERVAL.
3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
STORM WATER DRAIN

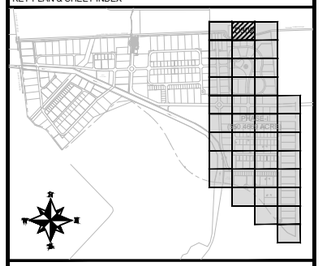
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-D301	00

MATCH LINE DWG NO:EA-01098-KIP-U-D301

MATCH LINE DWG NO:EA-01098-KIP-U-D303

MATCH LINE DWG NO:EA-01098-KIP-U-D305

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. ACCESS COVER AND COLLECTION CHAMBER ARE PROVIDED AT 15M INTERVAL.
3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

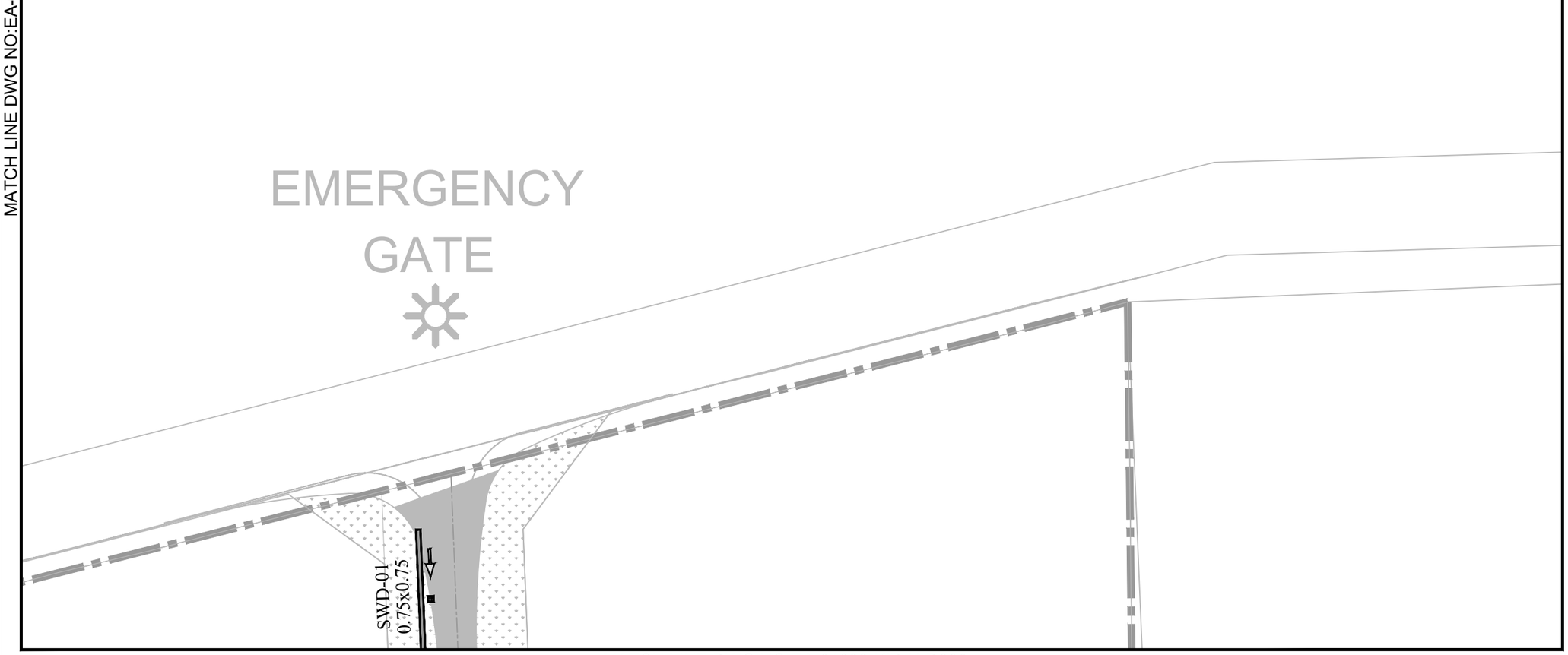
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DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
STORM WATER DRAIN

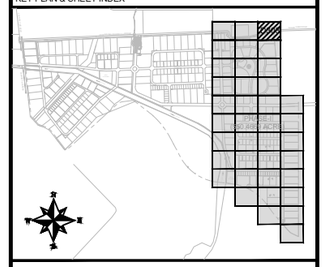
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-D302	00

MATCH LINE DWG NO:EA-01098-KIP-U-D302



MATCH LINE DWG NO:EA-01098-KIP-U-D306

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. ACCESS COVER AND COLLECTION CHAMBER ARE PROVIDED AT 15M INTERVAL.
3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
STORM WATER DRAIN

PROJ CODE	DRAWING NO.	REV.
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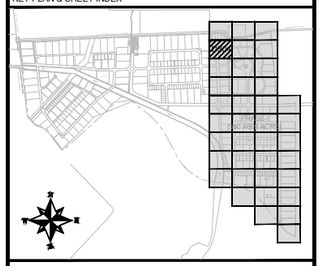
MATCH LINE DWG NO:EA-01098-KIP-U-D301



MATCH LINE DWG NO:EA-01098-KIP-U-D305

MATCH LINE DWG NO:EA-01098-KIP-U-D307

KEY PLAN & SHEET INDEX



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4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

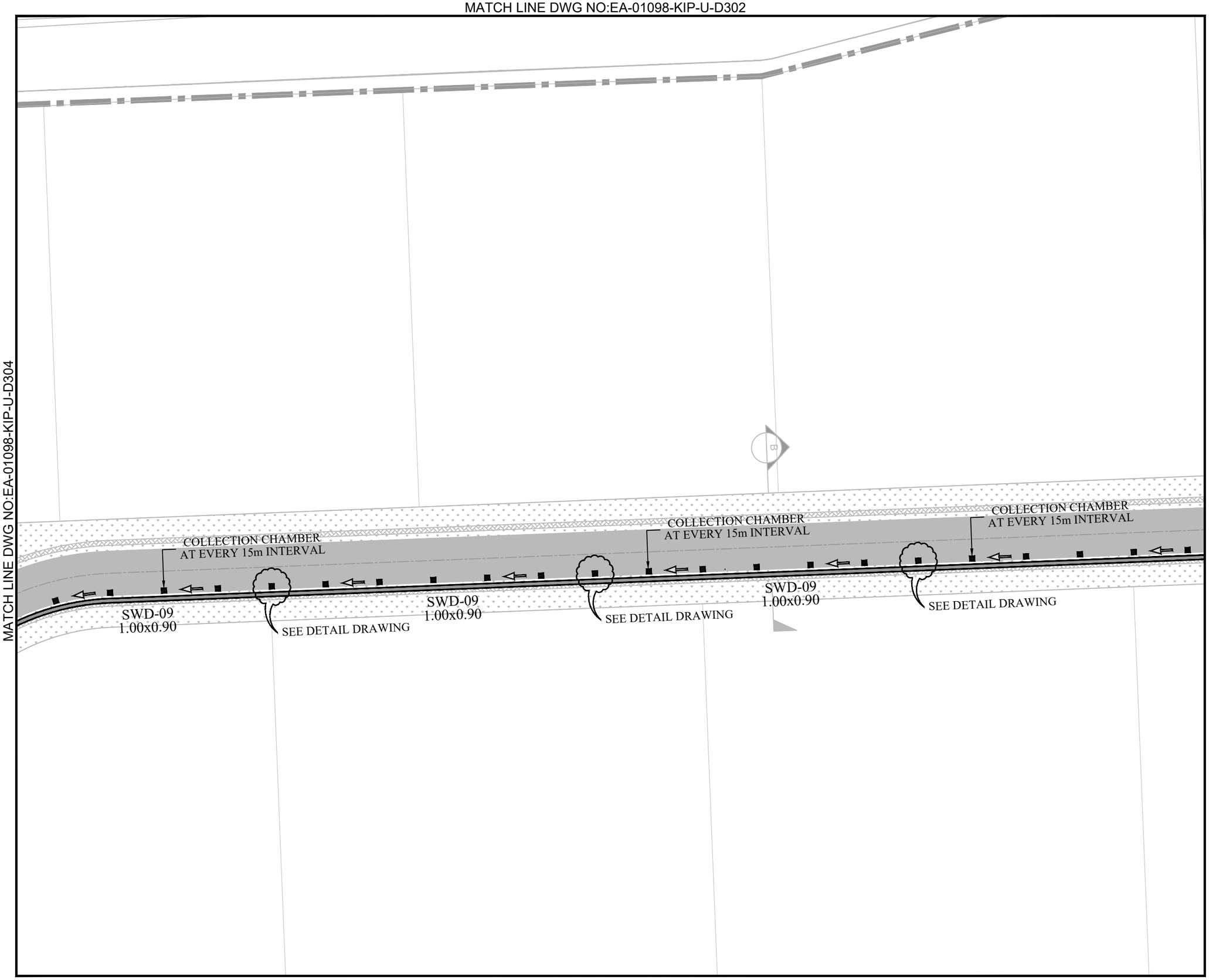
LAYOUT PLAN OF STORM WATER DRAIN

PROJ CODE	DRAWING NO.	REV.
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MATCH LINE DWG NO:EA-01098-KIP-U-D302

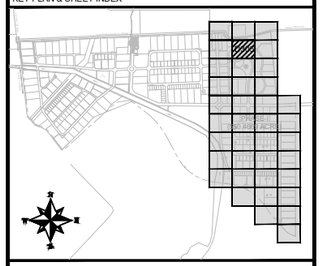
MATCH LINE DWG NO:EA-01098-KIP-U-D304

MATCH LINE DWG NO:EA-01098-KIP-U-D306



MATCH LINE DWG NO:EA-01098-KIP-U-D308

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
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3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

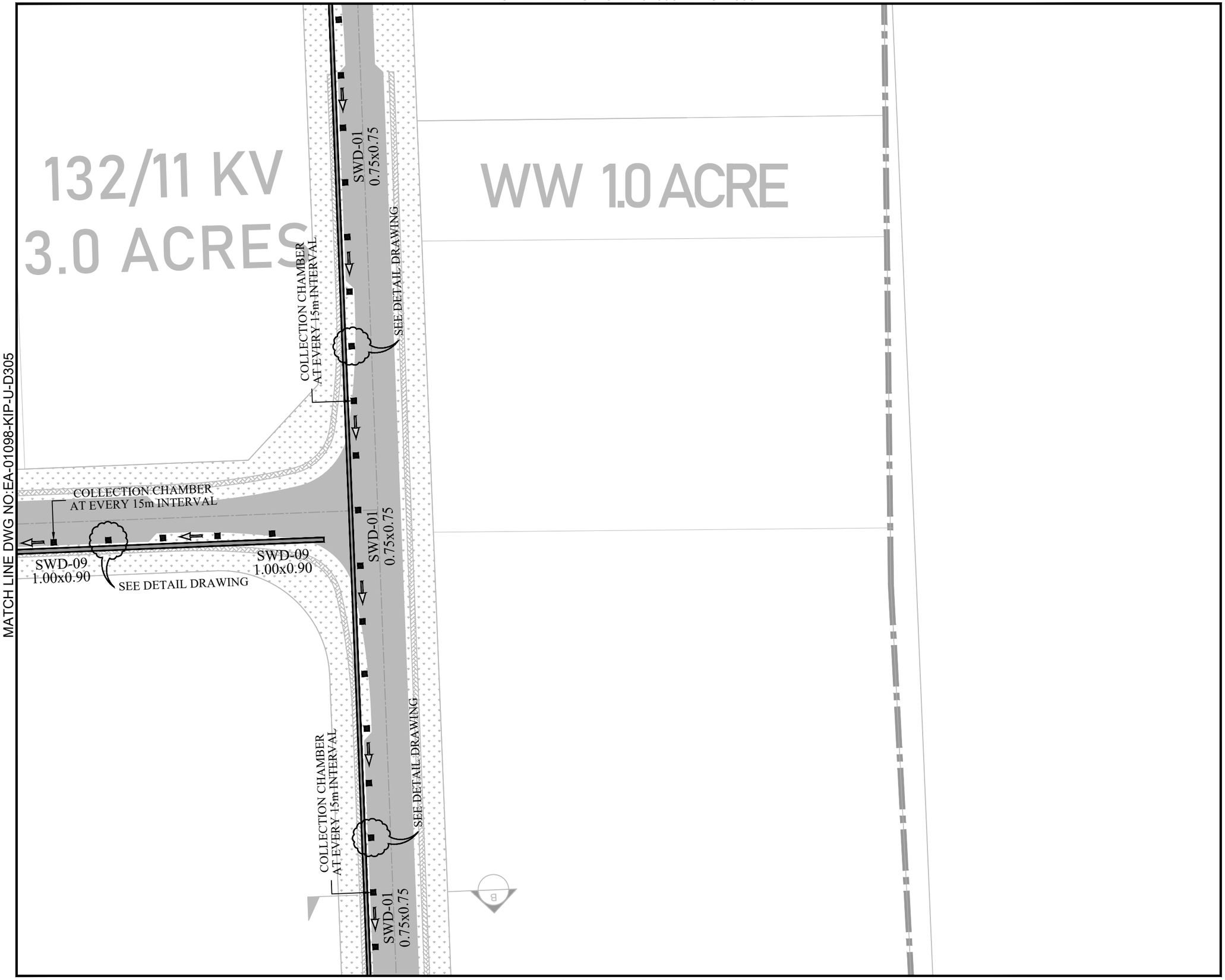
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
STORM WATER DRAIN

PROJ CODE	DRAWING NO.	REV.
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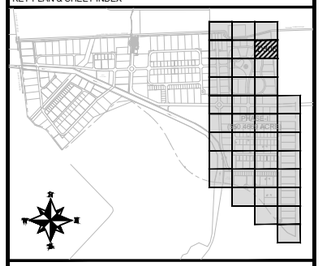
MATCH LINE DWG NO:EA-01098-KIP-U-D303



MATCH LINE DWG NO:EA-01098-KIP-U-D305

MATCH LINE DWG NO:EA-01098-KIP-U-D309

KEY PLAN & SHEET INDEX



NOTE:

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3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

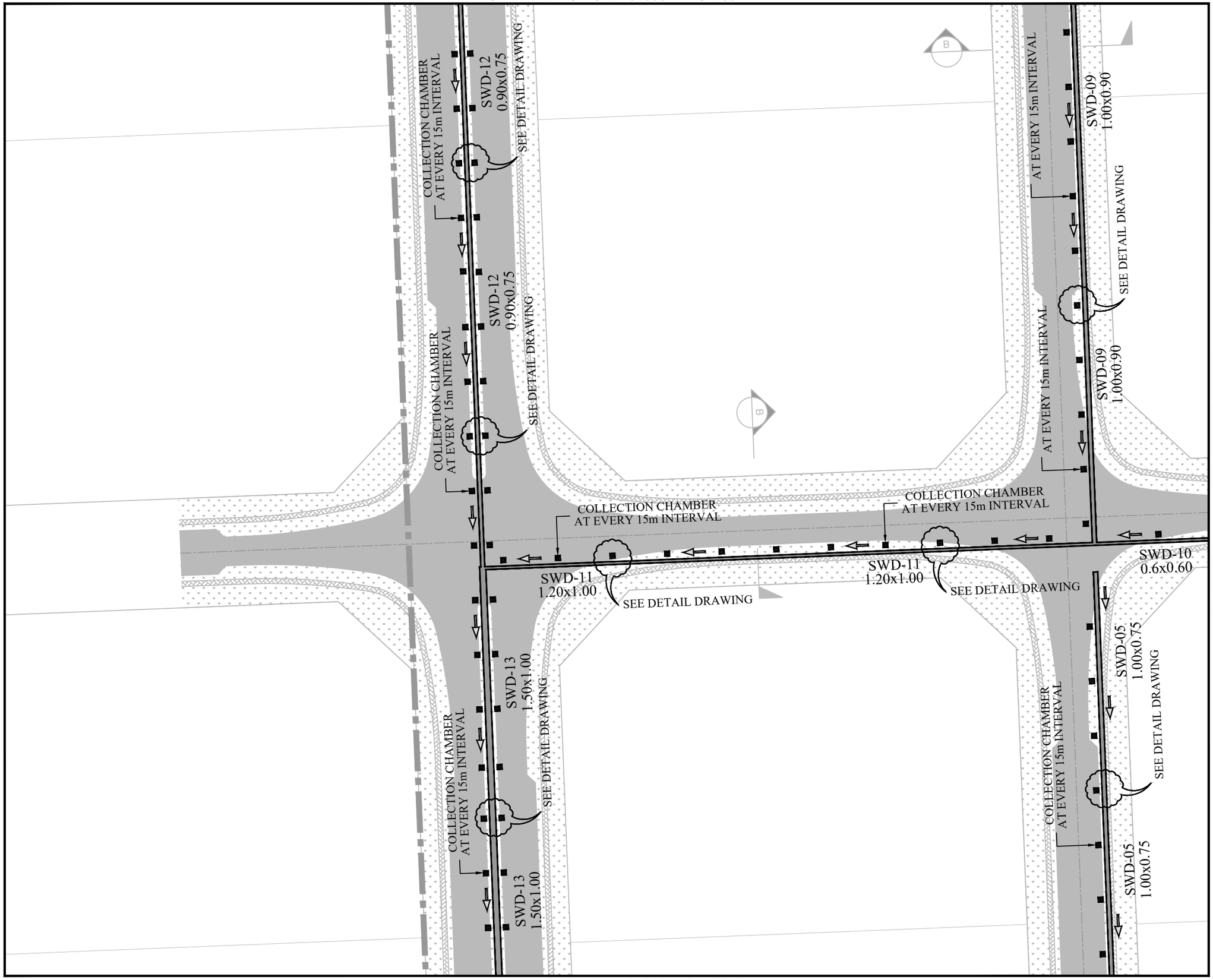
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
STORM WATER DRAIN

PROJ CODE	DRAWING NO.	REV.
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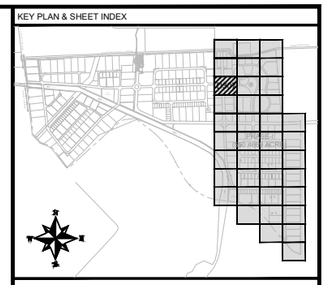
MATCH LINE DWG NO:EA-01098-KIP-U-D304



MATCH LINE DWG NO:EA-01098-KIP-U-D308

MATCH LINE DWG NO:EA-01098-KIP-U-D310

KEY PLAN & SHEET INDEX



NOTE:

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4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

PIDC

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

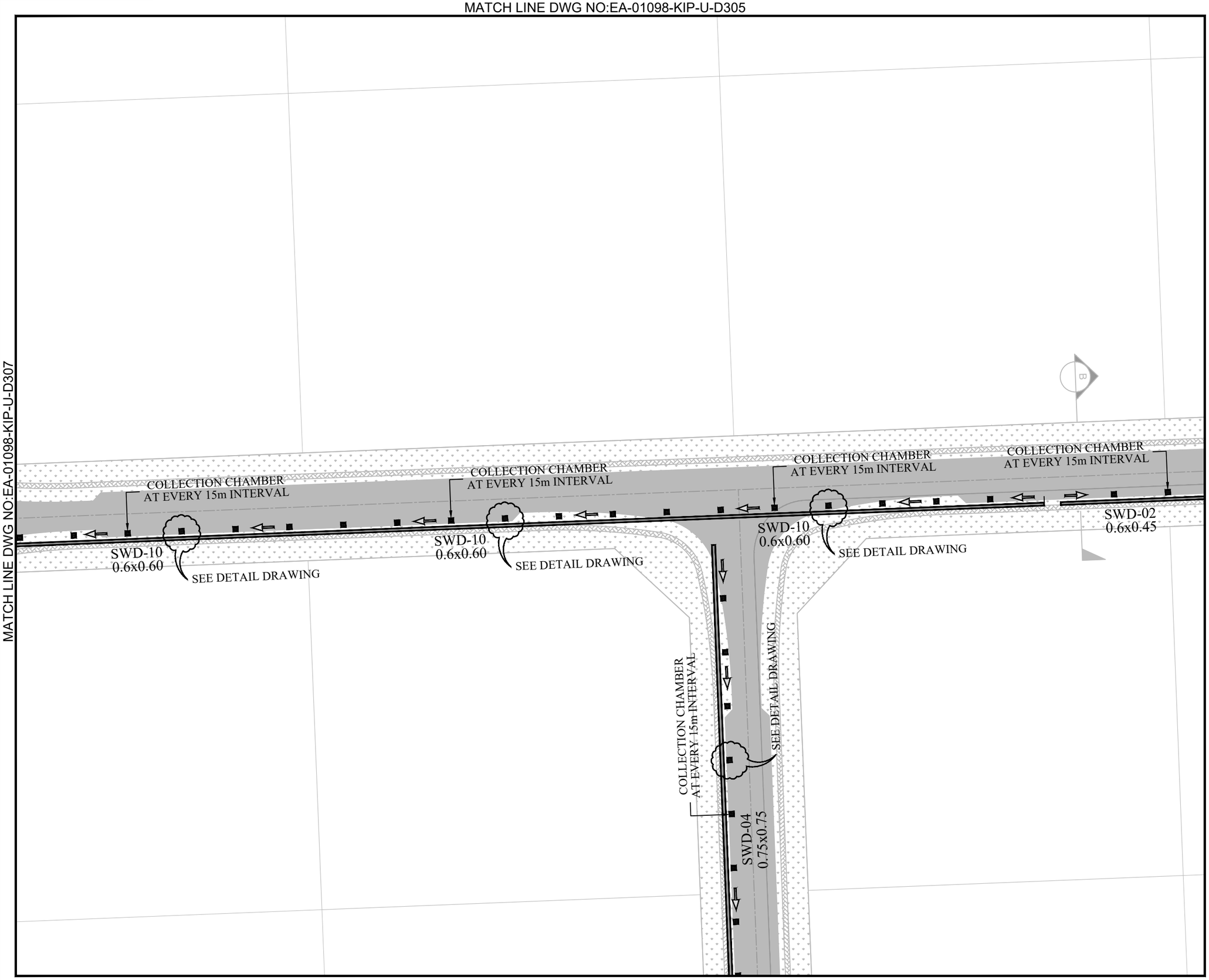
LAYOUT PLAN OF STORM WATER DRAIN

PROJ CODE	DRAWING NO.	REV.
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MATCH LINE DWG NO:EA-01098-KIP-U-D305

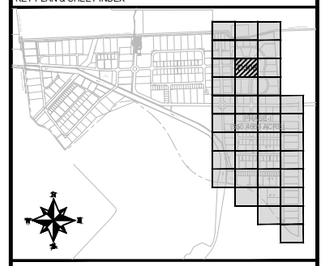
MATCH LINE DWG NO:EA-01098-KIP-U-D307

MATCH LINE DWG NO:EA-01098-KIP-U-D309



MATCH LINE DWG NO:EA-01098-KIP-U-D311

KEY PLAN & SHEET INDEX



NOTE:

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3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
STORM WATER DRAIN

PROJ CODE	DRAWING NO.	REV.
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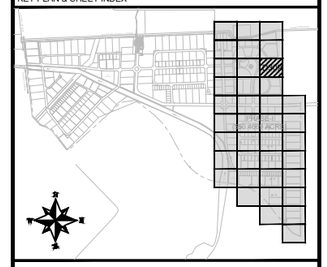
MATCH LINE DWG NO:EA-01098-KIP-U-D306



MATCH LINE DWG NO:EA-01098-KIP-U-D308

MATCH LINE DWG NO:EA-01098-KIP-U-D312

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
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3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
STORM WATER DRAIN

PROJ CODE	DRAWING NO.	REV.
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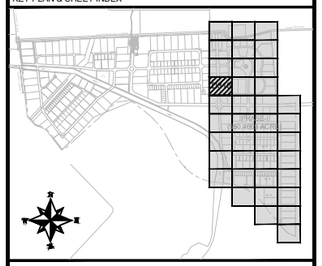
MATCH LINE DWG NO:EA-01098-KIP-U-D307



MATCH LINE DWG NO:EA-01098-KIP-U-D313

MATCH LINE DWG NO:EA-01098-KIP-U-D311

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
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3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

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JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

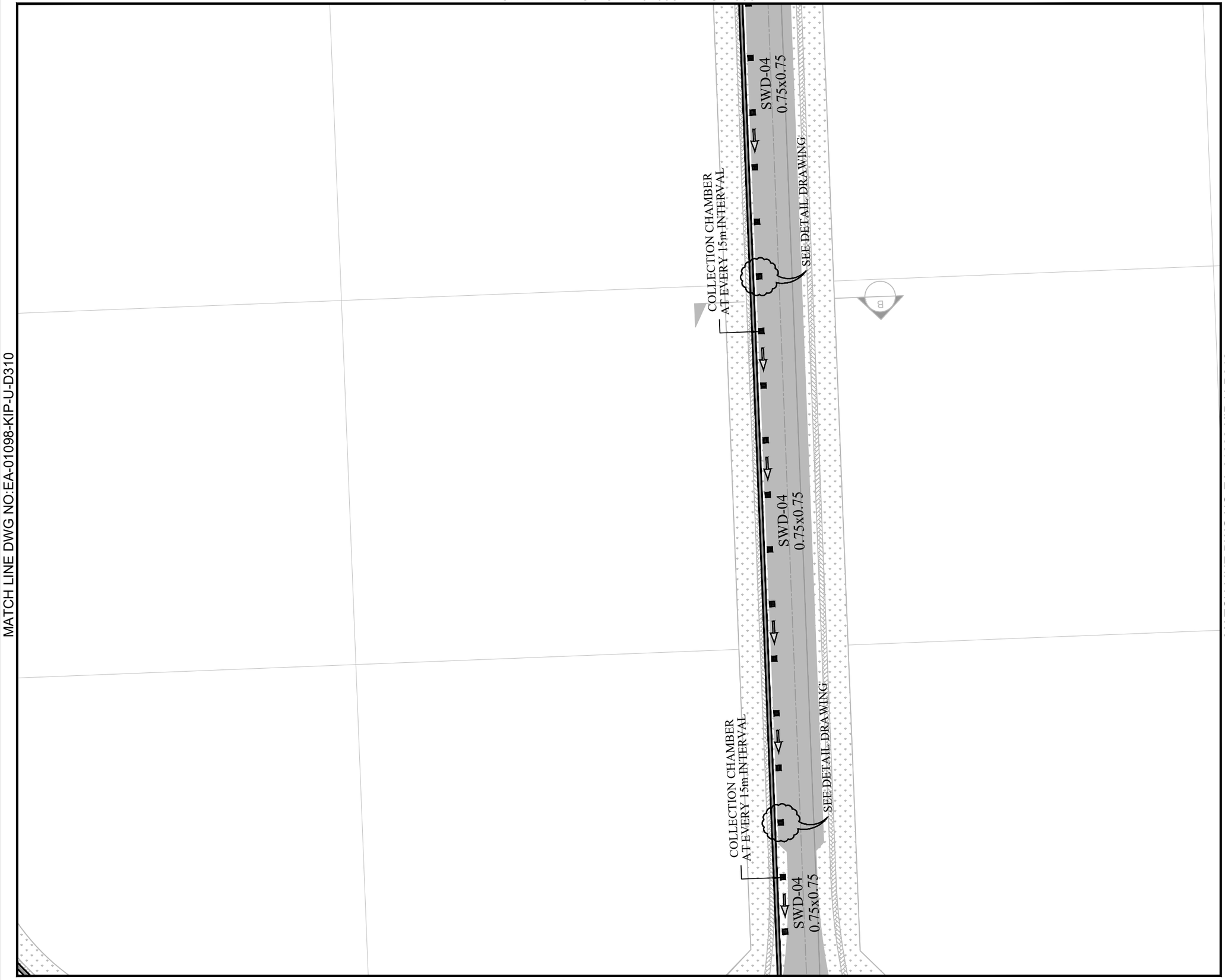
LAYOUT PLAN OF
STORM WATER DRAIN

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-D310	00

MATCH LINE DWG NO:EA-01098-KIP-U-D308

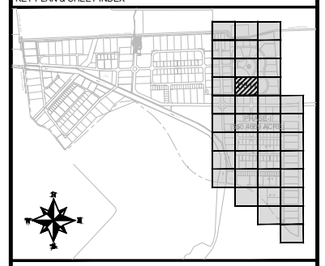
MATCH LINE DWG NO:EA-01098-KIP-U-D310

MATCH LINE DWG NO:EA-01098-KIP-U-D312



MATCH LINE DWG NO:EA-01098-KIP-U-D314

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
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3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
STORM WATER DRAIN

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-D311	00

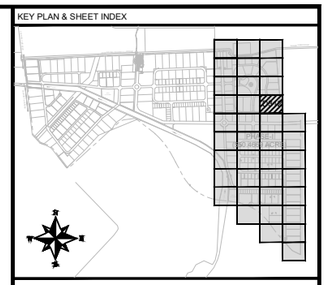
MATCH LINE DWG NO:EA-01098-KIP-U-D309



MATCH LINE DWG NO:EA-01098-KIP-U-D311

MATCH LINE DWG NO:EA-01098-KIP-U-D315

KEY PLAN & SHEET INDEX



NOTE:

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LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

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Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

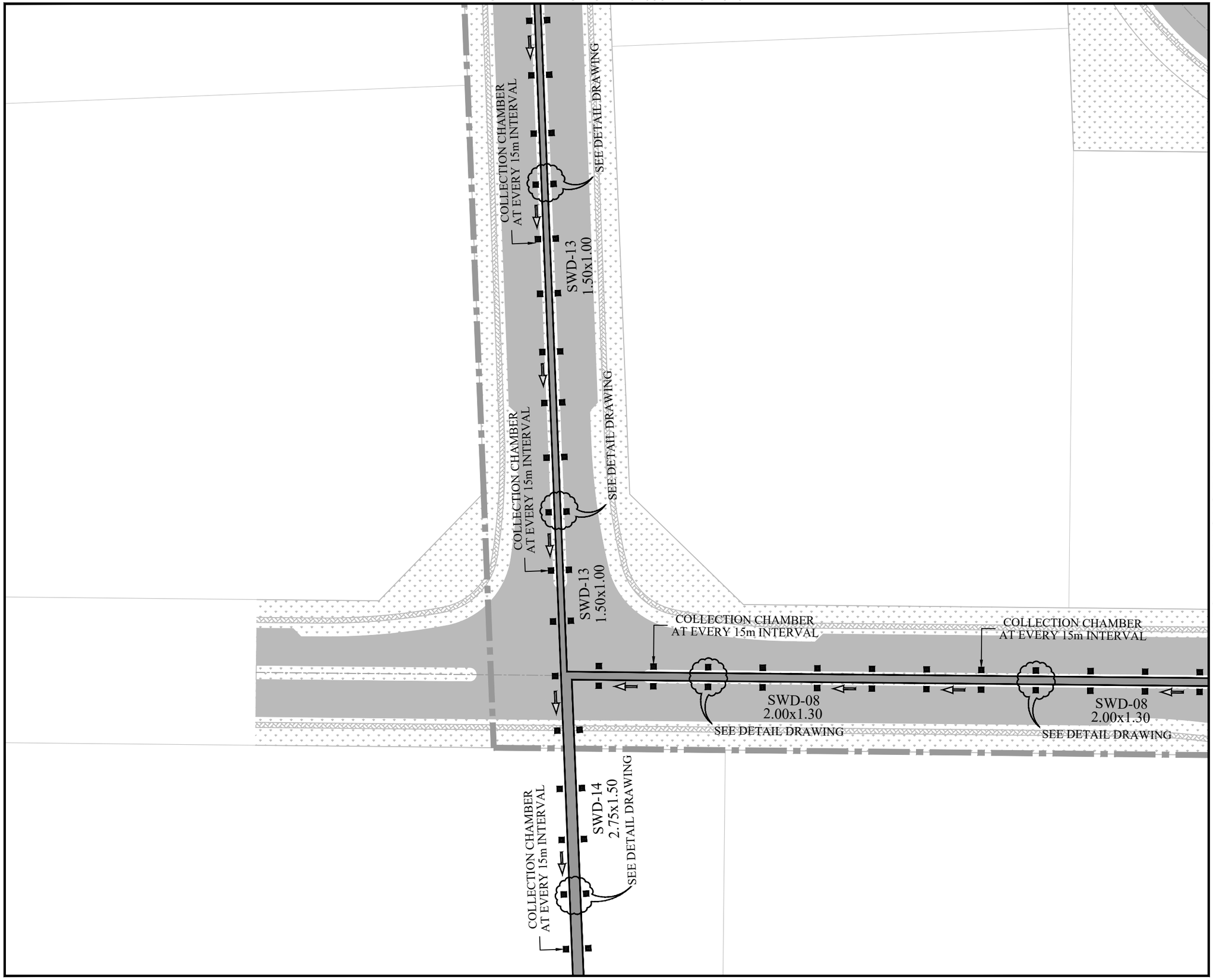
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF STORM WATER DRAIN

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-D312	00

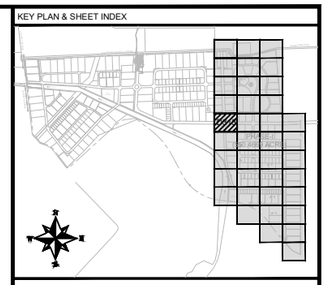
MATCH LINE DWG NO:EA-01098-KIP-U-D310



MATCH LINE DWG NO:EA-01098-KIP-U-D317

MATCH LINE DWG NO:EA-01098-KIP-U-D314

KEY PLAN & SHEET INDEX



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3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

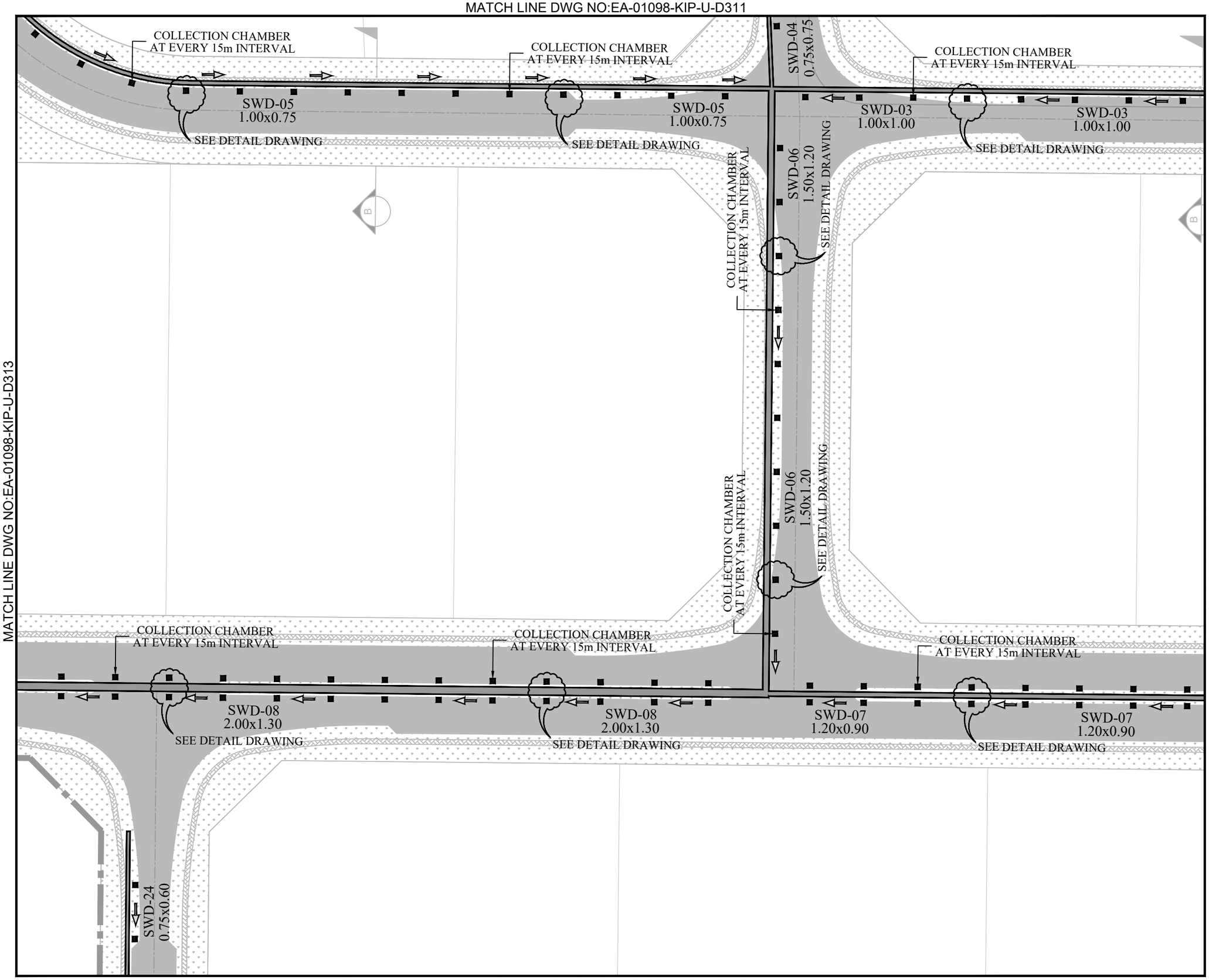
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
STORM WATER DRAIN

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-D313	00

MATCH LINE DWG NO:EA-01098-KIP-U-D311

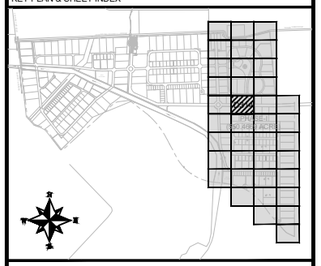


MATCH LINE DWG NO:EA-01098-KIP-U-D313

MATCH LINE DWG NO:EA-01098-KIP-U-D315

MATCH LINE DWG NO:EA-01098-KIP-U-D318

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. ACCESS COVER AND COLLECTION CHAMBER ARE PROVIDED AT 15M INTERVAL.
3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

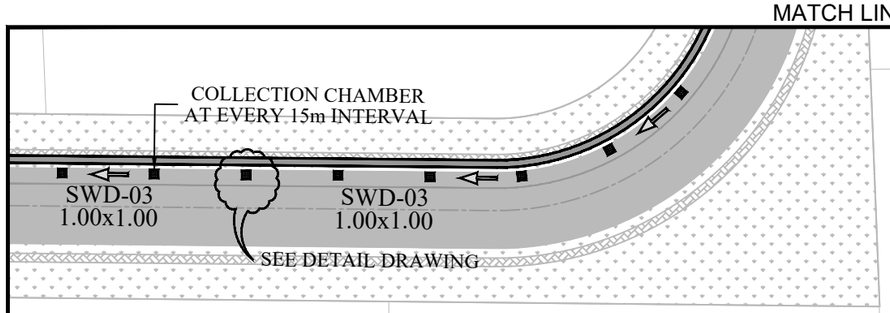
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF STORM WATER DRAIN

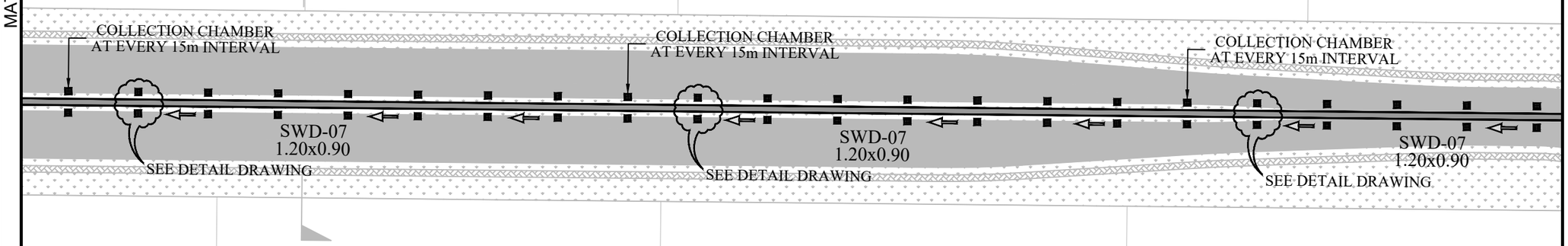
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-D314	00

MATCH LINE DWG NO:EA-01098-KIP-U-D312



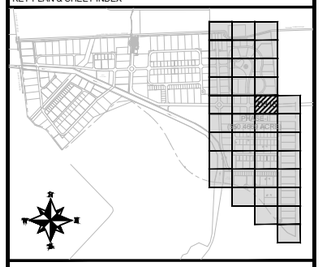
MATCH LINE DWG NO:EA-01098-KIP-U-D314

MATCH LINE DWG NO:EA-01098-KIP-U-D316



MATCH LINE DWG NO:EA-01098-KIP-U-D319

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. ACCESS COVER AND COLLECTION CHAMBER ARE PROVIDED AT 15M INTERVAL.
3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

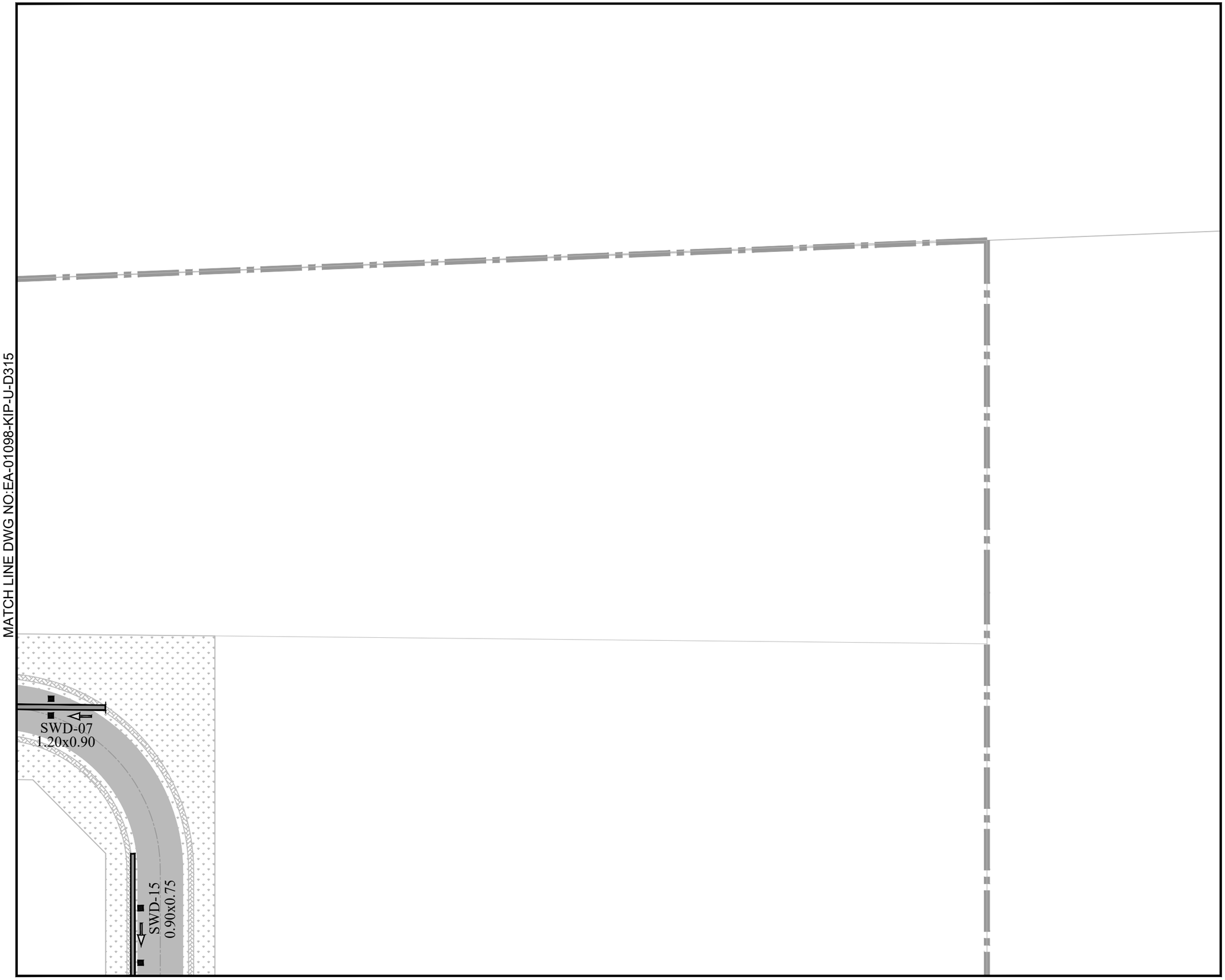
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
STORM WATER DRAIN

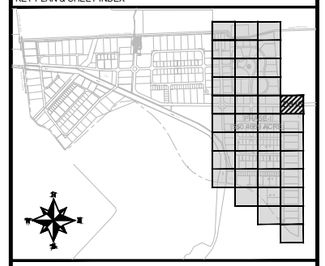
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-D315	00

MATCH LINE DWG NO:EA-01098-KIP-U-D315



MATCH LINE DWG NO:EA-01098-KIP-U-D320

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. ACCESS COVER AND COLLECTION CHAMBER ARE PROVIDED AT 15M INTERVAL.
3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

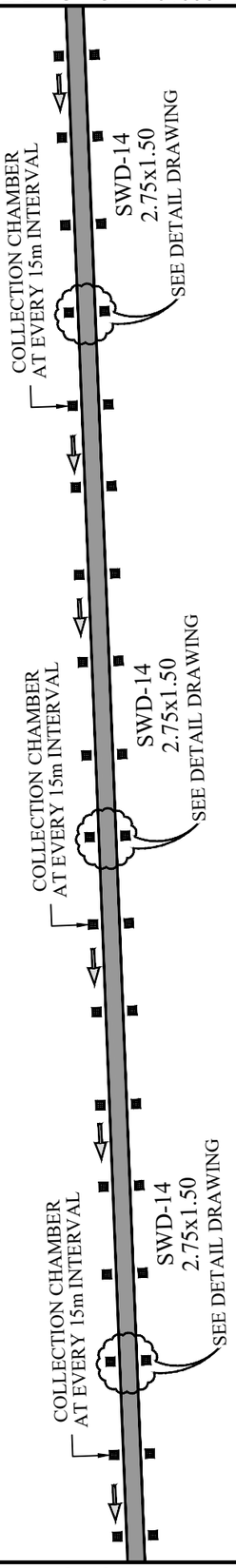
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
STORM WATER DRAIN

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-D316	00

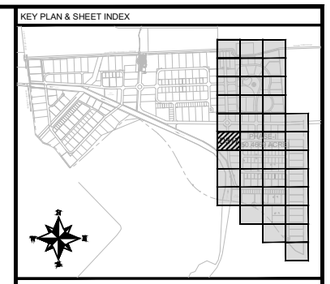
MATCH LINE DWG NO:EA-01098-KIP-U-D313



MATCH LINE DWG NO:EA-01098-KIP-U-D321

MATCH LINE DWG NO:EA-01098-KIP-U-D318

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. ACCESS COVER AND COLLECTION CHAMBER ARE PROVIDED AT 15M INTERVAL.
3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

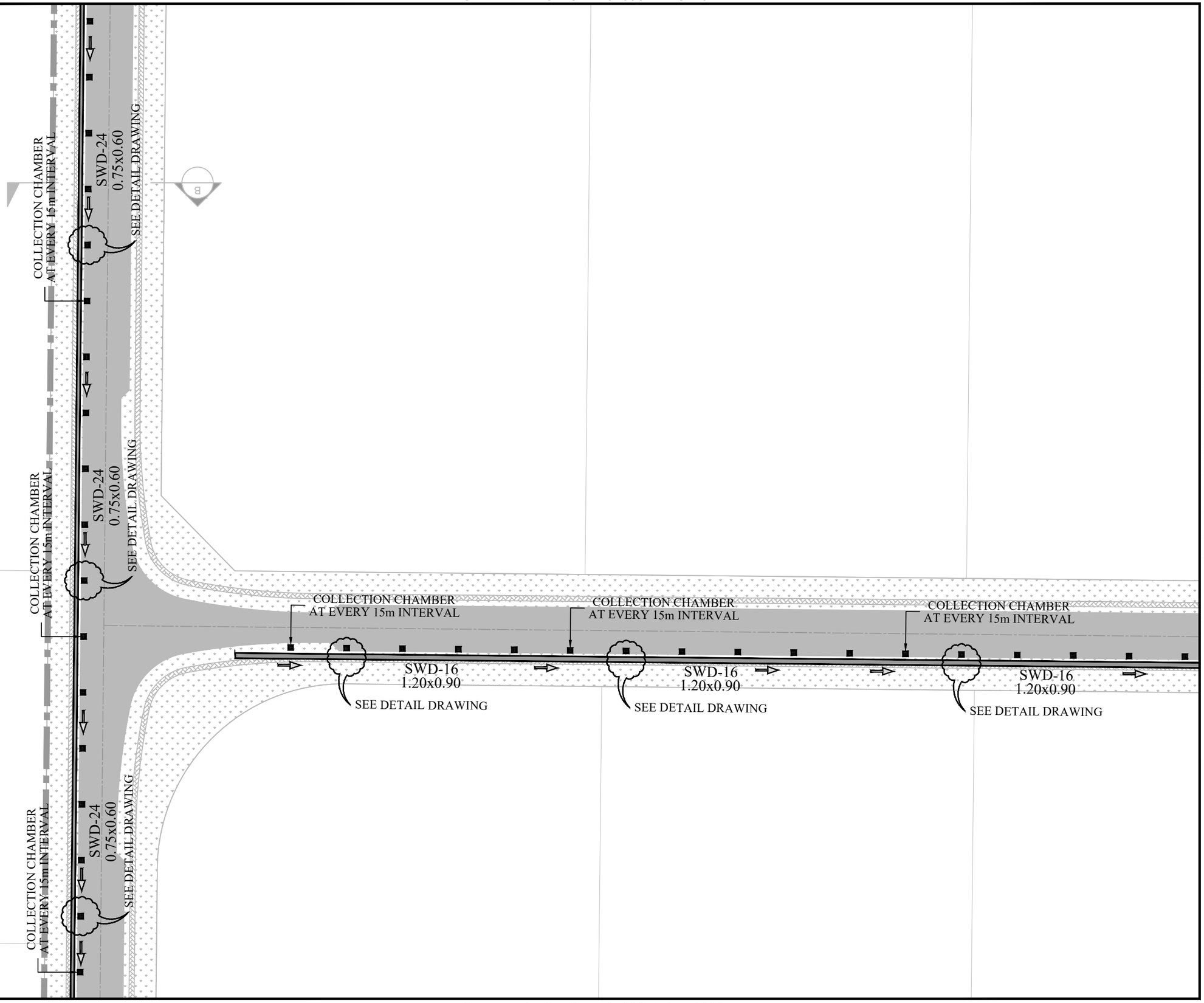
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
STORM WATER DRAIN

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-D317	00

MATCH LINE DWG NO:EA-01098-KIP-U-D314

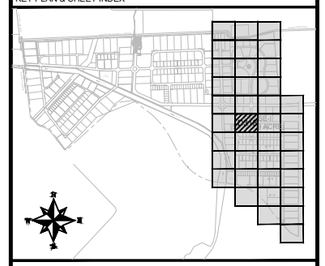


MATCH LINE DWG NO:EA-01098-KIP-U-D317

MATCH LINE DWG NO:EA-01098-KIP-U-D317

MATCH LINE DWG NO:EA-01098-KIP-U-D322

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. ACCESS COVER AND COLLECTION CHAMBER ARE PROVIDED AT 15M INTERVAL.
3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF STORM WATER DRAIN

PROJ CODE	DRAWING NO.	REV.
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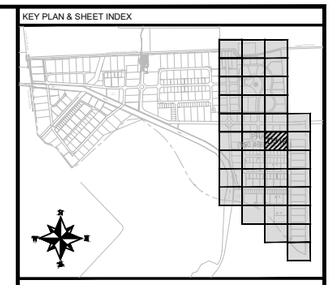
MATCH LINE DWG NO:EA-01098-KIP-U-D315

MATCH LINE DWG NO:EA-01098-KIP-U-D318

MATCH LINE DWG NO:EA-01098-KIP-U-D320

MATCH LINE DWG NO:EA-01098-KIP-U-D323

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
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3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

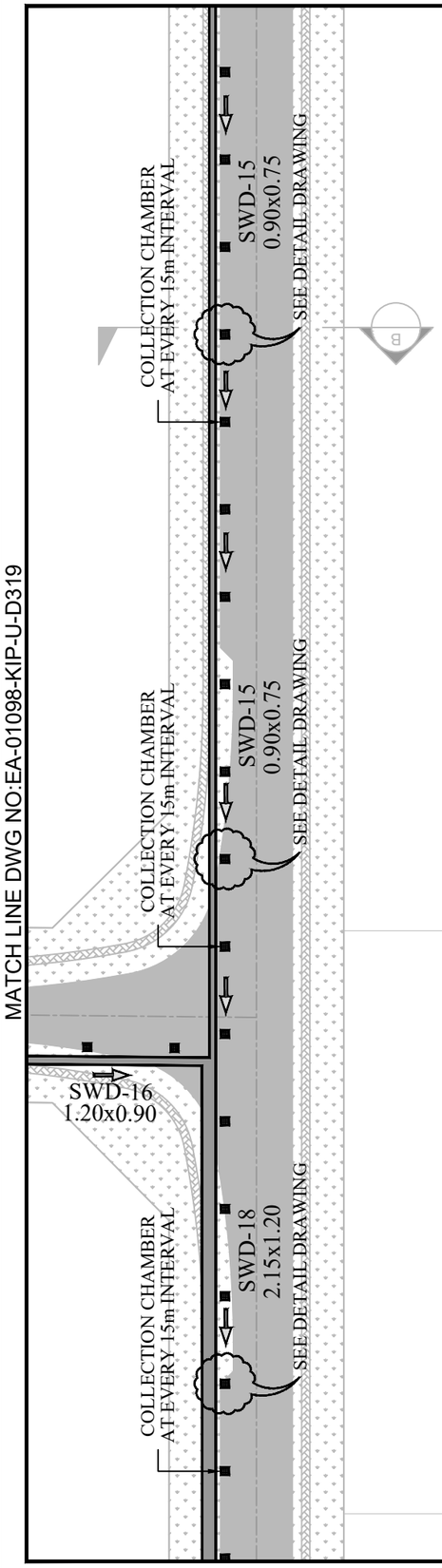
DRAWING TITLE:

LAYOUT PLAN OF
STORM WATER DRAIN

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-D319	00

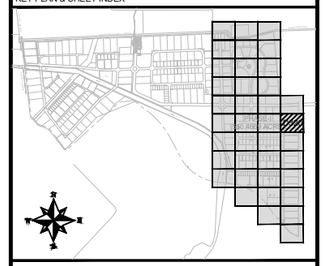
MATCH LINE DWG NO:EA-01098-KIP-U-D316

MATCH LINE DWG NO:EA-01098-KIP-U-D319



MATCH LINE DWG NO:EA-01098-KIP-U-D324

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. ACCESS COVER AND COLLECTION CHAMBER ARE PROVIDED AT 15M INTERVAL.
3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

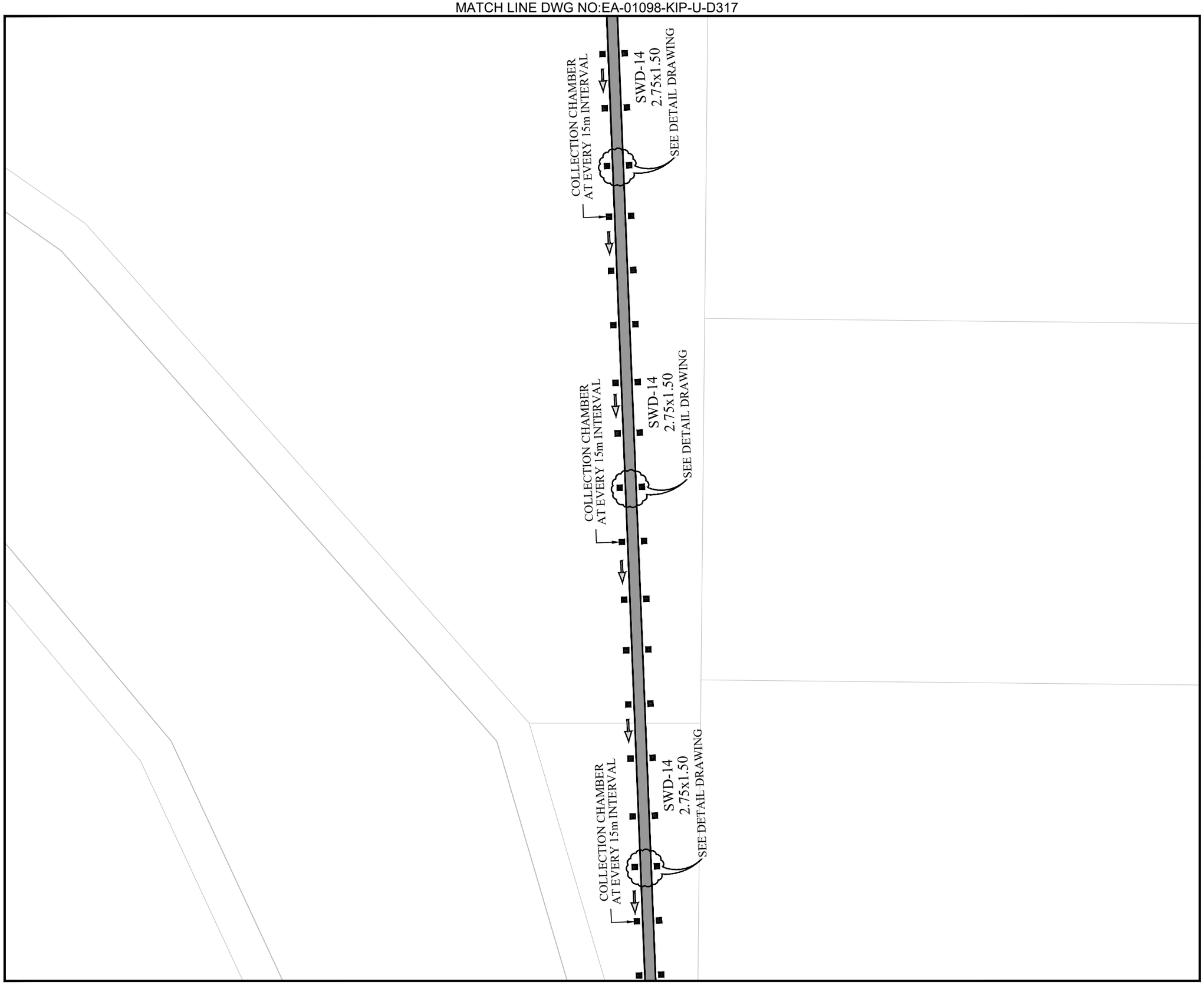
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
STORM WATER DRAIN

PROJ CODE	DRAWING NO.	REV.
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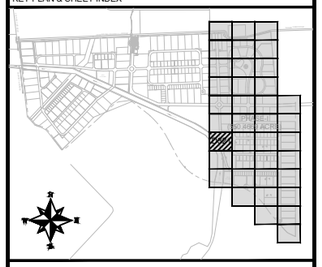
MATCH LINE DWG NO:EA-01098-KIP-U-D317



MATCH LINE DWG NO:EA-01098-KIP-U-D322

MATCH LINE DWG NO:EA-01098-KIP-U-D325

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. ACCESS COVER AND COLLECTION CHAMBER ARE PROVIDED AT 15M INTERVAL.
3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

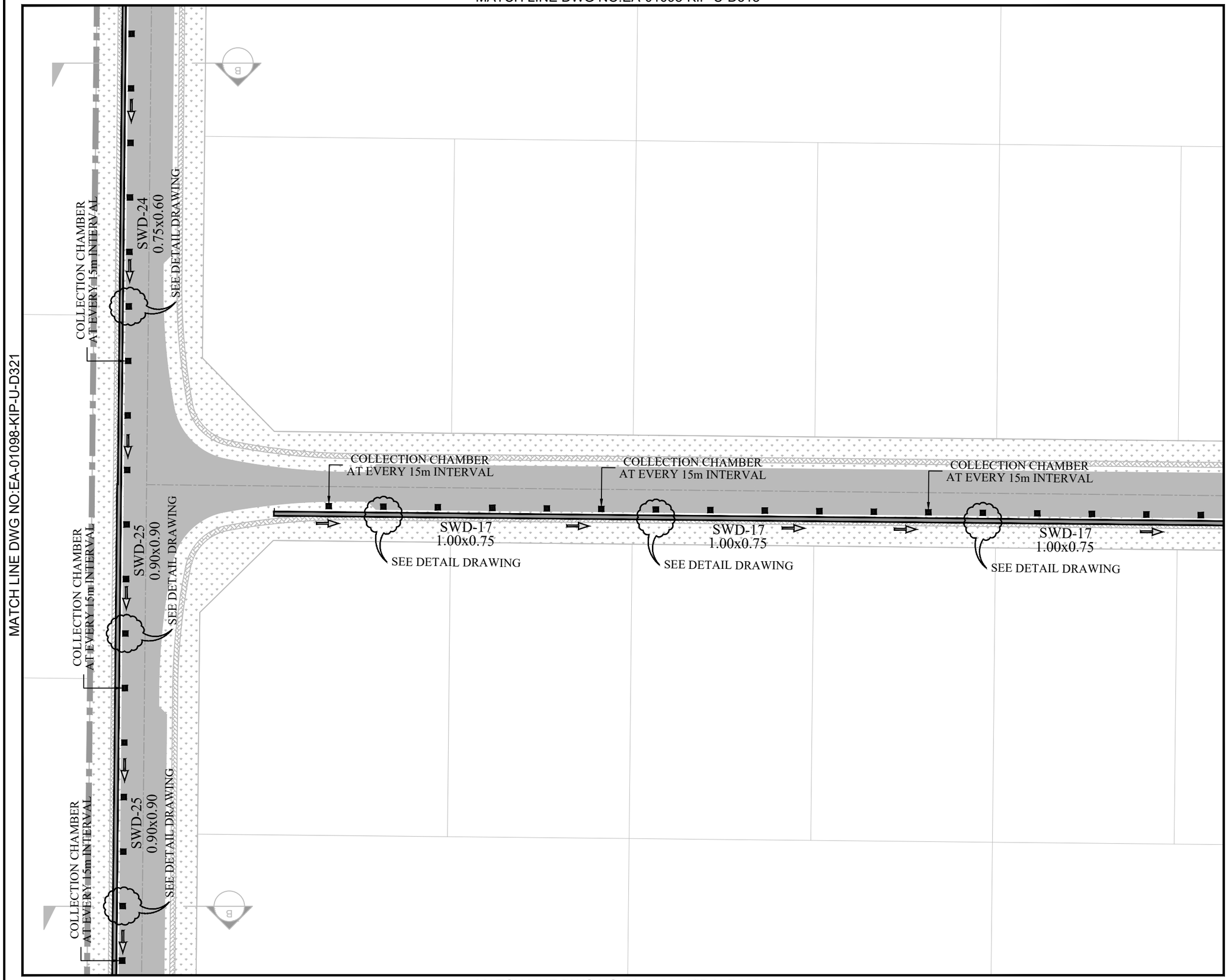
LAYOUT PLAN OF STORM WATER DRAIN

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-D321	00

MATCH LINE DWG NO:EA-01098-KIP-U-D318

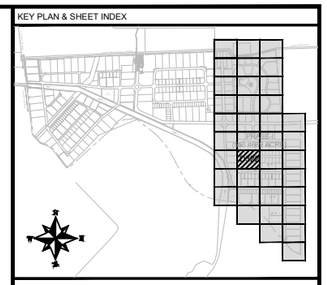
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MATCH LINE DWG NO:EA-01098-KIP-U-D323



MATCH LINE DWG NO:EA-01098-KIP-U-D326

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
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3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

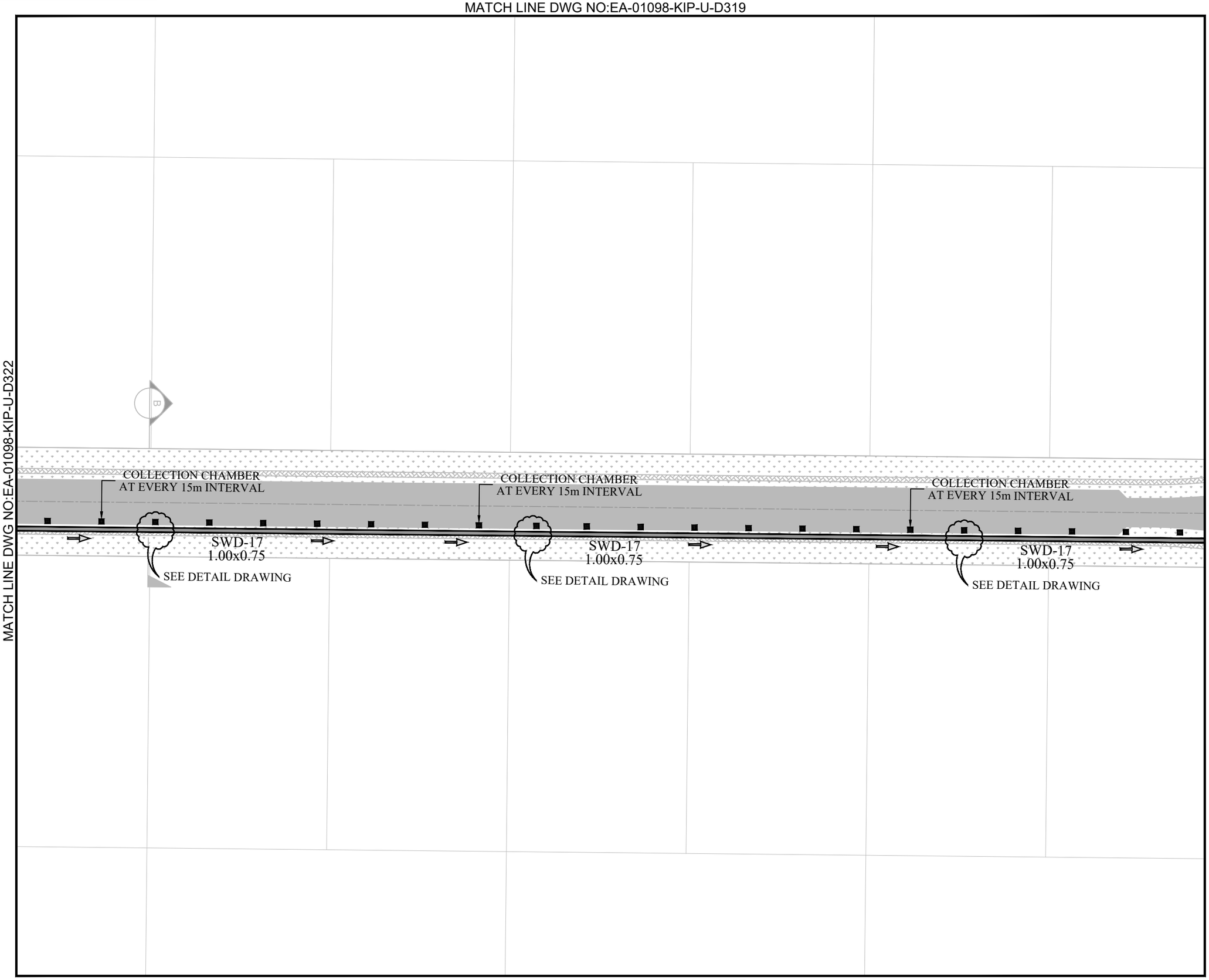
LAYOUT PLAN OF
STORM WATER DRAIN

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-D322	00

MATCH LINE DWG NO:EA-01098-KIP-U-D319

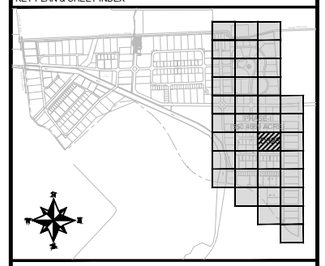
MATCH LINE DWG NO:EA-01098-KIP-U-D322

MATCH LINE DWG NO:EA-01098-KIP-U-D324



MATCH LINE DWG NO:EA-01098-KIP-U-D327

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
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3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
STORM WATER DRAIN

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-D323	00

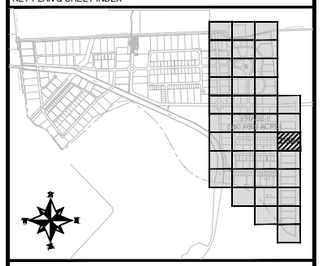
MATCH LINE DWG NO:EA-01098-KIP-U-D320



MATCH LINE DWG NO:EA-01098-KIP-U-D323

MATCH LINE DWG NO:EA-01098-KIP-U-D328

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. ACCESS COVER AND COLLECTION CHAMBER ARE PROVIDED AT 15M INTERVAL.
3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Surbana Jurong Consultants Pte Ltd
168 Jalan Bukit Merah
#01-01 Connection One
Singapore 150168
TEL : (65) 6248 1288, FAX : (65) 6273 9090
www.surbanajurong.com

CONSULTANT FOR ENGINEERING DESIGN:

EA Consulting Pvt Ltd
Engineering
Architecture &
Project Managment

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

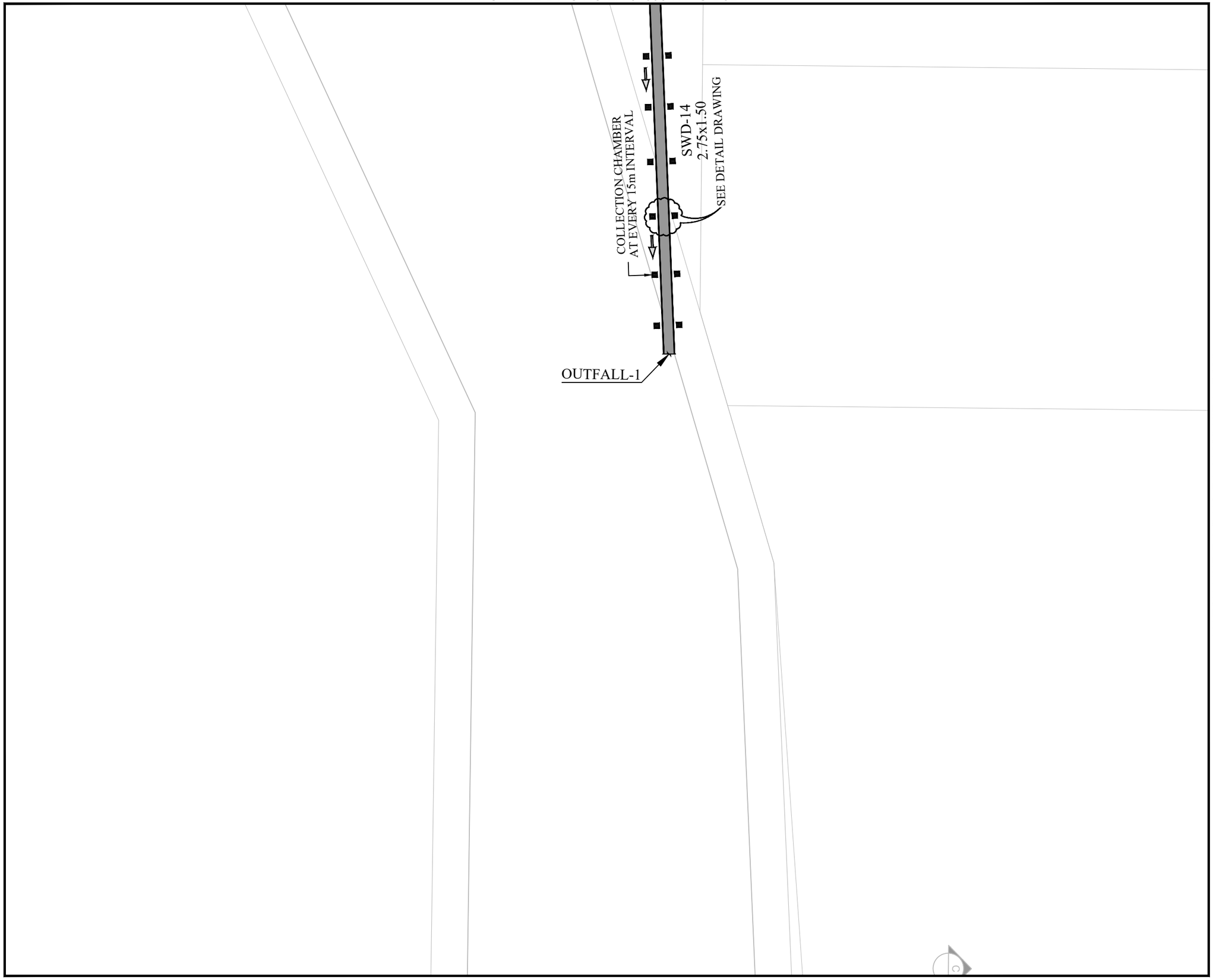
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
STORM WATER DRAIN

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-D324	00

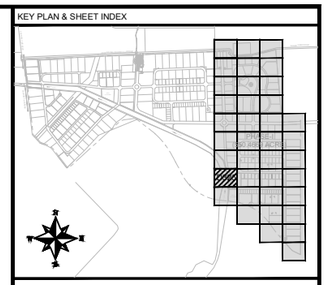
MATCH LINE DWG NO:EA-01098-KIP-U-D321



MATCH LINE DWG NO:EA-01098-KIP-U-D326

MATCH LINE DWG NO:EA-01098-KIP-U-D329

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. ACCESS COVER AND COLLECTION CHAMBER ARE PROVIDED AT 15M INTERVAL.
3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

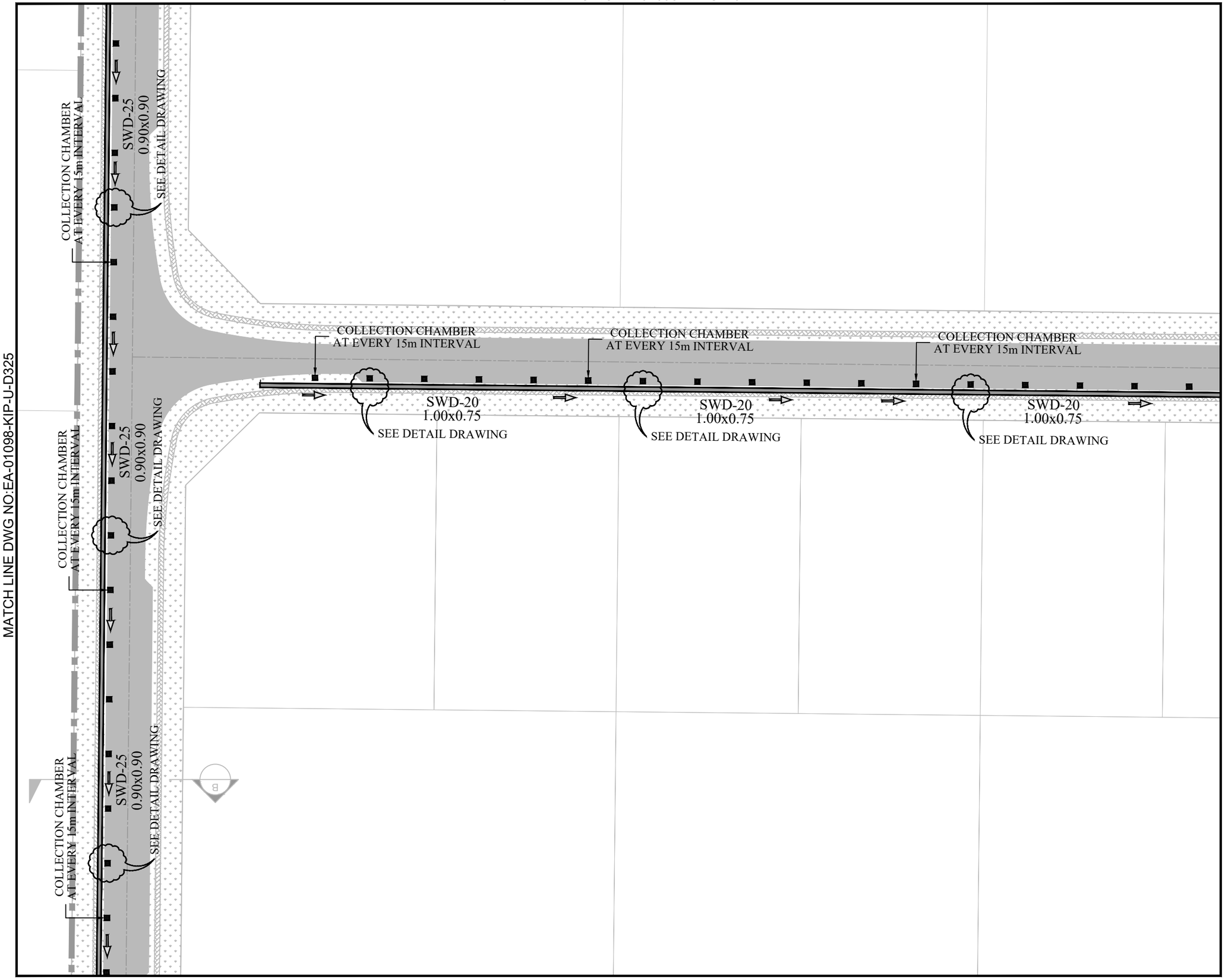
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
STORM WATER DRAIN

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-D325	00

MATCH LINE DWG NO:EA-01098-KIP-U-D322

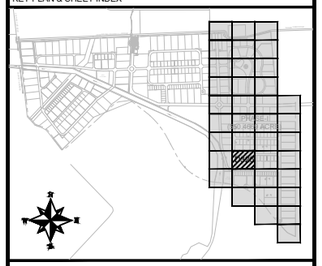


MATCH LINE DWG NO:EA-01098-KIP-U-D325

MATCH LINE DWG NO:EA-01098-KIP-U-D327

MATCH LINE DWG NO:EA-01098-KIP-U-D330

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. ACCESS COVER AND COLLECTION CHAMBER ARE PROVIDED AT 15M INTERVAL.
3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

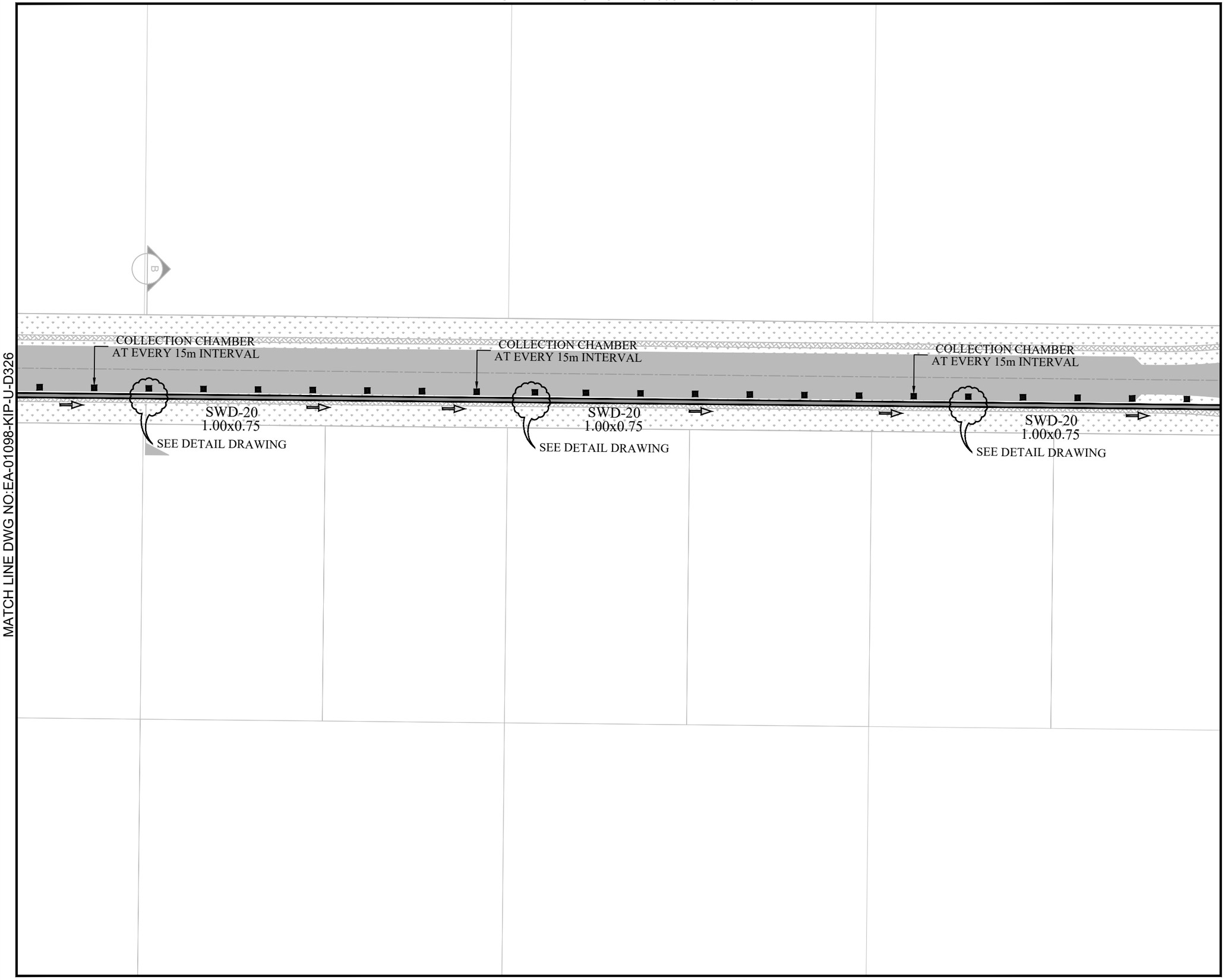
LAYOUT PLAN OF
STORM WATER DRAIN

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-D326	00

MATCH LINE DWG NO:EA-01098-KIP-U-D323

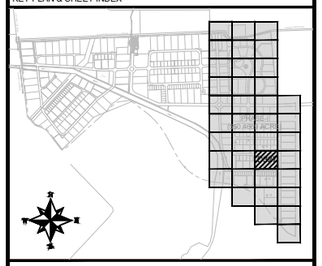
MATCH LINE DWG NO:EA-01098-KIP-U-D326

MATCH LINE DWG NO:EA-01098-KIP-U-D328



MATCH LINE DWG NO:EA-01098-KIP-U-D331

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. ACCESS COVER AND COLLECTION CHAMBER ARE PROVIDED AT 15M INTERVAL.
3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

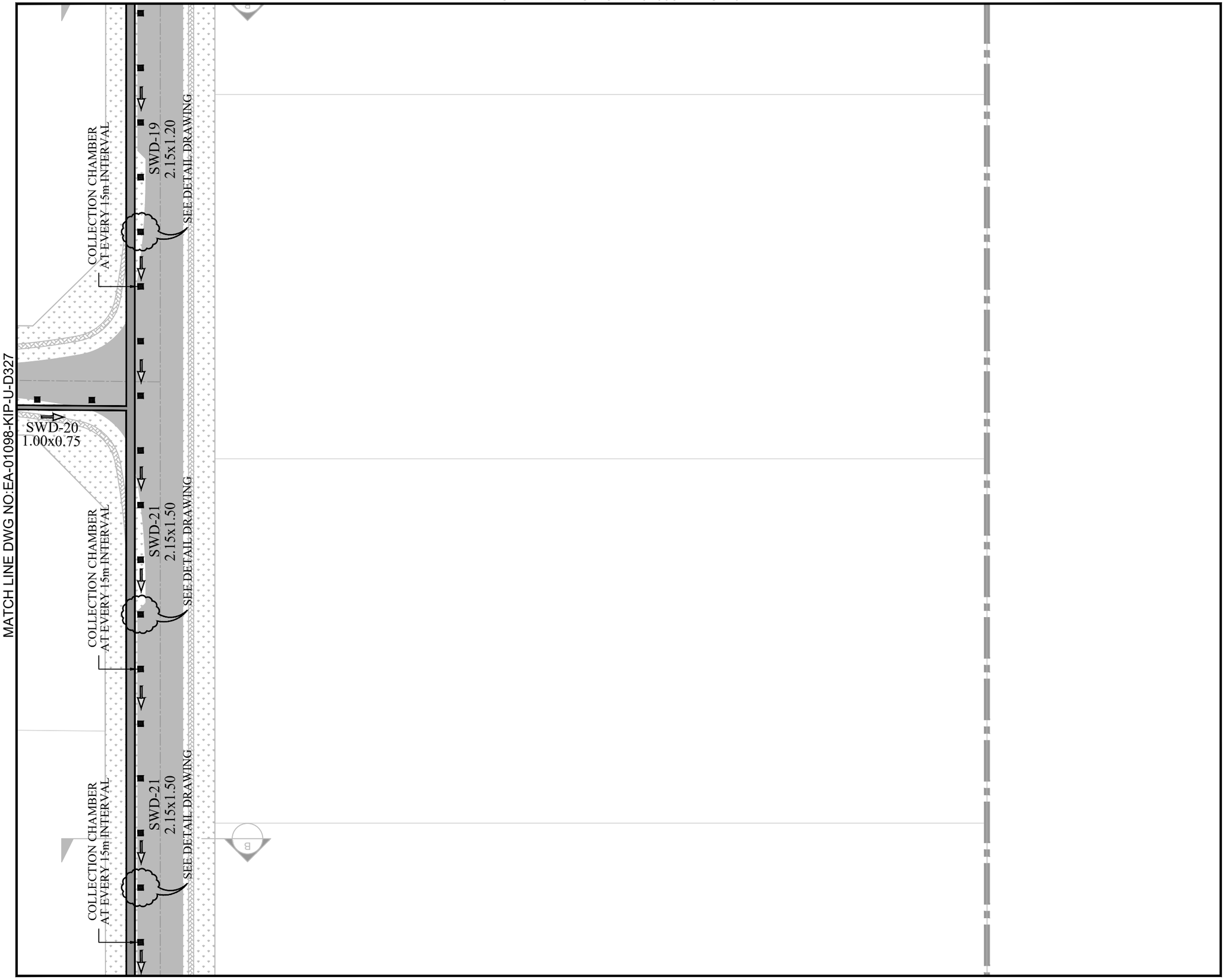
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF STORM WATER DRAIN

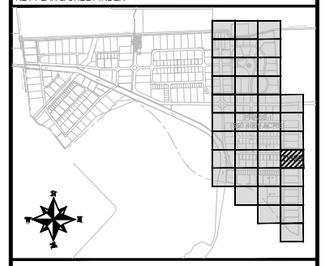
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-D327	00

MATCH LINE DWG NO:EA-01098-KIP-U-D324



MATCH LINE DWG NO:EA-01098-KIP-U-D332

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. ACCESS COVER AND COLLECTION CHAMBER ARE PROVIDED AT 15M INTERVAL.
3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Surbana Jurong Consultants Pte Ltd
168 Jalan Bukit Merah
#01-01 Connection One
Singapore 150168
TEL : (65) 6248 1288, FAX : (65) 6273 9090
www.surbanajurong.com

CONSULTANT FOR ENGINEERING DESIGN:

EA Consulting Pvt Ltd
Engineering
Architecture &
Project Managment

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

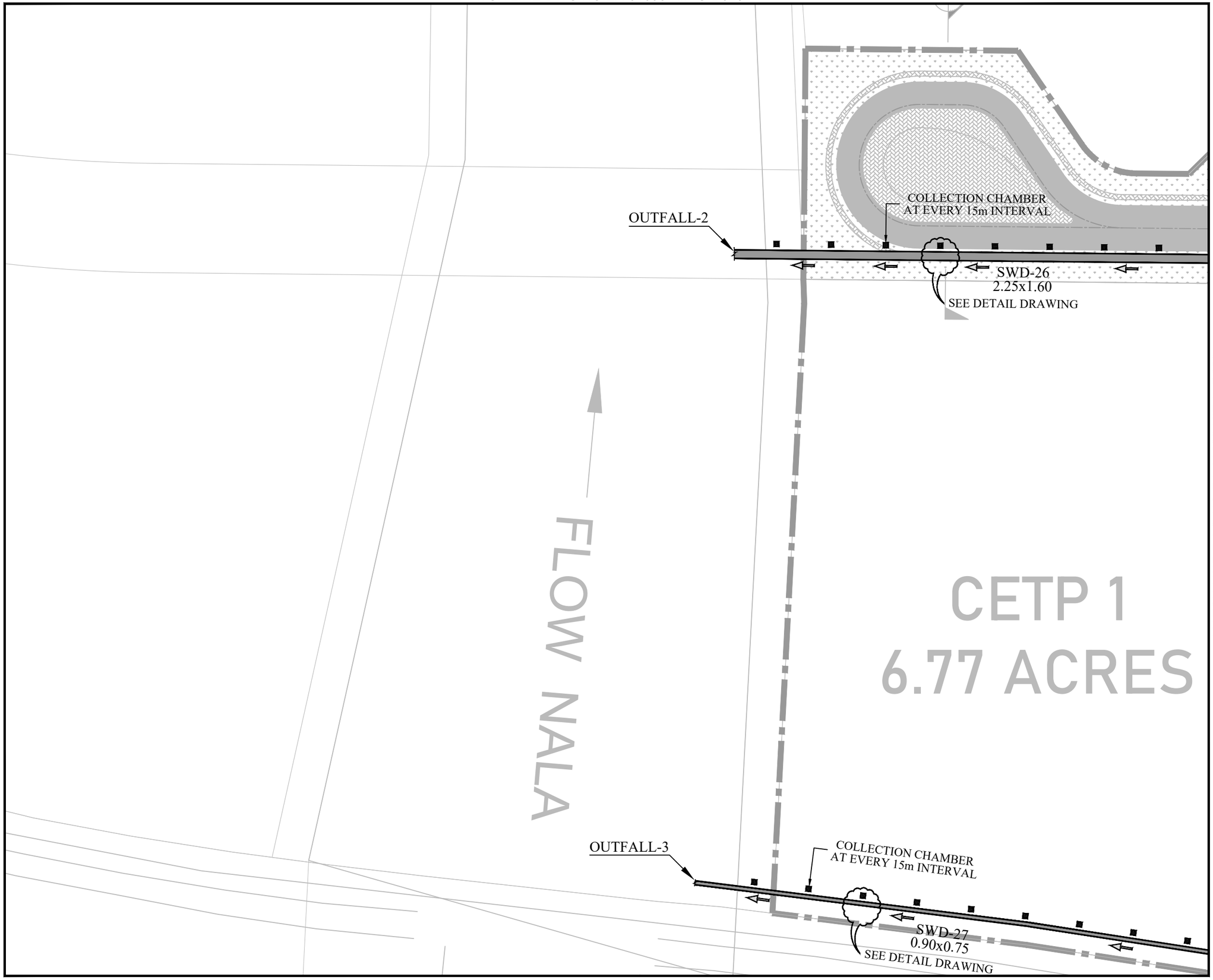
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
STORM WATER DRAIN

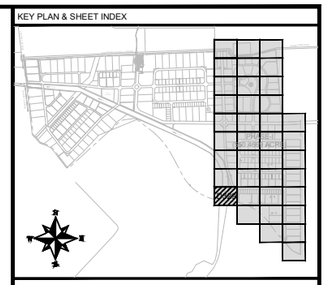
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-D328	00

MATCH LINE DWG NO:EA-01098-KIP-U-D325



MATCH LINE DWG NO:EA-01098-KIP-U-D330

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
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3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

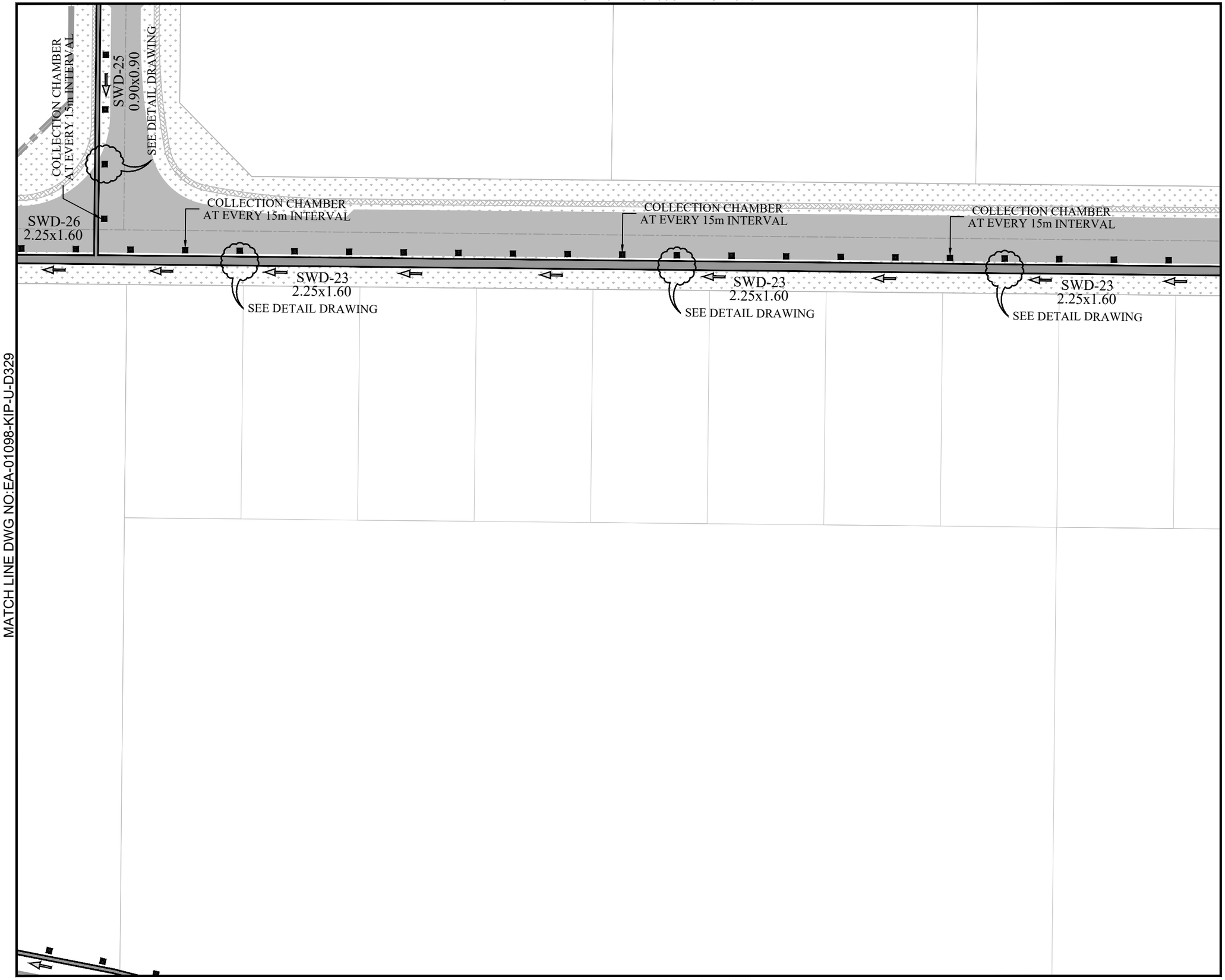
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
STORM WATER DRAIN

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-D329	00

MATCH LINE DWG NO:EA-01098-KIP-U-D326

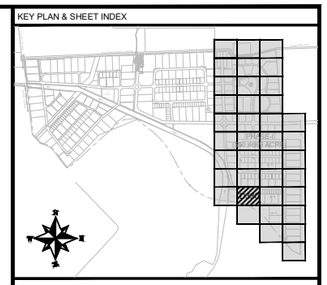


MATCH LINE DWG NO:EA-01098-KIP-U-D329

MATCH LINE DWG NO:EA-01098-KIP-U-D331

MATCH LINE DWG NO:EA-01098-KIP-U-D333

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. ACCESS COVER AND COLLECTION CHAMBER ARE PROVIDED AT 15M INTERVAL.
3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

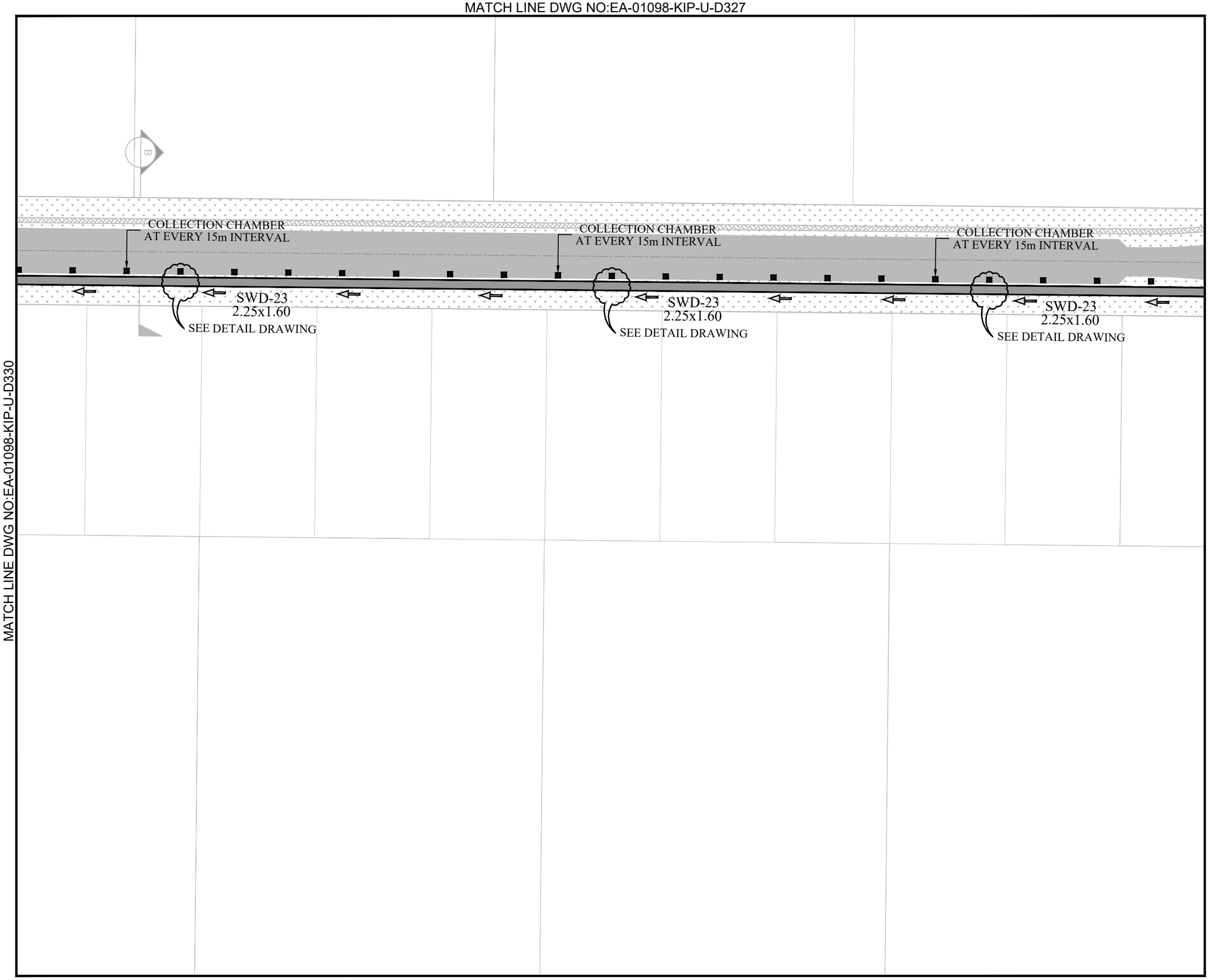
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
STORM WATER DRAIN

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-D330	00

MATCH LINE DWG NO:EA-01098-KIP-U-D327

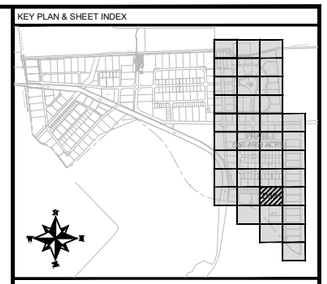


MATCH LINE DWG NO:EA-01098-KIP-U-D330

MATCH LINE DWG NO:EA-01098-KIP-U-D332

MATCH LINE DWG NO:EA-01098-KIP-U-D334

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. ACCESS COVER AND COLLECTION CHAMBER ARE PROVIDED AT 15M INTERVAL.
3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

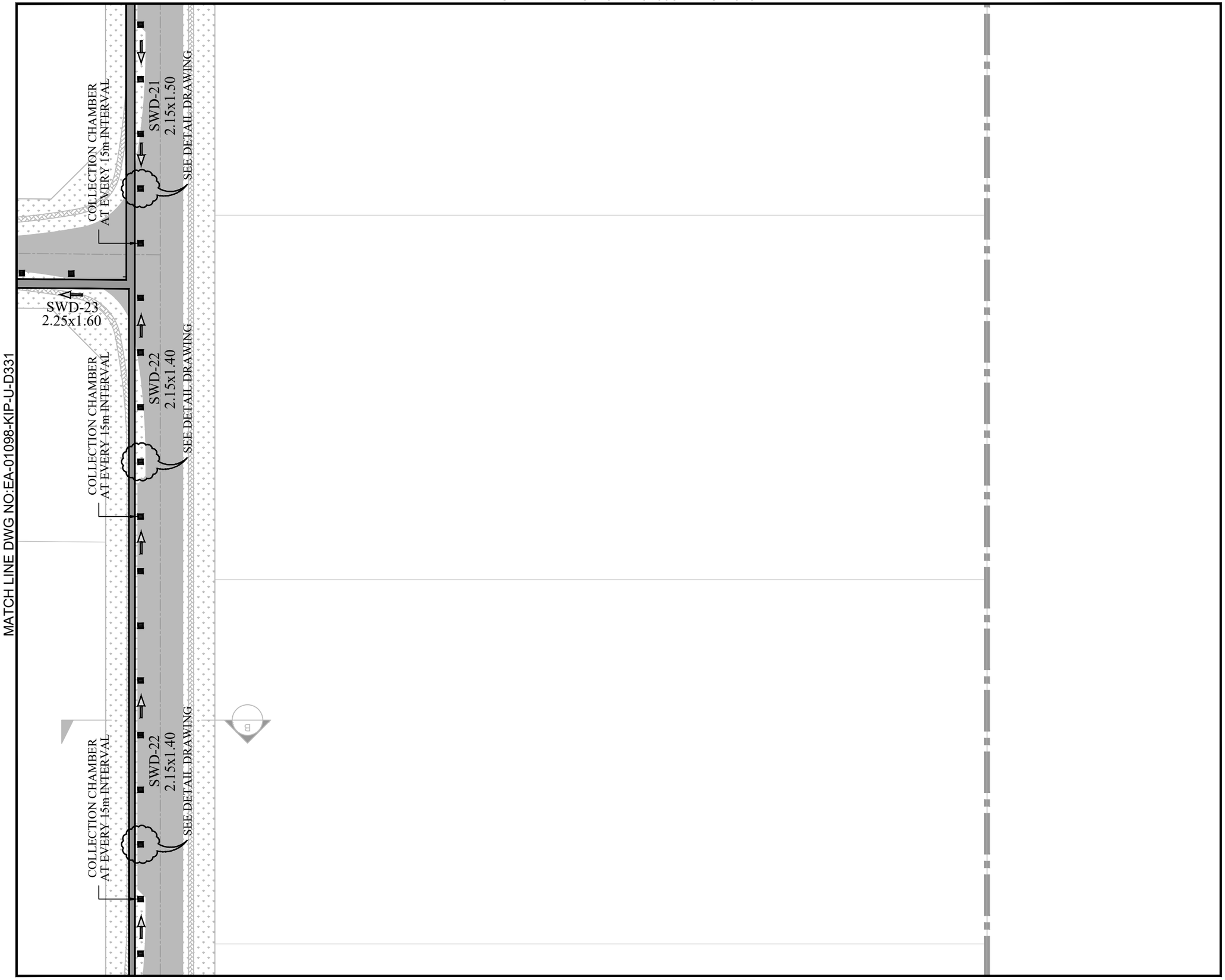
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
STORM WATER DRAIN

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-D331	00

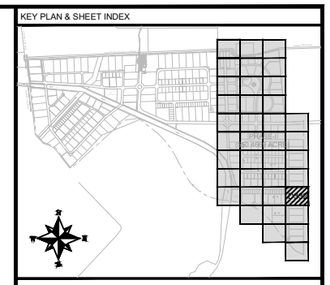
MATCH LINE DWG NO:EA-01098-KIP-U-D328



MATCH LINE DWG NO:EA-01098-KIP-U-D331

MATCH LINE DWG NO:EA-01098-KIP-U-D335

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. ACCESS COVER AND COLLECTION CHAMBER ARE PROVIDED AT 15M INTERVAL.
3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

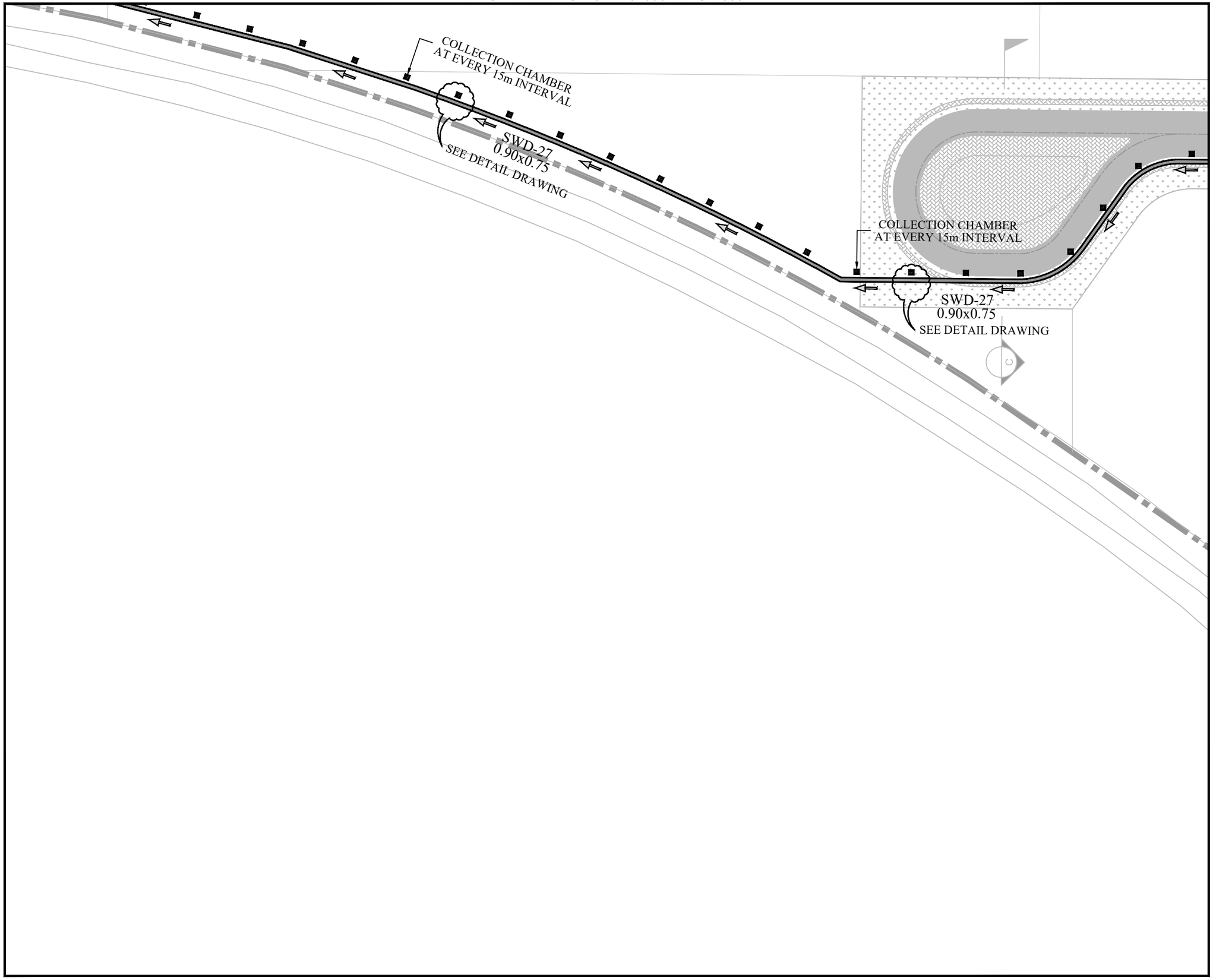
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF STORM WATER DRAIN

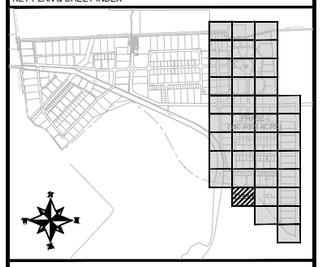
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-D332	00

MATCH LINE DWG NO:EA-01098-KIP-U-D330



MATCH LINE DWG NO:EA-01098-KIP-U-D334

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. ACCESS COVER AND COLLECTION CHAMBER ARE PROVIDED AT 15M INTERVAL.
3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

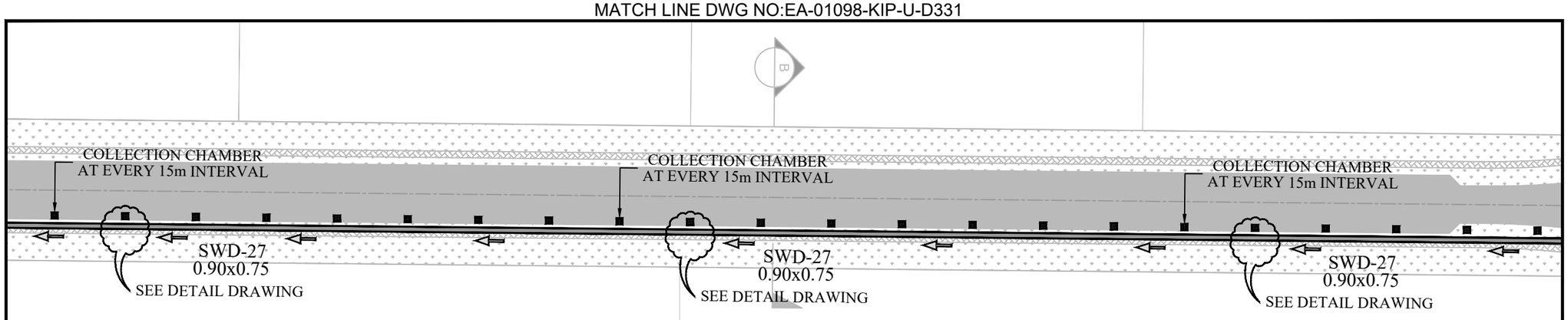
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
STORM WATER DRAIN

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-D333	00

MATCH LINE DWG NO:EA-01098-KIP-U-D331

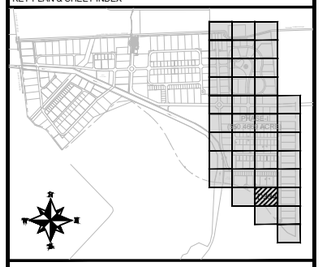


MATCH LINE DWG NO:EA-01098-KIP-U-D333

MATCH LINE DWG NO:EA-01098-KIP-U-D335

MATCH LINE DWG NO:EA-01098-KIP-U-D336

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. ACCESS COVER AND COLLECTION CHAMBER ARE PROVIDED AT 15M INTERVAL.
3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

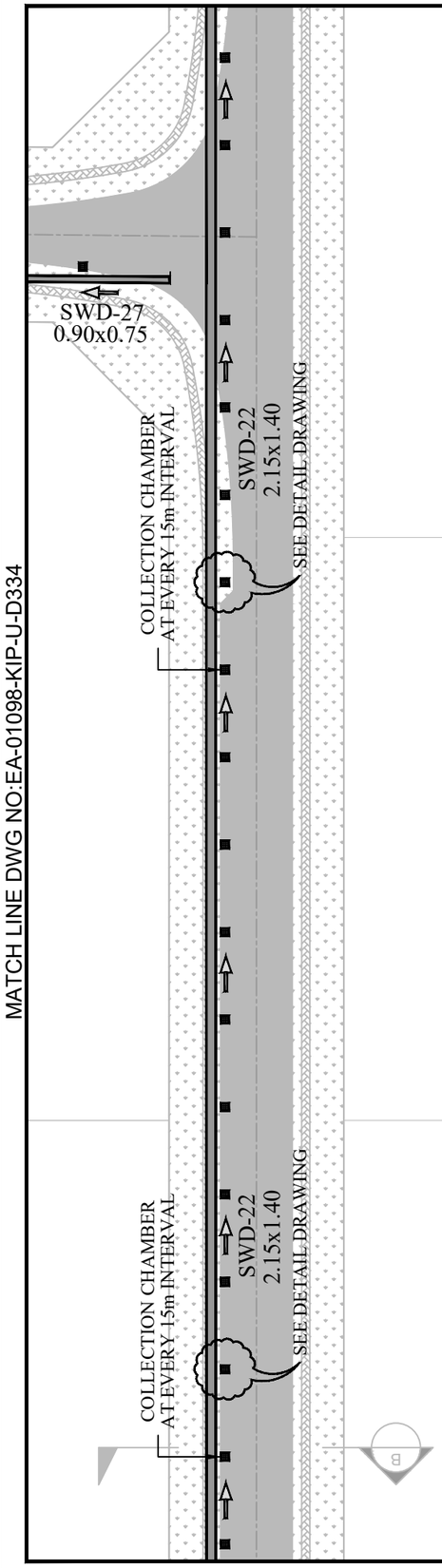
DRAWING TITLE:

LAYOUT PLAN OF
STORM WATER DRAIN

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-D334	00

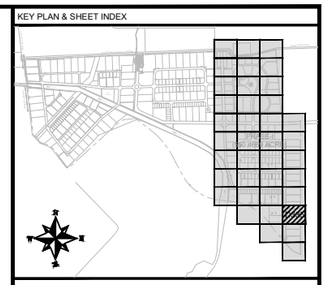
MATCH LINE DWG NO:EA-01098-KIP-U-D332

MATCH LINE DWG NO:EA-01098-KIP-U-D334



MATCH LINE DWG NO:EA-01098-KIP-U-D337

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. ACCESS COVER AND COLLECTION CHAMBER ARE PROVIDED AT 15M INTERVAL.
3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

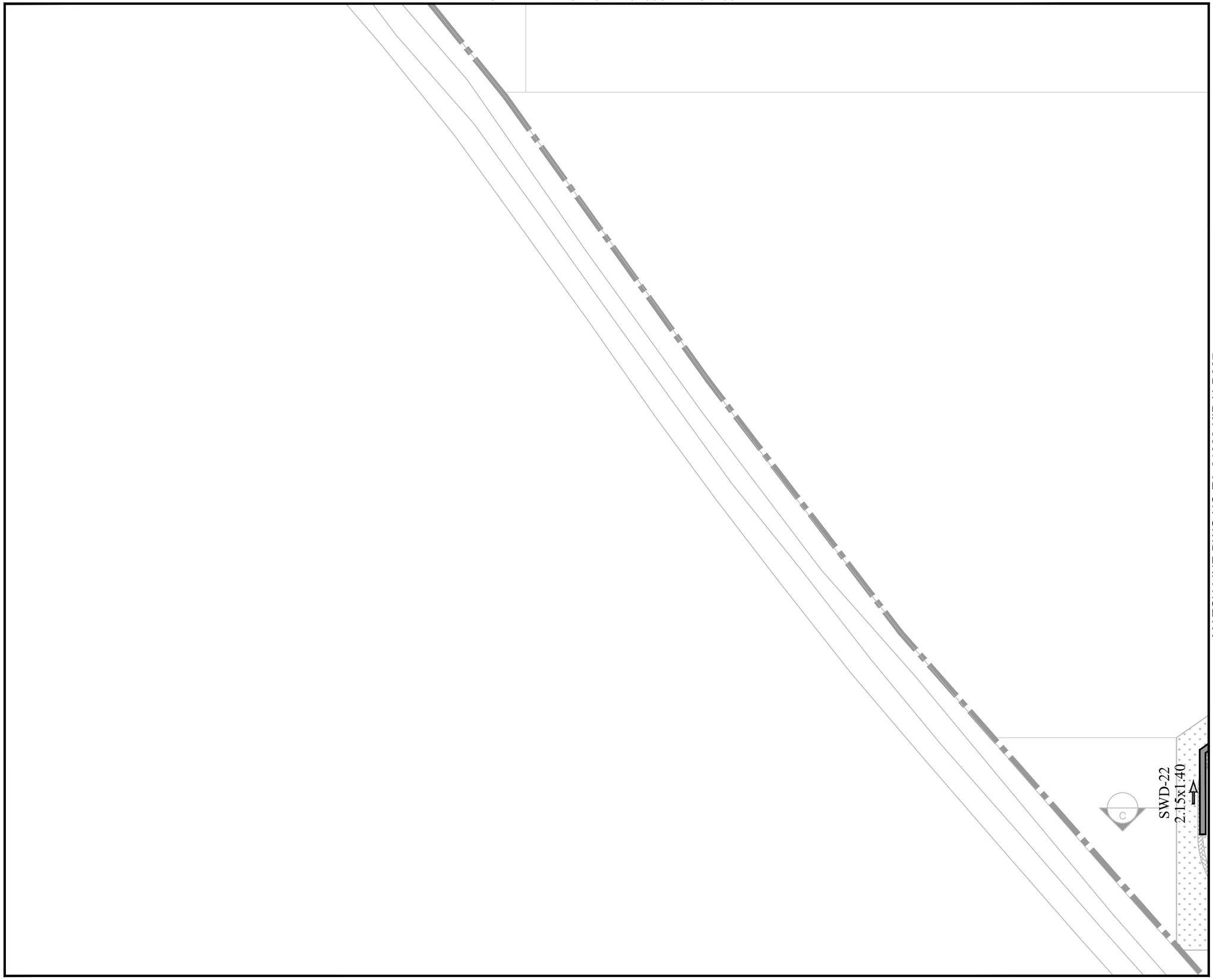
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
STORM WATER DRAIN

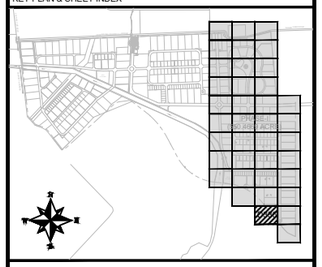
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01098	EA-01098-KIP-U-D335	00

MATCH LINE DWG NO:EA-01098-KIP-U-D334



MATCH LINE DWG NO:EA-01098-KIP-U-D337

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. ACCESS COVER AND COLLECTION CHAMBER ARE PROVIDED AT 15M INTERVAL.
3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm | JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

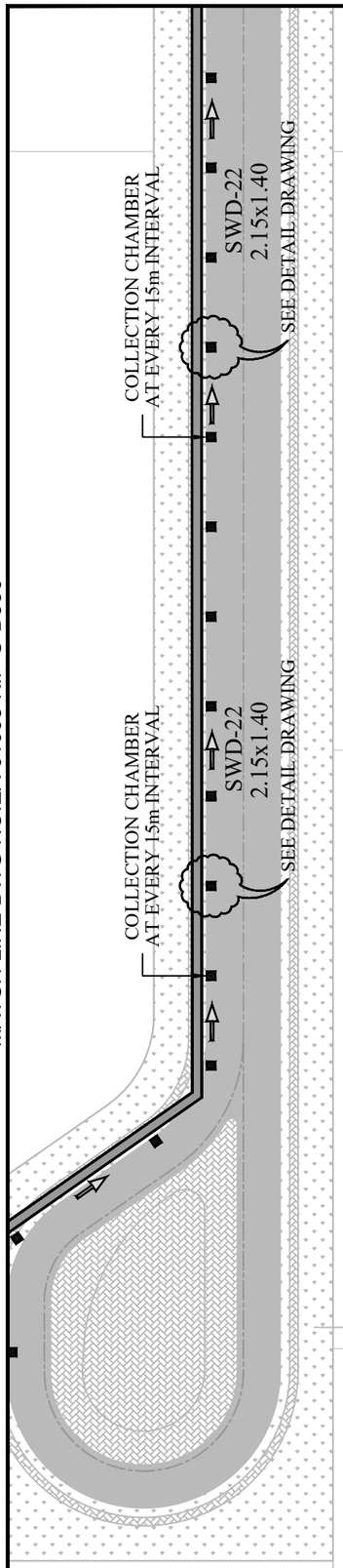
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DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LAYOUT PLAN OF
STORM WATER DRAIN

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-D336	00

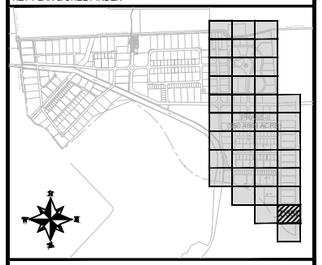
MATCH LINE DWG NO:EA-01098-KIP-U-D335



MATCH LINE DWG NO:EA-01098-KIP-U-D336

MATCH LINE DWG NO:EA-01098-KIP-U-D338

KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. ACCESS COVER AND COLLECTION CHAMBER ARE PROVIDED AT 15M INTERVAL.
3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

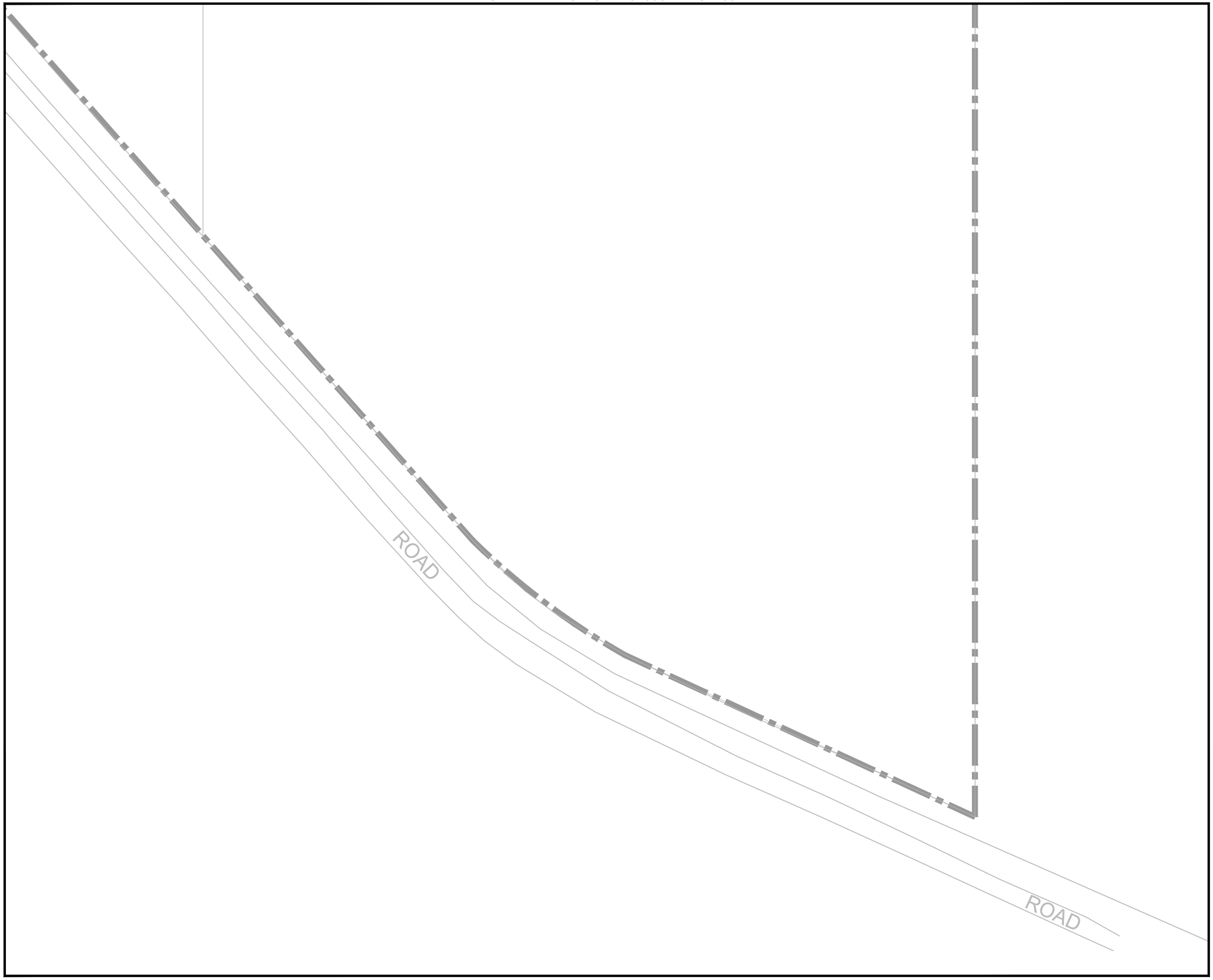
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DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

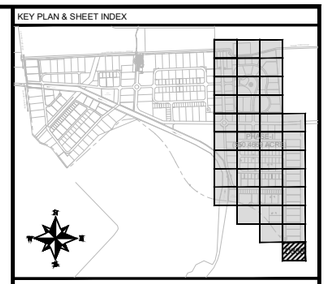
LAYOUT PLAN OF
STORM WATER DRAIN

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-D337	00

MATCH LINE DWG NO:EA-01098-KIP-U-D337



KEY PLAN & SHEET INDEX



NOTE:

1. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE STATED
2. ACCESS COVER AND COLLECTION CHAMBER ARE PROVIDED AT 15M INTERVAL.
3. FOR DETAIL OF DRAINAGE SYSTEM REFER DWG. EA-01098-KIP-U-D600 TO D601.
4. FOR UTILITY CROSS SECTION REFER DWG. EA-01098-KIP-U-CS01.

LEGEND:

PROPOSED STORM WATER DRAIN	
DRAIN FLOW DIRECTION	
COLLECTION CHAMBER	
STORM WATER DRAIN NO.	SWD-#

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

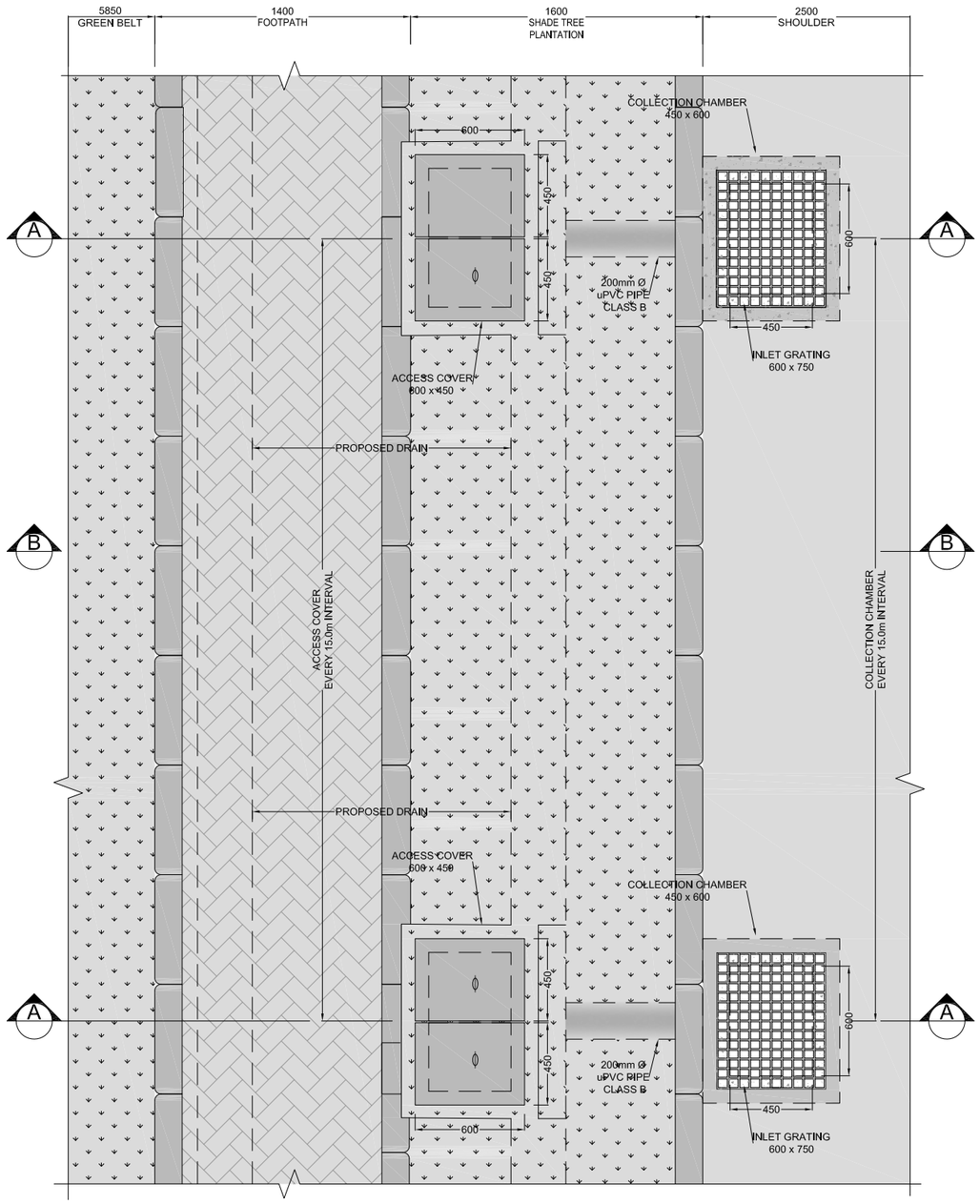
DRAWN	FURQAN	SCALE	1:500
DESIGN	TALHA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

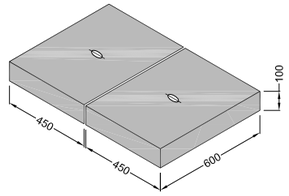
LAYOUT PLAN OF
STORM WATER DRAIN

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-D338	00

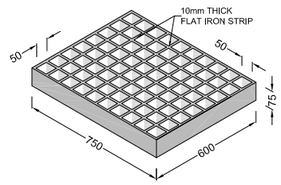
DETAIL DRAWING



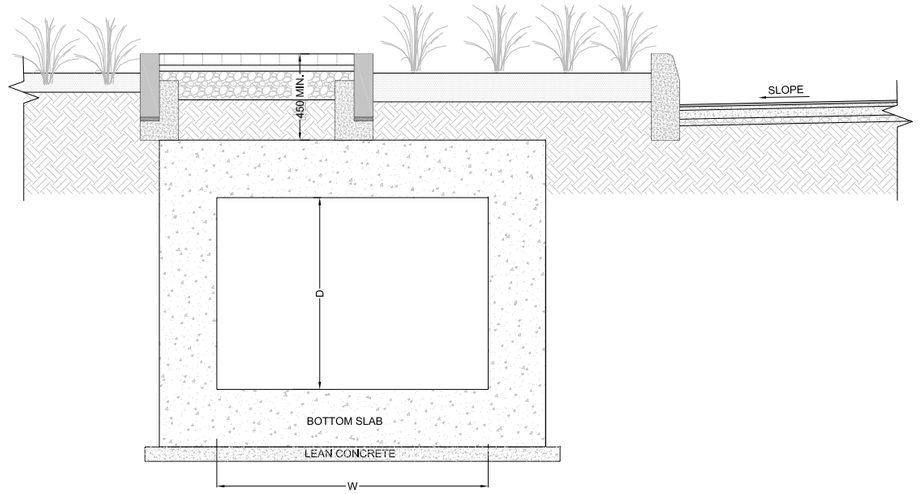
TYPICAL PLAN
SCALE=1:16



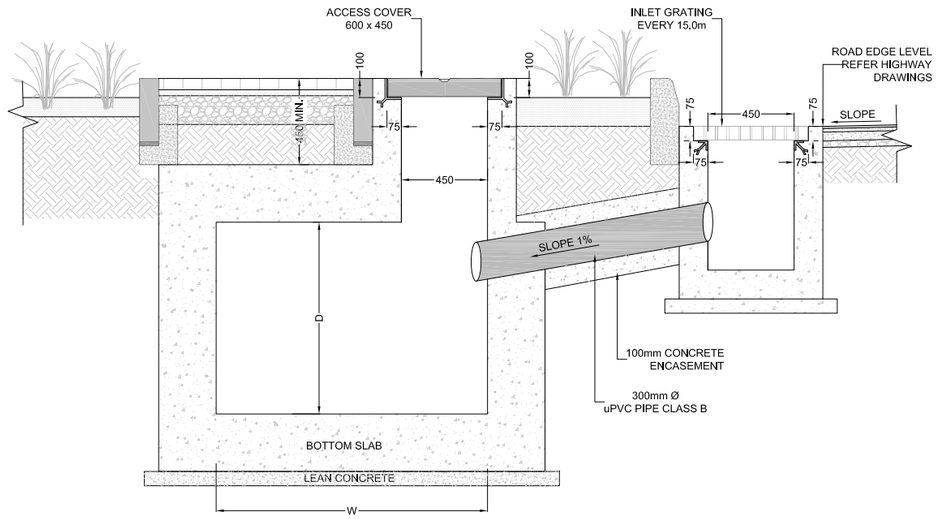
ACCESS COVER
SCALE=1:16



STEEL GRATING
SCALE=1:16



SECTION B-B
SCALE=1:16



SECTION A-A
SCALE=1:16

KEY PLAN & SHEET INDEX

NOTE:
1. ALL DIMENSIONS ARE IN MILLIMETER UNLESS OTHERWISE STATED
2. FOR DRAINAGE SYSTEM LAYOUT REFER DWG. EA-01098-KIP-U-D300 TO D338.

LEGEND:

CLIENT:
PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

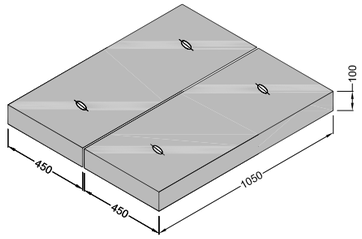
REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:
KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

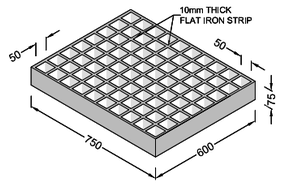
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DESIGN	KISA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:
TYPICAL DETAIL OF STORM WATER DRAIN

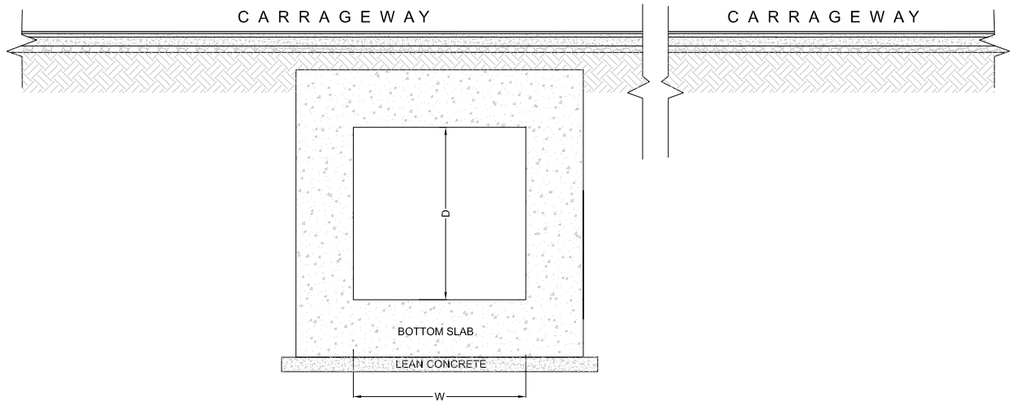
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01098	EA-01098-KIP-U-D600	00



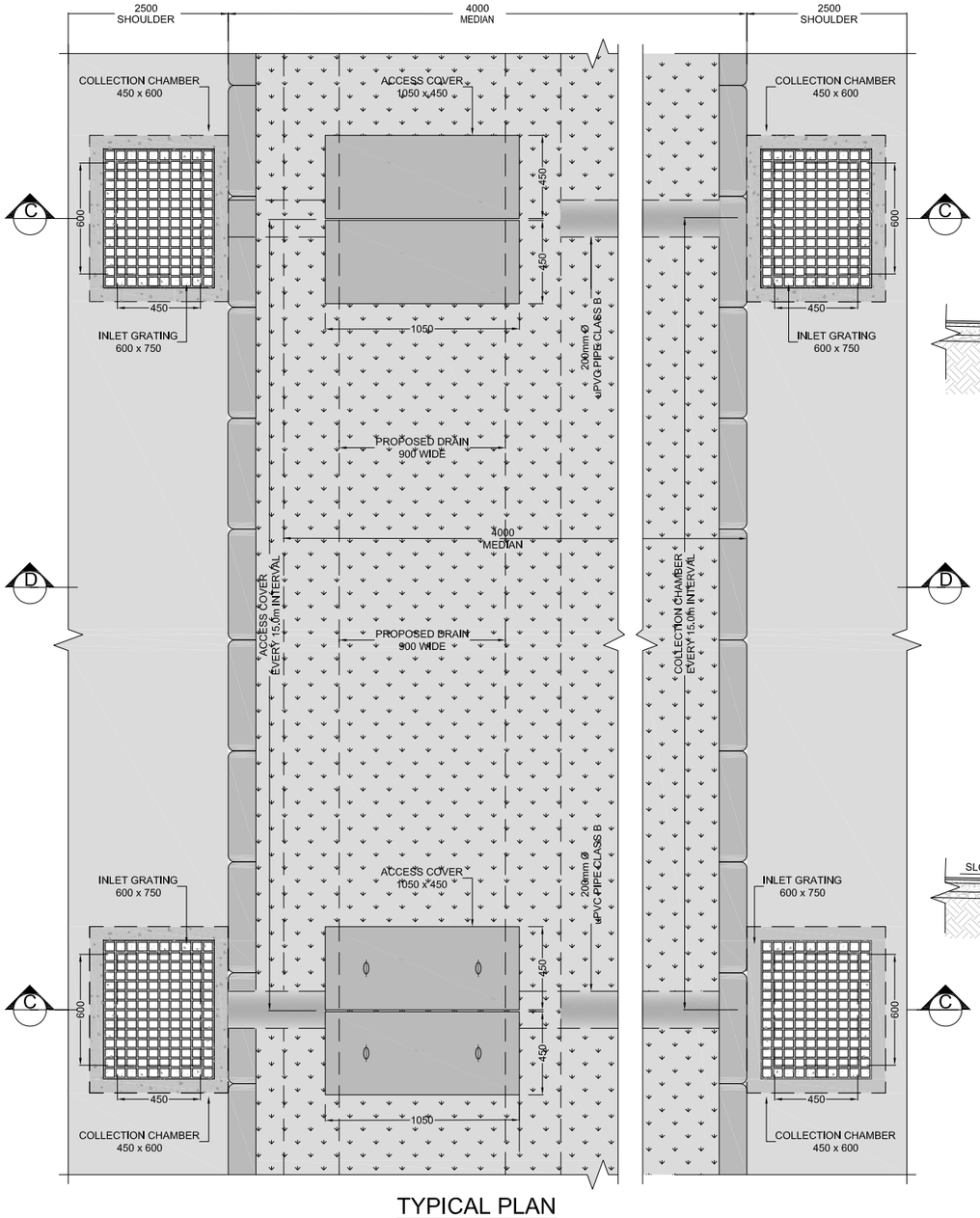
ACCESS COVER
SCALE=1:16



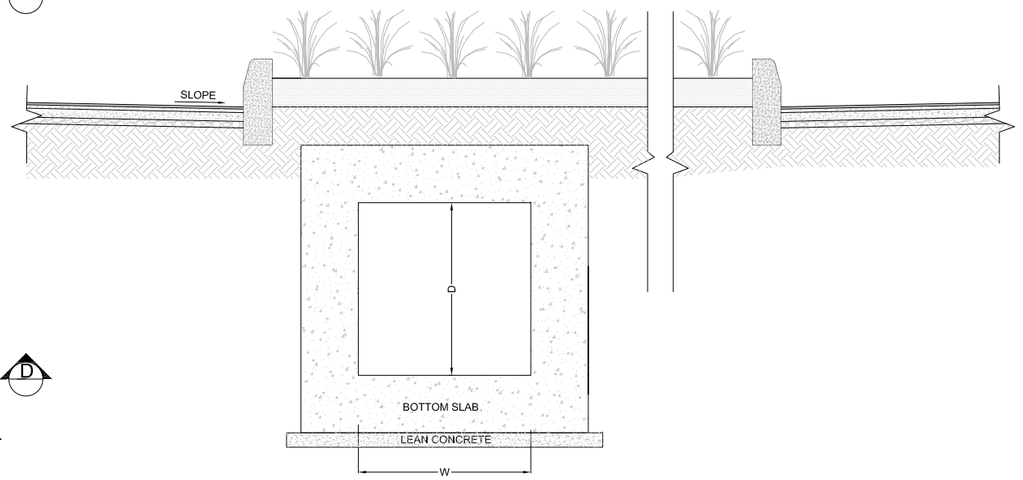
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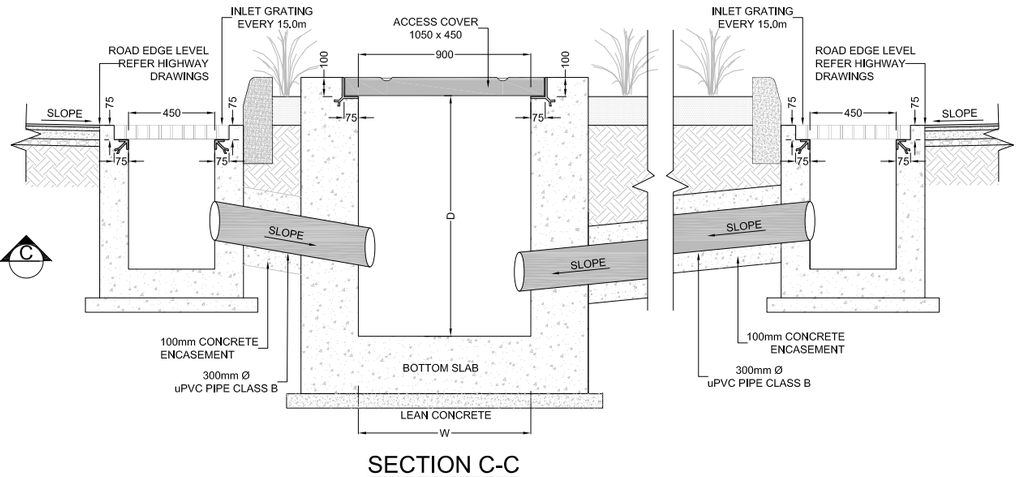
SECTION UNDER CARRAGEWAY
SCALE=1:16



TYPICAL PLAN
SCALE=1:16



SECTION D-D
SCALE=1:16



SECTION C-C
SCALE=1:16

KEY PLAN & SHEET INDEX

NOTE:
1. ALL DIMENSIONS ARE IN MILLIMETER UNLESS OTHERWISE STATED
2. FOR DRAINAGE SYSTEM LAYOUT REFER DWG. EA-01098-KIP-U-D300 TO D338.

LEGEND:

CLIENT:
PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

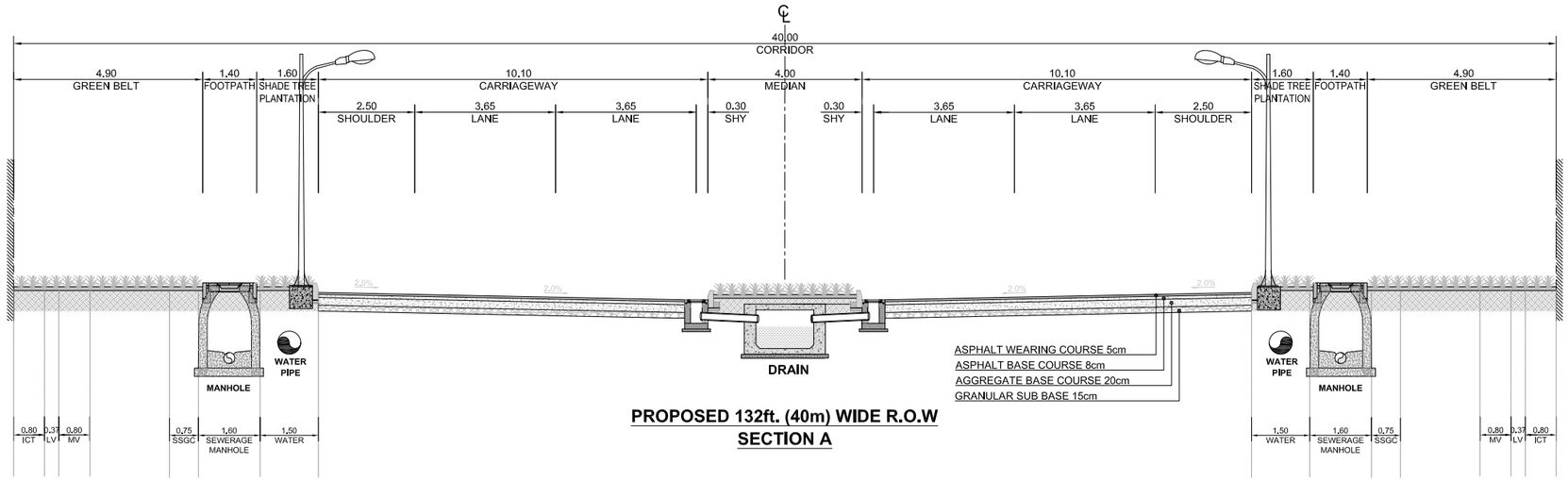
REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:
KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

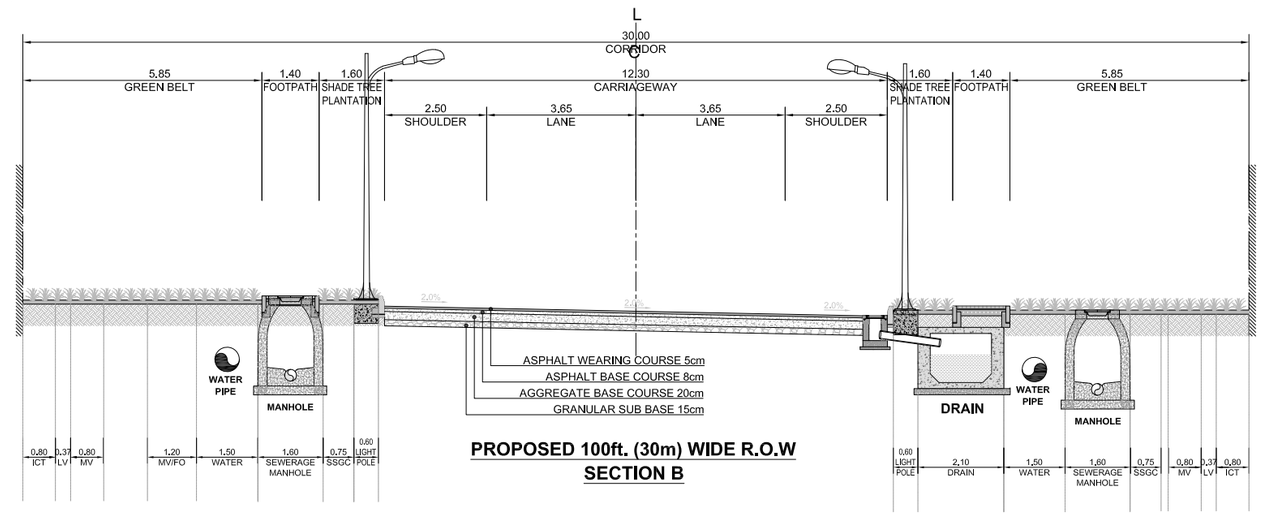
DRAWN	FURQAN	SCALE	1:16
DESIGN	KISA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:
TYPICAL DETAIL OF STORM WATER DRAIN

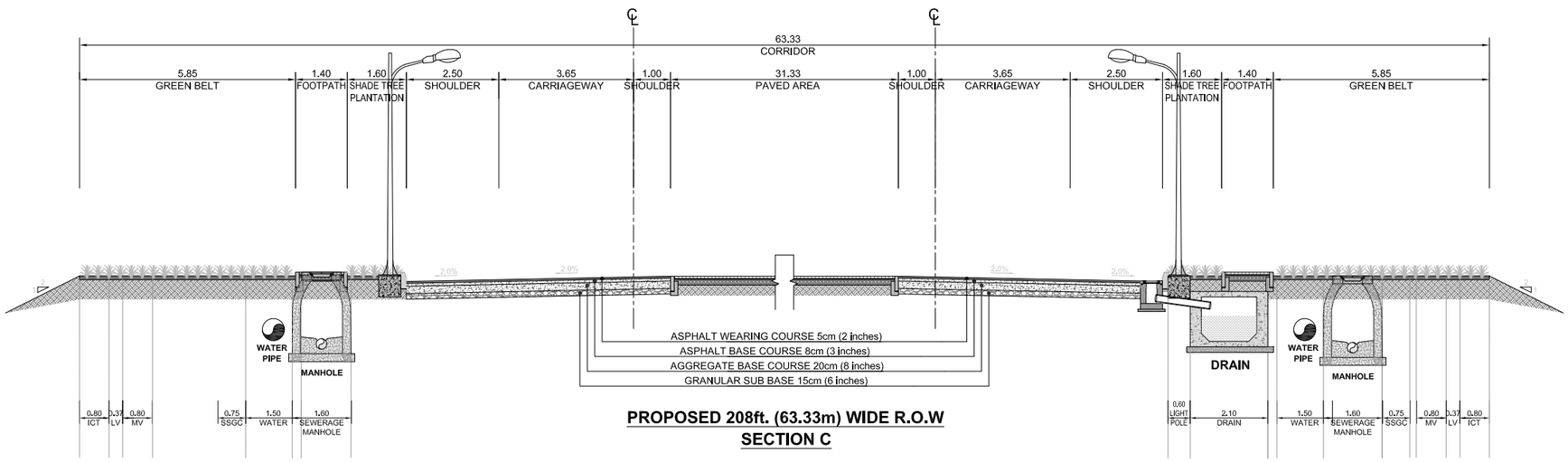
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-D601	00



PROPOSED 132ft. (40m) WIDE R.O.W
SECTION A



PROPOSED 100ft. (30m) WIDE R.O.W
SECTION B



PROPOSED 208ft. (63.33m) WIDE R.O.W
SECTION C

KEY PLAN & SHEET INDEX

NOTE:

1. ALL DIMENSIONS ARE IN MILLIMETER UNLESS OTHERWISE STATED
2. FOR DRAINAGE SYSTEM LAYOUT REFER DWG. EA-01098-KIP-U-D300 TO D338.
3. FOR SEWERAGE SYSTEM LAYOUT REFER DWG. EA-01098-KIP-U-S200 TO S238.
4. FOR WATER SUPPLY SYSTEM LAYOUT REFER DWG. EA-01098-KIP-U-W100 TO W138.

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	1:75
DESIGN	KISA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

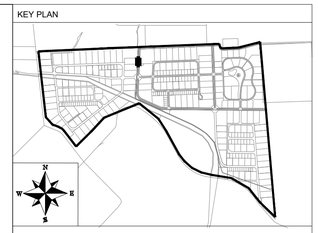
UTILITIES CORRIDOR
CROSS SECTIONS

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-CS01	00

LIST OF PLUMBING DRAWINGS

S.NO	DRAWING NO	TITLE OF DRAWINGS
01	EA-1098-KIP-U-WS-GH01-P0-0000	COVER SHEET
02	EA-1098-KIP-U-WS-GH01-P0-0001	LIST OF DRAWING
03	EA-1098-KIP-U-WS-GH01-P0-0002	LEGEND, SYMBOLS & GENERAL NOTES
04	EA-1098-KIP-U-WS-GH01-D1-0100	GATE HOUSE-01 DRAINAGE LAYOUT
05	EA-1098-KIP-U-WS-GH01-W1-0100	GATE HOUSE-01 WATER SUPPLY LAYOUT
06	EA-1098-KIP-U-WS-GH01-P1-0601	DETAIL-01
07	EA-1098-KIP-U-WS-GH01-P1-0602	DETAIL-02

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUN, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	MS	SCALE	1:50
DESIGN	MS	DATE	JUN, 2025
CHECKED	MT	DESIGN STAGE	TD
APPROVED	ZA	ISSUE	TD
ACTUAL SHEET SIZE			A1

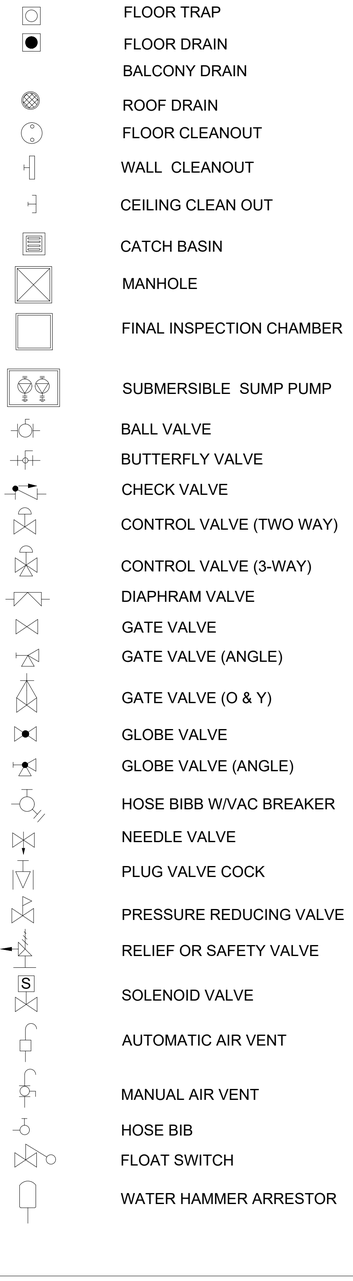
DRAWING TITLE:

EMERGENCY GATE
LIST OF DRAWINGS

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-GH01-P0-0001	0

LEGEND,SYMBOLS & ABBREVIATIONS

WP	WASTE PIPE
SP	SOIL PIPE
VP	VENT PIPE
RWP	RAIN WATER PIPE
RWS	RAIN WATER STACK
SS	SOIL STACK
WS	WASTE STACK
VS	VENT STACK
RWO	RAIN WATER OUTLET
PD	PLANTER DRAIN
CO	CLEAN OUT
FT	FLOOR TRAP
F/A	FROM ABOVE
F/B	FROM BELOW
T/A	TO ABOVE
T/B	TO BELOW
H/L	HIGH LEVEL
SP	SUMP PUMP
FCO	FLOOR CLEAN OUT
BD	BALCONY DRAIN
BCWS	BOOSTED COLD WATER SUPPLY
WTL	WATER TRANSFER LINE
WMC	WATER METER CABINET
NRV	NON-RETURN VALVE
PRV	PRESSURE REDUCING VALVE
TP	TRANSFER PUMP
WT	WATER TANK
BPS	BOOSTER PUMP SET
IWBP	IRRIGATION WATER BOOSTER PUMP
AFFL	ABOVE FINISHED FLOOR LEVEL
PRV	PRESSURE REDUCING VALVE
IW	IN WALL
BS	BELOW SLAB
BFC	BELOW FALE CEILING
BF	BELOW FINISH
HB	HOSE BIB
IL	INVERT LEVEL
MH	MANHOLE
GT	GULLY TRAP
WHA	WATER HAMMER ARRESTOR
CWS	COLD WATER SUPPLY
HWS	HOT WATER SUPPLY
BP	BOOSTER PUMP
FIC	FINAL INSPECTION CHAMBER
CA	COMPRESSED AIR
PBM	PRESSURE BREAKING MANHOLE

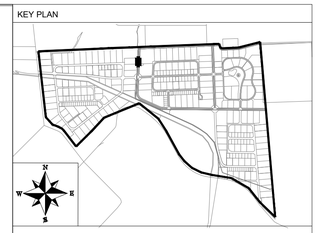


FLOOR TRAP
FLOOR DRAIN
BALCONY DRAIN
ROOF DRAIN
FLOOR CLEANOUT
WALL CLEANOUT
CEILING CLEAN OUT
CATCH BASIN
MANHOLE
FINAL INSPECTION CHAMBER
SUBMERSIBLE SUMP PUMP
BALL VALVE
BUTTERFLY VALVE
CHECK VALVE
CONTROL VALVE (TWO WAY)
CONTROL VALVE (3-WAY)
DIAPHRAM VALVE
GATE VALVE
GATE VALVE (ANGLE)
GATE VALVE (O & Y)
GLOBE VALVE
GLOBE VALVE (ANGLE)
HOSE BIBB W/VAC BREAKER
NEEDLE VALVE
PLUG VALVE COCK
PRESSURE REDUCING VALVE
RELIEF OR SAFETY VALVE
SOLENOID VALVE
AUTOMATIC AIR VENT
MANUAL AIR VENT
HOSE BIB
FLOAT SWITCH
WATER HAMMER ARRESTOR

GENERAL NOTES

1. ALL DIMENSIONS UNLESS OTHERWISE NOTED ARE IN INCHES.
2. CONTRACTOR SHALL EXECUTE ALL WORKS AS PER APPROVED SHOP DRAWING.
3. CONTRACTOR SHALL COORDINATE ALL WORKS WITH ELECTRICAL, PLUMBING, STRUCTURAL & ARCHITECTURAL DRAWINGS.
4. MECHANICAL SERVICES SHALL NOT CUT IN ANY STRUCTURAL BEAMS, RIBS OR ANY OTHER STRUCTURAL ELEMENTS UNLESS A PRIOR WRITTEN APPROVAL HAS BEEN TAKEN FROM THE ENGINEER
5. ALL EQUIPMENTS SHALL BE INSTALLED STRICTLY AS PER MANUFACUTRER'S RECOMMENDATION.
6. ALL EQUIPMENTS SHALL BE INSTALLED ON ANTI-VIBRATION MOUNTS.
7. MECHANICAL CONTRACTOR SHALL PROVIDE SLEEVE ON ALL PIPES PENETRATING.
8. ALL DRAINAGE AND PLUMBING SHALL CONFORM TO IPC
9. MANHOLE COVERS AND FRAMES ARE TO BE HEAVY DUTY IN TRAFFIC AREAS AND MEDIUM DUTY IN PEDESTRIAN AREAS.
10. MANHOLES SHALL BE CONCRETE AS INDICATED IN STRUCTURES
11. ALL UNDERGROUND SEWAGE PIPES SHALL HAVE A MINIMUM SLOPE AN INDICATED ON DRAWINGS
12. ALL PIPES UNDER TRAFFIC WILL HAVE MINIMUM 1000 (40°) mm COVER OR WALL BE ENCASED IN CONCRETE
13. ALL SANITARY APPLIANCES SHALL BE PROVIDED WITH TRAPS
14. JOINTS TO W.C. PANS SHALL BE WITH UPVC CONNECTORS & RUBBER GASKETS
15. ALL WATER PIPE TO RUNS ABOVE FALSE CEILING AND CONCEALED IN WALL
16. ISOLATING VALVES SHALL BE PROVIDED TO SEPARATE THE INDIVIDUAL TOILETS, GATE VALVES SHALL BE PROVIDED TO/ FROM WATER HEATERS
17. EXACT LOCATION OF WATER PIPEWORK SHALL BE DETERMINED ON SITE
18. EXACT LOCATION OF THE WATER HEATER SHALL BE DETERMINED ON SITE AND APPROVED BY THE ARCHITECT. COORDINATION SHALL BE MADE WITH THE OTHER TRADES FOR ELECTRIC AND STRUCTURAL REQUIREMENTS
19. PRESSURE REDUCING VALVE STATION SHALL BE PROVIDED IN ALL WATER SUPPLY LINES WHERE PRESSURE EXCEEDS 80 PSI
20. PROVIDE ISOLATING VALVE ON ALL MAIN AND BRANCH LINES FOR MAINTENANCE
21. CONTRACTOR TO VERIFY ALL PUMPS DISCHARGE HEAD AND MOTOR RATING BASED ON SHOP DRAWINGS.
22. CONTRACTOR TO PROVIDE OVERFLOW, TEST PIPE, WARNING LEVEL AND DRAIN CONNECTION
23. CONTRACTOR TO PROVIDE CLEAN OUTS AT EVERY 15 METER OF PIPE RUN EVEN IF IT IS NOT MENTIONED IN THE DRAWINGS.
24. ALL INTERNAL WATER SUPPLY PIPING SHALL BE PPR PN-20 AS MENTIONED IN THE SPECIFICATION.
25. ALL INTERNAL DRAINAGE PIPING SHALL BE UPVC AS MENTIONED IN THE SPECIFICATION.
26. CONTRACTOR TO SUBMIT SHOP DRAWING PRIOR TO EXECUTION OF WORKS.
27. CONTRACTOR TO GET APPROVAL FROM LOCAL AUTHORITIES/MUNCIPALITY PRIOR TO EXECUTION OF WORK
28. CONTRACTOR TO INDICATE VENT PIPING INSIDE TOILET IN SHOP DRAWINGS AS PER IPC FOR DOUBLE STACK PIPING SYSTEM.
29. SOLAR WATER HEATER SHALL BE INSTALLED BY SPECIALIST. THE SIZES OF COLLECTORS HAS TO BE CONFIRMED SY CONTRACTOR FOR VARIOUS SIZES.
30. ALL GRP TANKS IN EXTREME COLD CLIMATE SHALL BE INSULATED.

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUN, 2025

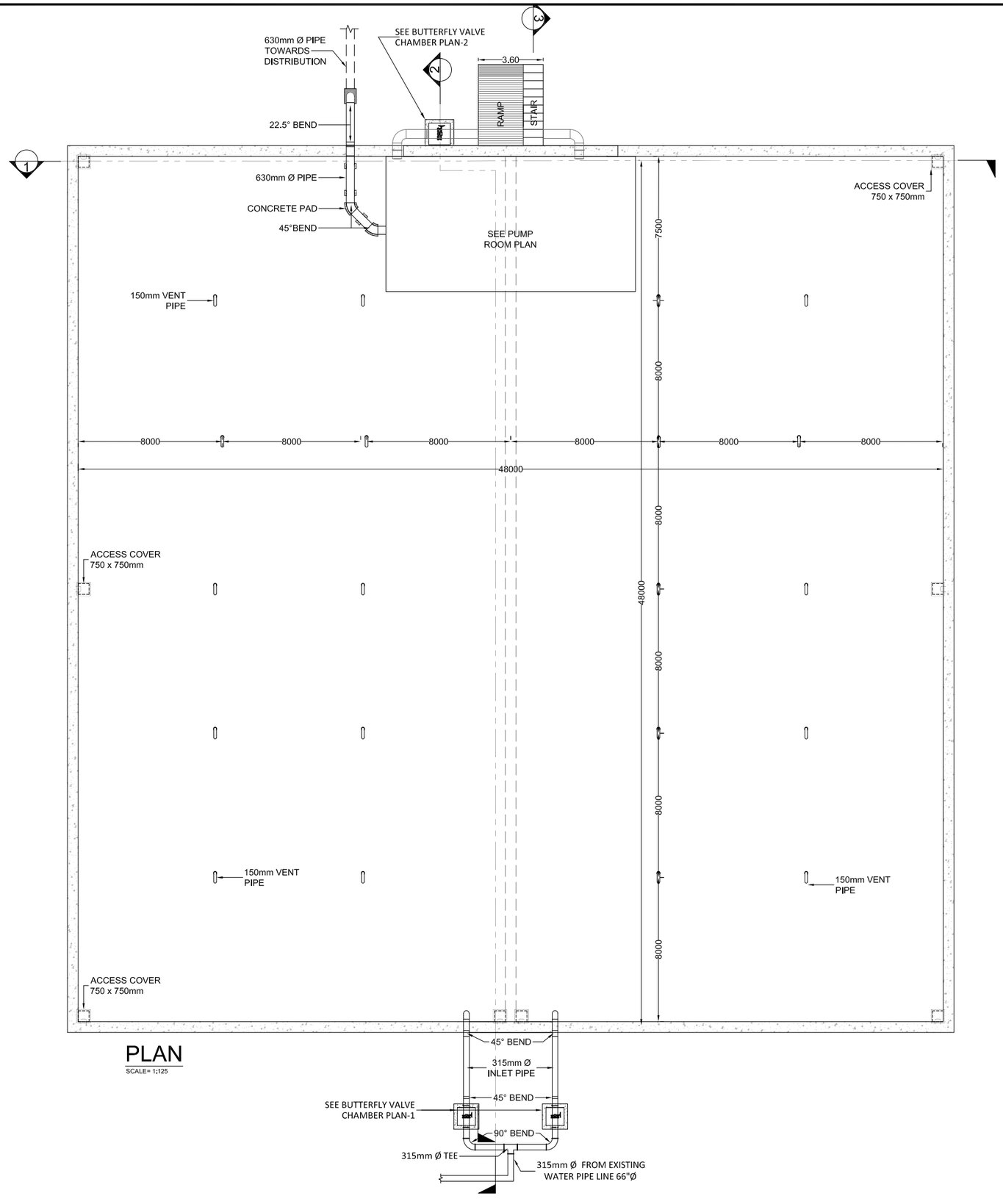
PROJECT:

KARACHI INDUSTRIAL PARK SEZ

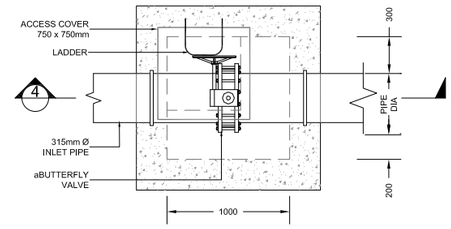
DRAWN	MS	SCALE	1:50
DESIGN	MS	DATE	JUN, 2025
CHECKED	MT	DESIGN STAGE	TD
APPROVED	ZA	ISSUE	TD
ACTUAL SHEET SIZE			A1

DRAWING TITLE: **EMERGENCY GATE LEGEND SYMBOLS & ABBREVIATIONS**

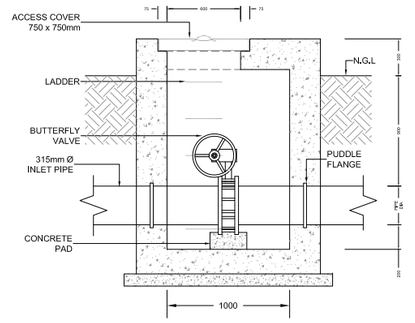
PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-GH01-P0-0002	0



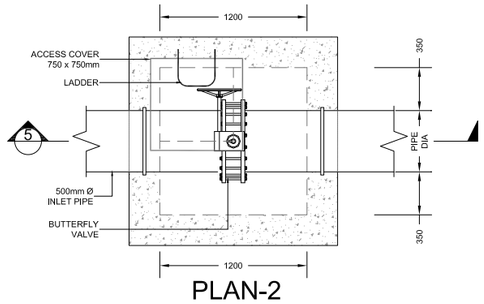
PLAN
SCALE= 1:125



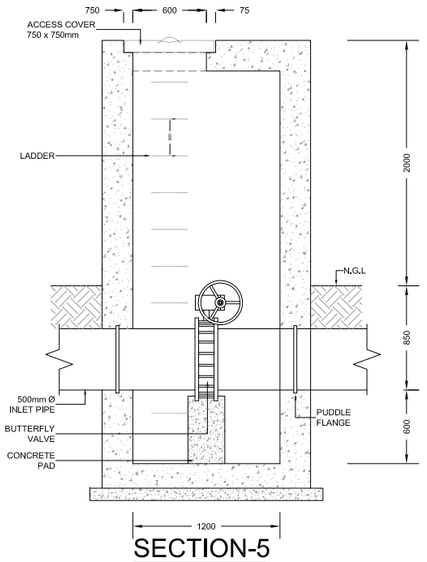
PLAN-1
SCALE= 1:25



SECTION-4
SCALE= 1:25



PLAN-2
SCALE= 1:25



SECTION-5
SCALE= 1:25

KEY PLAN & SHEET INDEX

NOTE:

1. ALL DIMENSIONS ARE IN MILLIMETER UNLESS OTHERWISE STATED
2. FOR LOCATION OF UNDER GROUND WATER TANK REFER DWG. NO. EA-01098-KIP-U-W101A.

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

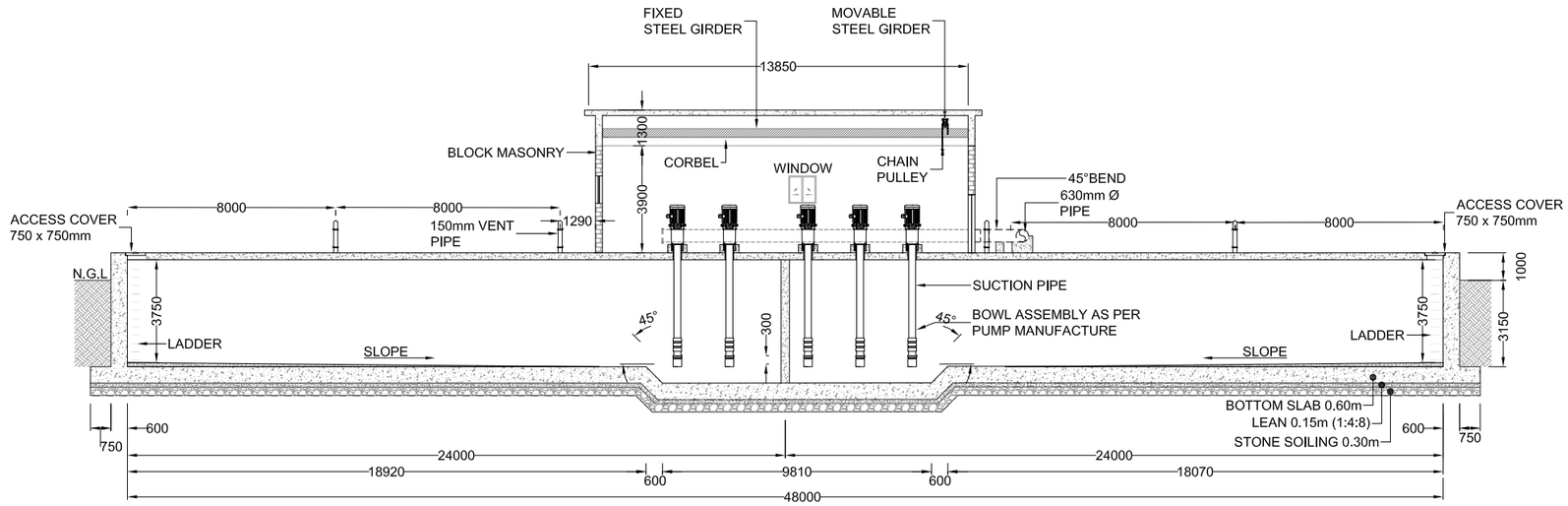
KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	AS SHOWN
DESIGN	KISA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

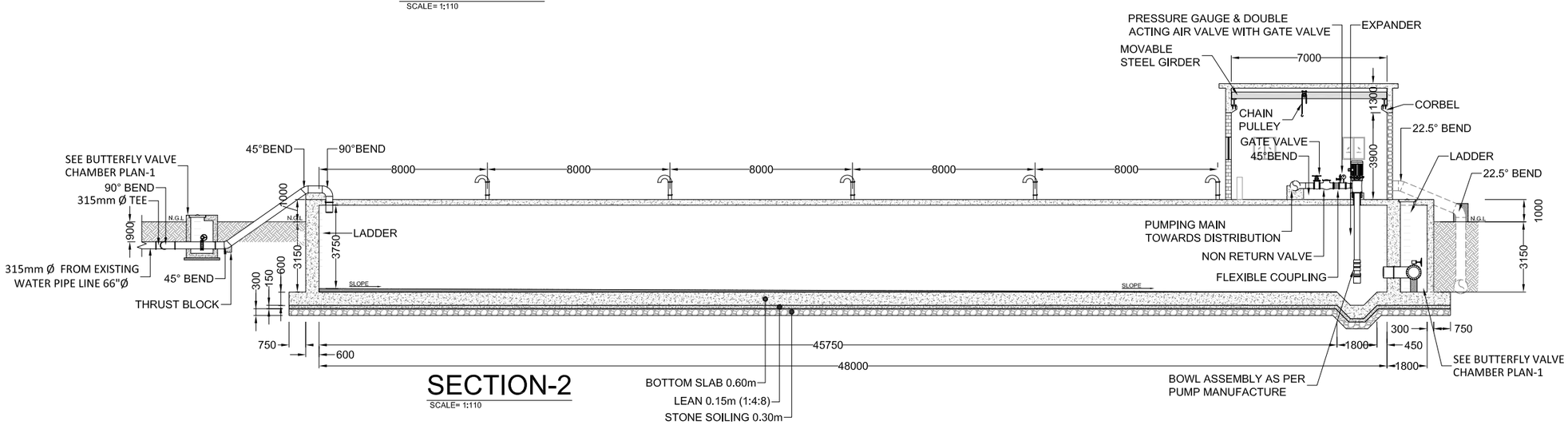
PLAN OF UNDER GROUND WATER TANK AND VALVE CHAMBER DETAIL

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W400	00



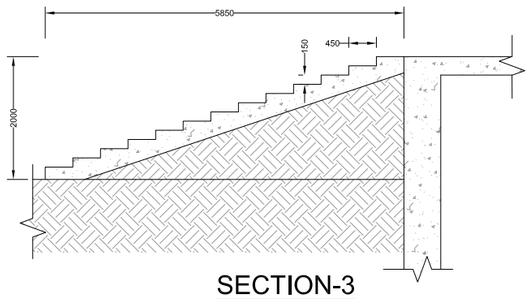
SECTION-1

SCALE= 1:110



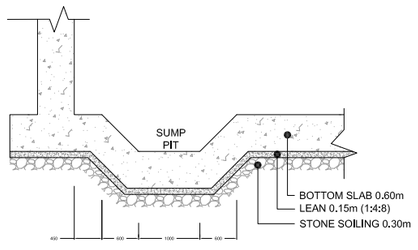
SECTION-2

SCALE= 1:110



SECTION-3

SCALE= 1:50



SUMP PIT DETAIL

SCALE= 1:50

KEY PLAN & SHEET INDEX

NOTE:

1. ALL DIMENSIONS ARE IN MILLIMETER UNLESS OTHERWISE STATED
2. FOR LOCATION OF UNDER GROUND WATER TANK REFER DWG. NO. EA-01098-KIP-U-W101A.

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

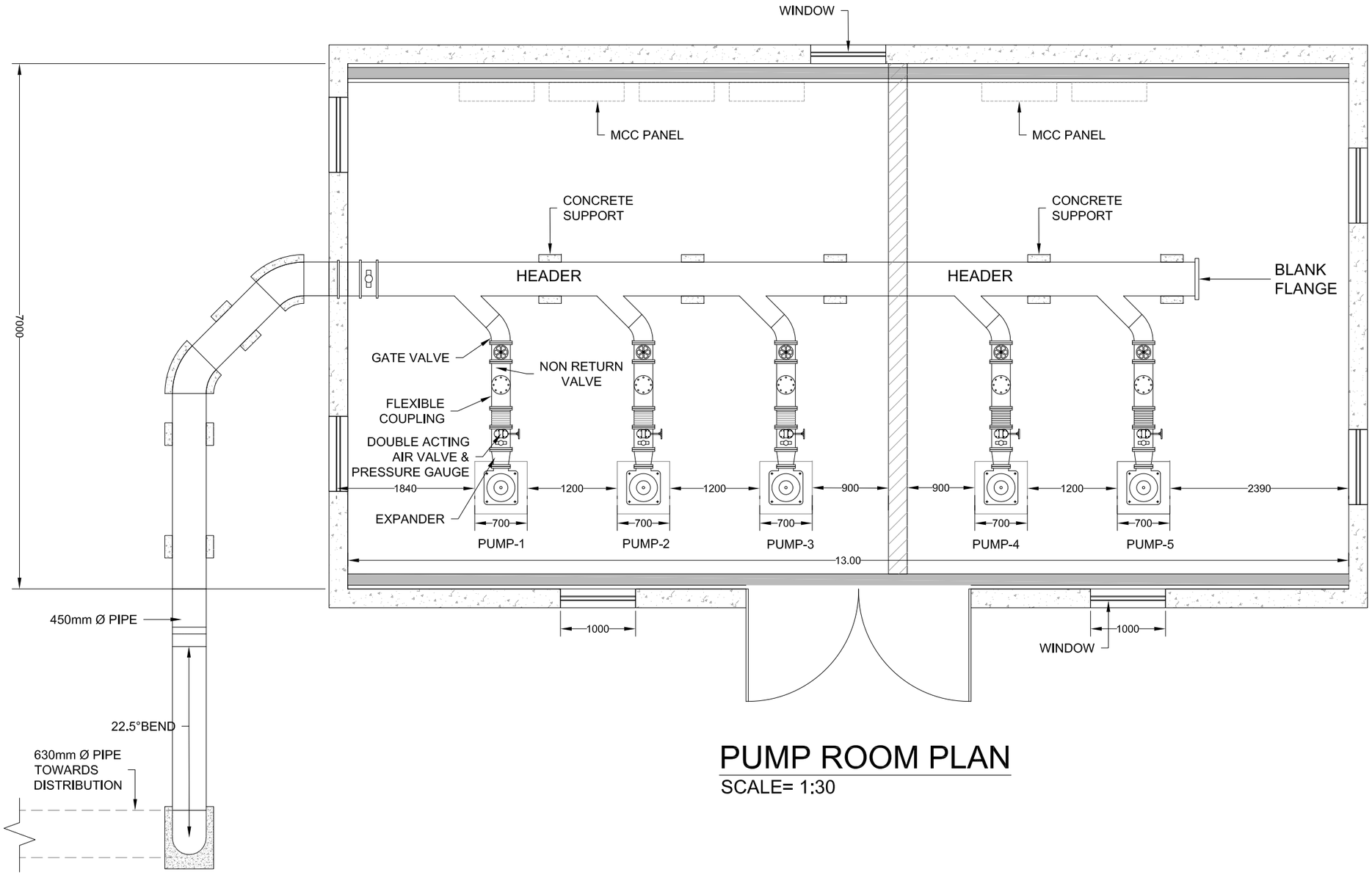
KARACHI INDUSTRIAL PARK SEZ
PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	AS SHOWN
DESIGN	KISA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

SECTIONS OF UNDER GROUND WATER TANK AND SUMP PIT DETAIL

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W401	00



PUMP ROOM PLAN

SCALE= 1:30

KEY PLAN & SHEET INDEX

NOTE:

1. ALL DIMENSIONS ARE IN MILLIMETER UNLESS OTHERWISE STATED
2. FOR LOCATION OF UNDER GROUND WATER TANK REFER DWG. NO. EA-01098-KIP-U-W101A.

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

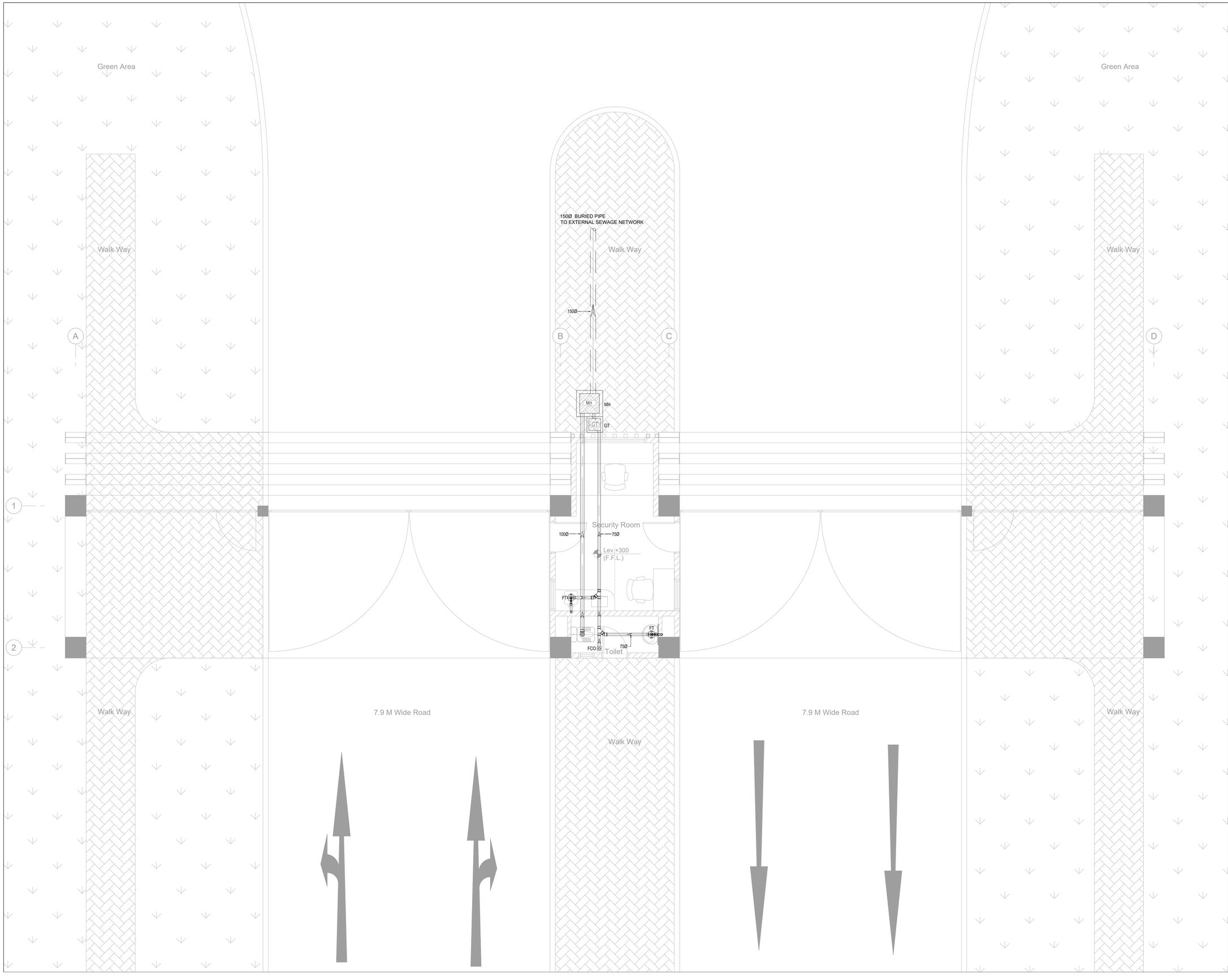
KARACHI INDUSTRIAL PARK SEZ PHASE-1 (550.4669 ACRE)

DRAWN	FURQAN	SCALE	AS SHOWN
DESIGN	KISA	DATE	JUNE, 2025
CHECKED	FAHAD	DESIGN STAGE	TENDER
APPROVED	FAHAD	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

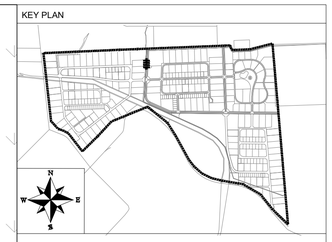
DRAWING TITLE:

PLAN OF PUMP ROOM

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-U-W402	00



KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUN, 2025

PROJECT:

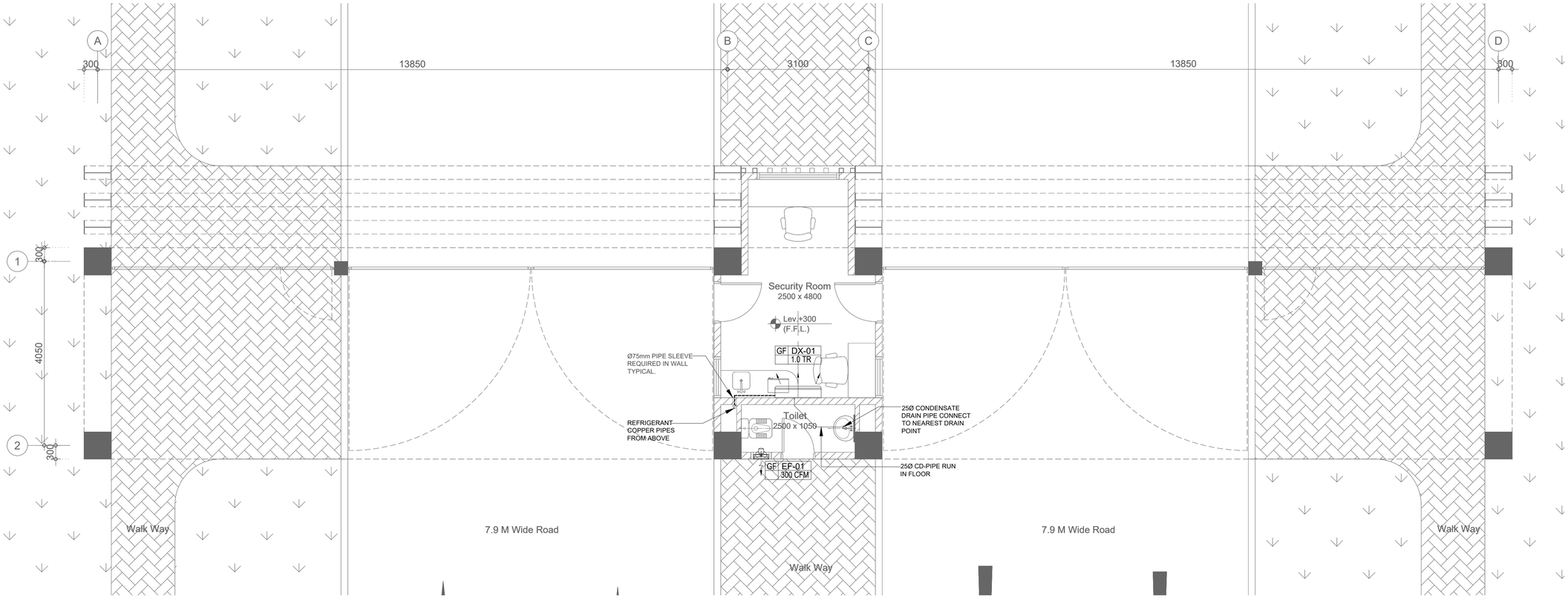
KARACHI INDUSTRIAL PARK SEZ

DRAWN	MD	SCALE	1:50
DESIGN	MD	DATE	JUN, 2025
CHECKED	MT	DESIGN STAGE	TD
APPROVED	ZA	ISSUE	TD
ACTUAL SHEET SIZE			A1

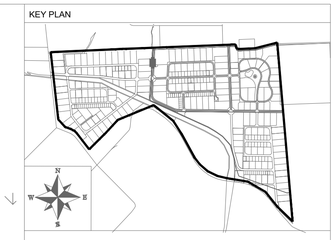
DRAWING TITLE:

GATE HOUSE-01
DRAINAGE LAYOUT

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-GH01-D1-0100	0



KEY PLAN



NOTE:

LEGEND:

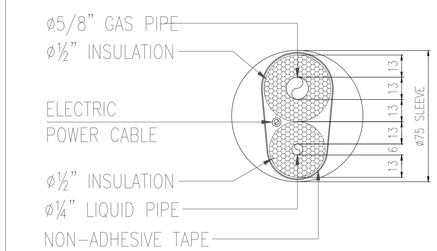
LEGEND	
----------	REFRIGERANTS PIPES
	CONDENSATE DRAIN PIPE
	SPLIT UNIT (INDOOR)
	CONDENSING UNIT (OUTDOOR)
	EXHAUST AIR FAN (PROPELLER TYPE)
G DX- O XX TR	EQUIPMENT DESIGNATION
T/B	TO BELOW
F/B	FROM BELOW
T/A	TO ABOVE
F/A	FROM ABOVE

INVERTER DX- SPLIT TYPE AIRCONDITIONING UNITS SCHEDULE

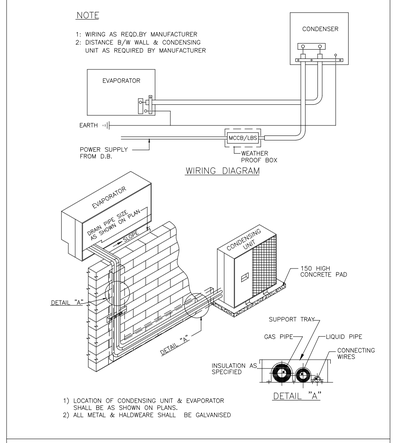
TAG NO.	AREA SERVED	LOCATION	QUANTITY (Nos.)	COOLING CAPACITY TOTAL KW	COOLING CAPACITY TOTAL TON	AMBIENT TEMP. °F	EAT °F DB/WB	LAT °F DB/WB	ELECTRICAL DATA V	PH	HZ	KW	REMARKS
DX-01 / CU-01	SECURITY ROOM	GROUND FLOOR	01	3.5	1.0	104	75 / 63	55 / 54	220	1	50	1.3	WALL MOUNTED DECORATIVE TYPE

HVAC FAN SCHEDULE

S.No	TAG	SERVICE	LOCATION	TYPE	QTY.	FAN DATA FLOW (CFM)	FAN DATA ESP (Inch of W.G)	MOTOR DATA RPM	MOTOR DATA POWER (KW)	MOTOR DATA V-PH-HZ	REMARKS
1	EF-01	TOILET EXHAUST	GROUND FLOOR	PROPELLER	1	300	0.25	-	0.20	220-1-50	PLASTIC BODY FAN WITH LOUVER



REFRIGERANT PIPES THROUGH SLEEVE INSTALLATION DETAIL



06 MINI SPLIT UNIT INSTALLATION DETAIL
NTS

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

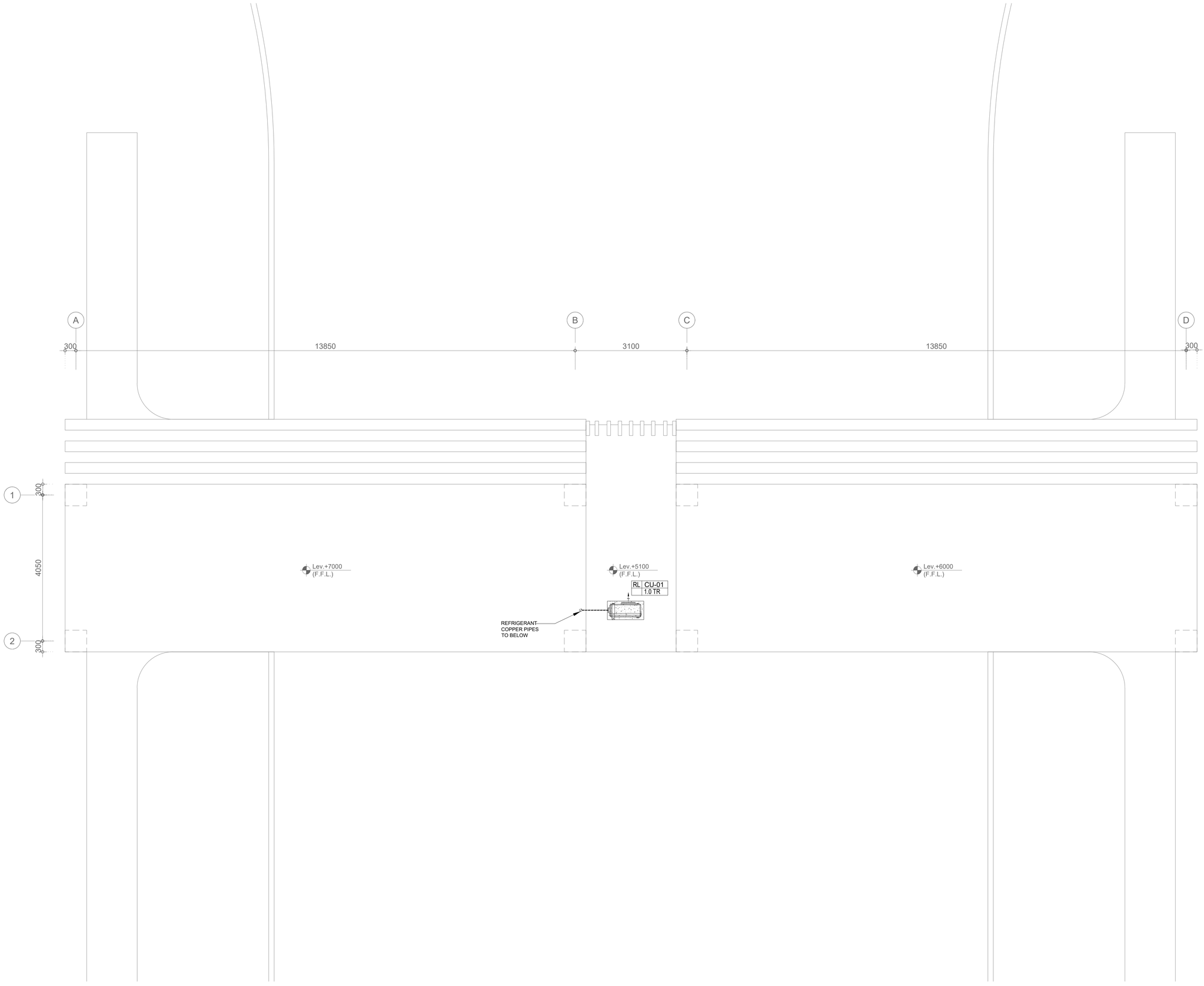
KARACHI INDUSTRIAL PARK SEZ

DRAWN	KA	SCALE	1:50
DESIGN	MI	DATE	JUNE, 2025
CHECKED	MAJ	DESIGN STAGE	TD
APPROVED	SZ	ISSUE	TD
ACTUAL SHEET SIZE			A1

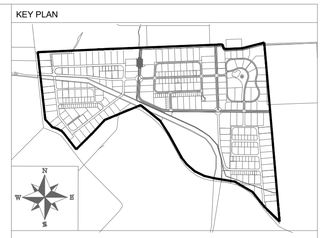
DRAWING TITLE:

GATE HOUSE-01
GROUND FLOOR HVAC LAYOUT

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-GH01-M1-0100	0



KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

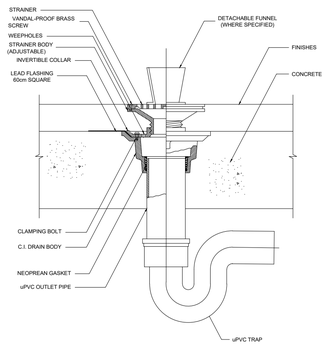
KARACHI INDUSTRIAL PARK SEZ

DRAWN	KA	SCALE	1:50
DESIGN	MI	DATE	JUNE, 2025
CHECKED	MAJ	DESIGN STAGE	TD
APPROVED	SZ	ISSUE	TD
ACTUAL SHEET SIZE			A1

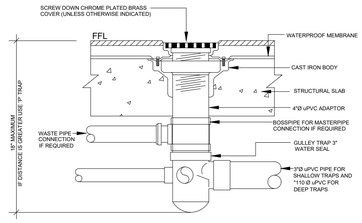
DRAWING TITLE:

GATE HOUSE-01
ROOF PLAN HVAC LAYOUT

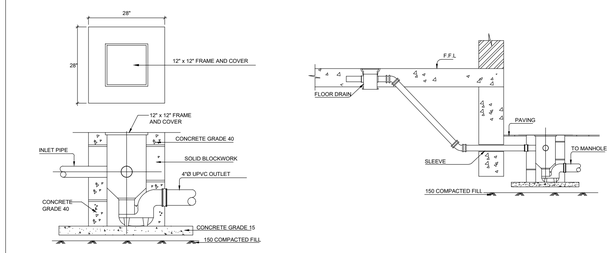
PROJ. CODE:	DRAWING NO.	REV.
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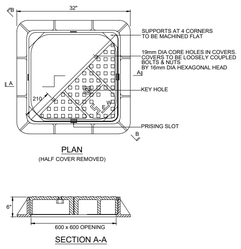
01 FUNNEL FLOOR DRAIN
NOT TO SCALE (NTS)



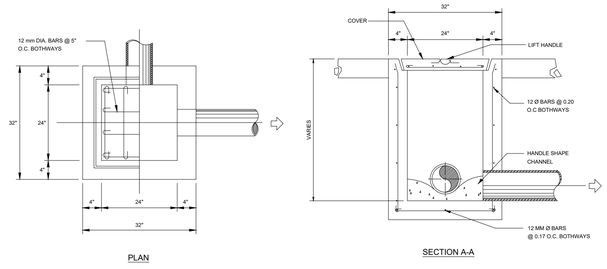
02 FLOOR GULLY
NOT TO SCALE (NTS)



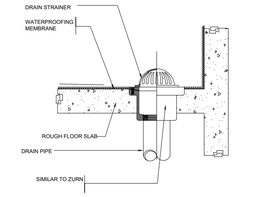
03 GULLY TRAP CONNECTION
NOT TO SCALE (NTS)



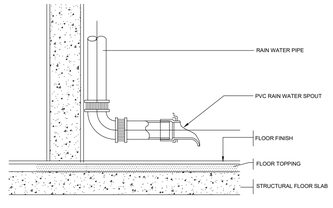
04 TYPICAL MANHOLE COVER
NOT TO SCALE (NTS)



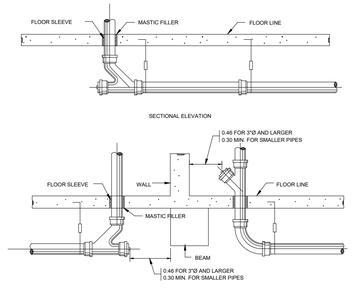
05 SEWAGE MANHOLE
NOT TO SCALE (NTS)



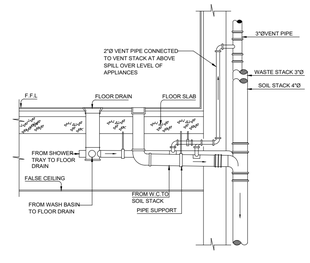
06 BALCONY DRAIN
NOT TO SCALE (NTS)



07 RAIN WATER SPOUT
NOT TO SCALE (NTS)

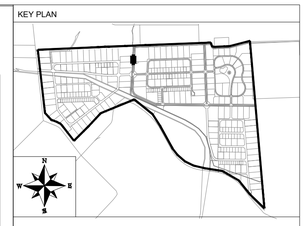


08 CEILING HUNG CLEANOUTS
NOT TO SCALE (NTS)



09 TYPICAL DRAINAGE INSTALLATION WITHIN THE BATHROOM
NOT TO SCALE (NTS)

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

0	ISSUED FOR TENDER	JUN, 2025
REV.	DESCRIPTION	DATE

PROJECT:

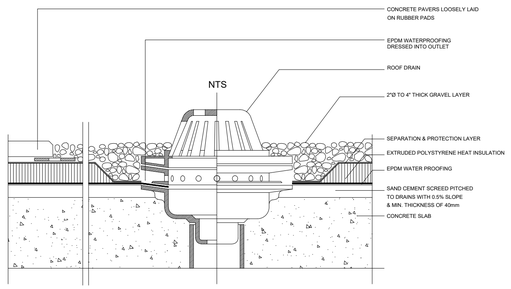
KARACHI INDUSTRIAL PARK SEZ

DRAWN	MS	SCALE	1:50
DESIGN	MS	DATE	JUN, 2025
CHECKED	MT	DESIGN STAGE	TD
APPROVED	ZA	ISSUE	TD
ACTUAL SHEET SIZE			A1

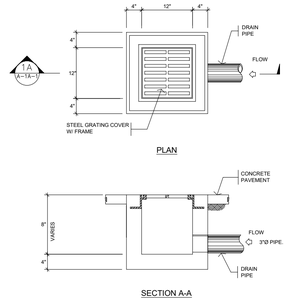
DRAWING TITLE:

EMERGENCY GATE DETAIL-01

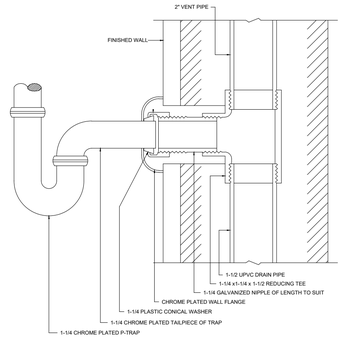
PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-GH01-P1-0601	0



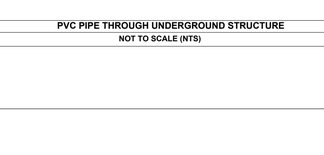
01 **TYPICAL RAIN WATER OUTLET**
NOT TO SCALE (NTS)



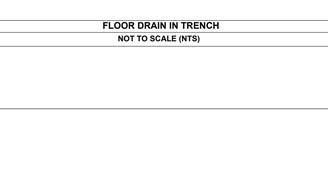
02 **CATCH BASIN INSTALLATION**
NOT TO SCALE (NTS)



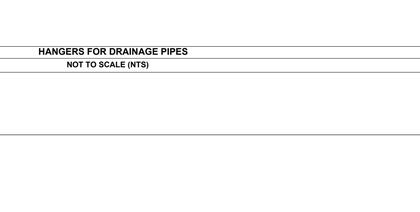
03 **LAVATORY OUTLET CONNECTION**
NOT TO SCALE (NTS)



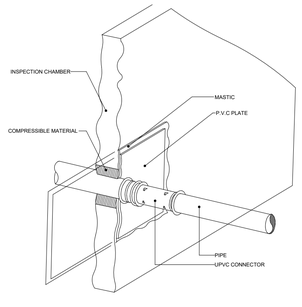
04 **FLOOR CLEAN OUT DETAIL**
NOT TO SCALE (NTS)



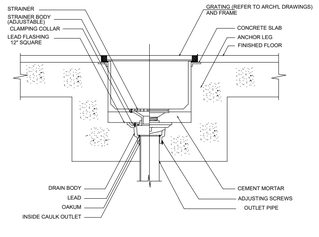
05 **PVC FLOOR DRAIN**
NOT TO SCALE (NTS)



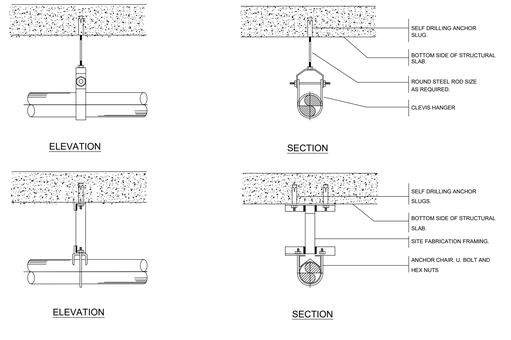
06 **PIPE THROUGH WATER TANK**
NOT TO SCALE (NTS)



07 **PVC PIPE THROUGH UNDERGROUND STRUCTURE**
NOT TO SCALE (NTS)

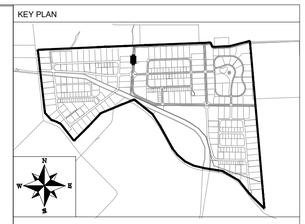


08 **FLOOR DRAIN IN TRENCH**
NOT TO SCALE (NTS)



09 **HANGERS FOR DRAINAGE PIPES**
NOT TO SCALE (NTS)

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

SUJ SUKSHMA JUNGWA | OMS | ICONSULT INNOVATION THROUGH EXCELLENCE

Lead Firm

JV-Team

0	ISSUED FOR TENDER	JUN, 2025
REV.	DESCRIPTION	DATE

PROJECT:

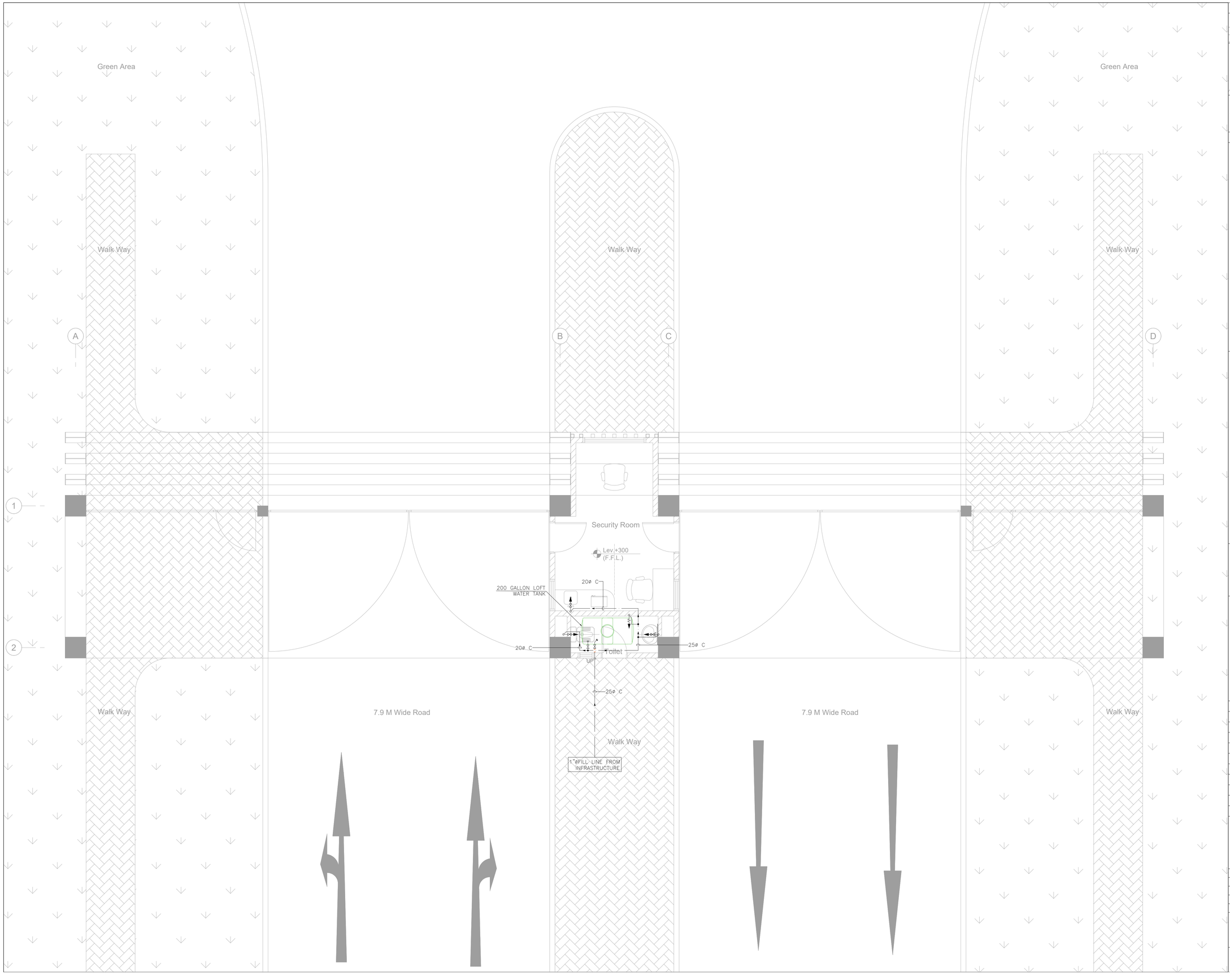
KARACHI INDUSTRIAL PARK SEZ

DRAWN	MS	SCALE	1:50
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CHECKED	MT	DESIGN STAGE	TD
APPROVED	ZA	ISSUE	TD
ACTUAL SHEET SIZE			A1

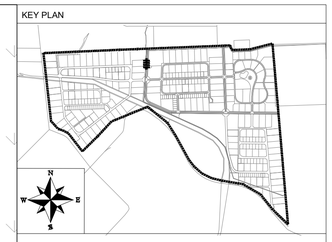
DRAWING TITLE:

EMERGENCY GATE DETAIL-02

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-GH01-P1-0602	0



KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUN, 2025

PROJECT:

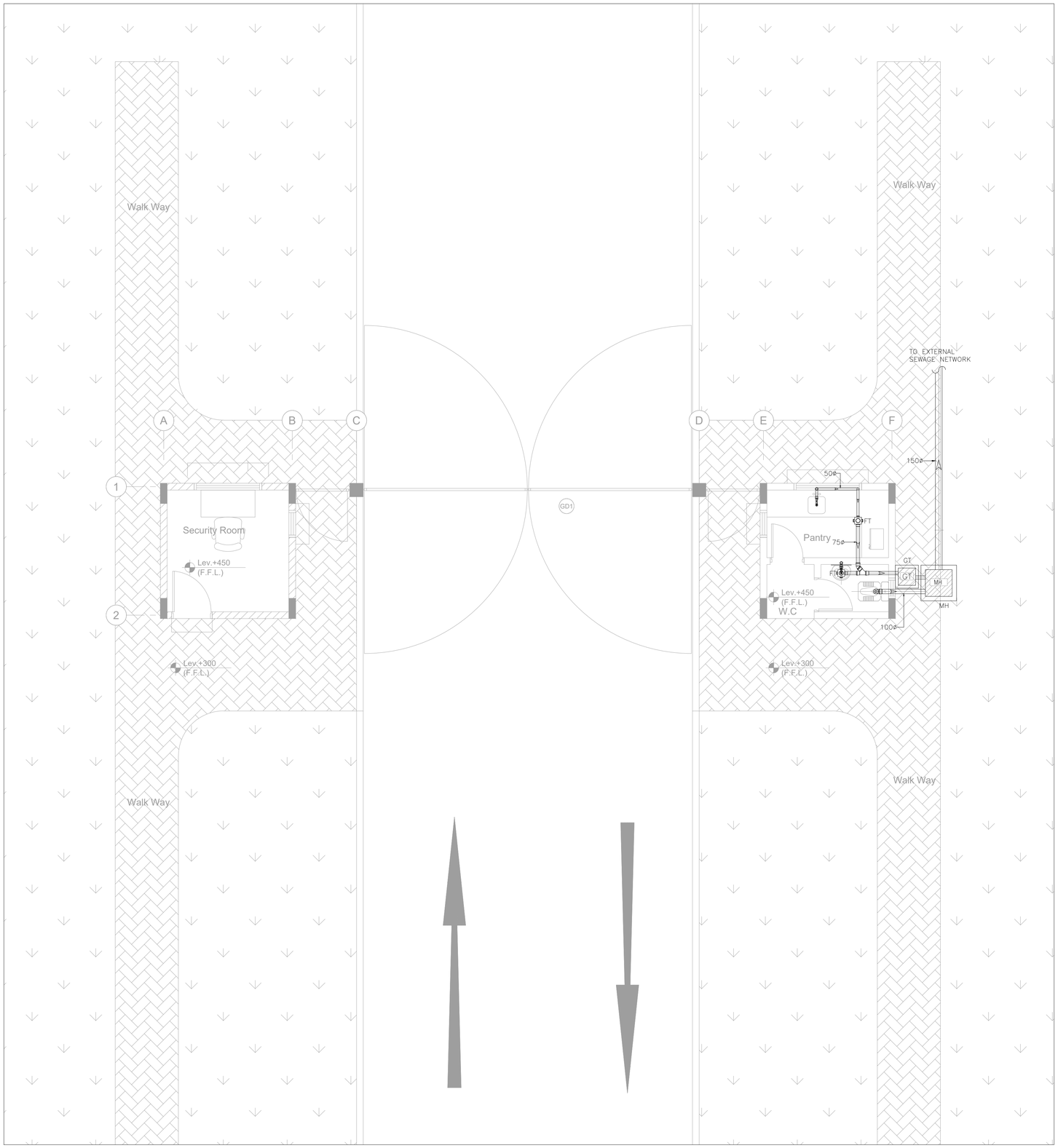
KARACHI INDUSTRIAL PARK SEZ

DRAWN	MD	SCALE	1:50
DESIGN	MD	DATE	JUN, 2025
CHECKED	MT	DESIGN STAGE	TD
APPROVED	ZA	ISSUE	TD
ACTUAL SHEET SIZE			A1

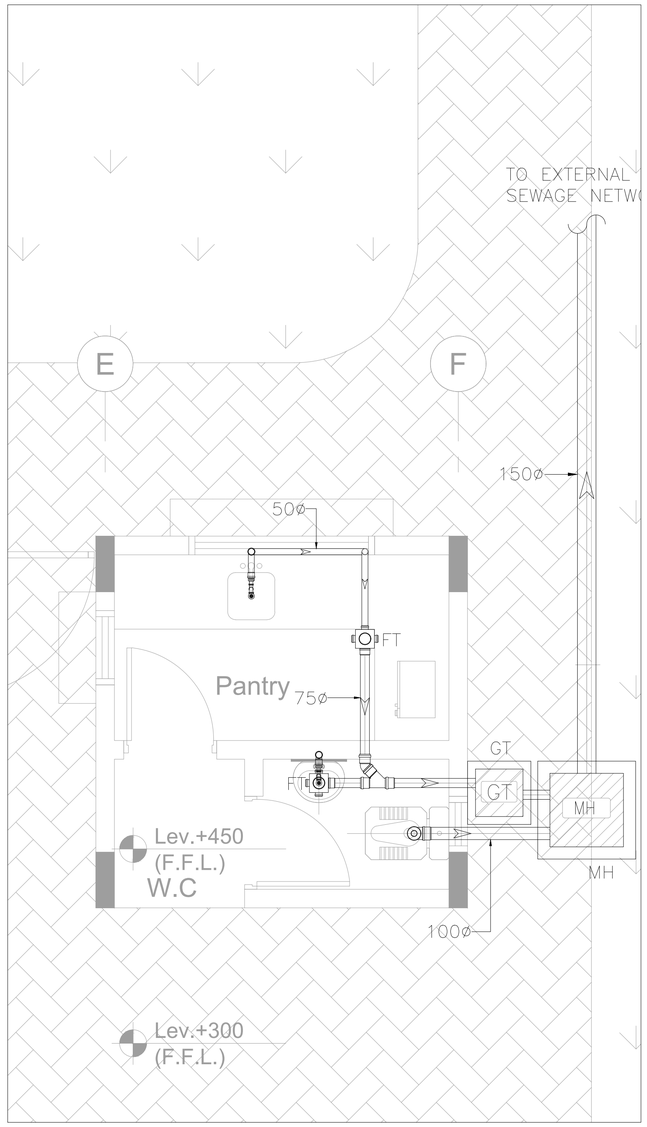
DRAWING TITLE:

GATE HOUSE-01 WATER SUPPLY LAYOUT

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-GH01-W1-0100	0

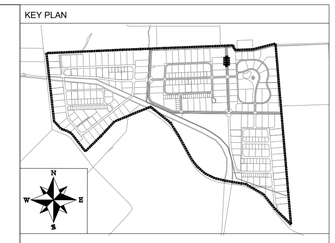


MAIN PLAN
SCALE-1:50



ENLARGE
SCALE-1:25

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUN, 2025

PROJECT:

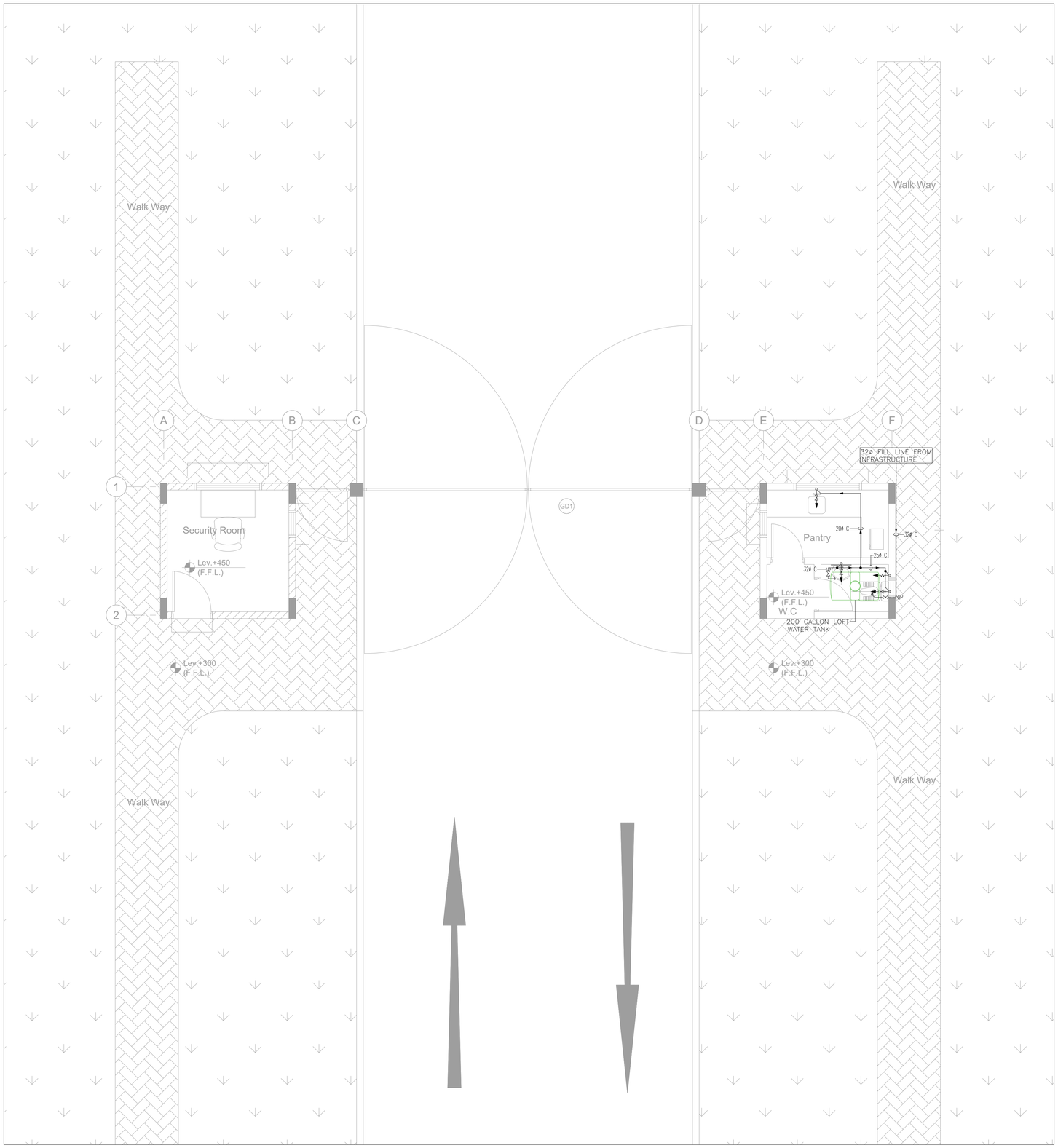
KARACHI INDUSTRIAL PARK SEZ

DRAWN	MD	SCALE	1:50
DESIGN	MD	DATE	JUN, 2025
CHECKED	MT	DESIGN STAGE	TD
APPROVED	ZA	ISSUE	TD
ACTUAL SHEET SIZE			A1

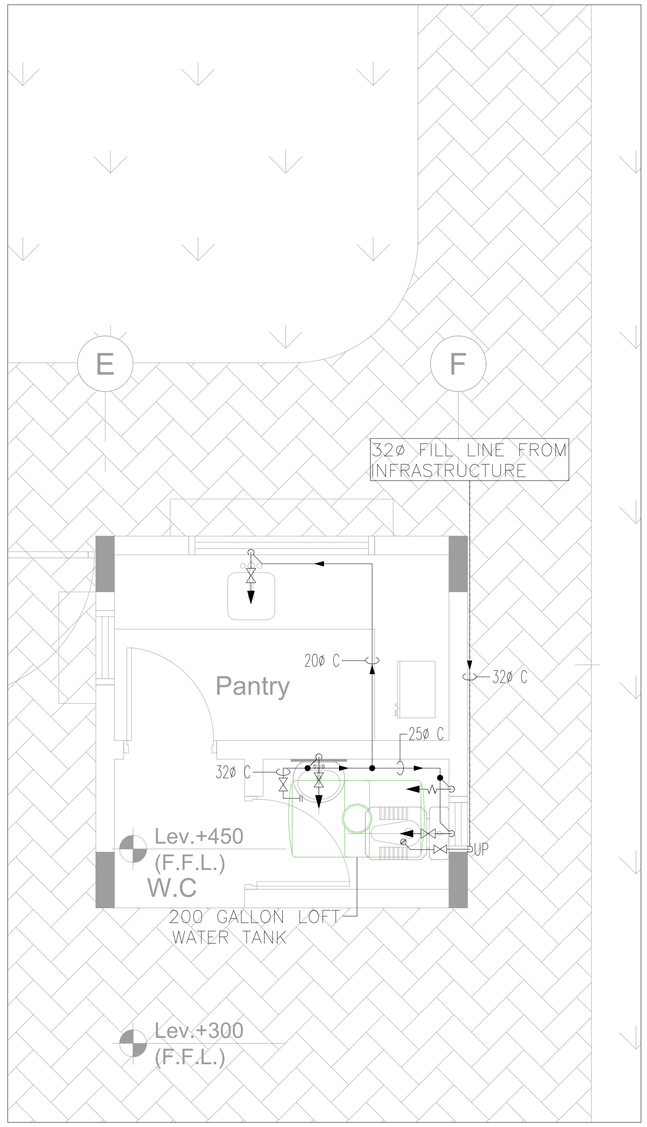
DRAWING TITLE:

EMERGENCY GATE PLAN DRAINAGE LAYOUT

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-GH02-D1-0100	0

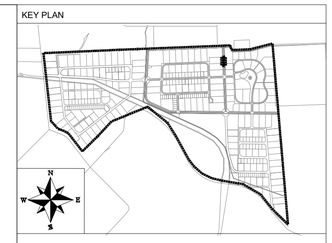


MAIN PLAN
SCALE-1:50



ENLARGE
SCALE-1:25

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUN, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	MD	SCALE	1:50
DESIGN	MD	DATE	JUN, 2025
CHECKED	MT	DESIGN STAGE	TD
APPROVED	ZA	ISSUE	TD
ACTUAL SHEET SIZE			A1

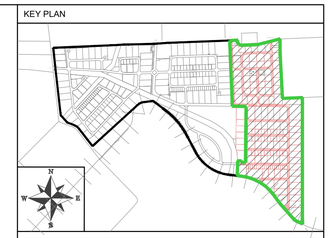
DRAWING TITLE:

EMERGENCY GATE PLAN
WATER SUPPLY LAYOUT

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-GH02-W1-0100	0

S.#	DRAWING NO.	DRAWING TITLE
	A0 - GENERAL DRAWINGS	
1	EA-1098-KIP-U-WS-EGH-A0-0001	LIST OF DRAWINGS
	A1 - ARCHITECTURAL PLANS	
2	EA-1098-KIP-U-WS-EGH-A1-0100	GROUND FLOOR PLAN
3	EA-1098-KIP-U-WS-EGH-A1-0200	ROOF PLAN
	A2 - SECTIONS	
4	EA-1098-KIP-U-WS-EGH-A2-0010	SECTION - A-A & B-B
	A3 - ELEVATIONS	
5	EA-1098-KIP-U-WS-EGH-A3-0010	ELEVATION - 01
	A6 - SCHEDULE	
6	EA-1098-KIP-U-WS-EGH-A6-0010	FINISHES SCHEDULE & DOOR & WINDOWS SCHEDULE
7	EA-1098-KIP-U-WS-EGH-A1-0020	DETAIL OF DOORS & WINDOWS

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

SUKKANA JURONG | OMS | ICONSULT INNOVATION THROUGH EXCELLENCE

Lead Firm **JV-Team**

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

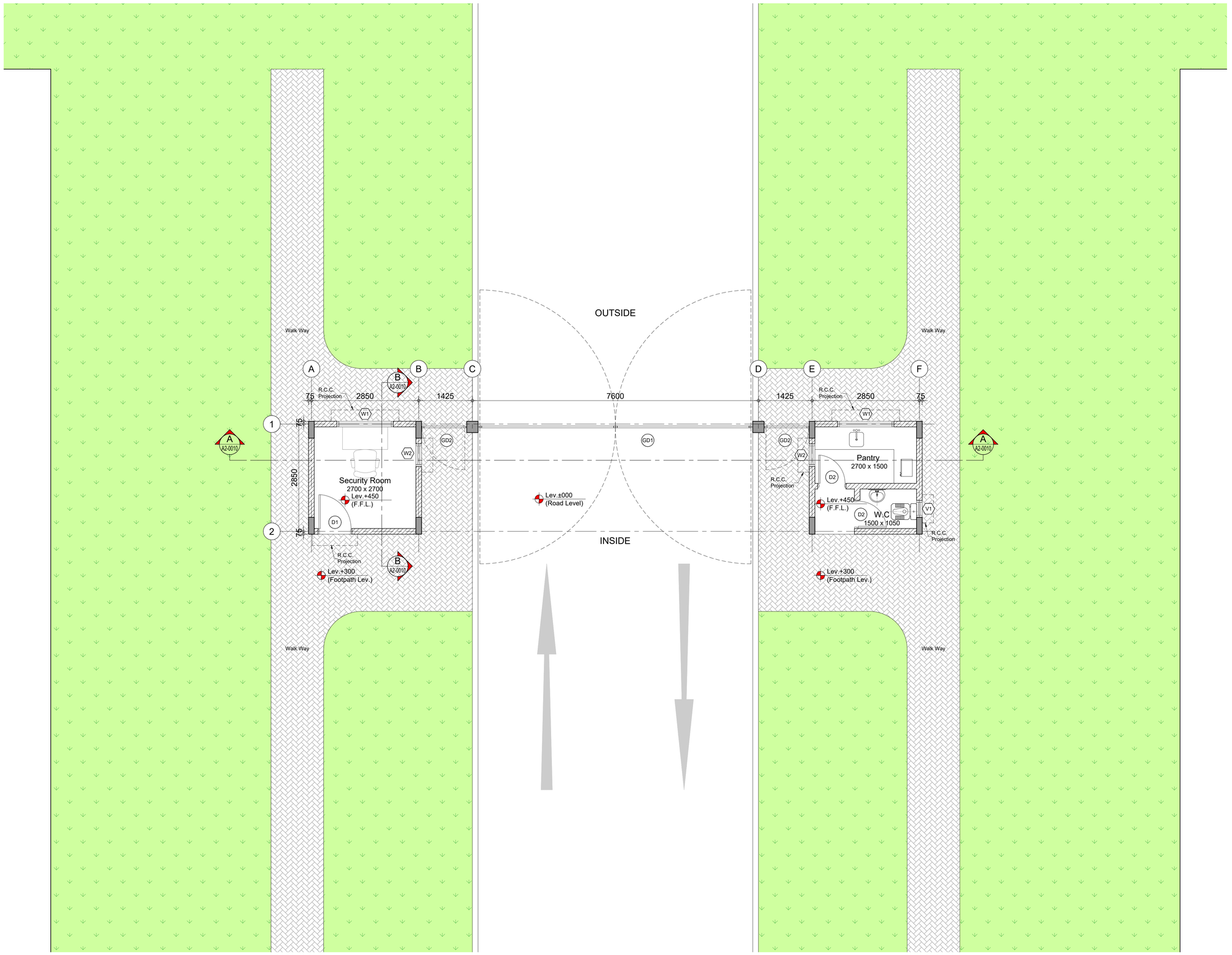
KARACHI INDUSTRIAL PARK SEZ

DRAWN	MT	SCALE	N.T.S.
DESIGN	SAF	DATE	JUNE, 2025
CHECKED	AM	DESIGN STAGE	TENDER
APPROVED	AM	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

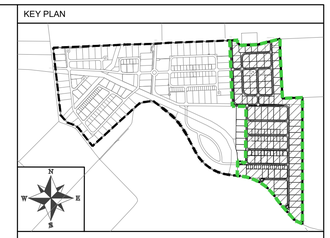
DRAWING TITLE:

EMERGENCY GATE
LIST OF DRAWING

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-EGH-A0-0001	0



KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

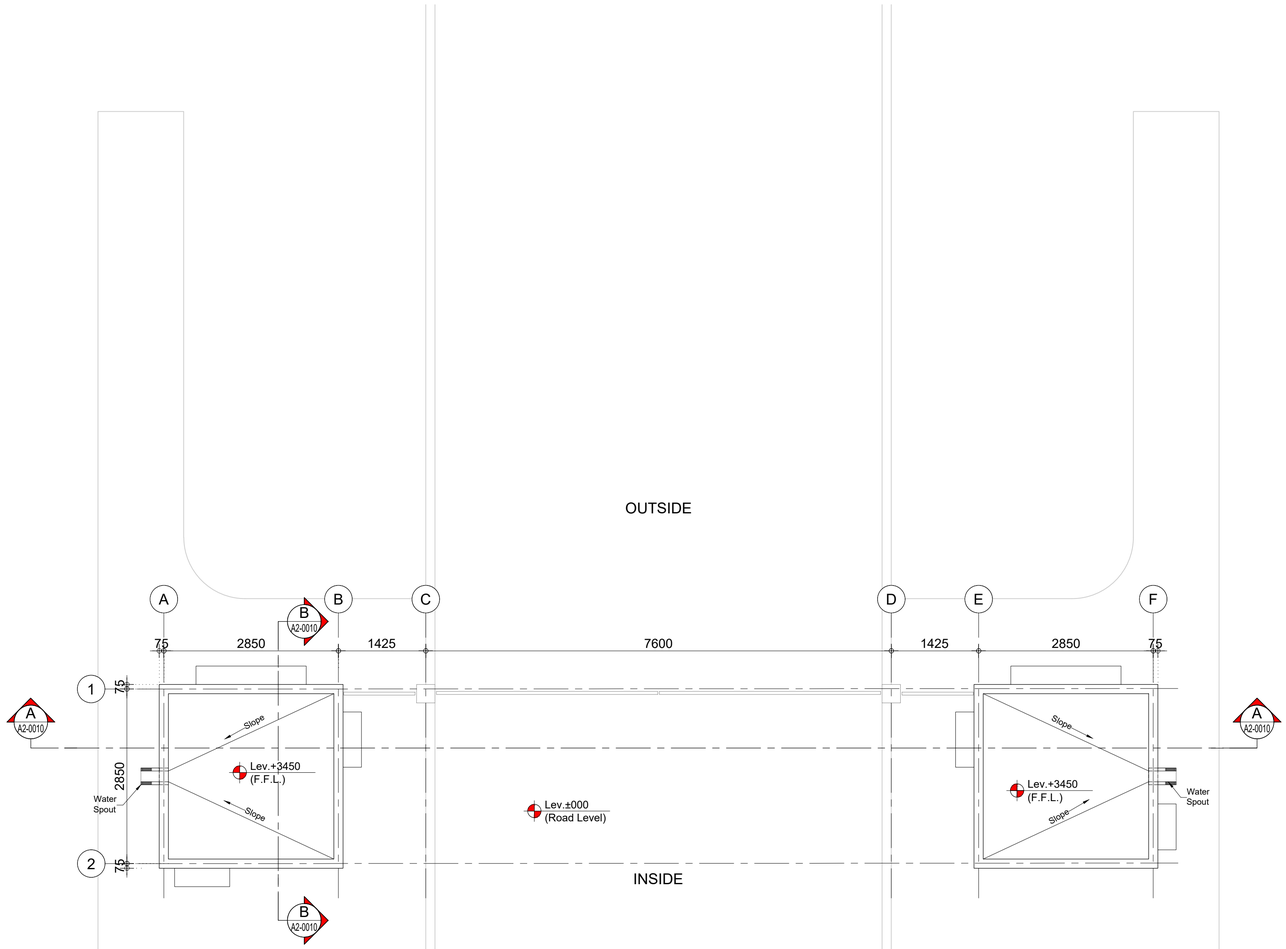
KARACHI INDUSTRIAL PARK SEZ

DRAWN	MT	SCALE	1:50
DESIGN	SAF	DATE	JUNE, 2025
CHECKED	AM	DESIGN STAGE	TENDER
APPROVED	AM	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

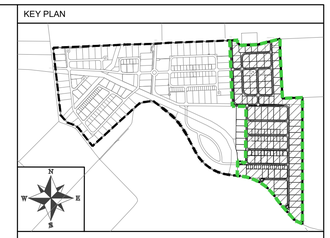
DRAWING TITLE:

EMERGENCY GATE GROUND FLOOR PLAN

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-EGH-A1-0100	0



KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

PIDC

SUKSAMA JURONG

OMS

ICONSULT
INNOVATION THROUGH EXCELLENCE

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

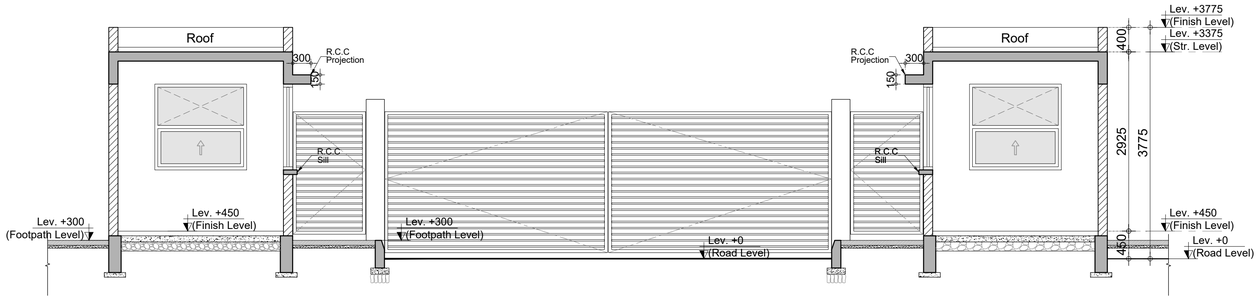
KARACHI INDUSTRIAL PARK SEZ

DRAWN	MT	SCALE	1:50
DESIGN	SAF	DATE	JUNE, 2025
CHECKED	AM	DESIGN STAGE	TENDER
APPROVED	AM	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

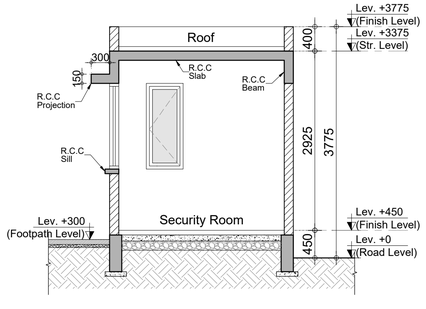
DRAWING TITLE:

EMERGENCY GATE ROOF PLAN

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-EGH-A1-0200	0

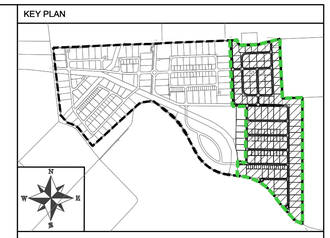


SECTION - AA



SECTION - BB

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

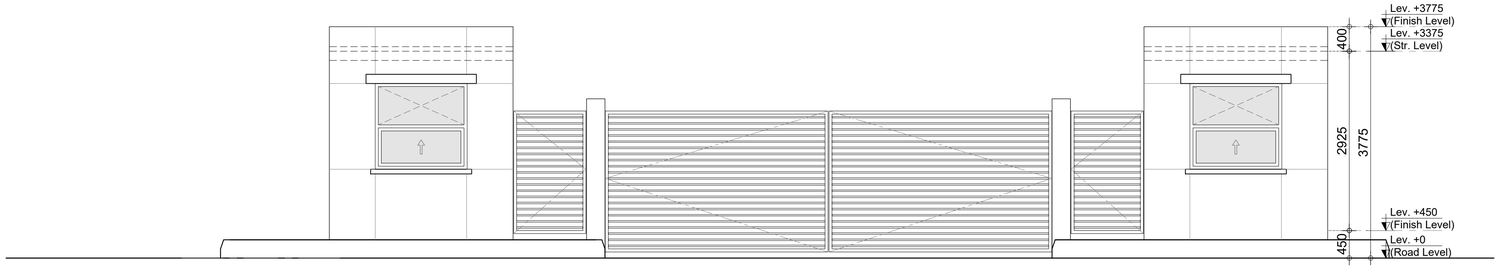
KARACHI INDUSTRIAL PARK SEZ

DRAWN	MT	SCALE	1:50
DESIGN	SAF	DATE	JUNE, 2025
CHECKED	AM	DESIGN STAGE	TENDER
APPROVED	AM	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

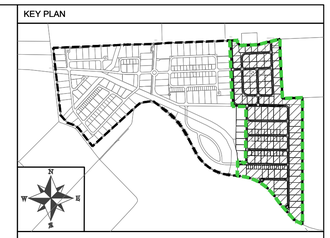
DRAWING TITLE:

EMERGENCY GATE
SECTION - AA & BB

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-EGH-A2-0100	0



KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

PIDC

SURBANA JURONG

OMS

iCONSULT
INNOVATION THROUGH EXCELLENCE

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	MT	SCALE	1:50
DESIGN	SAF	DATE	JUNE, 2025
CHECKED	AM	DESIGN STAGE	TENDER
APPROVED	AM	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

EMERGENCY GATE ELEVATION - 01

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-EGH-A3-0010	0

S#	TITLE	FLOOR	SKIRTING / DADO	WALL	CEILING	COLOR	REMARKS
	GROUND FLOOR						
01	Security Room	M.P.T	M.P.T.S	M.E.P	O.B.D	--	-
02	Toilet	C.T	C.T	M.E.P	O.B.D	--	-
03	Pantry	M.P.T	M.P.T.D	M.E.P	O.B.D	--	-

DESCRIPTION COMPOUND WORDS

S#	ABBREVIATION	MEANING
01	M.P.T	Matt Porcelain Tile
02	O.B.D	Oil Bond Distemper
03	MEP	Matt Enamel Paint
04	M.P.T.S	Matt Porcelain Tile Skirting 100mm High
05	M.P.T.D	Matt Porcelain Tile Dado 2100mm High
05	C.T	Ceramic Tile Dado 2100mm High

FINISHING SCHEDULE

WINDOWS

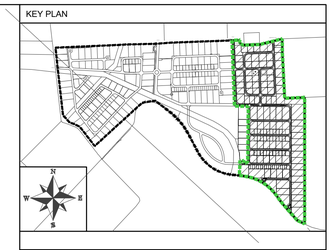
S.No.	Window Tags	Size Of Windows & Ventilators		Quantity		Glazing	Material	Finishes	Architrave	Chaukat	Chaukat Finish	Notes
		Width	Height	Ground Floor	Qty.							
01	W1	1500	1500	02	02	Sliding Window 6mm Th. Glass.	Aluminum	Colored Anodized		Aluminum	Colored Anodized	
02	W2	600	1500	02	02	Openable Window 6mm Th. Glass.	Aluminum	Colored Anodized		Aluminum	Colored Anodized	
03	V1	600	600	01	01	Openable Window 6mm Th. Glass.	Aluminum	Colored Anodized		Aluminum	Colored Anodized	

DOORS

S.No.	Door Type	Size Of Doors		Quantity		Type	Material	Finishes	Chaukat	Chaukat Finish	Notes
		Width	Height	Ground Floor	Qty.						
01	GD1	7300	2400	01	01	Double	Metal Door As Specified	Epoxy Paint Finish	-	-	-
02	GD2	1200	2100	02	02	Single	Metal Door As Specified	Epoxy Paint Finish	-	-	-
03	D1	900	2400	01	01	Single	UPVC Door	UPVC	G.I Sheet 16 S.W.G	Matt Enamel Paint Finish	
04	D2	750	2400	02	02	Single	UPVC Door	UPVC	G.I Sheet 16 S.W.G	Matt Enamel Paint Finish	

DOOR & WINDOW SCHEDULE

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

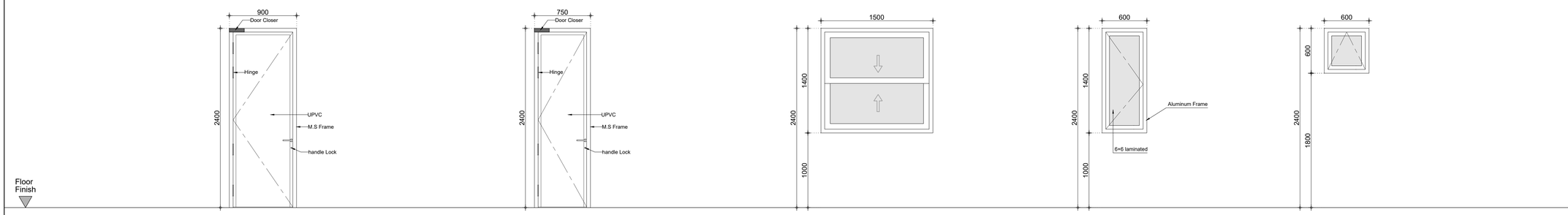
KARACHI INDUSTRIAL PARK SEZ

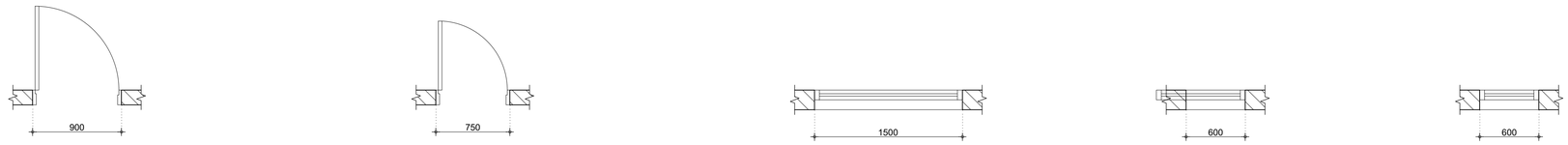
DRAWN	MT	SCALE	1:30
DESIGN	SAF	DATE	JUNE, 2025
CHECKED	AM	DESIGN STAGE	TENDER
APPROVED	AM	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

FINISHING SCHEDULE & DOOR & WINDOW SCHEDULE

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-EGH-A6-0010	0





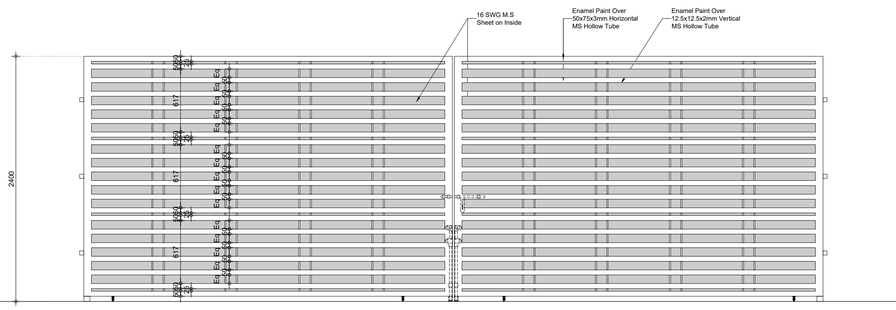
D1 PLAN 900x2400

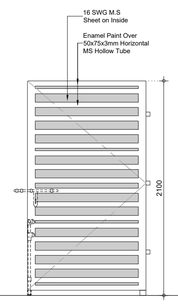
D1 PLAN 750x2400

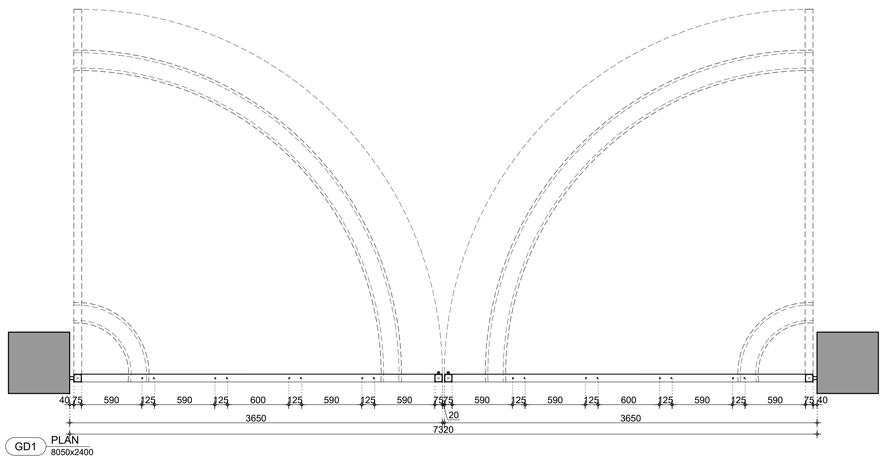
W1 PLAN 1500x1500

W2 PLAN 900x1500

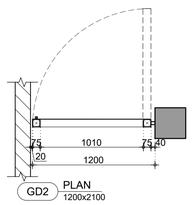
V1 PLAN 600x600





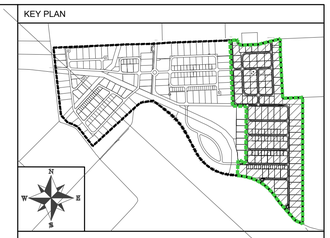


GD1 PLAN 8050x2400



GD2 PLAN 1200x2100

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

PIDC

SUNJANA JURONG

iCONSULT
INNOVATION THROUGH EXCELLENCE

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	MT	SCALE	1:30
DESIGN	SAF	DATE	JUNE, 2025
CHECKED	AM	DESIGN STAGE	TENDER
APPROVED	AM	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

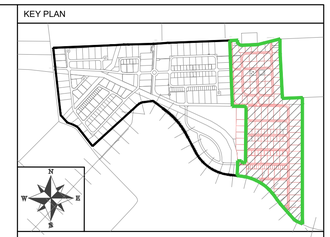
DRAWING TITLE:

DOOR & WINDOWS ELEVATIONS

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-EGH-A6-0020	0

S.#	DRAWING NO.	DRAWING TITLE
	A0 - GENERAL DRAWINGS	
1	EA-1098-KIP-U-WS-GH1-A0-0001	LIST OF DRAWINGS
2	EA-1098-KIP-U-WS-GH1-A0-0002	3D VIEWS
	A1 - ARCHITECTURAL PLANS	
3	EA-1098-KIP-U-WS-GH1-A1-0100	GROUND FLOOR PLAN
4	EA-1098-KIP-U-WS-GH1-A1-0200	ROOF PLAN
	A2 - SECTIONS	
5	EA-1098-KIP-U-WS-GH1-A2-0010	SECTION - A-A, B-B & C-C
	A3 - ELEVATIONS	
6	EA-1098-KIP-U-WS-GH1-A3-0010	ELEVATION - 01
	A6 - SCHEDULE	
7	EA-1098-KIP-U-WS-GH1-A6-0010	FINISHES & SCHEDULE OF DOOR, WINDOWS & VENTILATORS
8	EA-1098-KIP-U-WS-GH1-A1-0020	DOORS , WINDOWS ELEVATIONS

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	MT	SCALE	N.T.S.
DESIGN	SAF	DATE	JUNE, 2025
CHECKED	AM	DESIGN STAGE	TENDER
APPROVED	AM	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

GATE HOUSE - 1
LIST OF DRAWING

PROJ. CODE:	DRAWING NO.	REV.
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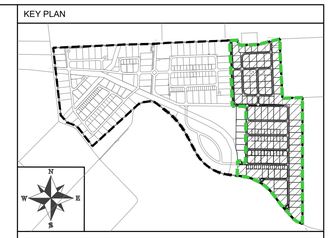


VIEW - 01



VIEW - 02

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

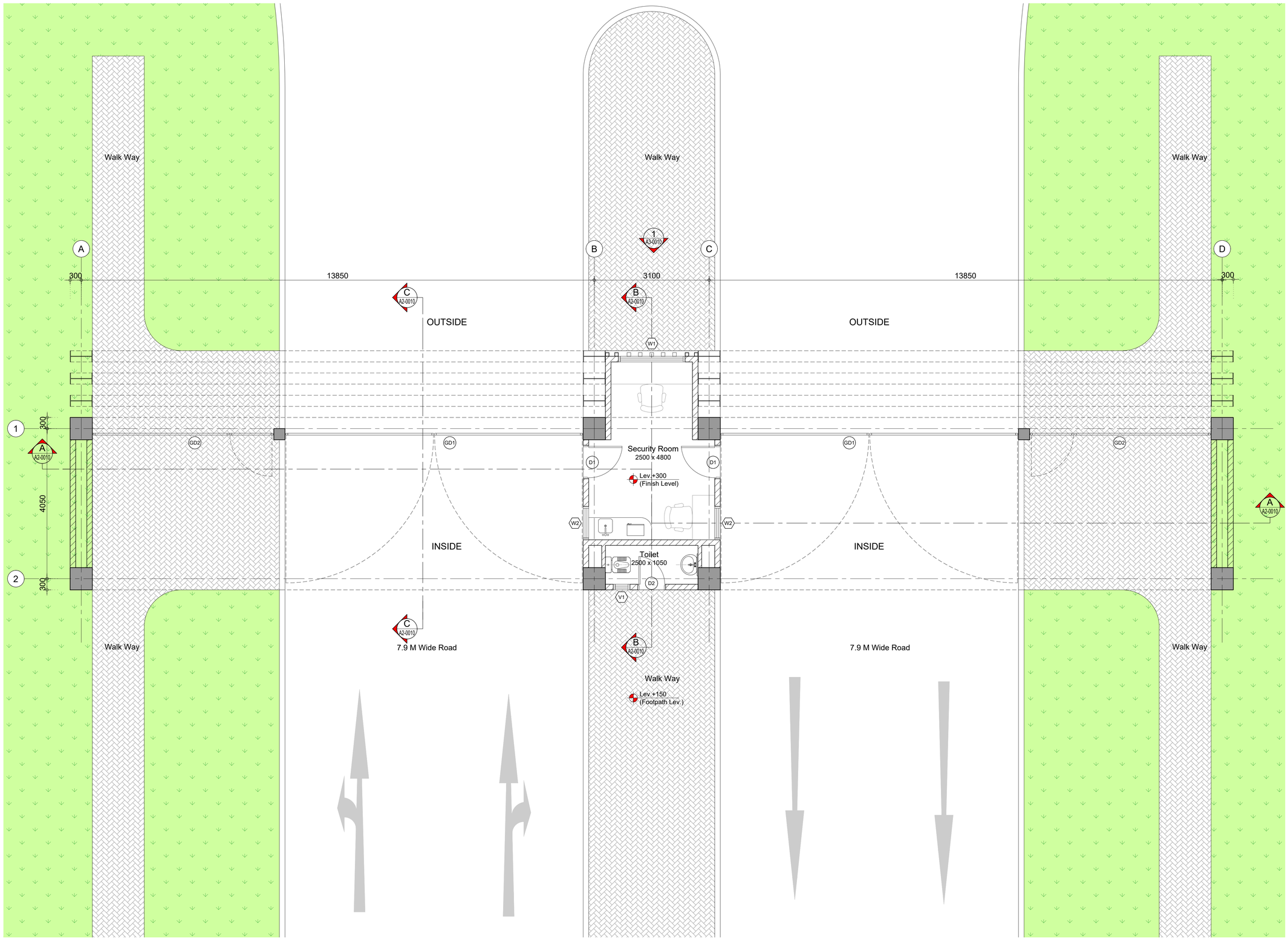
KARACHI INDUSTRIAL PARK SEZ

DRAWN	MT	SCALE	1:50
DESIGN	SAF	DATE	JUNE, 2025
CHECKED	AM	DESIGN STAGE	TENDER
APPROVED	AM	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

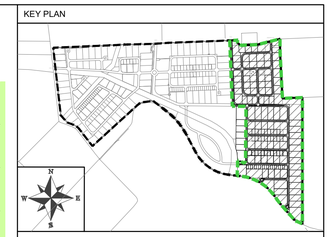
DRAWING TITLE:

GATE HOUSE - 1
3D VIEWS

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-GH1-A0-0002	0



KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

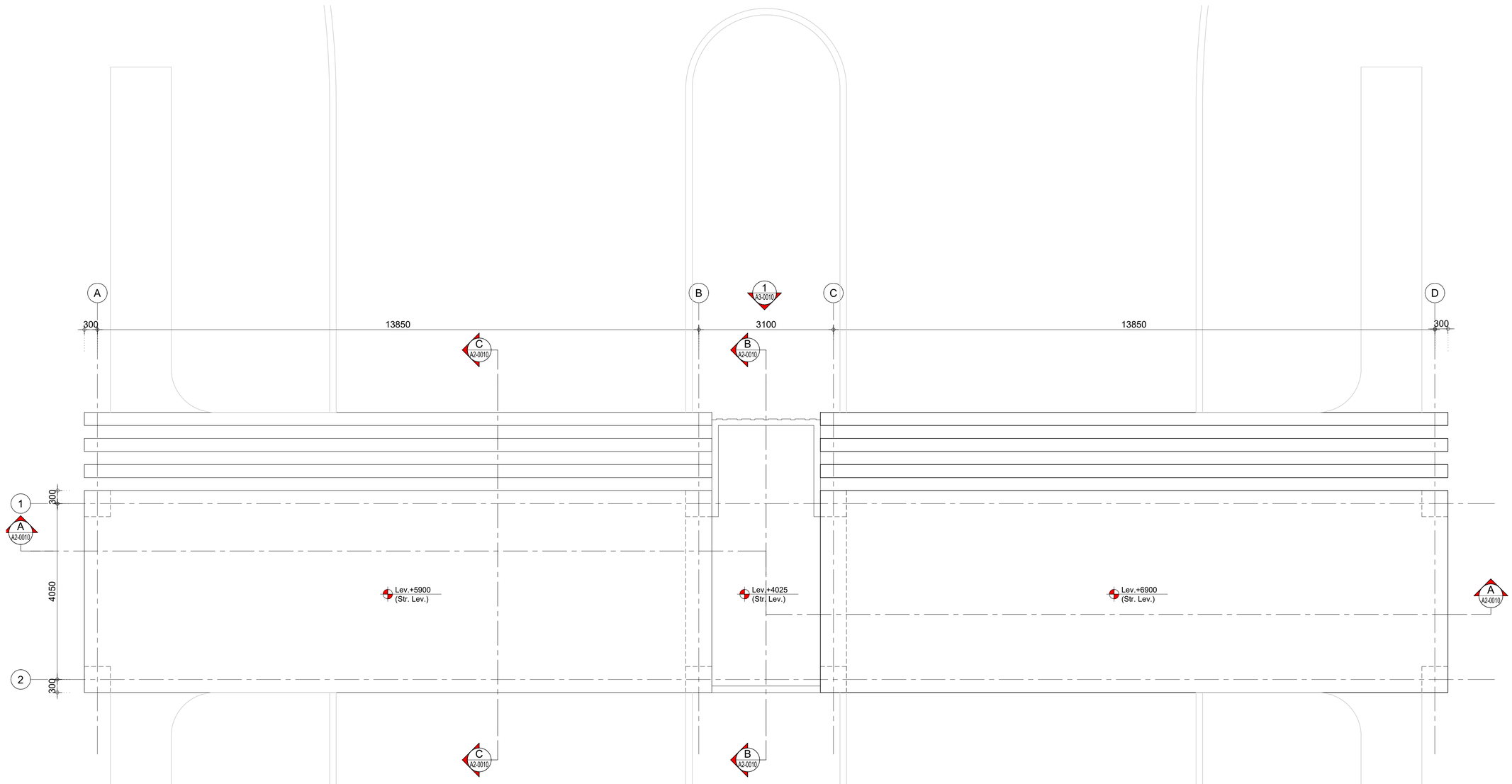
KARACHI INDUSTRIAL PARK SEZ

DRAWN	MT	SCALE	1:50
DESIGN	SAF	DATE	JUNE, 2025
CHECKED	AM	DESIGN STAGE	TENDER
APPROVED	AM	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

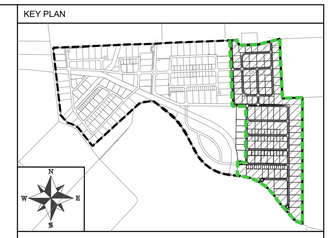
DRAWING TITLE:

GATE HOUSE - 1
GROUND FLOOR PLAN

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-GH1-A1-0100	0



KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

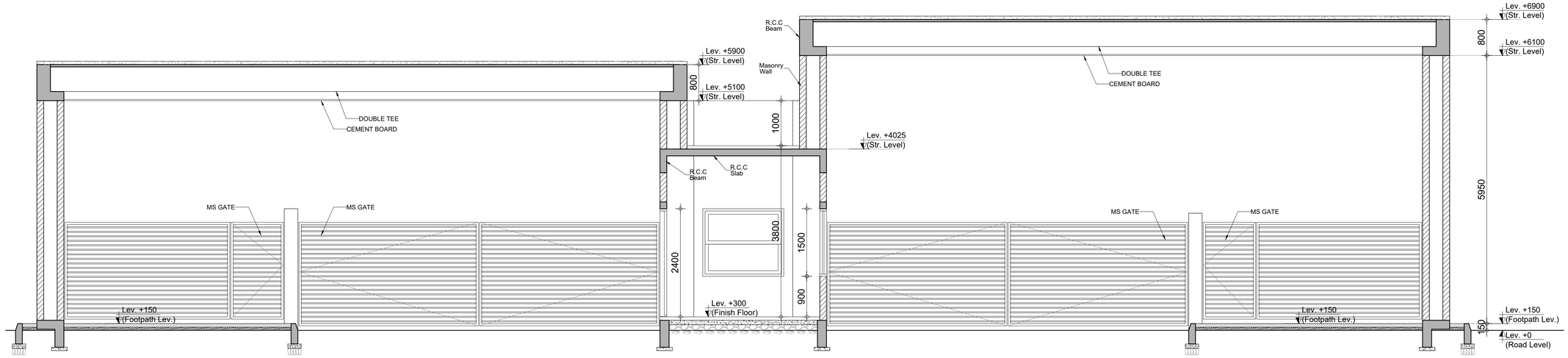
KARACHI INDUSTRIAL PARK SEZ

DRAWN	MT	SCALE	1:50
DESIGN	SAF	DATE	JUNE, 2025
CHECKED	AM	DESIGN STAGE	TENDER
APPROVED	AM	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

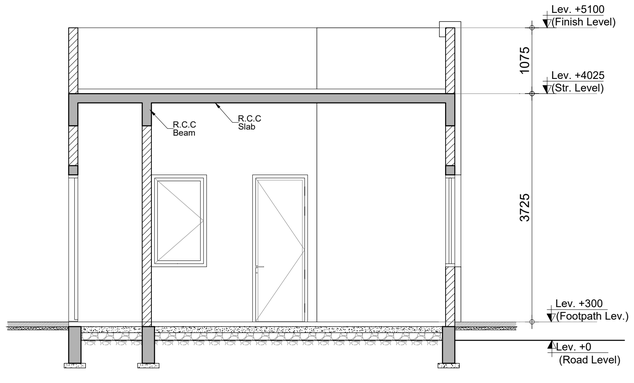
DRAWING TITLE:

GATE HOUSE - 1
ROOF PLAN

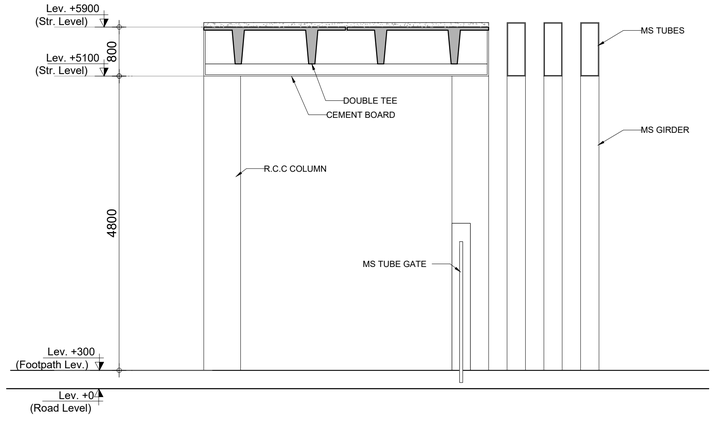
PROJ. CODE:	DRAWING NO.	REV.
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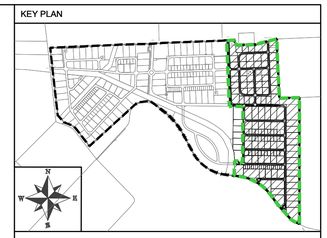
SECTION - AA



SECTION - BB



KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

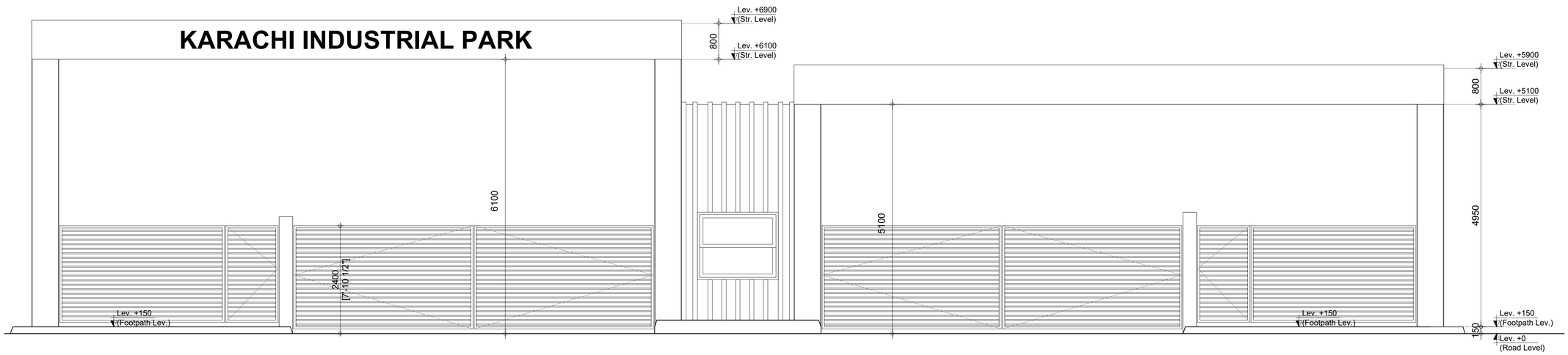
KARACHI INDUSTRIAL PARK SEZ

DRAWN	MT	SCALE	1:50
DESIGN	SAF	DATE	JUNE, 2025
CHECKED	AM	DESIGN STAGE	TENDER
APPROVED	AM	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

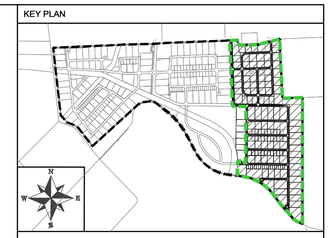
DRAWING TITLE:

GATE HOUSE - 1
SECTION - AA, BB & CC

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-GH1-A1-0200	0



KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

PIDC

SUJANA JURONG | OMS | iCONSULT
INNOVATION THROUGH EXCELLENCE

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	MT	SCALE	1:50
DESIGN	SAF	DATE	JUNE, 2025
CHECKED	AM	DESIGN STAGE	TENDER
APPROVED	AM	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

GATE HOUSE - 1
ELEVATION - 01

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-GH1-A3-0010	0

S#	TITLE	FLOOR	SKIRTING / DADO	WALL	CEILING	COLOR	REMARKS
	GROUND FLOOR						
01	Security Room	M.P.T	M.P.T.S	M.E.P	O.B.D	--	-
02	Toilet	C.T	C.T	M.E.P	O.B.D	--	-

DESCRIPTION COMPOUND WORDS

S#	ABBREVIATION	MEANING
01	M.P.T	Matt Porcelain Tile
02	O.B.D	Oil Bond Distemper
03	MEP	Matt Enamel Paint
04	M.P.T.S	Matt Porcelain Tile Skirting 100mm High
05	M.P.T.D	Matt Porcelain Tile Dado 2100mm High
06	C.T	Ceramic Tile Dado 2100mm High

FINISHING SCHEDULE

WINDOWS

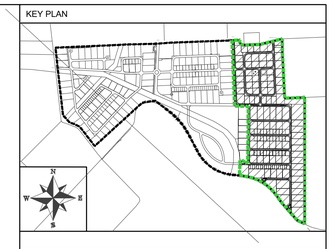
S.No.	Window Tags	Size Of Windows & Ventilators		Quantity		Glazing	Material	Finishes	Architrave	Chaukat	Chaukat Finish	Notes
		Width	Height	Ground Floor	Qty.							
01	W1	1800	1500	01	01	Sliding Window 6mm Th. Glass.	Aluminum	Colored Anodized		Aluminum	Colored Anodized	
02	W2	900	1500	02	02	Openable Window 6mm Th. Glass.	Aluminum	Colored Anodized		Aluminum	Colored Anodized	
03	V1	600	600	01	01	Openable Window 6mm Th. Glass.	Aluminum	Colored Anodized		Aluminum	Colored Anodized	

DOORS

S.No.	Door Type	Size Of Doors		Quantity		Type	Material	Finishes	Chaukat	Chaukat Finish	Notes
		Width	Height	Ground Floor	Qty.						
01	GD1	8050	2400	02	02	Double	Metal Door As Specified	Epoxy Paint Finish	-	-	-
02	GD2	4900	2100	02	02	Single	Metal Door As Specified	Epoxy Paint Finish	-	-	-
03	D1	900	2400	02	02	Single	UPVC Door	UPVC	G.I Sheet 16 S.W.G	Matt Enamel Paint Finish	
04	D2	750	2400	01	01	Single	UPVC Door	UPVC	G.I Sheet 16 S.W.G	Matt Enamel Paint Finish	

DOOR & WINDOW SCHEDULE

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

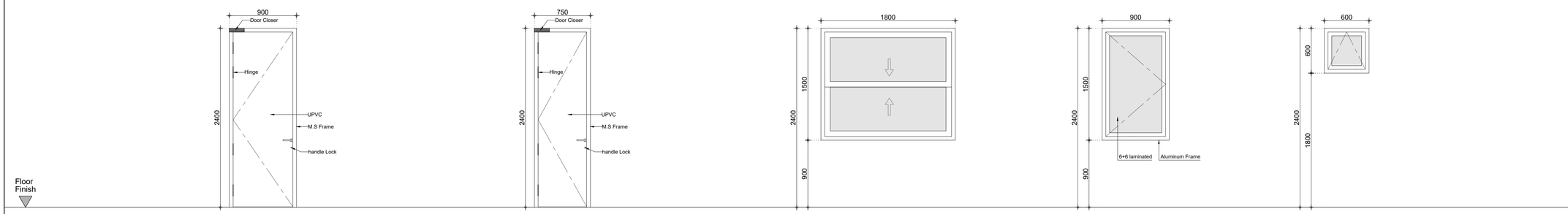
KARACHI INDUSTRIAL PARK SEZ

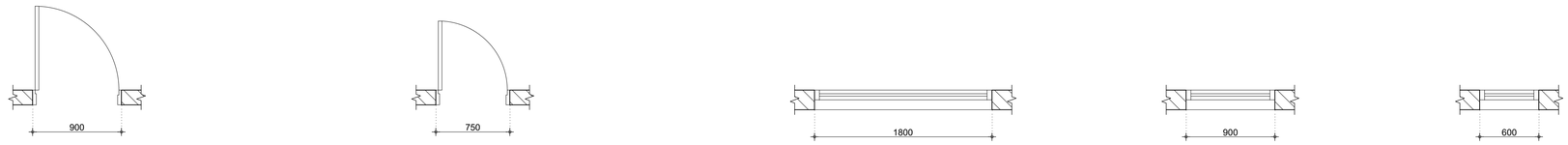
DRAWN	MT	SCALE	1:30
DESIGN	SAF	DATE	JUNE, 2025
CHECKED	AM	DESIGN STAGE	TENDER
APPROVED	AM	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

FINISHING SCHEDULE & DOOR & WINDOW SCHEDULE

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-GH1-A6-0010	0





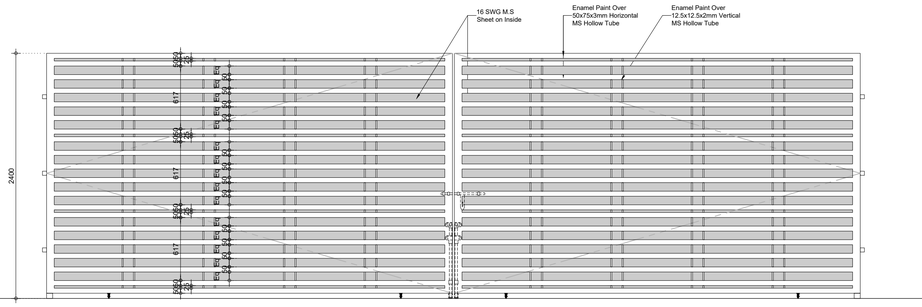
D1 PLAN 900x2400

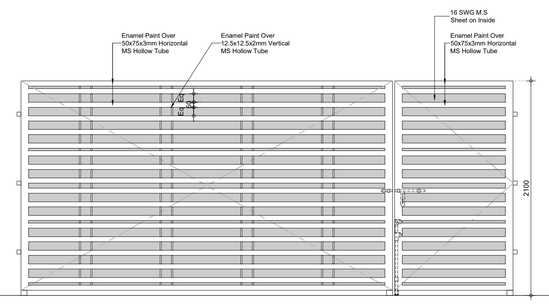
D1 PLAN 750x2400

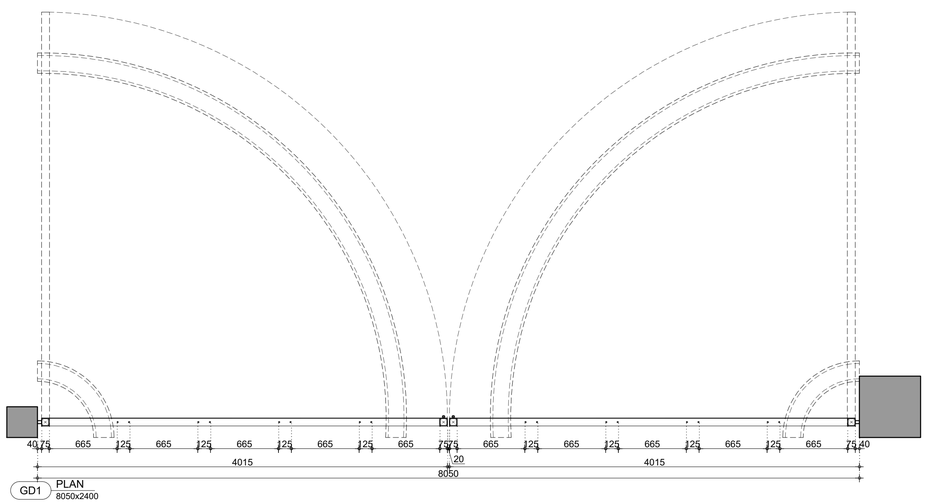
W1 PLAN 1800x1500

W2 PLAN 900x1500

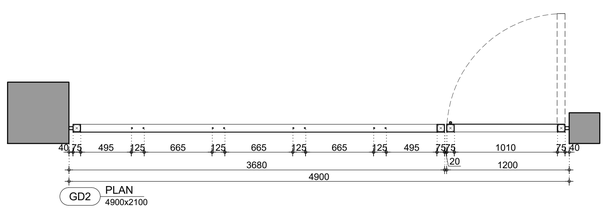
V1 PLAN 600x600





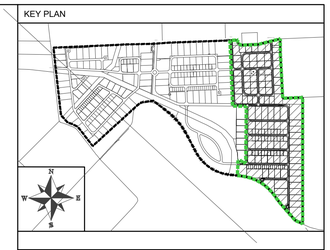


GD1 PLAN 8050x2400



GD2 PLAN 4900x2100

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	MT	SCALE	1:30
DESIGN	SAF	DATE	JUNE, 2025
CHECKED	AM	DESIGN STAGE	TENDER
APPROVED	AM	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

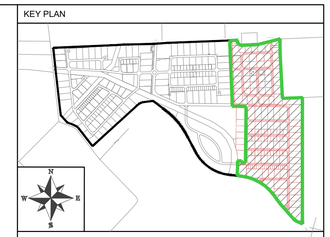
DRAWING TITLE:

GATE HOUSE - 1
DETAIL OF DOOR & WINDOW

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-GH1-A6-0020	0

S.#	DRAWING NO.	DRAWING TITLE
	A0 - GENERAL DRAWINGS	
1	EA-1098-KIP-U-WS-ST-A0-0000	COVER SHEET
2	EA-1098-KIP-U-WS-ST-A0-0001	LIST OF DRAWINGS
3	EA-1098-KIP-U-WS-ST-A0-0002	3D VIEWS
4	EA-1098-KIP-U-WS-ST-A0-0003	LOCATION PLAN
5	EA-1098-KIP-U-WS-ST-A0-0004	S.O.P (SETTING OUT PLAN)
	A1 - ARCHITECTURAL PLANS	
6	EA-1098-KIP-U-WS-ST-A1-0100	GROUND, FIRST & ROOF PLAN
	A2 - SECTIONS	
7	EA-1098-KIP-U-WS-ST-A2-0010	SECTION - AA
	A3 - ELEVATIONS	
8	EA-1098-KIP-U-WS-ST-A3-0010	ELEVATION - 01 & 02

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	FEB, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	AF	SCALE	N.T.S.
DESIGN	SAF	DATE	FEB, 2025
CHECKED	AM	DESIGN STAGE	TENDER
APPROVED	AM	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

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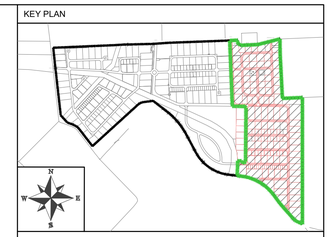
SECURITY TOWER
LIST OF DRAWING

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-ST-A0-0001	0



VIEW - 01

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	FEB, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	AF	SCALE	N.T.S.
DESIGN	SAF	DATE	FEB, 2025
CHECKED	AM	DESIGN STAGE	TENDER
APPROVED	AM	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

SECURITY TOWER 3D VIEW

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-ST-A0-0002	0

SECURITY TOWER - 01

SECURITY TOWER - 02

SECURITY TOWER - 03

SECURITY TOWER - 04

SECURITY TOWER - 05

SECURITY TOWER - 06

SECURITY TOWER - 07

SECURITY TOWER - 08

SECURITY TOWER - 08 Nos.
LENGTH OF BOUNDARY - 8073.00 M

GATE 1

GATE 2

GATE 3

EMERGENCY GATE

SS1 & SS2

SS3 & SS4

SS5

SS6

PLOT A

PLOT B

WALTER PIPE 66"Ø

65m-77m WIDE CORRIDOR (varies corridor width)

FLOW NALA

P1-01 Project Office

P1-07 132/11 KV 3.0 ACRES

P1-08 WW 1 1.0 ACRE

P3-10 WW 3 4.40 ACRES

P3-09 CETP 3 6.70 ACRES

P3-55 132 / 11 KV 3.0 ACRES

P2-44 WW 2 1.4 ACRES

P2-45 CETP 2 3.0 ACRES

P2-46 220/132/11 KV 6.0 ACRES

P1-159 CETP 1 6.77 ACRES

P2-101

P2-100

KEY PLAN

NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	FEB, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

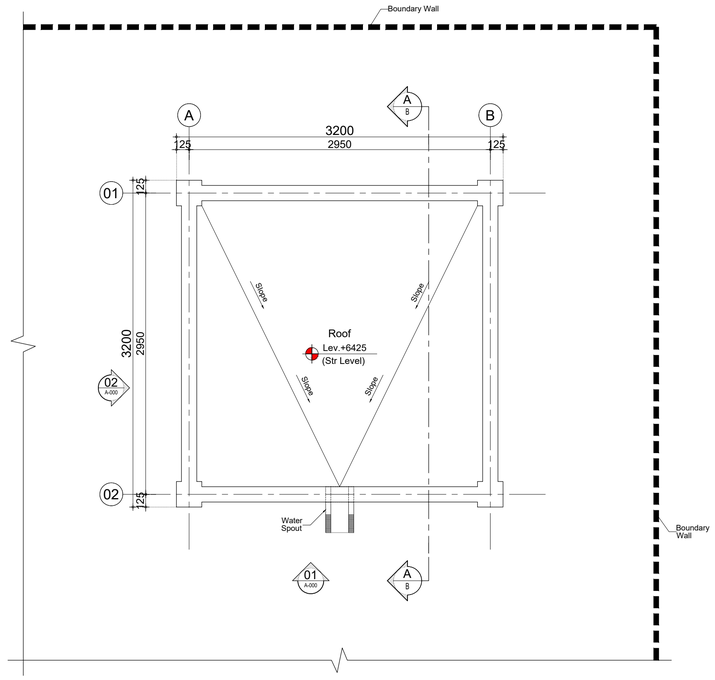
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CHECKED	AM	DESIGN STAGE	TENDER
APPROVED	AM	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

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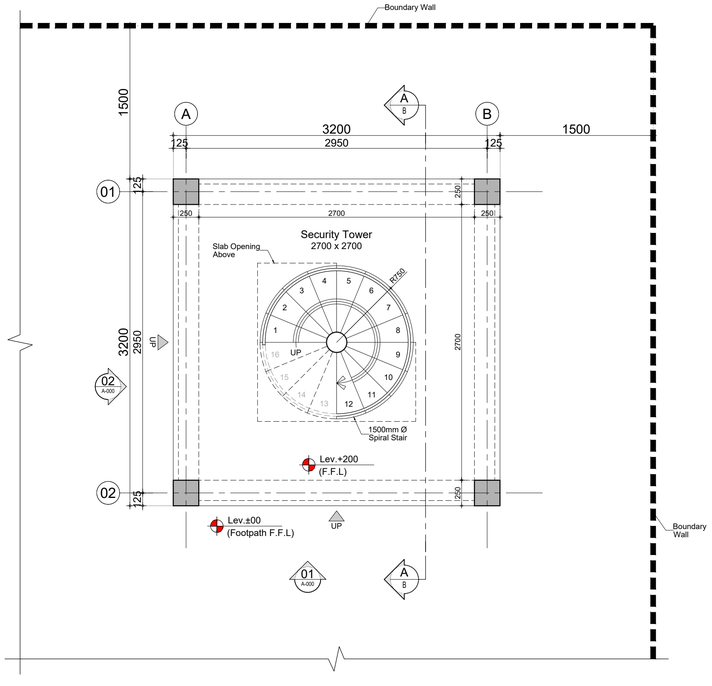
SECURITY TOWER LOCATION PLAN

PROJ. CODE:	DRAWING NO.	REV.
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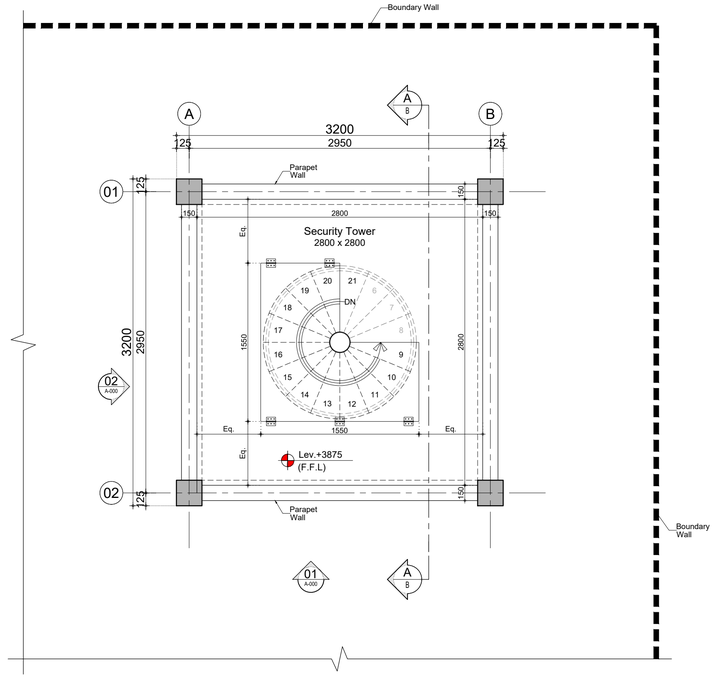
ROOF PLAN



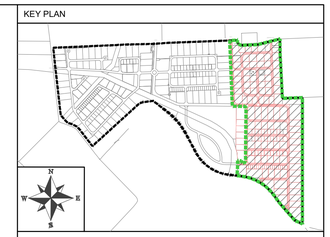
GROUND FLOOR PLAN



FIRST FLOOR PLAN



KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	FEB, 2025

PROJECT:

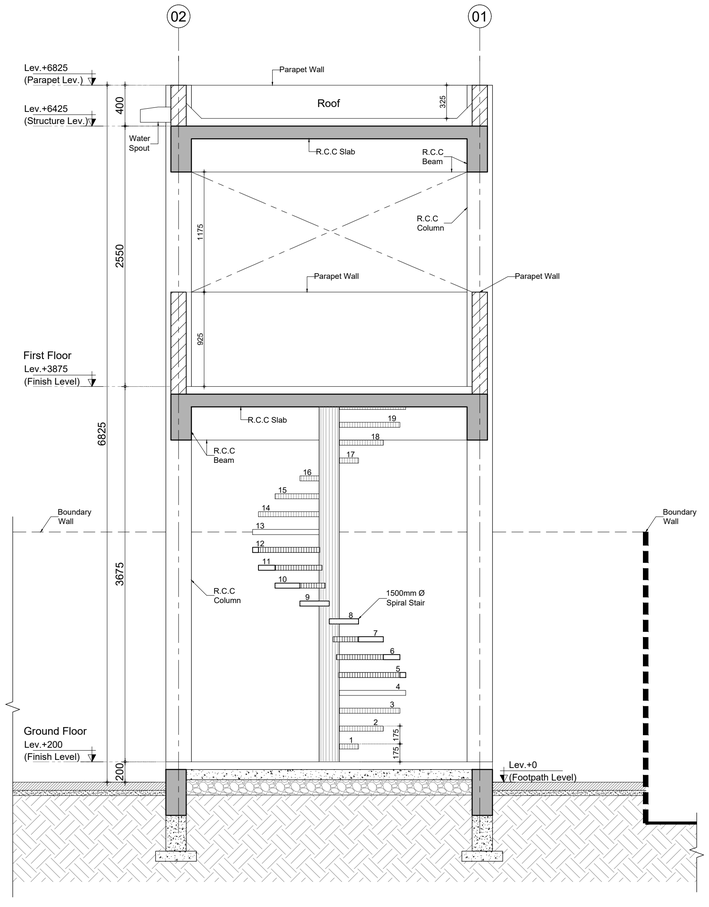
KARACHI INDUSTRIAL PARK SEZ

DRAWN	AF	SCALE	1:30
DESIGN	SAF	DATE	FEB, 2025
CHECKED	AM	DESIGN STAGE	TENDER
APPROVED	AM	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

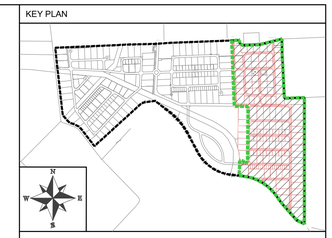
SECURITY TOWER
GROUND, FIRST & ROOF PLAN

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-ST-A1-0100	0



SECTION - AA

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	FEB, 2025

PROJECT:

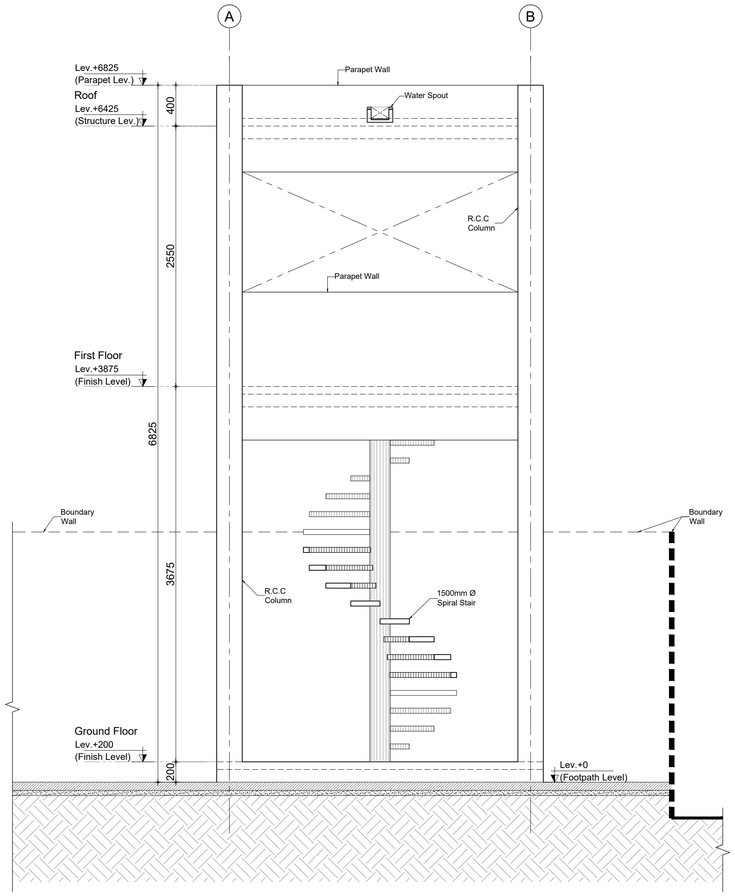
KARACHI INDUSTRIAL PARK SEZ

DRAWN	AF	SCALE	1:30
DESIGN	SAF	DATE	FEB, 2025
CHECKED	AM	DESIGN STAGE	TENDER
APPROVED	AM	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

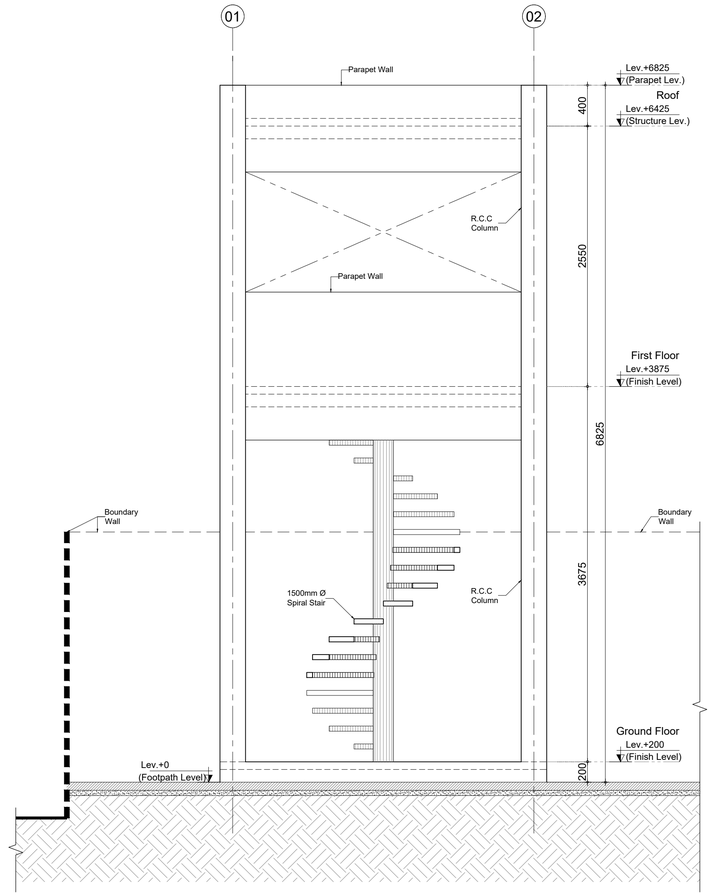
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SECURITY TOWER SECTION - AA

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-ST-A2-0010	0

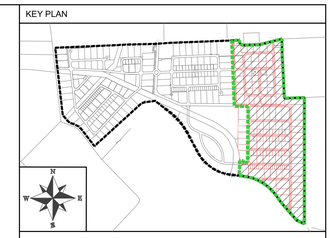


ELEVATION - 01



ELEVATION - 02

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	FEB, 2025

PROJECT:

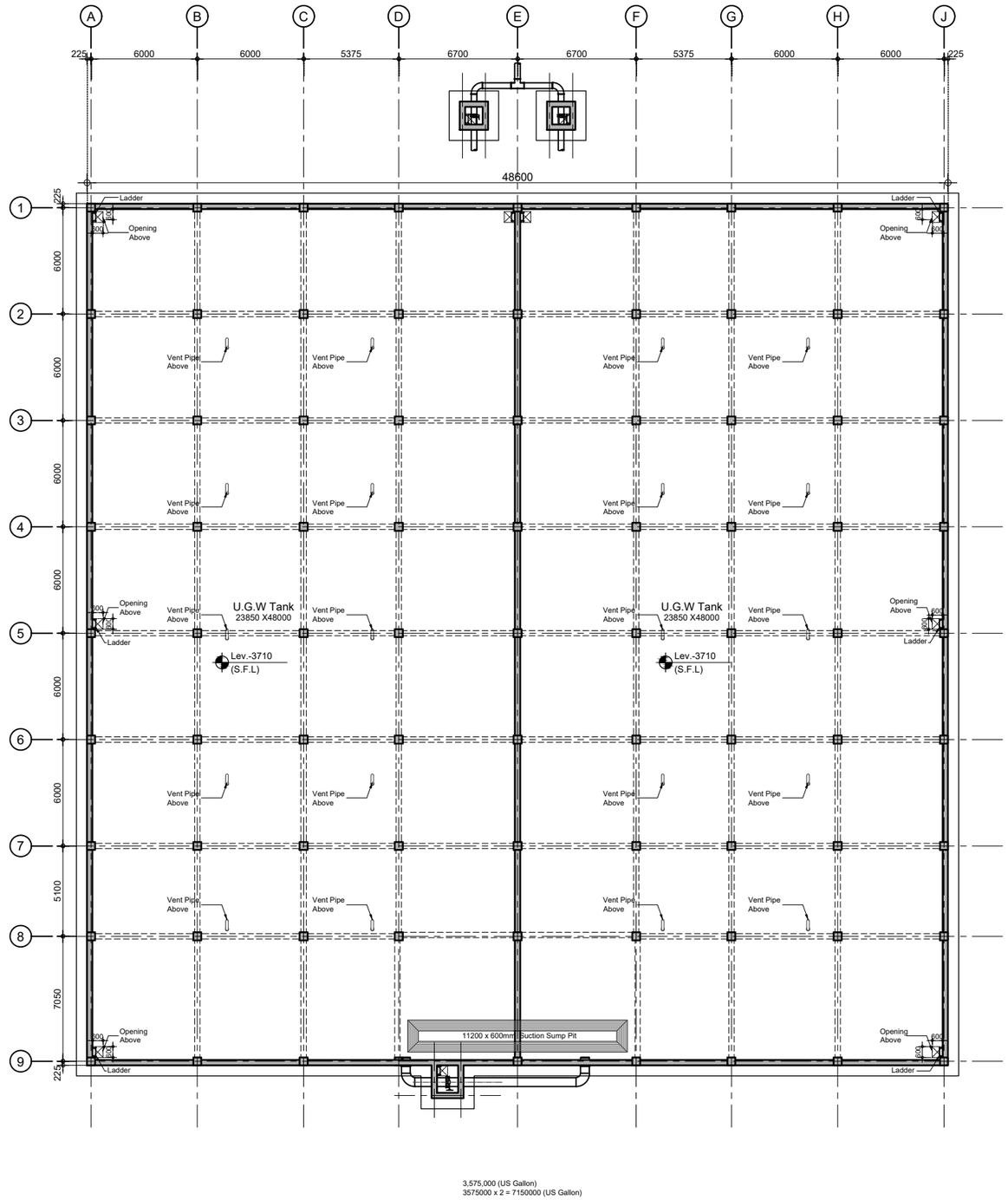
KARACHI INDUSTRIAL PARK SEZ

DRAWN	AF	SCALE	1:30
DESIGN	SAF	DATE	FEB, 2025
CHECKED	AM	DESIGN STAGE	TENDER
APPROVED	AM	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

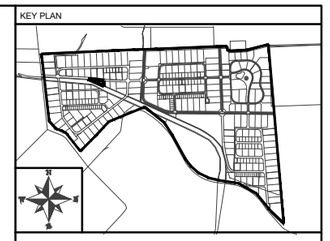
SECURITY TOWER
ELEVATION - 01 & 02

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-ST-A3-0010	0



3,575,000 (US Gallon)
3575000 x 2 = 7150000 (US Gallon)

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	FEB, 2025

PROJECT:

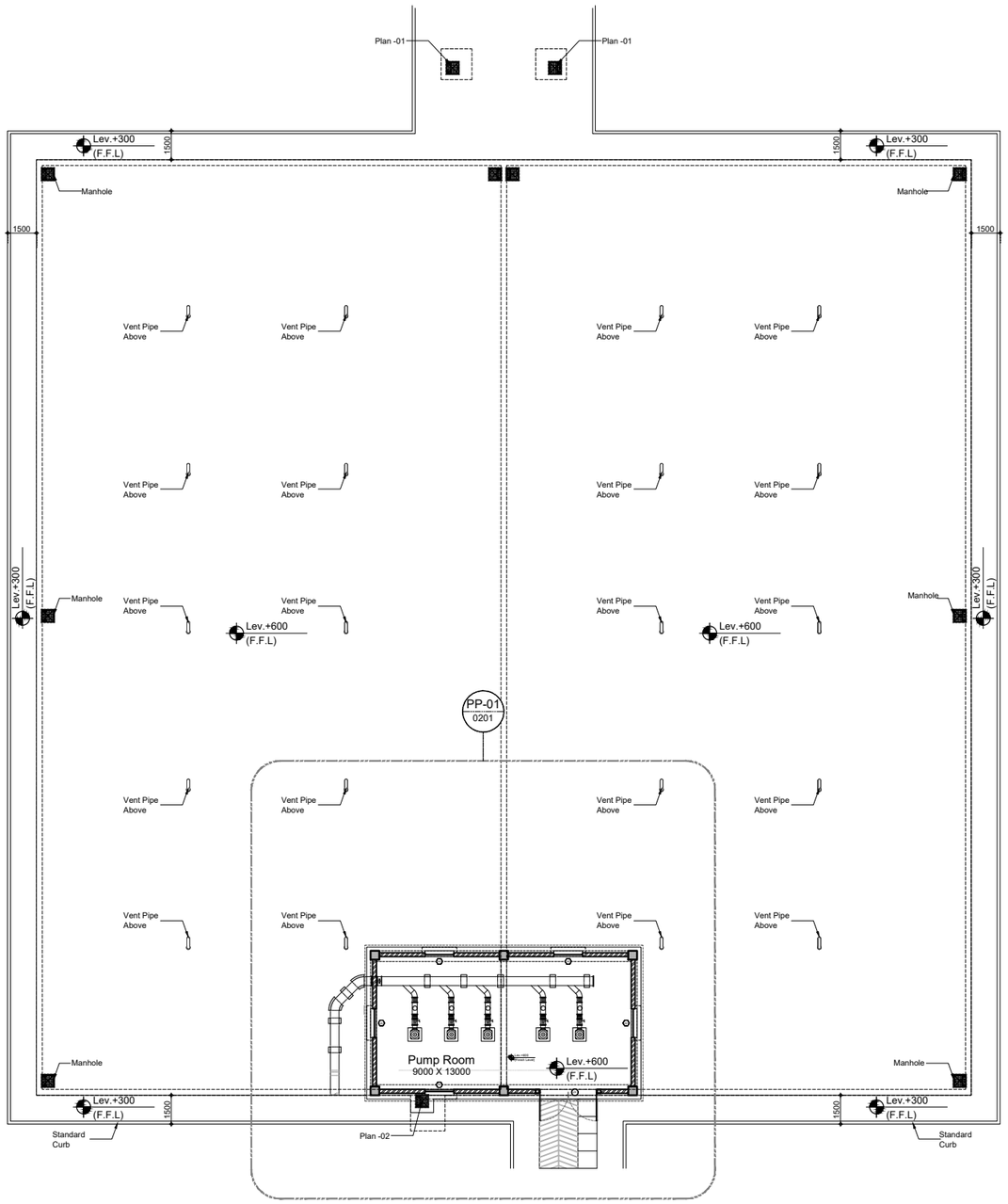
KARACHI INDUSTRIAL PARK SEZ

DRAWN	MT	SCALE	1:150
DESIGN	SAF	DATE	FEB, 2025
CHECKED	AM	DESIGN STAGE	TD
APPROVED	AM	ISSUE	TD
ACTUAL SHEET SIZE			A1

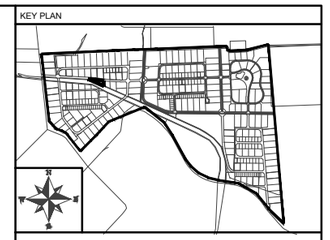
DRAWING TITLE:

UNDER GROUND TANK PLAN

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-PS-A1-0100	0



KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	FEB, 2025

PROJECT:

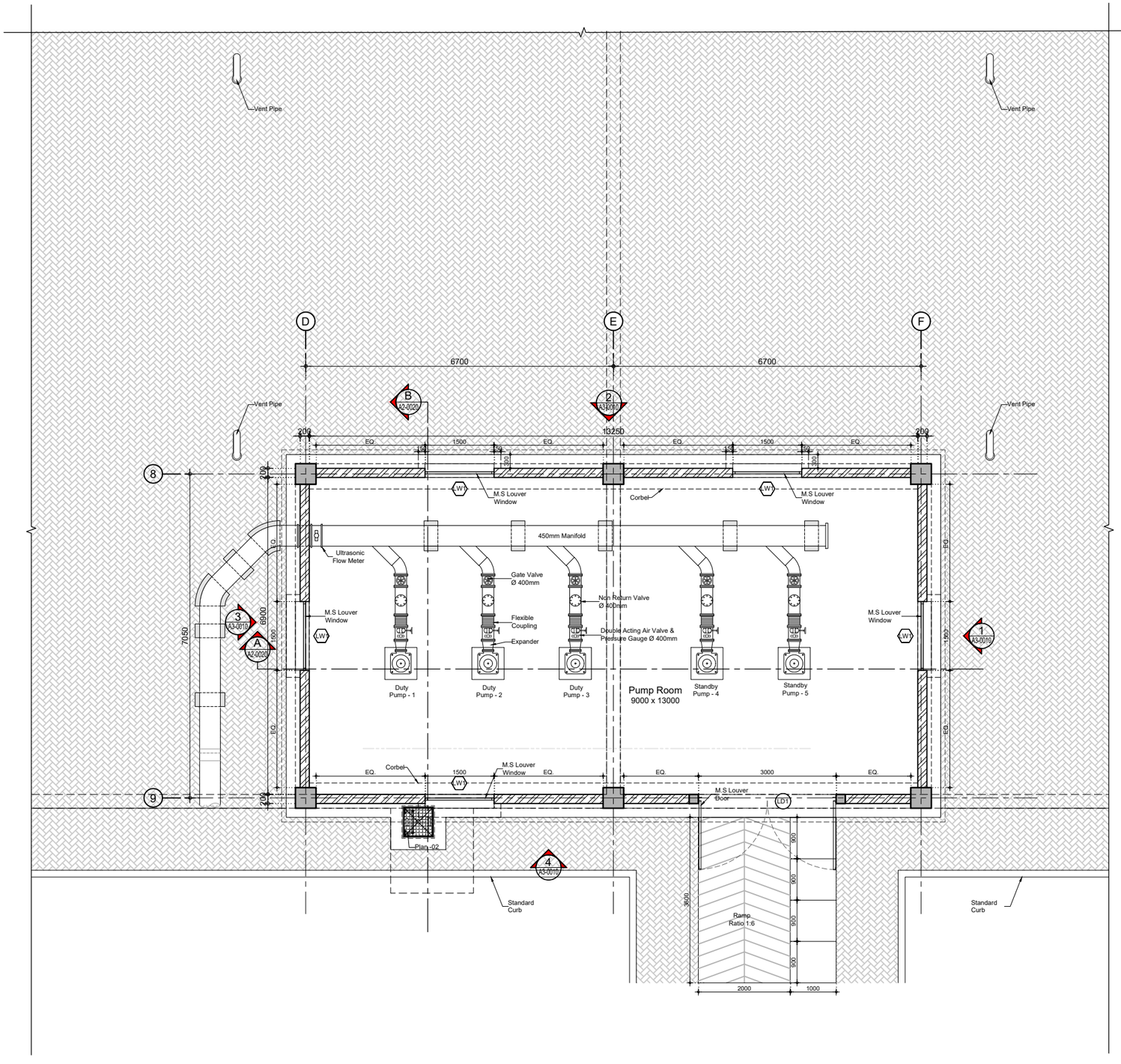
KARACHI INDUSTRIAL PARK SEZ

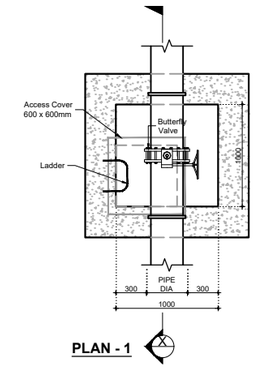
DRAWN	MT	SCALE	1:150
DESIGN	SAF	DATE	FEB, 2025
CHECKED	AM	DESIGN STAGE	TD
APPROVED	AM	ISSUE	TD
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

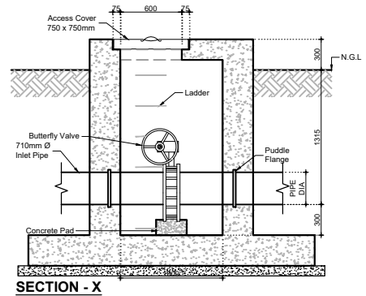
PUMP ROOM PLAN

PROJ. CODE:	DRAWING NO.	REV.
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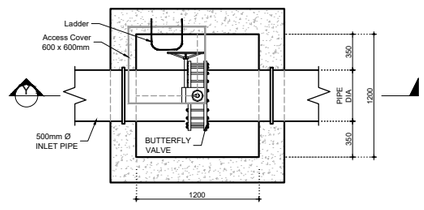




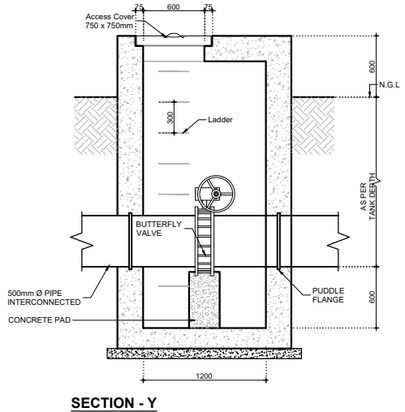
PLAN - 1



SECTION - X

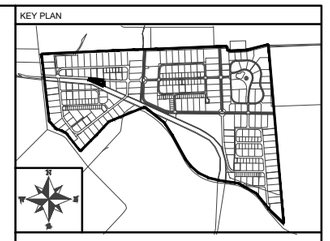


PLAN - 2



SECTION - Y

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	FEB, 2025

PROJECT:

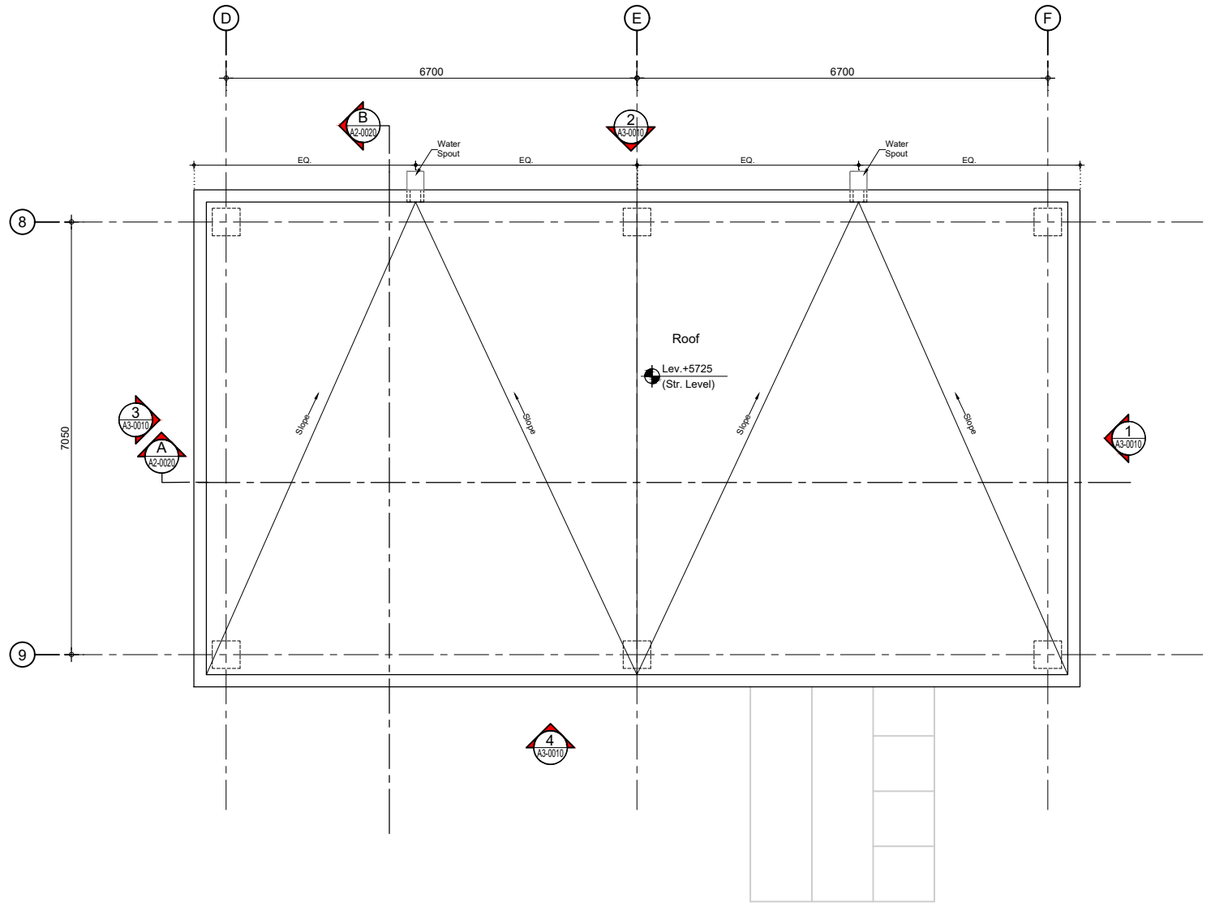
KARACHI INDUSTRIAL PARK SEZ

DRAWN	MT	SCALE	1:50
DESIGN	SAF	DATE	FEB, 2025
CHECKED	AM	DESIGN STAGE	TD
APPROVED	AM	ISSUE	TD
ACTUAL SHEET SIZE			A1

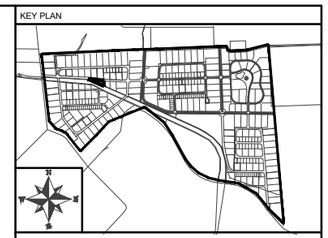
DRAWING TITLE:

PP-01 (Part Plan -01)

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-PS-A1-0201	0



KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

PIDC

SUBSANA JURONG | OMS | iCONSULT — INNOVATION THROUGH EXCELLENCE

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	FEB, 2025

PROJECT:

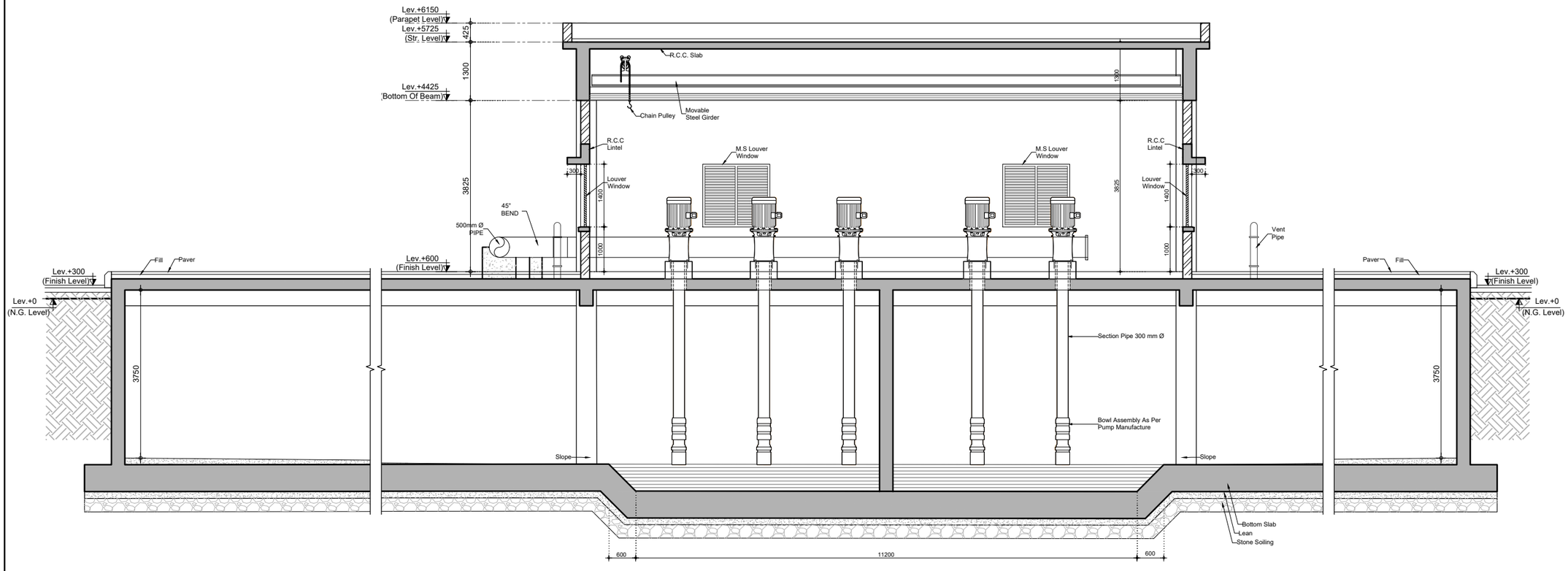
KARACHI INDUSTRIAL PARK SEZ

DRAWN	MT	SCALE	1:50
DESIGN	SAF	DATE	FEB, 2025
CHECKED	AM	DESIGN STAGE	TD
APPROVED	AM	ISSUE	TD
ACTUAL SHEET SIZE			A1

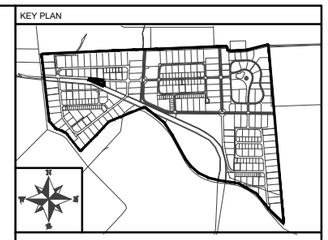
DRAWING TITLE:

ROOF

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-PS-A1-0300	0



KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	FEB, 2025

PROJECT:

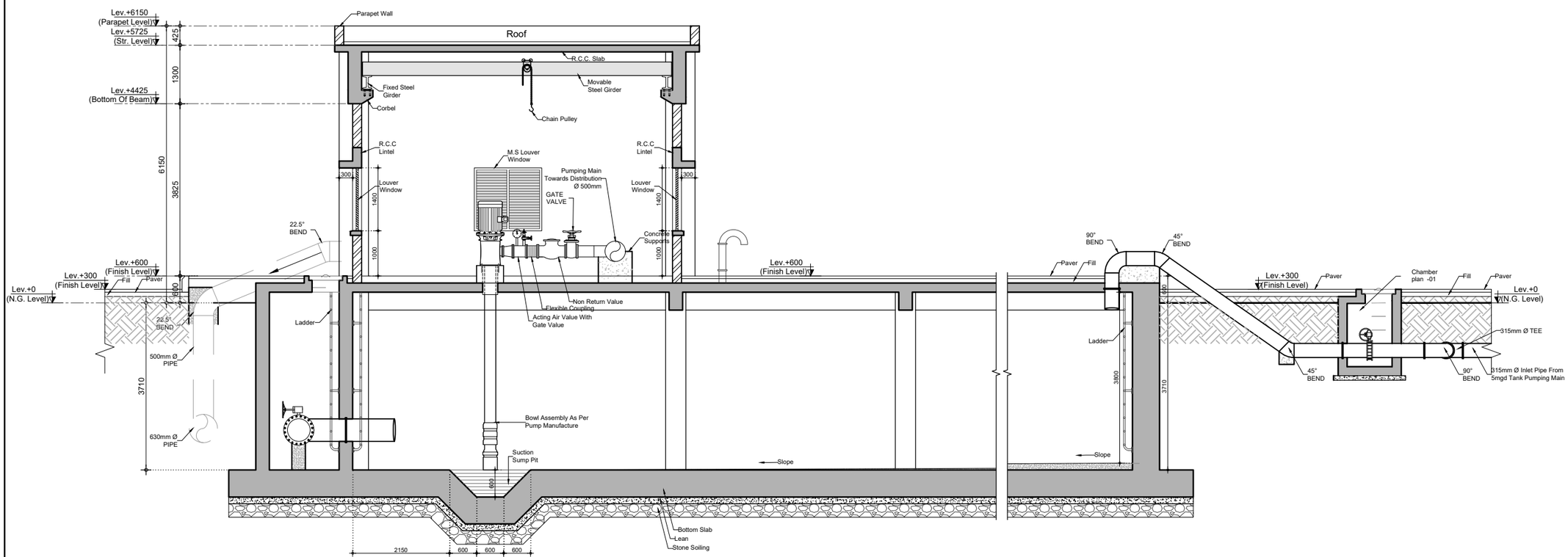
KARACHI INDUSTRIAL PARK SEZ

DRAWN	MT	SCALE	1:50
DESIGN	SAF	DATE	FEB, 2025
CHECKED	AM	DESIGN STAGE	TD
APPROVED	AM	ISSUE	TD
ACTUAL SHEET SIZE			A1

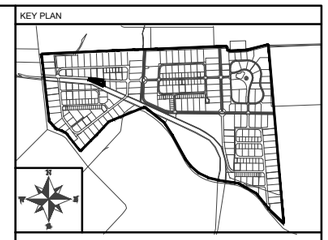
DRAWING TITLE:

SECTION A

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-PS-A2-0010	0



KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	FEB, 2025

PROJECT:

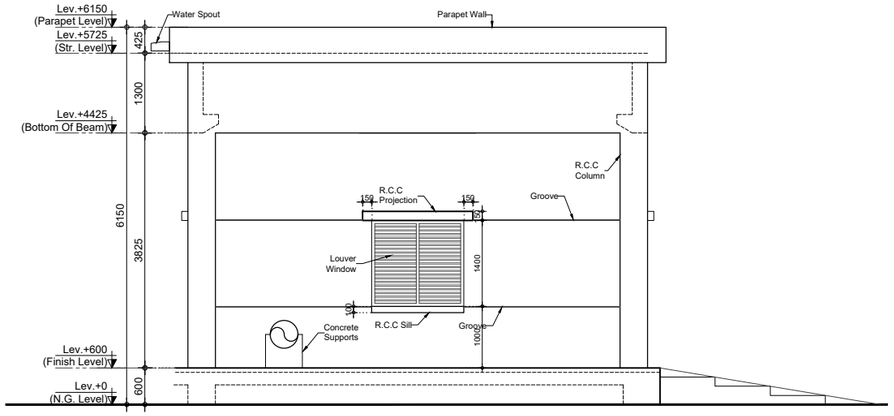
KARACHI INDUSTRIAL PARK SEZ

DRAWN	MT	SCALE	1:50
DESIGN	SAF	DATE	FEB, 2025
CHECKED	AM	DESIGN STAGE	TD
APPROVED	AM	ISSUE	TD
ACTUAL SHEET SIZE			A1

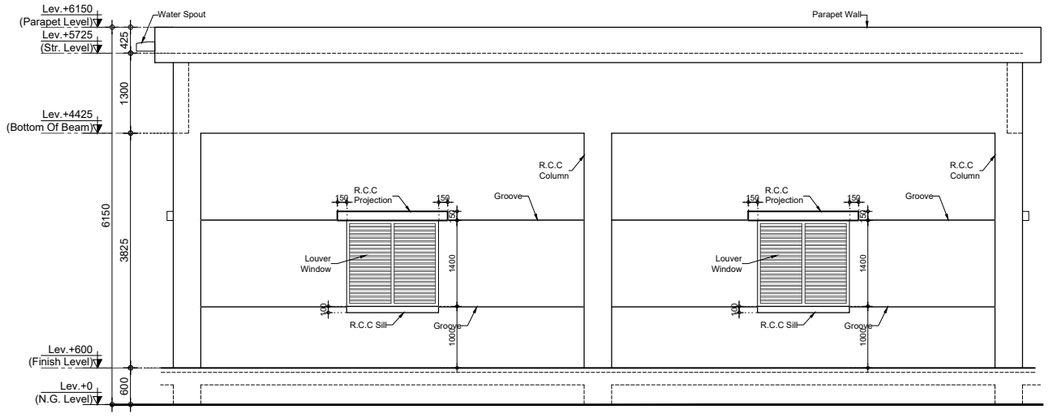
DRAWING TITLE:

SECTION B

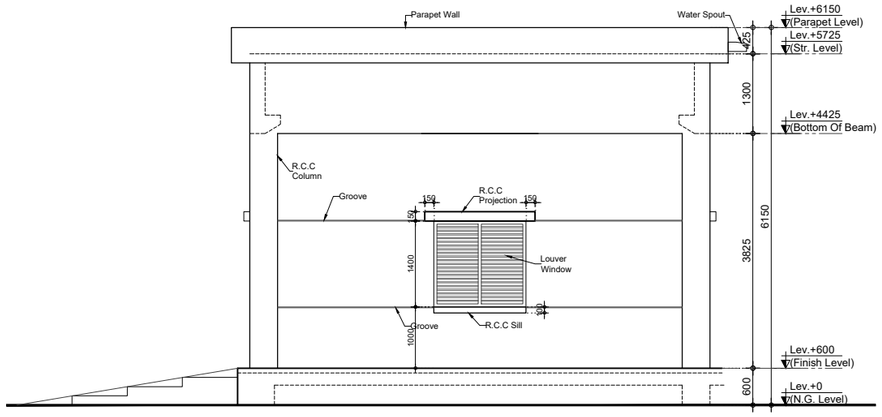
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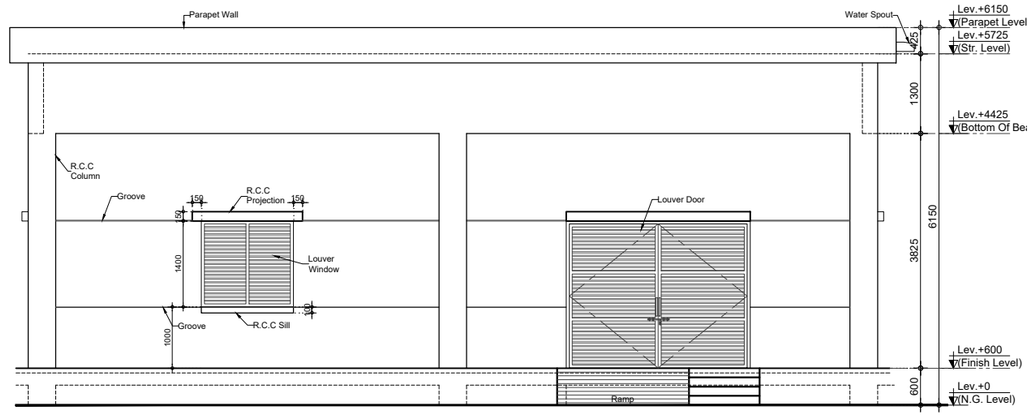
ELEVATION - 03



ELEVATION - 04

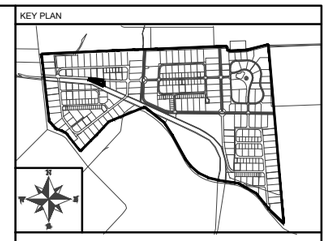


ELEVATION - 01



ELEVATION - 02

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	FEB, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	MT	SCALE	1:50
DESIGN	SAF	DATE	FEB, 2025
CHECKED	AM	DESIGN STAGE	TD
APPROVED	AM	ISSUE	TD
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

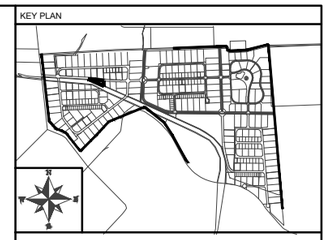
ELEVATIONS

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-PS-A3-0010	0

S#	TITLE	FLOOR	SKIRTING / DADO	WALL	CEILING	COLOR	REMARKS
	GROUND FLOOR						
01	Pump Room	PCC	-	MEP	OBD	--	-

DESCRIPTION COMPOUND WORDS		
S#	**ABBREVIATION**	**MEANING**
01	PCC	Plain Cement Concrete
02	OBD	Oil Bond Distemper
03	MEP	Matt Enamel Paint

KEY PLAN



NOTE:

LEGEND:

FINISHES SCHEDULE

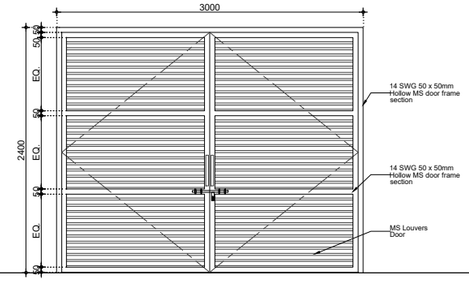
WINDOWS

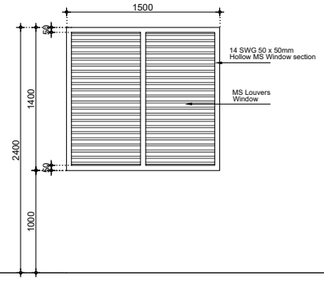
S.No.	Window Tags	Size Of Windows & Ventilators		Quantity		Glazing	Material	Finishes	Architrave	Chaukat	Chaukat Finish	Notes
		Width	Height	Ground Floor	Qty.							
01	LW1	1500	1400	05	05	Louvers	M.S	Matt Enamel Paint	-	-	-	-

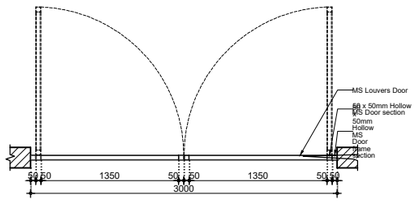
DOORS

S.No.	Door Type	Size Of Doors		Quantity		Type	Material	Finishes	Chaukat	Chaukat Finish	Notes
		Width	Height	Ground Floor	Qty.						
01	LD1	3000	2400	01	01	Double	Metal Door As Specified	Matt Enamel Paint	-	-	-

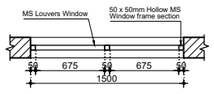
DOOR & WINDOW SCHEDULE







LD1 PLAN 3000x2400



LW1 PLAN 1200x1000

DOOR & WINDOW ELEVATIONS

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	FEB, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	MT	SCALE	1:50
DESIGN	SAF	DATE	FEB, 2025
CHECKED	AM	DESIGN STAGE	TD
APPROVED	AM	ISSUE	TD
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

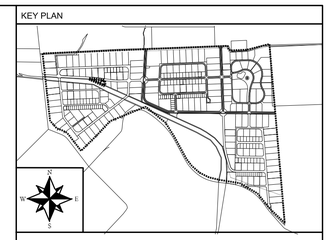
FINISHES, DOOR & WINDOW SCHEDULE

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-PS-A6-0010	0

SECURITY TOWER

S. NO.	DRAWING NO.	DRAWING TITLE	REVISION NO
1	EA-1098-KIP-ST-000	LIST OF DRAWING	00
2	EA-1098-KIP-ST-001	GENERAL NOTES	00
3	EA-1098-KIP-ST-101	SECURITY TOWER CONCRETE, FOUNDATION & COLUMN REINFORCEMENT DETAILS	00

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	AF	SCALE	1:30
DESIGN	SAF	DATE	FEB, 2025
CHECKED	AM	DESIGN STAGE	TENDER
APPROVED	AM	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LIST OF DRAWING

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-ST-000	0

CONCRETE GENERAL NOTES

1. GENERAL

1.1 STRUCTURAL DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL OTHER DISCIPLINE DRAWINGS, DOCUMENTS, SPECIFICATIONS ETC. AS PART OF THE CONTRACT DOCUMENT OR. MAY BE ISSUED DURING THE COURSE OF THE CONTRACT.

1.2 DIMENSIONS SHALL NOT BE OBTAINED BY SCALING DRAWINGS.

1.3 FOR MAIN SETTING OUT LINES AND LEVELS REFER TO ARCHITECTURAL DRAWINGS.

1.4 THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THE SAFETY OF CONSTRUCTION AT ALL TIMES AND SHALL ENSURE THAT NO PART OF INTERMEDIATE COMPLETED CONSTRUCTION IS HAZARDOUS (FOR EXAMPLE; SIDES OF EXCAVATION, STARTER BARS ETC.)

1.5 THE CONTRACTOR SHALL PROVIDE TEMPORARY BRACING AND SHORING AGAINST LATERAL FORCES AND ALL CONSTRUCTION LOADS THROUGHOUT THE CONSTRUCTION PROCESS.

1.6 ALL ELEMENTS OF THE STRUCTURE DESIGNED BY THE CONTRACTOR SHALL BE SUBMITTED TO DESIGN CONSULTANT FOR REVIEW.

1.7 THE DESIGN CONSULTANT'S REVIEW PROCESS FOR ALL SUBMITTALS, DRAWINGS, METHOD STATEMENTS AND DOCUMENTS IS ONLY COMPLETE ONCE A STATUS OF 'NO OBJECTION' IS REACHED. THE SUBMITTAL SHALL BE REVIEWED BY THE DESIGN CONSULTANT FOR COMPLIANCE WITH THE DESIGN INTENT THIS DOES NOT RELIEVE THE CONTRACTOR FROM HIS CONTRACTUAL RESPONSIBILITIES.

1.8 FOR ALL BUILDERS WORK INFORMATION (OPENINGS IN STRUCTURAL ELEMENTS):- LIGHTING POINTS, GULLIES, CAST-IN PIPES, SLEEVES, ELECTRICAL TRENCHES, MANHOLES ETC, REFER TO MEP DRAWINGS FOR LOCATION. THE CONTRACTOR SHALL PREPARE COORDINATED SERVICES DRAWINGS IDENTIFYING STRUCTURAL, MEP AND ARCHITECTURAL ELEMENTS/DETAILS FOR CONSULTANT'S REVIEW BEFORE COMMENCEMENT OF CONSTRUCTION IN THE AREA CONCERNED.

1.9 ALL DESIGN, WORKMANSHIP AND MATERIAL SHALL BE IN ACCORDANCE WITH THE CURRENT ACI, UBC, IBC, AISC AND LOCAL AUTHORITY STANDARDS AND PROJECT DESIGN CRITERIA UNLESS NOTED OTHERWISE.

2. DESIGN CODE OF PRACTICE

2.1 1997 UNIFORM BUILDING CODE.

2.2 ACI-318 BUILDING CODE FOR STRUCTURAL CONCRETE AND COMMENTARY.

2.3 ASCE/SEI 7 MINIMUM DESIGN LOADS FOR BUILDING AND OTHER STRUCTURES.

2.4 ANSI/AISC 360 SPECIFICATION FOR STRUCTURAL STEEL BUILDING.

2.5 ANSI/AISC 341 SEISMIC PROVISIONS FOR STRUCTURAL STEEL BUILDING.

2.6 BCP-SP-2007 SEISMIC BUILDING CODE OF PAKISTAN.

2.7 ACI 360 DESIGN OF SLAB ON GRADE

3. FOUNDATIONS

3.1 THE CONTRACTOR SHALL READ AND FAMILIARIZE HIMSELF WITH THE GEOTECHNICAL INVESTIGATION REPORT AS WELL AS VISIT THE SITE AND BECOME THOROUGHLY FAMILIAR WITH THE SURFACE AND SUBSURFACE CONDITIONS.

3.2 LOOSE POCKETS OF SOIL WHICH ARE ENCOUNTERED SHALL BE REMOVED AND REPLACED WITH GOOD GRANULAR FILL MATERIAL TO ACHIEVE THE DESIRED BEARING PRESSURE.

3.3 ANY ADJACENT FOOTING IN THE VICINITY OF THE WORK SHALL BE PROPERLY PROTECTED BEFORE EXECUTION OF WORK.

3.4 FOUNDATION SHALL BE PLACED ON FIRM AND VIRGIN GROUND FROM EXISTING GROUND LEVEL AS PER SOIL INVESTIGATION REPORT CONDUCTED BY SOILMAT, BEFORE PLACING THE FOUNDATION CONCRETE, THE EXCAVATIONS SHOULD BE CAREFULLY INSPECTED TO ENSURE THAT COMPETENT BEARING STRATUM HAS BEEN REACHED AND FILL HAS BEEN CROSSED.

3.5 FOUNDATION IS DESIGN ON ASSUMED NET BEARING CAPACITY OF 170 KPA AT THE DEPTH OF 2.0m.

3.5 DEWATERING MUST BE STARTED RIGHT AFTER EXCAVATION AND CONTINUE UNTIL WHOLE STRUCTURE IS CONSTRUCTED.

4. REINFORCED CONCRETE

4.1 THE CONTRACTOR SHALL SUBMIT DETAILED RC DRAWINGS AND BAR BENDING SCHEDULES SHOWING BAR SIZES, SPACING, PLACEMENT AND SUPPORT DETAILS DOWELS AT EXPANSION JOINTS AND LAPS ETC. FOR REVIEW AND ACCEPTANCE OF THE DESIGN CONSULTANT. WORK SHALL NOT COMMENCE UNTIL THE SHOP DRAWINGS ARE REVIEWED AND ACCEPTED REVIEW OF SHOP DRAWINGS DOES NOT ALLEVIATE THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE THE INPUT OF ALL TRADES ON THE SHOP DRAWINGS.

4.2 REFER TO SPECIFICATIONS FOR QUALITY AND PERFORMANCE REQUIREMENTS OF CONCRETE.
(I) FOR THE TYPE OF CEMENT FOLLOW THE GEOTECHNICAL RECOMMENDATION

4.3 ALL CAST-IN-SITU CONCRETE SHALL HAVE A MINIMUM 28 DAYS CYLINDRICAL STRENGTH UNLESS NOTED OTHERWISE OR MENTIONED IN FOLLOWING TABLE:

COLUMNS	= 28 Mpa (4000 Psi) 28 DAYS CYLINDRICAL STRENGTH.
WALLS, BEAMS, SLABS & FOUNDATIONS	= 28 Mpa (3000 Psi) 28 DAYS CYLINDRICAL STRENGTH.

4.4 WATER CEMENT RATIO SHALL NOT EXCEED 0.5

4.5 MAXIMUM POSSIBLE WATER-SOLUBLE CHLORIDE ION (CL) CONTENT IN CONCRETE SHALL NOT EXCEED 0.15% BY WEIGHT OF CEMENT.

4.6 MAXIMUM SIZE OF COURSE AGGREGATE SHALL BE 25MM UNLESS NOTED OTHERWISE.

4.7 CONTRACTOR SHALL GET APPROVAL FROM DESIGN CONSULTANT OF A CONCRETE MIX DESIGN.

4.8 THE CONTRACTOR SHALL PERFORM AND SUBMIT FOR REVIEW INSTRUMENT SURVEYS OF FINISHED CONCRETE SLAB SURFACES, BOTH BEFORE AND AFTER REMOVAL OF FORM WORK AND/OR SHORING SYSTEM TO VERIFY AS-BUILT TOLERANCES.

4.9 REFER TO SPECIFICATIONS FOR REQUIREMENTS OF CONCRETE SURFACE FINISH AND CASTING TOLERANCE.

4.10 PROVIDE UPWARD CAMBER TO SLABS AND BEAMS AS NOTED ON STRUCTURAL DRAWINGS AND/OR SPECIFICATIONS CAMBER BOTH UNDERSIDE AND TOP OF CONCRETE TO MAINTAIN THE SLAB AND BEAM DEPTH SHOWN ON THE DRAWINGS UNLESS NOTED OTHERWISE.

4.11 BEAMS, SLABS, COLUMNS, WALLS AND FOUNDATION ELEMENTS SHALL NOT BE SLEEVED OR BOXED-OUT OR HAVE THE REINFORCEMENT INTERRUPTED EXCEPT AS INDICATED ON THE STRUCTURAL DRAWINGS.

4.12 ALL CONCRETE SHALL CONTAIN AN APPROVED WATER REDUCING, PLASTICIZING ADMIXTURE. APPROVED HIGH RANGE WATER REDUCING ADMIXTURE MAY BE UTILIZED AT THE CONTRACTOR'S OPTION. ALL CONCRETE PERMANENTLY EXPOSED TO WEATHER SHALL ALSO CONTAIN AN APPROVED AIR-ENTRAINING ADMIXTURE TO PROVIDE PERCENTAGE OF AIR REQUIRED FOR SEVERE EXPOSURE AS PER ACI 318.

4.13 ADMIXTURE/WATER CONTAINING CHLORIDE IONS SHELL NOT BE USED IN ANY CONCRETE.

4.14 THE FOLLOWING CONCRETE CLEAR COVER TO PRIMARY REINFORCEMENT SHALL BE PROVIDED, UNLESS LARGER COVER IS NOTED ON THE STRUCTURAL DRAWINGS.

ELEMENT	CONCRETE CLEAR COVER SCHEDULE	
	ABOVE GROUND INTERIOR ENVIRONMENT	ABOVE GROUND EXTERIOR ENVIRONMENT
COLUMNS(VERTICAL BARS)	40	50
BEAMS(LONGITUDINAL BARS)	40	50
WALLS	25	35
GRADE SLAB	25	35
SUSPENDED SLAB	25	35
EQUIPMENT PAD	25	35
WATER TANK	50	50

NOTE: - CLEAR COVER SHALL NOT BE LESS THAN ONE BAR DIA.
- CONCRETE COVER FOR SURFACE CAST AGAINST SOIL SHALL BE 75 AND FOR SURFACE INCONTACT WITH SOIL SHALL BE 50.

4.15 AGGREGATE FOR CONCRETE SHALL BE FROM APPROVED SOURCE AND SHALL COMPLY WITH THE SPECIFICATION REQUIREMENTS.

4.16 HORIZONTAL CONSTRUCTION JOINTS SHALL NOT BE MADE IN BEAMS UNLESS SHOWN OR REVIEWED BY DESIGN CONSULTANT. VERTICAL CONSTRUCTION JOINTS MAY BE MADE AT MIDSPAN OF BEAMS. OR SLABS HAVING NO POINT LOADS AT CENTER OF SPAN. UNLESS OTHERWISE NOTED OR SHOWN OR DIRECTED BY THE DESIGN CONSULTANT.

4.17 ALL CONCRETE SHALL BE COMPACTED USING ONLY MECHANICAL VIBRATION PROCESS.

4.18 ALL CONCRETE SHALL BE CURED IN ACCORDANCE WITH THE SPECIFICATIONS.

5. REINFORCEMENT

5.1 ALL REINFORCING BARS SHALL BE DEFORMED BARS WITH YIELD STRENGTH OF 414MPa CONFORMING TO ASTM A615.

5.2 EPOXY COATED REINFORCING BARS SHALL NOT BE PERMITTED.

5.3 ALL REINFORCING BARS SHALL BE DETAILED, FABRICATED, LABELED, SUPPORTED, SPACED IN FORMS AND SECURED IN PLACE IN ACCORDANCE WITH THE PROCEDURES AND REQUIREMENTS OUTLINED IN THE CURRENT ACI 318 AND ACI 315 UNLESS NOTED OTHERWISE ON THE STRUCTURAL DRAWINGS.

5.4 ALL STARTER BARS SHALL BE SURVEYED AND LOCATION CONFIRMED IN AS-BUILT CONDITION PRIOR TO PLACING WALL/COLUMN REINFORCEMENT AND ANY DISCREPANCIES SHALL BE REPORTED TO THE DESIGN CONSULTANT FOR INSTRUCTIONS.

5.5 PROVIDE STARTER BARS TO WALLS AND COLUMNS SIMILAR IN NUMBER AND SIZE AND SPACING TO THE VERTICAL BARS ABOVE UNLESS NOTED OTHERWISE.

5.6 WELDING AND/OR SITE CUTTING OF THE REINFORCING BARS SHALL NOT BE PERMITTED UNLESS REVIEWED AND ACCEPTED BY THE DESIGN CONSULTANT.

5.7 ALL PROPRIETARY FIXING SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.

5.8 ALL REINFORCING SPLICES SHALL BE CLASS B TENSION SPLICES IN ACCORDANCE WITH THE CURRENT ACI 318 UNLESS NOTED OTHERWISE. REFER TO SCHEDULE BELOW FOR SPLICE LENGTHS.

TENSION SPLICE LENGTH	
CLASS A	1.0X DEVELOPMENT LENGTH
CLASS B	1.3X DEVELOPMENT LENGTH

CLASS A = As PROVIDED ⩾ 2 As REQUIRED AND PERCENTAGE As SPLIES < 50%
CLASS B = ALL OTHER CONDITIONS

5.9 ALL WIRE MESH REINFORCEMENT SHALL BE LAPPED AT LEAST 2 MESH PANELS AND SECURELY TIED. ALL REINFORCING DEVELOPMENT LENGTHS SHALL BE TENSION DEVELOPMENT LENGTHS IN ACCORDANCE WITH THE CURRENT ACI 318 UNLESS NOTED OTHERWISE. REFER TO SCHEDULE BELOW.

	TENSION DEVELOPMENT LENGTHS*					
	FOR f'c= 4ksi (28MPa)					
	T10	T12	T16	T20	T25	T32
CLEAR SPACING OF BARS BEING DEVELOPED OR SPLICED NOT LESS THAN DIA OF BAR, AND BEAM STIRRUPS COLUMNS TIES THROUGHOUT SPACE LENGTH NOT LESS THAN THE CODE MINIMUM OR CLEAR SPACING OF BARS BEING DEVELOPED OR SPLICED NOT LESS THAN TWICE THE DIA OF BAR, AND CLEAR COVER NOT LESS THAN DIA OF BAR	385	465	615	925	1200	1550
OTHER CASES	575	690	925	1450	1800	2300
*ABOVE DEVELOPMENT LENGTH SHALL BE MULTIPLIED BY 1.3 WHERE HORIZONTAL REINFORCEMENT IS PLACED SUCH THAT MORE THEN 300mm OF FRESH CONCRETE IS CAST BELOW.						

	TENSION DEVELOPMENT LENGTHS*					
	FOR f'c= 21 Mpa (3 Ksi)					
	T10	T12	T16	T20	T25	T32
CLEAR SPACING OF BARS BEING DEVELOPED OR SPLICED NOT LESS THAN DIA OF BAR, AND BEAM STIRRUPSOR COLUMNS TIES THROUGHOUT SPACE LENGTH NOT LESS THAN THE CODE MINMUM OR CLEAR SPACING OF BARS BEING DEVELOPED OR SPLICED NOT LESSTHAN TWICE THE DIA OF BAR, AND CLEAR COVER NOT LESS THAN DIA OF BAR	435	525	700	1075	1350	1725
OTHER CASES	655	790	1050	1650	2080	2665
*ABOVE DEVELOPMENT LENGTH SHALL BE MULTIPLIED BY 1.3 WHERE HORIZONTAL REINFORCEMENT IS PLACED SUCH THAT MORE THEN 300mm OF FRESH CONCRETE IS CAST BELOW.						

5.10 MECHANICAL SPLICING OF LARGE DIAMETER BARS MAY BE ACCEPTABLE SUBJECT T0 REVIEW BY THE DESIGN CONSULTANT

5.11 FOR HOUSE KEEPING PADS AND FLOATING SLABS PROVIDE REINFORCEMENT IN ACCORDANCE WITH THE CURRENT ACI 318 UNLESS NOTED OTHERWISE OR SHOWN ON THE STRUCTURAL DRAWINGS.

5.12 COUPLERS TO BE PROVIDED COLUMN R/F EXCEEDS 3.0%.

6. ANCHORAGE OF BARS BY HOOKS:

* THE DIMENSIONS AND BENDING RADII FOR HOOKS TO BE USE AS STANDARDIZED IN THE ACI CODE:

6.1 A 180° BEND PLUS AN EXTENSION OF AT LEAST 4 BAR DIAMETERS, BUT NOT LESS THAN 2.5 IN AT THE FREE END OF BAR OR

6.2 A 90° BEND PLUS AN EXTENSION OF AT LEAST 12 BAR DIAMETERS AT THE FREE END OF THE BAR, OR

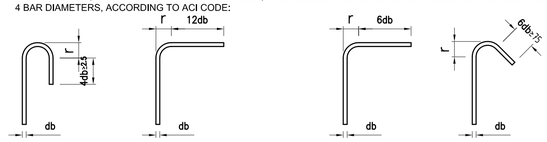
6.3 FOR STIRRUP AND TIE ANCHORAGE ONLY:

6.3.1 FOR NO. 5 BARS AND SMALER, A 90° BEND PLUS AN EXTENSION OF AT LEAST 6 BAR DIAMETERS AT THE FREE END OF THE BAR, OR

6.3.2 FOR NOS. 6.7 AND 8 BARS, A 90° BEND PLUS AN EXTENSION OF AT LEAST 12 BAR DIAMETERS AT THE FREE END OF THE BAR, OR

6.3.3 FOR NO. 8 BARS AND SMALLER, A 135° BEND PLUS AN EXTENSION OF AT LEAST 6 BAR DIAMETERS AT THE FREE END OF THE BAR.

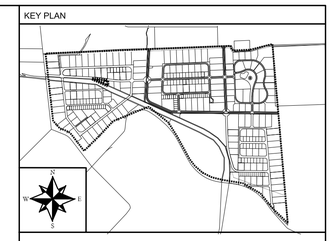
THE MINIMUM DIAMETER OF BEND, MEASURED ON THE INSIDE OF THE BAR, FOR STANDARD HOOKS OTHER THAN FOR STIRRUPS OR TIES IN SIZES NOS. 3 THROUGH 5, SHOULD NOT BE LESS THAN 6 BAR DIAMETER. FOR STIRRUP AND TIE HOOKS, FOR BAR SIZES NO.5 AND SMALLER, THE INSIDE DIAMETER OF BEND SHOULD NOT BE LESS THEN 4 BAR DIAMETERS, ACCORDING TO ACI CODE:



(a). MAIN REINFORCEMENT
r = 4db FOR db ≤T25
r = 5db FOR db >T25

(b). STIRRUPS AND TIES

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

SUBSANA JURONG | OMS | iCONSULT INNOVATION THROUGH EXCELLENCE

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	AF	SCALE	1:30
DESIGN	SAF	DATE	FEB, 2025
CHECKED	AM	DESIGN STAGE	TENDER
APPROVED	AM	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

GENERAL NOTES

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-ST-001	0

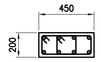
NOTES:

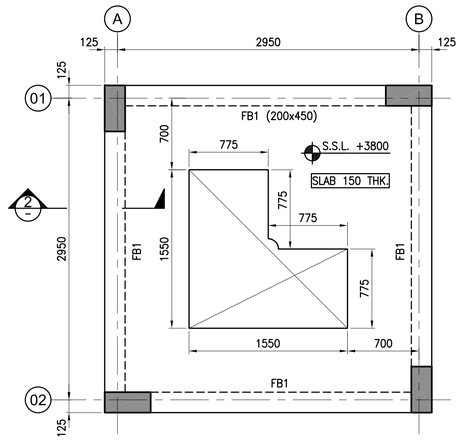
1. ALL DIMENSIONS ARE IN MILLIMETER AND ELEVATIONS ARE ALSO IN MIILLIMETERS UNLESS NOTED OTHERWISE.
2. FOR NOTES REFER DWG NO EA–1098–KIP–ST–001.

SCHEDULE OF FOOTING

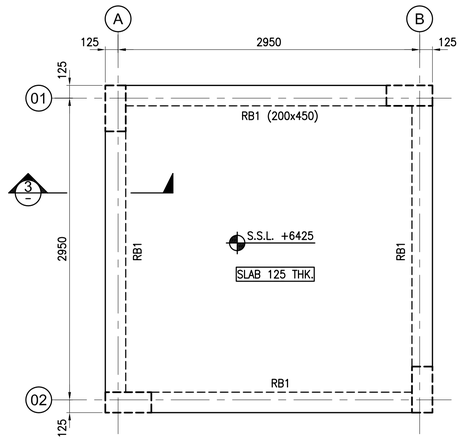
S.NO.	FOOTING	FOOTING SIZE		FOOTING THICKNESS	BOTTOM REINFORCEMENT		TOP REINFORCEMENT		REMARKS
		A	B	C	SHORT BAR	LONG BAR	SHORT BAR	LONG BAR	
1	F1	1350	1050	375	T12–150	T12–150	–	–	ISOLATED FOOTING

COLUMN SCHEDULE

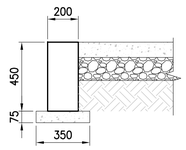
ROOF TO FOUNDATION	 BARS: 8–T12 RINGS: 2–T12–150
COLUMN MARK	C1



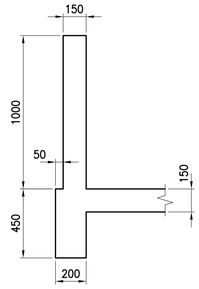
D – FIRST FLOOR FRAMING PLAN
SCALE = 1:30



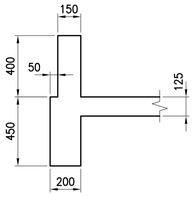
E – ROOF FRAMING PLAN
SCALE = 1:30



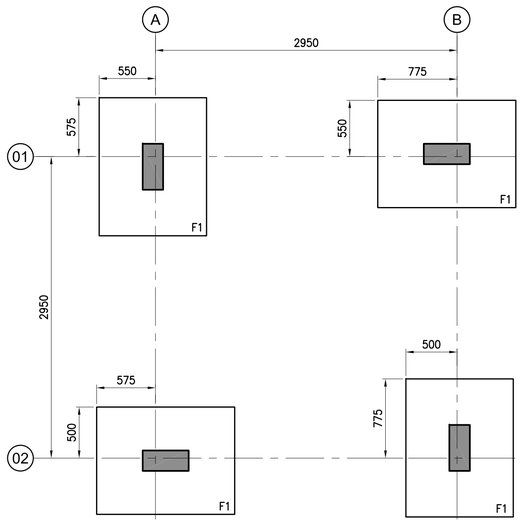
SECTION 1 –
SCALE = 1:20



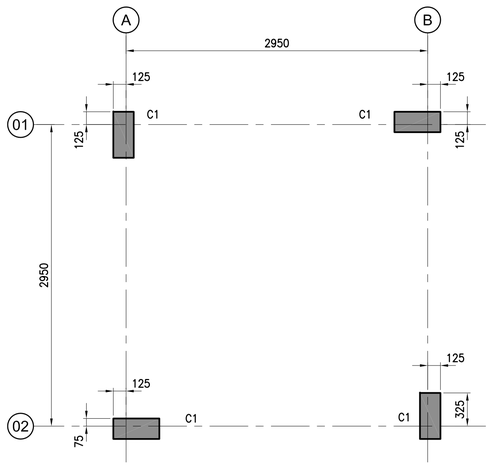
SECTION 2 –
SCALE = 1:20



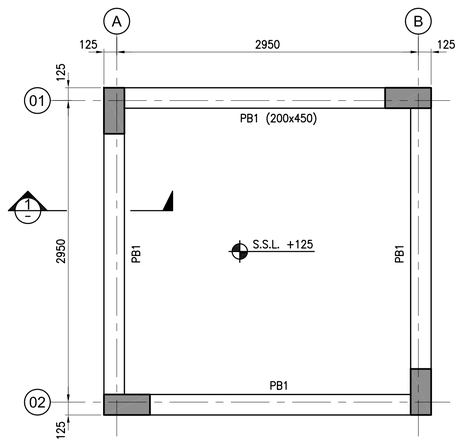
SECTION 3 –
SCALE = 1:20



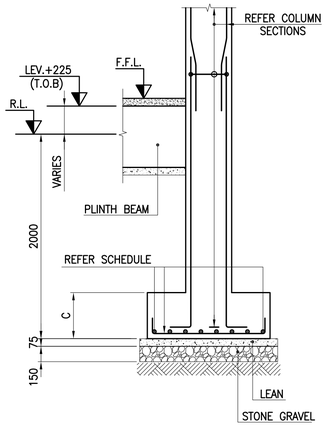
A – FOUNDATION LAYOUT
SCALE = 1:30



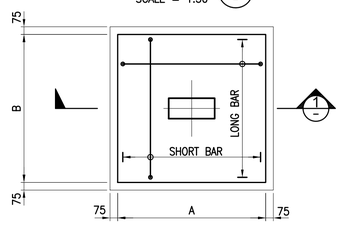
B – COLUMN LAYOUT
SCALE = 1:30



C – GROUND FLOOR FRAMING PLAN
SCALE = 1:30

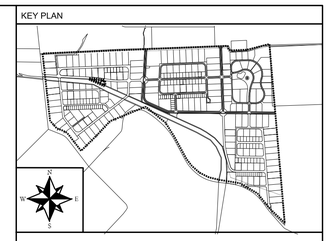


SECTION 1 –
SCALE = 1:30



C – TYPICAL PLAN OF ISOLATED FOOTING
SCALE = 1:30

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	AF	SCALE	1:30
DESIGN	SAF	DATE	FEB, 2025
CHECKED	AM	DESIGN STAGE	TENDER
APPROVED	AM	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

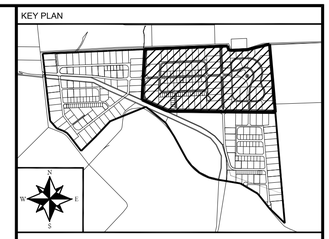
SECURITY TOWER CONCRETE, FOUNDATION & COLUMN REINFORCEMENT DETAILS

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-ST-101	0

GATE HOUSE - 02

S. NO.	DRAWING NO.	DRAWING TITLE	REVISION NO
1	EA-1098-KIP-U-GH02-S-000	LIST OF DRAWING	00
2	EA-1098-KIP-U-GH02-S-001	GENERAL NOTES	00
3	EA-1098-KIP-U-GH02-S-101	GATE HOUSE - 02 COLUMN, FOUNDATION LAYOUT PLAN AND DETAILS	00
4	EA-1098-KIP-U-GH02-S-102	GATE HOUSE - 02 PLINTH LEVEL, ROOF FRAMING PLAN AND DETAILS	00

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	A.I	SCALE	AS SHOWN
DESIGN	A.A	DATE	JUNE, 2025
CHECKED	M.L	DESIGN STAGE	TENDER
APPROVED	M.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LIST OF DRAWING

PROJ CODE	DRAWING NO.	REV.
01098	EA-1098-KIP-U-GH02-S-000	0

CONCRETE GENERAL NOTES

1. GENERAL

1.1 STRUCTURAL DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL OTHER DISCIPLINE DRAWINGS, DOCUMENTS, SPECIFICATIONS ETC. AS PART OF THE CONTRACT DOCUMENT OR. MAY BE ISSUED DURING THE COURSE OF THE CONTRACT.

1.2 DIMENSIONS SHALL NOT BE OBTAINED BY SCALING DRAWINGS.

1.3 FOR MAIN SETTING OUT LINES AND LEVELS REFER TO ARCHITECTURAL DRAWINGS.

1.4 THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THE SAFETY OF CONSTRUCTION AT ALL TIMES AND SHALL ENSURE THAT NO PART OF INTERMEDIATE COMPLETED CONSTRUCTION IS HAZARDOUS (FOR EXAMPLE; SIDES OF EXCAVATION, STARTER BARS ETC.)

1.5 THE CONTRACTOR SHALL PROVIDE TEMPORARY BRACING AND SHORING AGAINST LATERAL FORCES AND ALL CONSTRUCTION LOADS THROUGHOUT THE CONSTRUCTION PROCESS.

1.6 ALL ELEMENTS OF THE STRUCTURE DESIGNED BY THE CONTRACTOR SHALL BE SUBMITTED TO DESIGN CONSULTANT FOR REVIEW.

1.7 THE DESIGN CONSULTANT'S REVIEW PROCESS FOR ALL SUBMITTALS, DRAWINGS, METHOD STATEMENTS AND DOCUMENTS IS ONLY COMPLETE ONCE A STATUS OF 'NO OBJECTION' IS REACHED, THE SUBMITTAL SHALL BE REVIEWED BY THE DESIGN CONSULTANT FOR COMPLIANCE WITH THE DESIGN INTENT THIS DOES NOT RELIEVE THE CONTRACTOR FROM HIS CONTRACTUAL RESPONSIBILITIES.

1.8 FOR ALL BUILDERS WORK INFORMATION (OPENINGS IN STRUCTURAL ELEMENTS):- LIGHTING POINTS, GULLIES, CAST-IN PIPES, SLEEVES, ELECTRICAL TRENCHES, MANHOLES ETC, REFER TO MEP DRAWINGS FOR LOCATION. THE CONTRACTOR SHALL PREPARE COORDINATED SERVICES DRAWINGS IDENTIFYING STRUCTURAL, MEP AND ARCHITECTURAL ELEMENTS/DETAILS FOR CONSULTANT'S REVIEW BEFORE COMMENCEMENT OF CONSTRUCTION IN THE AREA CONCERNED.

1.9 ALL DESIGN, WORKMANSHIP AND MATERIAL SHALL BE IN ACCORDANCE WITH THE CURRENT ACI, UBC, IBC, AISC AND LOCAL AUTHORITY STANDARDS AND PROJECT DESIGN CRITERIA UNLESS NOTED OTHERWISE.

2. DESIGN CODE OF PRACTICE

2.1 1997 UNIFORM BUILDING CODE.

2.2 ACI-318 BUILDING CODE FOR STRUCTURAL CONCRETE AND COMMENTARY.

2.3 ASCE/SEI 7 MINIMUM DESIGN LOADS FOR BUILDING AND OTHER STRUCTURES.

2.4 ANSI/AISC 360 SPECIFICATION FOR STRUCTURAL STEEL BUILDING.

2.5 ANSI/AISC 341 SEISMIC PROVISIONS FOR STRUCTURAL STEEL BUILDING.

2.6 BCP-SP-2007 SEISMIC BUILDING CODE OF PAKISTAN.

2.7 ACI 360 DESIGN OF SLAB ON GRADE

3. FOUNDATIONS

3.1 THE CONTRACTOR SHALL READ AND FAMILIARIZE HIMSELF WITH THE GEOTECHNICAL INVESTIGATION REPORT AS WELL AS VISIT THE SITE AND BECOME THOROUGHLY FAMILIAR WITH THE SURFACE AND SUBSURFACE CONDITIONS.

3.2 LOOSE POCKETS OF SOIL WHICH ARE ENCOUNTERED SHALL BE REMOVED AND REPLACED WITH GOOD GRANULAR FILL MATERIAL TO ACHIEVE THE DESIRED BEARING PRESSURE.

3.3 ANY ADJACENT FOOTING IN THE VICINITY OF THE WORK SHALL BE PROPERLY PROTECTED BEFORE EXECUTION OF WORK.

3.4 FOUNDATION SHALL BE PLACED ON FIRM AND VIRGIN GROUND FROM EXISTING GROUND LEVEL AS PER SOIL INVESTIGATION REPORT CONDUCTED BY SOILMAT. BEFORE PLACING THE FOUNDATION CONCRETE, THE EXCAVATIONS SHOULD BE CAREFULLY INSPECTED TO ENSURE THAT COMPETENT BEARING STRATUM HAS BEEN REACHED AND FILL HAS BEEN CROSSED.

3.5 FOUNDATION IS DESIGN ON ASSUMED NET BEARING CAPACITY OF 170 KPA AT THE DEPTH OF 2.0m.

3.5 DEWATERING MUST BE STARTED RIGHT AFTER EXCAVATION AND CONTINUE UNTIL WHOLE STRUCTURE IS CONSTRUCTED.

4. REINFORCED CONCRETE

4.1 THE CONTRACTOR SHALL SUBMIT DETAILED RC DRAWINGS AND BAR BENDING SCHEDULES SHOWING BAR SIZES, SPACING, PLACEMENT AND SUPPORT DETAILS DOWELS AT EXPANSION JOINTS AND LAPS ETC. FOR REVIEW AND ACCEPTANCE OF THE DESIGN CONSULTANT. WORK SHALL NOT COMMENCE UNTIL THE SHOP DRAWINGS ARE REVIEWED AND ACCEPTED REVIEW OF SHOP DRAWINGS DOES NOT ALLEVIATE THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE THE INPUT OF ALL TRADES ON THE SHOP DRAWINGS.

4.2 REFER TO SPECIFICATIONS FOR QUALITY AND PERFORMANCE REQUIREMENTS OF CONCRETE.
(I) FOR THE TYPE OF CEMENT FOLLOW THE GEOTECHNICAL RECOMMENDATION

4.3 ALL CAST-IN-SITU CONCRETE SHALL HAVE A MINIMUM 28 DAYS CYLINDRICAL STRENGTH UNLESS NOTED OTHERWISE OR MENTIONED IN FOLLOWING TABLE:

COLUMNS	= 28 Mpa (4000 Psi) 28 DAYS CYLINDRICAL STRENGTH.
WALLS, BEAMS, SLABS & FOUNDATIONS	= 28 Mpa (3000 Psi) 28 DAYS CYLINDRICAL STRENGTH.

4.4 WATER CEMENT RATIO SHALL NOT EXCEED 0.5

4.5 MAXIMUM POSSIBLE WATER-SOLUBLE CHLORIDE ION (CL) CONTENT IN CONCRETE SHALL NOT EXCEED 0.15% BY WEIGHT OF CEMENT.

4.6 MAXIMUM SIZE OF COURSE AGGREGATE SHALL BE 25MM UNLESS NOTED OTHERWISE.

4.7 CONTRACTOR SHALL GET APPROVAL FROM DESIGN CONSULTANT OF A CONCRETE MIX DESIGN.

4.8 THE CONTRACTOR SHALL PERFORM AND SUBMIT FOR REVIEW INSTRUMENT SURVEYS OF FINISHED CONCRETE SLAB SURFACES, BOTH BEFORE AND AFTER REMOVAL OF FORM WORK AND/OR SHORING SYSTEM TO VERIFY AS-BUILT TOLERANCES.

4.9 REFER TO SPECIFICATIONS FOR REQUIREMENTS OF CONCRETE SURFACE FINISH AND CASTING TOLERANCE.

4.10 PROVIDE UPWARD CAMBER TO SLABS AND BEAMS AS NOTED ON STRUCTURAL DRAWINGS AND/OR SPECIFICATIONS CAMBER BOTH UNDERSIDE AND TOP OF CONCRETE TO MAINTAIN THE SLAB AND BEAM DEPTH SHOWN ON THE DRAWINGS UNLESS NOTED OTHERWISE.

4.11 BEAMS, SLABS, COLUMNS, WALLS AND FOUNDATION ELEMENTS SHALL NOT BE SLEEVED OR BOXED-OUT OR HAVE THE REINFORCEMENT INTERRUPTED EXCEPT AS INDICATED ON THE STRUCTURAL DRAWINGS.

4.12 ALL CONCRETE SHALL CONTAIN AN APPROVED WATER REDUCING, PLASTICIZING ADMIXTURE. APPROVED HIGH RANGE WATER REDUCING ADMIXTURE MAY BE UTILIZED AT THE CONTRACTOR'S OPTION. ALL CONCRETE PERMANENTLY EXPOSED TO WEATHER SHALL ALSO CONTAIN AN APPROVED AIR-ENTRAINING ADMIXTURE TO PROVIDE PERCENTAGE OF AIR REQUIRED FOR SEVERE EXPOSURE AS PER ACI 318.

4.13 ADMIXTURE/WATER CONTAINING CHLORIDE IONS SHELL NOT BE USED IN ANY CONCRETE.

4.14 THE FOLLOWING CONCRETE CLEAR COVER TO PRIMARY REINFORCEMENT SHALL BE PROVIDED, UNLESS LARGER COVER IS NOTED ON THE STRUCTURAL DRAWINGS.

ELEMENT	CONCRETE CLEAR COVER SCHEDULE	
	ABOVE GROUND INTERIOR ENVIRONMENT	ABOVE GROUND EXTERIOR ENVIRONMENT
COLUMNS(VERTICAL BARS)	40	50
BEAMS(LONGITUDINAL BARS)	40	50
WALLS	25	35
GRADE SLAB	25	35
SUSPENDED SLAB	25	35
EQUIPMENT PAD	25	35
WATER TANK	50	50

NOTE: - CLEAR COVER SHALL NOT BE LESS THAN ONE BAR DIA.
- CONCRETE COVER FOR SURFACE CAST AGAINST SOIL SHALL BE 75 AND FOR SURFACE INCONTACT WITH SOIL SHALL BE 50.

4.15 AGGREGATE FOR CONCRETE SHALL BE FROM APPROVED SOURCE AND SHALL COMPLY WITH THE SPECIFICATION REQUIREMENTS.

4.16 HORIZONTAL CONSTRUCTION JOINTS SHALL NOT BE MADE IN BEAMS UNLESS SHOWN OR REVIEWED BY DESIGN CONSULTANT. VERTICAL CONSTRUCTION JOINTS MAY BE MADE AT MIDSPAN OF BEAMS. OR SLABS HAVING NO POINT LOADS AT CENTER OF SPAN. UNLESS OTHERWISE NOTED OR SHOWN OR DIRECTED BY THE DESIGN CONSULTANT.

4.17 ALL CONCRETE SHALL BE COMPACTED USING ONLY MECHANICAL VIBRATION PROCESS.

4.18 ALL CONCRETE SHALL BE CURED IN ACCORDANCE WITH THE SPECIFICATIONS.

5. REINFORCEMENT

5.1 ALL REINFORCING BARS SHALL BE DEFORMED BARS WITH YIELD STRENGTH OF 414MPa CONFORMING TO ASTM A615.

5.2 EPOXY COATED REINFORCING BARS SHALL NOT BE PERMITTED.

5.3 ALL REINFORCING BARS SHALL BE DETAILED, FABRICATED, LABELED, SUPPORTED, SPACED IN FORMS AND SECURED IN PLACE IN ACCORDANCE WITH THE PROCEDURES AND REQUIREMENTS OUTLINED IN THE CURRENT ACI 318 AND ACI 315 UNLESS NOTED OTHERWISE ON THE STRUCTURAL DRAWINGS.

5.4 ALL STARTER BARS SHALL BE SURVEYED AND LOCATION CONFIRMED IN AS-BUILT CONDITION PRIOR TO PLACING WALL/COLUMN REINFORCEMENT AND ANY DISCREPANCIES SHALL BE REPORTED TO THE DESIGN CONSULTANT FOR INSTRUCTIONS.

5.5 PROVIDE STARTER BARS TO WALLS AND COLUMNS SIMILAR IN NUMBER AND SIZE AND SPACING TO THE VERTICAL BARS ABOVE UNLESS NOTED OTHERWISE.

5.6 WELDING AND/OR SITE CUTTING OF THE REINFORCING BARS SHALL NOT BE PERMITTED UNLESS REVIEWED AND ACCEPTED BY THE DESIGN CONSULTANT.

5.7 ALL PROPRIETARY FIXING SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.

5.8 ALL REINFORCING SPLICES SHALL BE CLASS B TENSION SPLICES IN ACCORDANCE WITH THE CURRENT ACI 318 UNLESS NOTED OTHERWISE. REFER TO SCHEDULE BELOW FOR SPLICE LENGTHS.

TENSION SPLICE LENGTH	
CLASS A	1.0X DEVELOPMENT LENGTH
CLASS B	1.3X DEVELOPMENT LENGTH

CLASS A = As PROVIDED ⩾ 2 As REQUIRED AND PERCENTAGE As SPLIES < 50%
CLASS B = ALL OTHER CONDITIONS

5.9 ALL WIRE MESH REINFORCEMENT SHALL BE LAPPED AT LEAST 2 MESH PANELS AND SECURELY TIED. ALL REINFORCING DEVELOPMENT LENGTHS SHALL BE TENSION DEVELOPMENT LENGTHS IN ACCORDANCE WITH THE CURRENT ACI 318 UNLESS NOTED OTHERWISE. REFER TO SCHEDULE BELOW.

	TENSION DEVELOPMENT LENGTHS* FOR f'c= 4ksi (28MPa)					
	T10	T12	T16	T20	T25	T32
CLEAR SPACING OF BARS BEING DEVELOPED OR SPLICED NOT LESS THAN DIA OF BAR, AND BEAM STIRRUPS COLUMNS TIES THROUGHOUT SPACE LENGTH NOT LESS THAN THE CODE MINIMUM OR CLEAR SPACING OF BARS BEING DEVELOPED OR SPLICED NOT LESS THAN TWICE THE DIA OF BAR, AND CLEAR COVER NOT LESS THAN DIA OF BAR	385	465	615	925	1200	1550
OTHER CASES	575	690	925	1450	1800	2300
*ABOVE DEVELOPMENT LENGTH SHALL BE MULTIPLIED BY 1.3 WHERE HORIZONTAL REINFORCEMENT IS PLACED SUCH THAT MORE THEN 300mm OF FRESH CONCRETE IS CAST BELOW.						

	TENSION DEVELOPMENT LENGTHS* FOR f'c= 21 Mpa (3 Ksi)					
	T10	T12	T16	T20	T25	T32
CLEAR SPACING OF BARS BEING DEVELOPED OR SPLICED NOT LESS THAN DIA OF BAR, AND BEAM STIRRUPSOR COLUMNS TIES THROUGHOUT SPACE LENGTH NOT LESS THAN THE CODE MINMUM OR CLEAR SPACING OF BARS BEING DEVELOPED OR SPLICED NOT LESSTHAN TWICE THE DIA OF BAR, AND CLEAR COVER NOT LESS THAN DIA OF BAR	435	525	700	1075	1350	1725
OTHER CASES	655	790	1050	1650	2080	2665
*ABOVE DEVELOPMENT LENGTH SHALL BE MULTIPLIED BY 1.3 WHERE HORIZONTAL REINFORCEMENT IS PLACED SUCH THAT MORE THEN 300mm OF FRESH CONCRETE IS CAST BELOW.						

5.10 MECHANICAL SPLICING OF LARGE DIAMETER BARS MAY BE ACCEPTABLE SUBJECT T0 REVIEW BY THE DESIGN CONSULTANT

5.11 FOR HOUSE KEEPING PADS AND FLOATING SLABS PROVIDE REINFORCEMENT IN ACCORDANCE WITH THE CURRENT ACI 318 UNLESS NOTED OTHERWISE OR SHOWN ON THE STRUCTURAL DRAWINGS.

5.12 COUPLERS TO BE PROVIDED COLUMN R/F EXCEEDS 3.0%.

6. ANCHORAGE OF BARS BY HOOKS:

* THE DIMENSIONS AND BENDING RADII FOR HOOKS TO BE USE AS STANDARDIZED IN THE ACI CODE:

6.1 A 180° BEND PLUS AN EXTENSION OF AT LEAST 4 BAR DIAMETERS, BUT NOT LESS THAN 2.5 IN AT THE FREE END OF BAR OR

6.2 A 90° BEND PLUS AN EXTENSION OF AT LEAST 12 BAR DIAMETERS AT THE FREE END OF THE BAR, OR

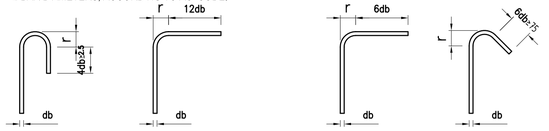
6.3 FOR STIRRUP AND TIE ANCHORAGE ONLY:

6.3.1 FOR NO. 5 BARS AND SMALER, A 90° BEND PLUS AN EXTENSION OF AT LEAST 6 BAR DIAMETERS AT THE FREE END OF THE BAR, OR

6.3.2 FOR NOS. 6,7 AND 8 BARS, A 90° BEND PLUS AN EXTENSION OF AT LEAST 12 BAR DIAMETERS AT THE FREE END OF THE BAR, OR

6.3.3 FOR NO. 8 BARS AND SMALLER, A 135° BEND PLUS AN EXTENSION OF AT LEAST 6 BAR DIAMETERS AT THE FREE END OF THE BAR.

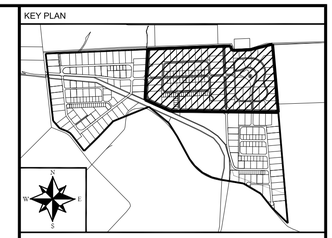
THE MINIMUM DIAMETER OF BEND, MEASURED ON THE INSIDE OF THE BAR, FOR STANDARD HOOKS OTHER THAN FOR STIRRUPS OR TIES IN SIZES NOS. 3 THROUGH 5, SHOULD NOT BE LESS THAN 6 BAR DIAMETER. FOR STIRRUP AND TIE HOOKS, FOR BAR SIZES NO.5 AND SMALLER, THE INSIDE DIAMETER OF BEND SHOULD NOT BE LESS THEN 4 BAR DIAMETERS, ACCORDING TO ACI CODE:



(a). MAIN REINFORCEMENT
r = 4db FOR db ≤T25
r = 5db FOR db >T25

(b). STIRRUPS AND TIES

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

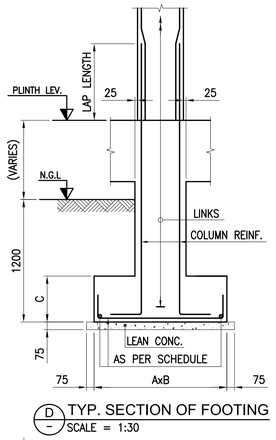
KARACHI INDUSTRIAL PARK SEZ

DRAWN	A.I	SCALE	AS SHOWN
DESIGN	A.A	DATE	JUNE, 2025
CHECKED	M.L	DESIGN STAGE	TENDER
APPROVED	M.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

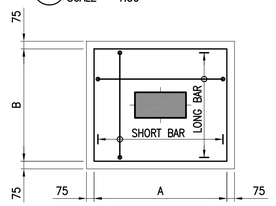
DRAWING TITLE:

GENERAL NOTES

PROJ CODE	DRAWING NO.	REV.
01098	EA-1098-KIP-U-GH02-S-001	0



D – TYP. SECTION OF FOOTING
SCALE = 1:30



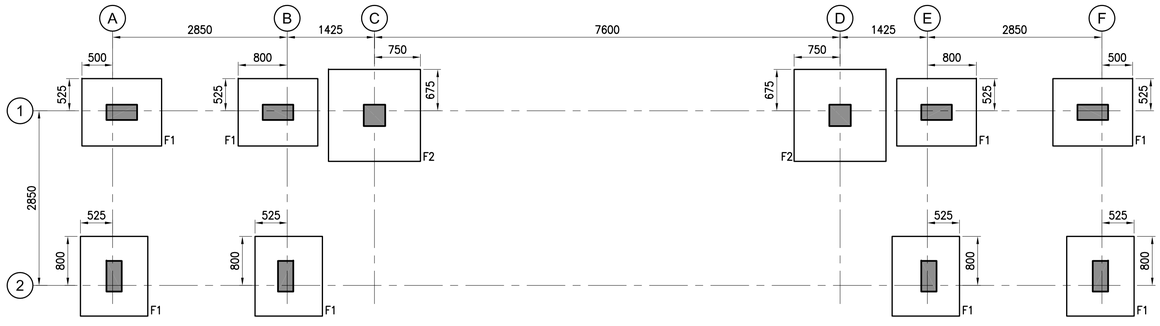
C – TYP. PLAN OF FOOTING
SCALE = 1:30

COLUMNS SCHEDULE

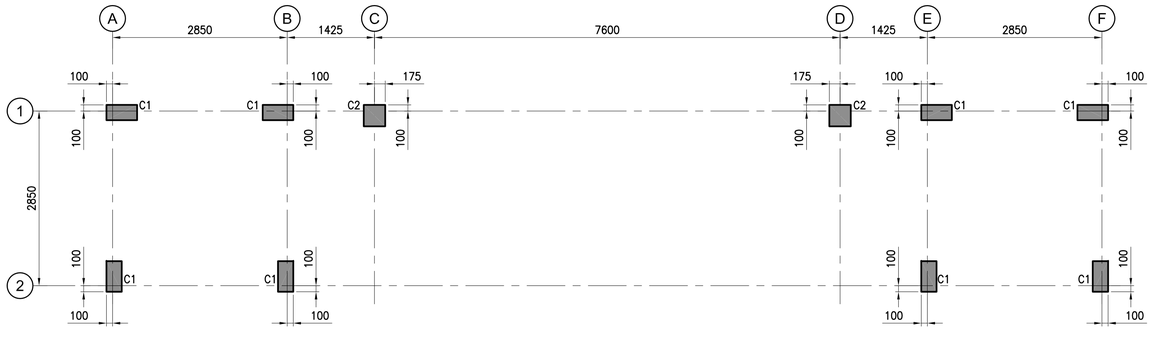
ROOF TO PLINTH	fc' = 28MPa	450 × 200	300 × 300
PLINTH TO FOUNDATION	fc' = 28MPa	500 × 250	350 × 350
COLUMN ID		C1	C2

SCHEDULE OF FOOTING

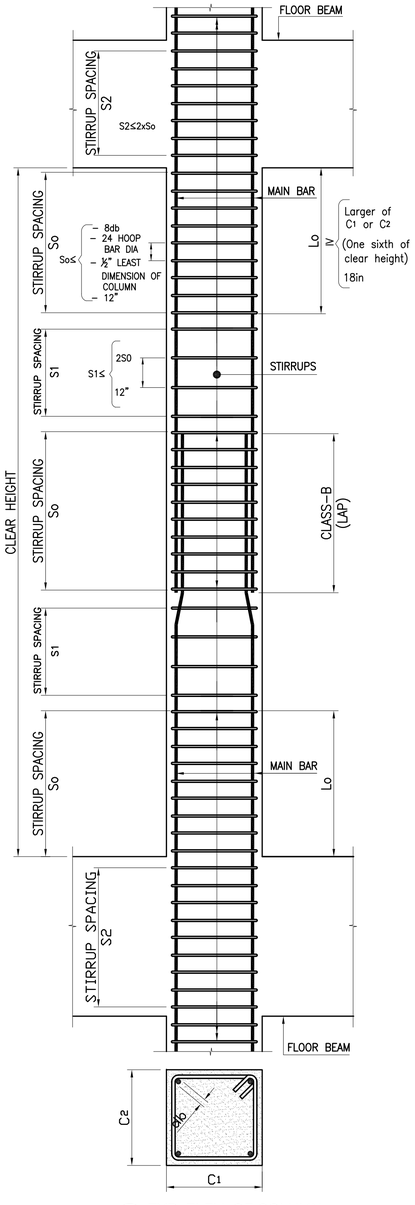
S.NO.	FOOTING MARKS	FOOTING SIZE		THICKNESS	BOTTOM REINFORCEMENT		REMARKS
		A	B	C	SHORT BAR	LONG BAR	
1	F1	1300	1100	450	–	–	–
2	F2	1500	1500	450	–	–	–



B – FOUNDATION LAYOUT PLAN
SCALE = 1:50



A – COLUMN LAYOUT PLAN
SCALE = 1:50



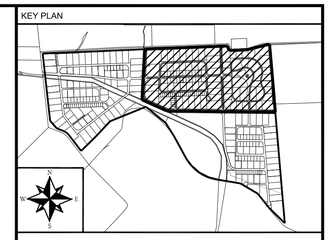
E – TYP. ELEV. OF COLUMN
SCALE = 1:30

* COLUMN LINKS ARE SPECIFIES AS NO@ So/S (Lo)

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETER AND ELEVATIONS ARE ALSO IN MIILLIMETERS UNLESS NOTED OTHERWISE.
2. FOR NOTES REFER DWG NO EA-1098-KIP-U-GH02-S-001.

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	A.I	SCALE	AS SHOWN
DESIGN	A.A	DATE	JUNE, 2025
CHECKED	M.L	DESIGN STAGE	TENDER
APPROVED	M.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

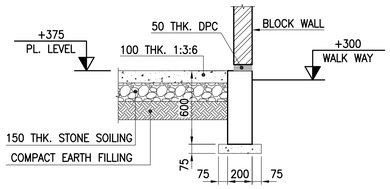
DRAWING TITLE:

GATE HOUSE - 02
COLUMN, FOUNDATION LAYOUT PLAN AND DETAILS

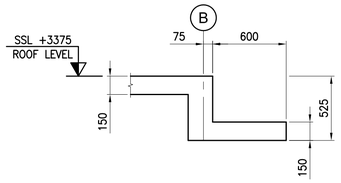
PROJ CODE	DRAWING NO.	REV.
01098	EA-1098-KIP-U-GH02-S-101	0

NOTES:

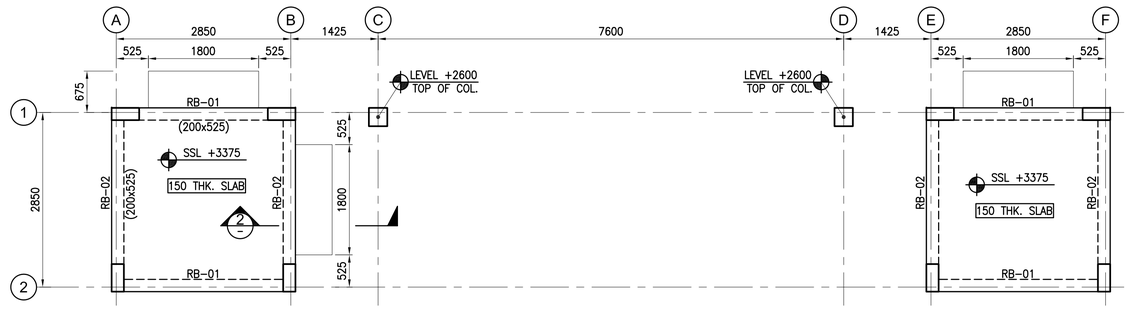
1. ALL DIMENSIONS ARE IN MILLIMETER AND ELEVATIONS ARE ALSO IN MIILLIMETERS UNLESS NOTED OTHERWISE.
2. FOR NOTES REFER DWG NO EA-1098-KIP-U-GH02-S-001.



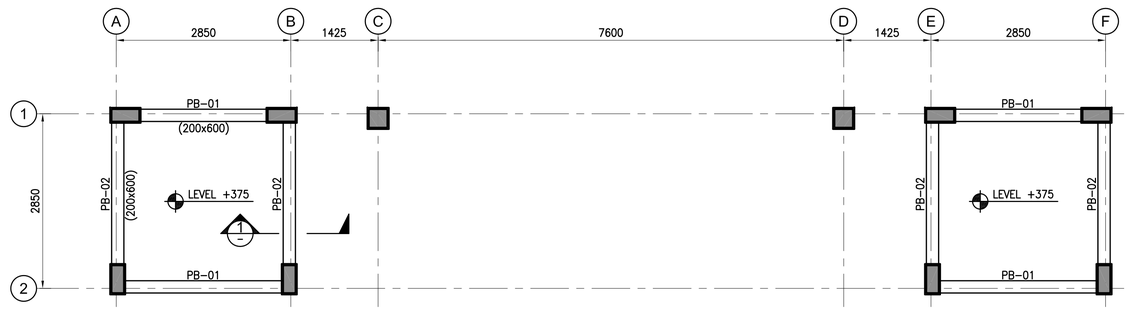
SECTION 1 / SCALE = 1:25



SECTION 2 / SCALE = 1:25

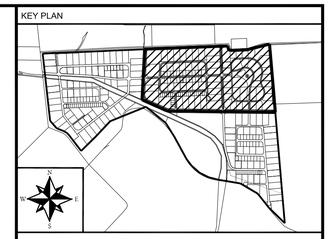


B ROOF FRAMING PLAN / SCALE = 1:50



A PLINTH LEVEL PLAN / SCALE = 1:50

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	A.I	SCALE	AS SHOWN
DESIGN	A.A	DATE	JUNE, 2025
CHECKED	M.L	DESIGN STAGE	TENDER
APPROVED	M.S	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

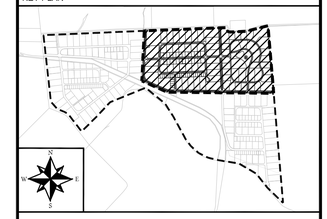
GATE HOUSE - 02
PLINTH LEVEL, ROOF FRAMING PLAN AND DETAILS

PROJ CODE	DRAWING NO.	REV.
01098	EA-1098-KIP-U-GH02-S-102	0

GATE HOUSE - 01

S. NO.	DRAWING NO.	DRAWING TITLE	REVISION NO
1	EA-1098-KIP-U-SS-S-000	LIST OF DRAWING	00
2	EA-1098-KIP-U-SS-S-001	GENERAL NOTES	00
3	EA-1098-KIP-U-SS-S-101	GATE HOUSE - 01 COLUMN,& FOUNDATION LAYOUT PLAN AND DETAILS	00
4	EA-1098-KIP-U-SS-S-102	GATE HOUSE - 01 FOUNDATION,COLUMN & PEDESTAL SCHEDULE	00
5	EA-1098-KIP-U-SS-S-102	GATE HOUSE - 01 PLINTH LEVEL, ROOF FRAMING PLAN AND SECTION DETAILS	00

KEY PLAN



NOTE:

NOTES:-

1. ALL DIMENSIONS ARE IN MILLIMETER AND ELEVATIONS ARE ALSO IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. GENERAL NOTES FOR CONCRETE WORK, REFER DWG NO. EA-1098-KIP-U-GH02-S-001
3. FOUNDATIONS IS DESIGNED AT THE BEARING CAPACITY OF 170 KPA AT THE DEPTH OF 2m, SHOULD BE CHECKED PRIOR TO WORK.
4. CONCRETE IN CONTACT WITH SOIL SHALL BE COATED WITH 2 COATS OF HOT BITUMEN AND ONE PRIMER COAT OF ASPHALT OIL.
5. DE-WATERING SHOULD BE DONE SO THAT THE WATER LEVEL SHOULD REMAIN AT 1.5M BELOW THE BOTTOM OF THE FOOTING.
6. PLINTH LEVEL SHOULD BE COORDINATED WITH ARCHITECTURE AND HIGHWAY DRAWINGS PRIOR TO EXECUTION.

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUNE-2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	M,D	SCALE	AS SHOWN
DESIGN	A,A	DATE	JUNE,2025
CHECKED	M,L	DESIGN STAGE	TD
APPROVED	M,S	ISSUE	TD
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

LIST OF DRAWING

PROJ CODE	DRAWING NO.	REV.
01098	EA-1098-KIP-U-SS-S-000	0

CONCRETE GENERAL NOTES

1. GENERAL

1.1 STRUCTURAL DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL OTHER DISCIPLINE DRAWINGS, DOCUMENTS, SPECIFICATIONS ETC, AS PART OF THE CONTRACT DOCUMENT OR, MAY BE ISSUED DURING THE COURSE OF THE CONTRACT.

1.2 DIMENSIONS SHALL NOT BE OBTAINED BY SCALING DRAWINGS.

1.3 FOR MAIN SETTING OUT LINES AND LEVELS REFER TO ARCHITECTURAL DRAWINGS.

1.4 THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THE SAFETY OF CONSTRUCTION AT ALL TIMES AND SHALL ENSURE THAT NO PART OF INTERMEDIATE COMPLETED CONSTRUCTION IS HAZARDOUS (FOR EXAMPLE; SIDES OF EXCAVATION, STARTER BARS ETC,)

1.5 THE CONTRACTOR SHALL PROVIDE TEMPORARY BRACING AND SHORING AGAINST LATERAL FORCES AND ALL CONSTRUCTION LOADS THROUGHOUT THE CONSTRUCTION PROCESS.

1.6 ALL ELEMENTS OF THE STRUCTURE DESIGNED BY THE CONTRACTOR SHALL BE SUBMITTED TO DESIGN CONSULTANT FOR REVIEW.

1.7 THE DESIGN CONSULTANT'S REVIEW PROCESS FOR ALL SUBMITTALS, DRAWINGS, METHOD STATEMENTS AND DOCUMENTS IS ONLY COMPLETE ONCE A STATUS OF 'NO OBJECTION' IS REACHED. THE SUBMITTAL SHALL BE REVIEWED BY THE DESIGN CONSULTANT FOR COMPLIANCE WITH THE DESIGN INTENT THIS DOES NOT RELIEVE THE CONTRACTOR FROM HIS CONTRACTUAL RESPONSIBILITIES.

1.8 FOR ALL BUILDERS WORK INFORMATION (OPENINGS IN STRUCTURAL ELEMENTS):- LIGHTING POINTS, GULLIES, CAST-IN PIPES, SLEEVES, ELECTRICAL TRENCHES, MANHOLES ETC, REFER TO MEP DRAWINGS FOR LOCATION. THE CONTRACTOR SHALL PREPARE COORDINATED SERVICES DRAWINGS IDENTIFYING STRUCTURAL, MEP AND ARCHITECTURAL ELEMENTS/DETAILS FOR CONSULTANT'S REVIEW BEFORE COMMENCEMENT OF CONSTRUCTION IN THE AREA CONCERNED.

1.9 ALL DESIGN, WORKMANSHIP AND MATERIAL SHALL BE IN ACCORDANCE WITH THE CURRENT ACI, UBC, IBC, AISC AND LOCAL AUTHORITY STANDARDS AND PROJECT DESIGN CRITERIA UNLESS NOTED OTHERWISE.

2. DESIGN CODE OF PRACTICE

2.1 1997 UNIFORM BUILDING CODE.

2.2 ACI-318 BUILDING CODE FOR STRUCTURAL CONCRETE AND COMMENTARY.

2.3 ASCE/SEI 7 MINIMUM DESIGN LOADS FOR BUILDING AND OTHER STRUCTURES.

2.4 ANSI/AISC 360 SPECIFICATION FOR STRUCTURAL STEEL BUILDING.

2.5 ANSI/AISC 341 SEISMIC PROVISIONS FOR STRUCTURAL STEEL BUILDING.

2.6 BCP-SP-2007 SEISMIC BUILDING CODE OF PAKISTAN.

2.7 ACI 360 DESIGN OF SLAB ON GRADE

3. FOUNDATIONS

3.1 THE CONTRACTOR SHALL READ AND FAMILIARIZE HIMSELF WITH THE GEOTECHNICAL INVESTIGATION REPORT AS WELL AS VISIT THE SITE AND BECOME THOROUGHLY FAMILIAR WITH THE SURFACE AND SUBSURFACE CONDITIONS.

3.2 LOOSE POCKETS OF SOIL WHICH ARE ENCOUNTERED SHALL BE REMOVED AND REPLACED WITH GOOD GRANULAR FILL MATERIAL TO ACHIEVE THE DESIRED BEARING PRESSURE.

3.3 ANY ADJACENT FOOTING IN THE VICINITY OF THE WORK SHALL BE PROPERLY PROTECTED BEFORE EXECUTION OF WORK.

3.4 FOUNDATION SHALL BE PLACED ON FIRM AND VIRGIN GROUND FROM EXISTING GROUND LEVEL AS PER SOIL INVESTIGATION REPORT CONDUCTED BY SOILMAT. BEFORE PLACING THE FOUNDATION CONCRETE, THE EXCAVATIONS SHOULD BE CAREFULLY INSPECTED TO ENSURE THAT COMPETENT BEARING STRATUM HAS BEEN REACHED AND FILL HAS BEEN CROSSED.

3.5 FOUNDATION IS DESIGN ON ASSUMED NET BEARING CAPACITY OF 170 KPA AT THE DEPTH OF 2.0m.

3.5 DEWATERING MUST BE STARTED RIGHT AFTER EXCAVATION AND CONTINUE UNTIL WHOLE STRUCTURE IS CONSTRUCTED.

4. REINFORCED CONCRETE

4.1 THE CONTRACTOR SHALL SUBMIT DETAILED RC DRAWINGS AND BAR BENDING SCHEDULES SHOWING BAR SIZES, SPACING, PLACEMENT AND SUPPORT DETAILS DOWELS AT EXPANSION JOINTS AND LAPS ETC. FOR REVIEW AND ACCEPTANCE OF THE DESIGN CONSULTANT. WORK SHALL NOT COMMENCE UNTIL THE SHOP DRAWINGS ARE REVIEWED AND ACCEPTED REVIEW OF SHOP DRAWINGS DOES NOT ALLEVIATE THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE THE INPUT OF ALL TRADES ON THE SHOP DRAWINGS.

4.2 REFER TO SPECIFICATIONS FOR QUALITY AND PERFORMANCE REQUIREMENTS OF CONCRETE.
(i) FOR THE TYPE OF CEMENT FOLLOW THE GEOTECHNICAL RECOMMENDATION

4.3 ALL CAST-IN-SITU CONCRETE SHALL HAVE A MINIMUM 28 DAYS CYLINDRICAL STRENGTH UNLESS NOTED OTHERWISE OR MENTIONED IN FOLLOWING TABLE:

COLUMNS = 28 Mpa (4000 Psi) 28 DAYS CYLINDRICAL STRENGTH.
WALLS, BEAMS, SLABS & FOUNDATIONS = 28 Mpa (3000 Psi) 28 DAYS CYLINDRICAL STRENGTH.

4.4 WATER CEMENT RATIO SHALL NOT EXCEED 0.5

4.5 MAXIMUM POSSIBLE WATER-SOLUBLE CHLORIDE ION (CL) CONTENT IN CONCRETE SHALL NOT EXCEED 0.15% BY WEIGHT OF CEMENT.

4.6 MAXIMUM SIZE OF COURSE AGGREGATE SHALL BE 25MM UNLESS NOTED OTHERWISE.

4.7 CONTRACTOR SHALL GET APPROVAL FROM DESIGN CONSULTANT OF A CONCRETE MIX DESIGN.

4.8 THE CONTRACTOR SHALL PERFORM AND SUBMIT FOR REVIEW INSTRUMENT SURVEYS OF FINISHED CONCRETE SLAB SURFACES, BOTH BEFORE AND AFTER REMOVAL OF FORM WORK AND/OR SHORING SYSTEM TO VERIFY AS-BUILT TOLERANCES.

4.9 REFER TO SPECIFICATIONS FOR REQUIREMENTS OF CONCRETE SURFACE FINISH AND CASTING TOLERANCE.

4.10 PROVIDE UPWARD CAMBER TO SLABS AND BEAMS AS NOTED ON STRUCTURAL DRAWINGS AND/OR SPECIFICATIONS CAMBER BOTH UNDERSIDE AND TOP OF CONCRETE TO MAINTAIN THE SLAB AND BEAM DEPTH SHOWN ON THE DRAWINGS UNLESS NOTED OTHERWISE.

4.11 BEAMS, SLABS, COLUMNS, WALLS AND FOUNDATION ELEMENTS SHALL NOT BE SLEEVED OR BOXED-OUT OR HAVE THE REINFORCEMENT INTERRUPTED EXCEPT AS INDICATED ON THE STRUCTURAL DRAWINGS.

4.12 ALL CONCRETE SHALL CONTAIN AN APPROVED WATER REDUCING, PLASTICIZING ADMIXTURE. APPROVED HIGH RANGE WATER REDUCING ADMIXTURE MAY BE UTILIZED AT THE CONTRACTOR'S OPTION. ALL CONCRETE PERMANENTLY EXPOSED TO WEATHER SHALL ALSO CONTAIN AN APPROVED AIR-ENTRAINING ADMIXTURE TO PROVIDE PERCENTAGE OF AIR REQUIRED FOR SEVERE EXPOSURE AS PER ACI 318.

4.13 ADMIXTURE/WATER CONTAINING CHLORIDE IONS SHELL NOT BE USED IN ANY CONCRETE.

4.14 THE FOLLOWING CONCRETE CLEAR COVER TO PRIMARY REINFORCEMENT SHALL BE PROVIDED, UNLESS LARGER COVER IS NOTED ON THE STRUCTURAL DRAWINGS.

ELEMENT	CONCRETE CLEAR COVER SCHEDULE	
	ABOVE GROUND INTERIOR ENVIRONMENT	ABOVE GROUND EXTERIOR ENVIRONMENT
COLUMNS(VERTICAL BARS)	40	50
BEAMS(LONGITUDINAL BARS)	40	50
WALLS	25	35
GRADE SLAB	25	35
SUSPENDED SLAB	25	35
EQUIPMENT PAD	25	35
WATER TANK	50	50

NOTE: - CLEAR COVER SHALL NOT BE LESS THAN ONE BAR DIA.
- CONCRETE COVER FOR SURFACE CAST AGAINST SOIL SHALL BE 75 AND FOR SURFACE INCONTACT WITH SOIL SHALL BE 50.

4.15 AGGREGATE FOR CONCRETE SHALL BE FROM APPROVED SOURCE AND SHALL COMPLY WITH THE SPECIFICATION REQUIREMENTS.

4.16 HORIZONTAL CONSTRUCTION JOINTS SHALL NOT BE MADE IN BEAMS UNLESS SHOWN OR REVIEWED BY DESIGN CONSULTANT. VERTICAL CONSTRUCTION JOINTS MAY BE MADE AT MIDSPAN OF BEAMS. OR SLABS HAVING NO POINT LOADS AT CENTER OF SPAN. UNLESS OTHERWISE NOTED OR SHOWN OR DIRECTED BY THE DESIGN CONSULTANT.

4.17 ALL CONCRETE SHALL BE COMPACTED USING ONLY MECHANICAL VIBRATION PROCESS.

4.18 ALL CONCRETE SHALL BE CURED IN ACCORDANCE WITH THE SPECIFICATIONS.

5. REINFORCEMENT

5.1 ALL REINFORCING BARS SHALL BE DEFORMED BARS WITH YIELD STRENGTH OF 414MPa CONFORMING TO ASTM A615.

5.2 EPOXY COATED REINFORCING BARS SHALL NOT BE PERMITTED.

5.3 ALL REINFORCING BARS SHALL BE DETAILED, FABRICATED, LABELED, SUPPORTED, SPACED IN FORMS AND SECURED IN PLACE IN ACCORDANCE WITH THE PROCEDURES AND REQUIREMENTS OUTLINED IN THE CURRENT ACI 318 AND ACI 315 UNLESS NOTED OTHERWISE ON THE STRUCTURAL DRAWINGS.

5.4 ALL STARTER BARS SHALL BE SURVEYED AND LOCATION CONFIRMED IN AS-BUILT CONDITION PRIOR TO PLACING WALL/COLUMN REINFORCEMENT AND ANY DISCREPANCIES SHALL BE REPORTED TO THE DESIGN CONSULTANT FOR INSTRUCTIONS.

5.5 PROVIDE STARTER BARS TO WALLS AND COLUMNS SIMILAR IN NUMBER AND SIZE AND SPACING TO THE VERTICAL BARS ABOVE UNLESS NOTED OTHERWISE.

5.6 WELDING AND/OR SITE CUTTING OF THE REINFORCING BARS SHALL NOT BE PERMITTED UNLESS REVIEWED AND ACCEPTED BY THE DESIGN CONSULTANT.

5.7 ALL PROPRIETARY FIXING SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.

5.8 ALL REINFORCING SPLICES SHALL BE CLASS B TENSION SPLICES IN ACCORDANCE WITH THE CURRENT ACI 318 UNLESS NOTED OTHERWISE. REFER TO SCHEDULE BELOW FOR SPLICE LENGTHS.

TENSION SPLICE LENGTH	
CLASS A	1,0X DEVELOPMENT LENGTH
CLASS B	1,3X DEVELOPMENT LENGTH

CLASS A = As PROVIDED ⩾ 2 As REQUIRED AND PERCENTAGE As SPLIES < 50%
CLASS B = ALL OTHER CONDITIONS

5.9 ALL WIRE MESH REINFORCEMENT SHALL BE LAPPED AT LEAST 2 MESH PANELS AND SECURELY TIED. ALL REINFORCING DEVELOPMENT LENGTHS SHALL BE TENSION DEVELOPMENT LENGTHS IN ACCORDANCE WITH THE CURRENT ACI 318 UNLESS NOTED OTHERWISE, REFER TO SCHEDULE BELOW.

	TENSION DEVELOPMENT LENGTHS* FOR f'c= 4ksi (28MPa)					
	T10	T12	T16	T20	T25	T32
CLEAR SPACING OF BARS BEING DEVELOPED OR SPLICED NOT LESS THAN DIA OF BAR, AND BEAM STIRRUPS COLUMNS TIES THROUGHOUT SPACE LENGTH NOT LESS THAN THE CODE MINIMUM OR CLEAR SPACING OF BARS BEING DEVELOPED OR SPLICED NOT LESS THAN TWICE THE DIA OF BAR, AND CLEAR COVER NOT LESS THAN DIA OF BAR	385	465	615	925	1200	1550
OTHER CASES	575	690	925	1450	1800	2300
*ABOVE DEVELOPMENT LENGTH SHALL BE MULTIPLIED BY 1,3 WHERE HORIZONTAL REINFORCEMENT IS PLACED SUCH THAT MORE THEN 300mm OF FRESH CONCRETE IS CAST BELOW.						

	TENSION DEVELOPMENT LENGTHS* FOR f'c= 21 Mpa (3 Ksi)					
	T10	T12	T16	T20	T25	T32
CLEAR SPACING OF BARS BEING DEVELOPED OR SPLICED NOT LESS THAN DIA OF BAR, AND BEAM STIRRUPSOR COLUMNS TIES THROUGHOUT SPACE LENGTH NOT LESS THAN THE CODE MINMUM OR CLEAR SPACING OF BARS BEING DEVELOPED OR SPLICED NOT LESSTHAN TWICE THE DIA OF BAR, AND CLEAR COVER NOT LESS THAN DIA OF BAR	435	525	700	1075	1350	1725
OTHER CASES	655	790	1050	1650	2080	2665
*ABOVE DEVELOPMENT LENGTH SHALL BE MULTIPLIED BY 1,3 WHERE HORIZONTAL REINFORCEMENT IS PLACED SUCH THAT MORE THEN 300mm OF FRESH CONCRETE IS CAST BELOW.						

5.10 MECHANICAL SPLICING OF LARGE DIAMETER BARS MAY BE ACCEPTABLE SUBJECT T0 REVIEW BY THE DESIGN CONSULTANT

5.11 FOR HOUSE KEEPING PADS AND FLOATING SLABS PROVIDE REINFORCEMENT IN ACCORDANCE WITH THE CURRENT ACI 318 UNLESS NOTED OTHERWISE OR SHOWN ON THE STRUCTURAL DRAWINGS.

5.12 COUPLERS TO BE PROVIDED COLUMN R/F EXCEEDS 3.0%.

6. ANCHORAGE OF BARS BY HOOKS:

* THE DIMENSIONS AND BENDING RADII FOR HOOKS TO BE USE AS STANDARDIZED IN THE ACI CODE:

6.1 A 180° BEND PLUS AN EXTENSION OF AT LEAST 4 BAR DIAMETERS, BUT NOT LESS THAN 2.5 IN AT THE FREE END OF BAR OR

6.2 A 90° BEND PLUS AN EXTENSION OF AT LEAST 12 BAR DIAMETERS AT THE FREE END OF THE BAR, OR

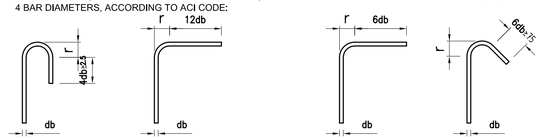
6.3 FOR STIRRUP AND TIE ANCHORAGE ONLY:

6.3,1 FOR NO, 5 BARS AND SMALER, A 90° BEND PLUS AN EXTENSION OF AT LEAST 6 BAR DIAMETERS AT THE FREE END OF THE BAR, OR

6.3.2 FOR NOS, 6,7 AND 8 BARS, A 90° BEND PLUS AN EXTENSION OF AT LEAST 12 BAR DIAMETERS AT THE FREE END OF THE BAR, OR

6.3,3 FOR NO, 8 BARS AND SMALLER, A 135° BEND PLUS AN EXTENSION OF AT LEAST 6 BAR DIAMETERS AT THE FREE END OF THE BAR.

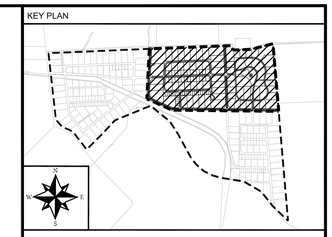
THE MINIMUM DIAMETER OF BEND, MEASURED ON THE INSIDE OF THE BAR, FOR STANDARD HOOKS OTHER THAN FOR STIRRUPS OR TIES IN SIZES NOS. 3 THROUGH 5, SHOULD NOT BE LESS THAN 6 BAR DIAMETER. FOR STIRRUP AND TIE HOOKS, FOR BAR SIZES NO.5 AND SMALLER, THE INSIDE DIAMETER OF BEND SHOULD NOT BE LESS THEN 4 BAR DIAMETERS, ACCORDING TO ACI CODE:



(a). MAIN REINFORCEMENT
r = 4db FOR db ≤T25
r = 5db FOR db >T25

(b). STIRRUPS AND TIES

KEY PLAN



NOTE:

NOTES:-
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3. FOUNDATIONS IS DESIGNED AT THE BEARING CAPACITY OF 170 KPA AT THE DEPTH OF 2m, SHOULD BE CHECKED PRIOR TO WORK.
4. CONCRETE IN CONTACT WITH SOIL SHALL BE COATED WITH 2 COATS OF HOT BITUMEN AND ONE PRIMER COAT OF ASPHALT OIL.
5. DE-WATERING SHOULD BE DONE SO THAT THE WATER LEVEL SHOULD REMAIN AT 1.5M BELOW THE BOTTOM OF THE FOOTING.
6. PLINTH LEVEL SHOULD BE COORDINATED WITH ARCHITECTURE AND HIGHWAY DRAWINGS PRIOR TO EXECUTION.

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUNE-2025

PROJECT:

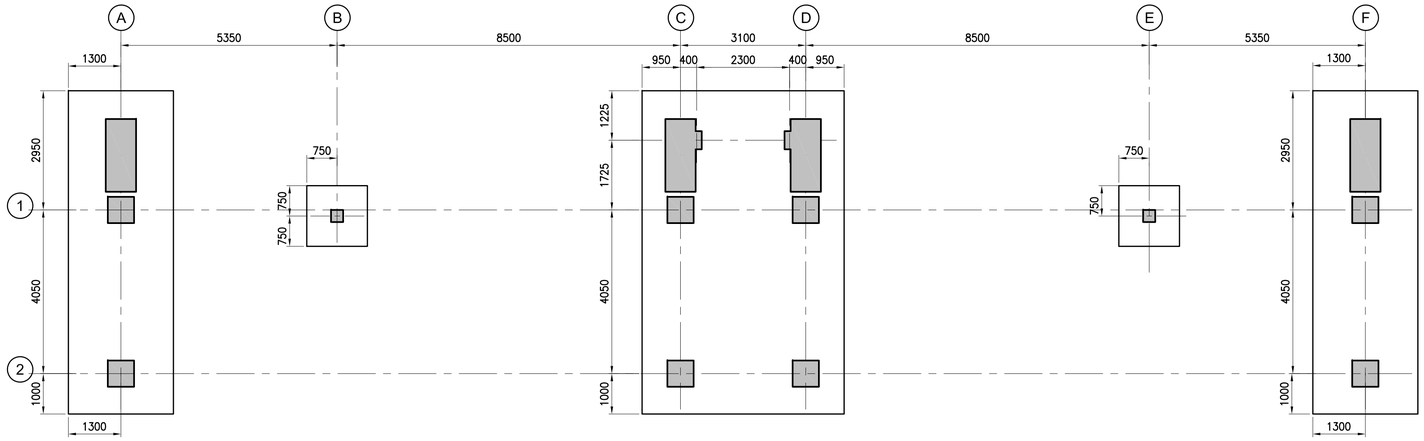
KARACHI INDUSTRIAL PARK SEZ

DRAWN	M.D	SCALE	AS SHOWN
DESIGN	A.A	DATE	JUNE,2025
CHECKED	M.L	DESIGN STAGE	TD
APPROVED	M.S	ISSUE	TD
ACTUAL SHEET SIZE			A1

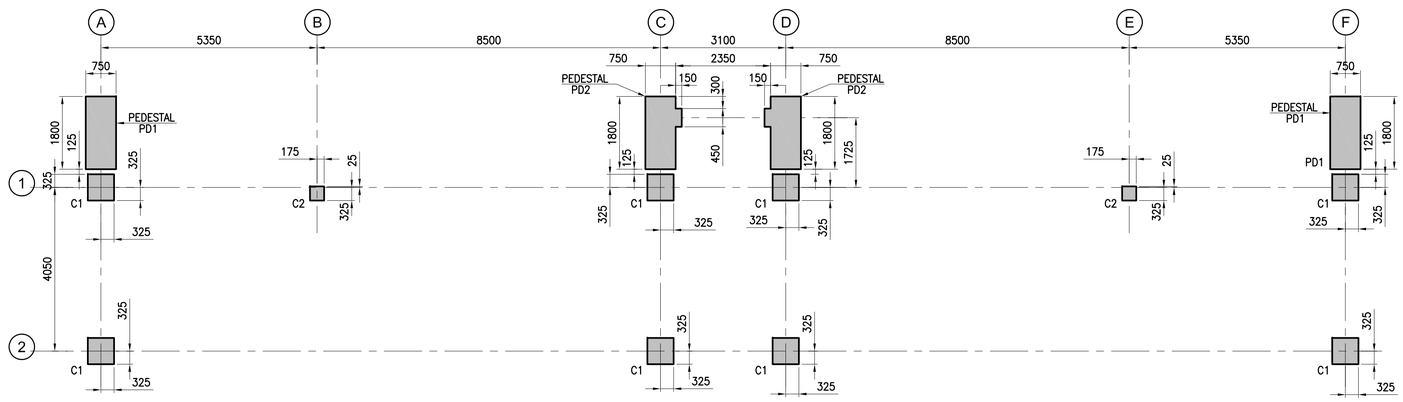
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GENERAL NOTES

PROJ CODE	DRAWING NO.	REV.
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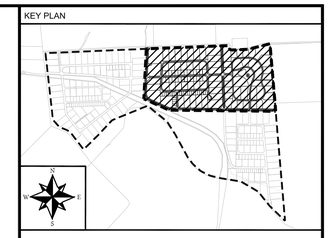


B FOUNDATION LAYOUT PLAN
SCALE = 1:75



A COLUMN LAYOUT PLAN
SCALE = 1:75

KEY PLAN



NOTE:

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5. DE-WATERING SHOULD BE DONE SO THAT THE WATER LEVEL SHOULD REMAIN AT 1.5M BELOW THE BOTTOM OF THE FOOTING.

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUNE-2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	M.D	SCALE	AS SHOWN
DESIGN	A.A	DATE	JUNE,2025
CHECKED	M.L	DESIGN STAGE	TD
APPROVED	M.S	ISSUE	TD
ACTUAL SHEET SIZE			A1

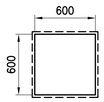
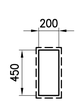
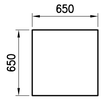
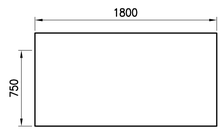
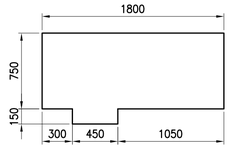
DRAWING TITLE: GATE HOUSE-01
COLUMN, & FOUNDATION
LAYOUT PLAN AND DETAILS

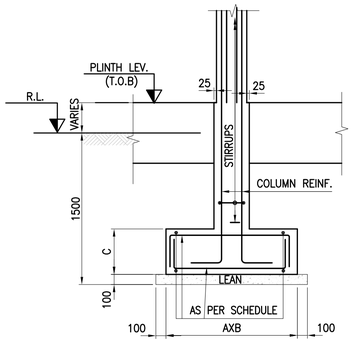
PROJ CODE	DRAWING NO.	REV.
01098	EA-1098-KIP-U-SS-S-101	0

SCHEDULE OF FOOTING

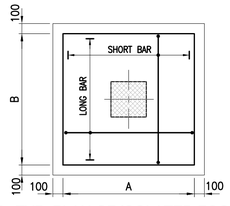
S.NO.	FOOTING	FOOTING SIZE		FOOTING THICKNESS
		A	B	C
1	F1	1500	1500	450
2	CF1	SEE PLAN		450
3	CF2	SEE PLAN		450

COLUMN SCHEDULE

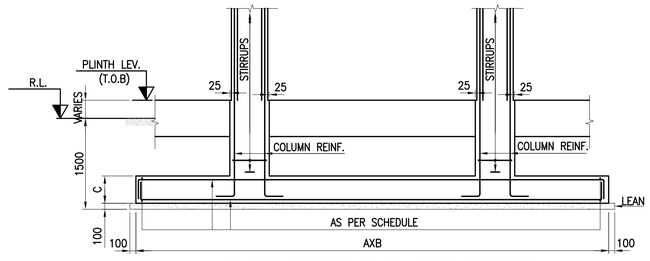
ROOF TO PLINTH LEVEL		TOP LEVEL + 2700 	TOP LEVEL + 2700 	-	-
PLINTH LEVEL TO FOUNDATION		-	-		
COLUMN MARK	C1	C2	C3	PEDESTAL PD1	PEDESTAL PD2



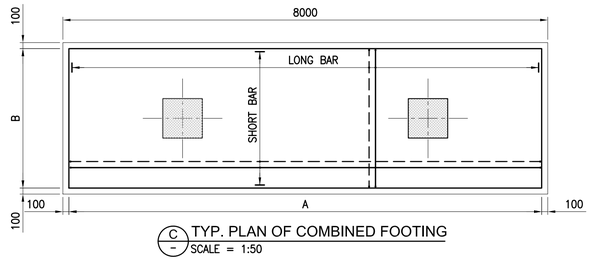
B – TYP. SECTION OF ISOLATED FOOTING
SCALE = 1:30



A – TYP. PLAN OF ISOLATED FOOTING
SCALE = 1:30

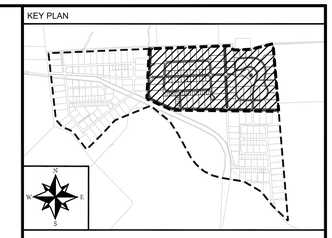


D – TYP. SECTION OF COMBINED FOOTING
SCALE = 1:50



C – TYP. PLAN OF COMBINED FOOTING
SCALE = 1:50

KEY PLAN



NOTE:

NOTES:-

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5. DE-WATERING SHOULD BE DONE SO THAT THE WATER LEVEL SHOULD REMAIN AT 1.5M BELOW THE BOTTOM OF THE FOOTING.

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUNE-2025

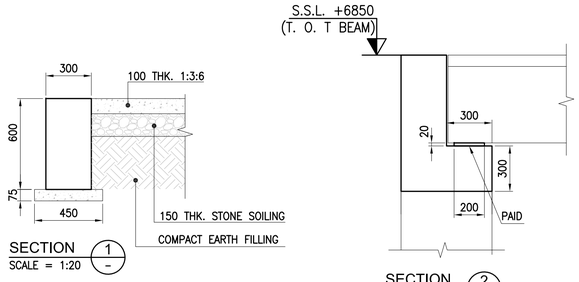
PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	M,D	SCALE	AS SHOWN
DESIGN	A,A	DATE	JUNE,2025
CHECKED	M,L	DESIGN STAGE	TD
APPROVED	M,S	ISSUE	TD
ACTUAL SHEET SIZE			A1

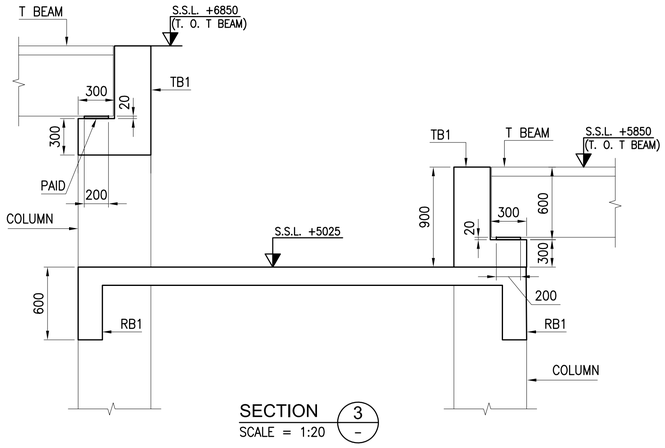
DRAWING TITLE: GATE HOUSE -01 FOUNDATION , COLUMN & PEDESTAL SCHEDULE

PROJ CODE	DRAWING NO.	REV.
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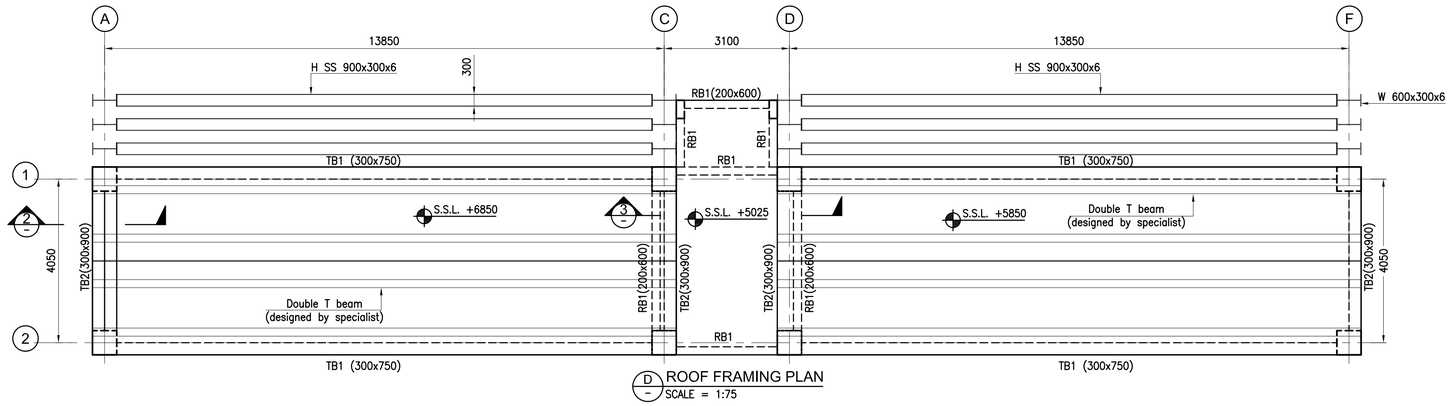


SECTION 1
SCALE = 1:20

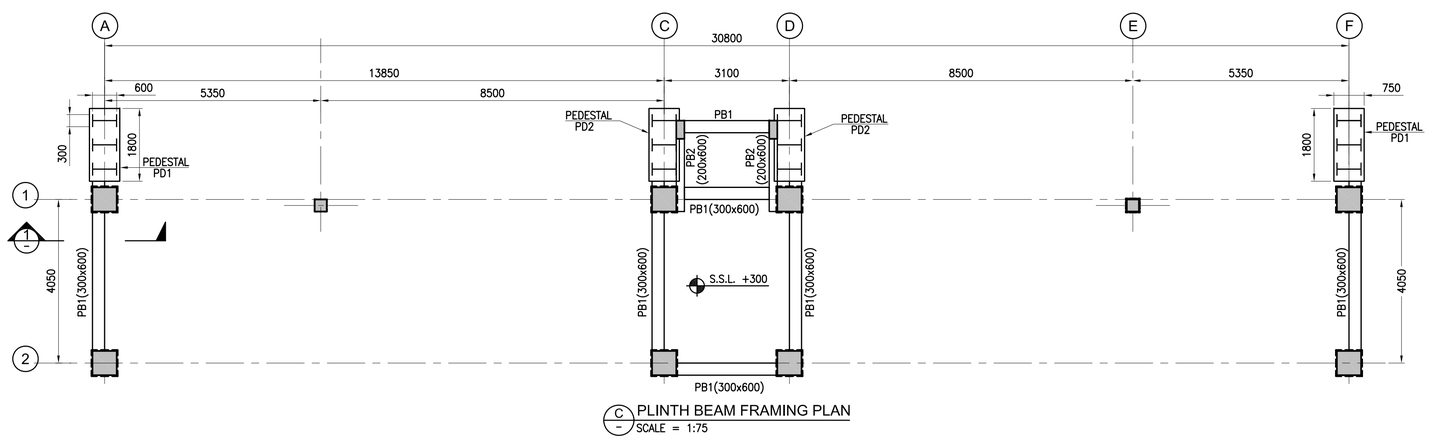
SECTION 2
SCALE = 1:20



SECTION 3
SCALE = 1:20

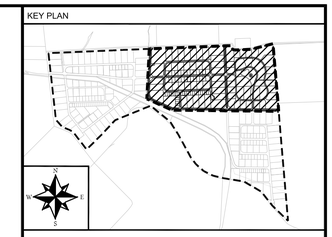


D ROOF FRAMING PLAN
SCALE = 1:75



C PLINTH BEAM FRAMING PLAN
SCALE = 1:75

KEY PLAN



NOTE:

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6. PLINTH LEVEL SHOULD BE COORDINATED WITH ARCHITECTURE AND HIGHWAY DRAWINGS PRIOR TO EXECUTION.

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUNE-2025

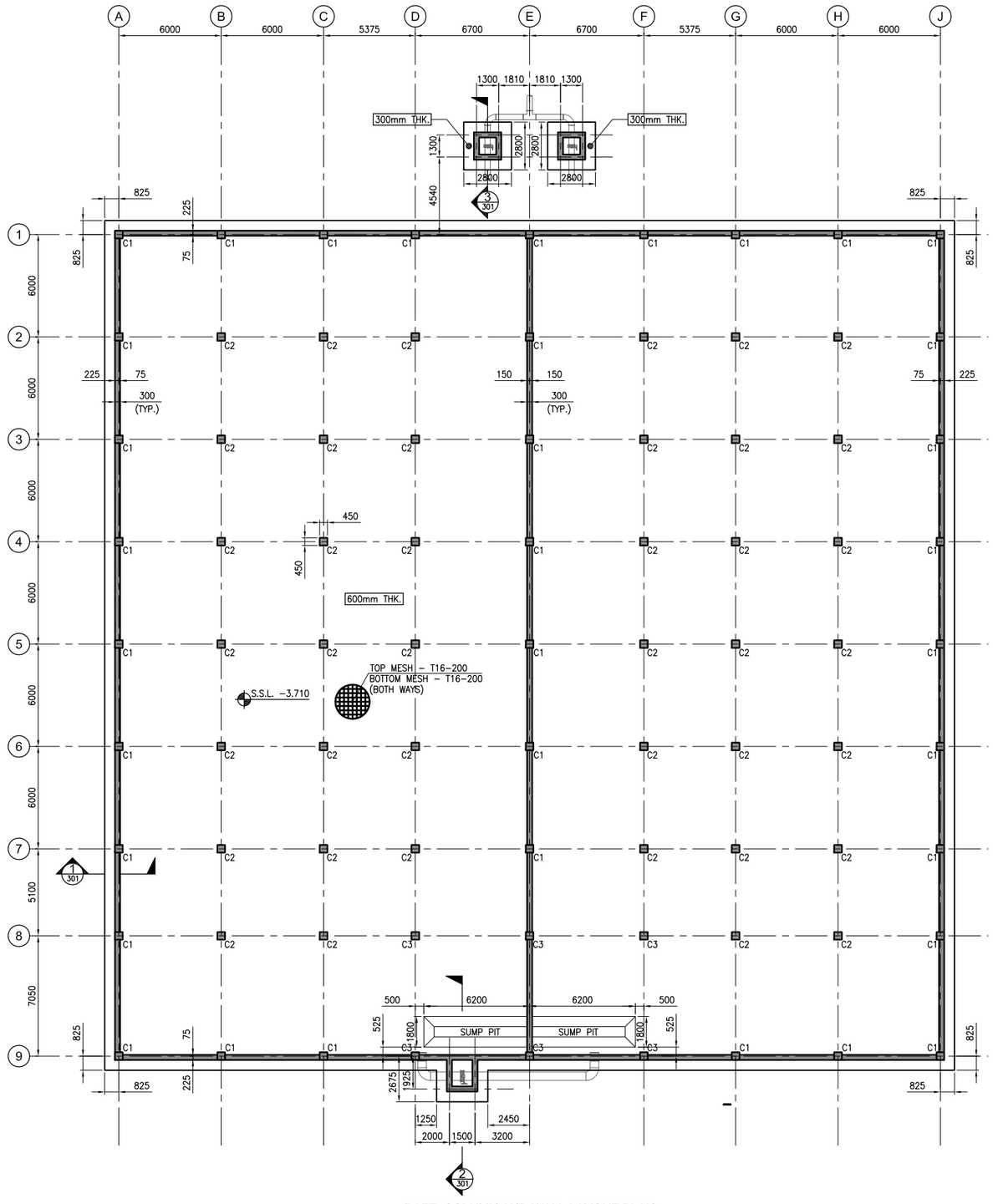
PROJECT:

KARACHI INDUSTRIAL PARK SEZ

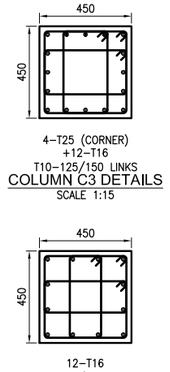
DRAWN	M.D	SCALE	AS SHOWN
DESIGN	A.A	DATE	JUNE,2025
CHECKED	M.L	DESIGN STAGE	TD
APPROVED	M.S	ISSUE	TD
ACTUAL SHEET SIZE			A1

DRAWING TITLE: GATE HOUSE-01
PLINTH BEAM & ROOF
LAYOUT PLAN AND SECTION DETAILS

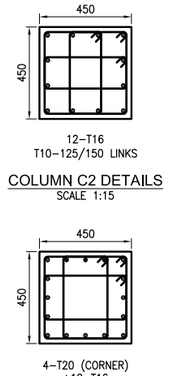
PROJ CODE	DRAWING NO.	REV.
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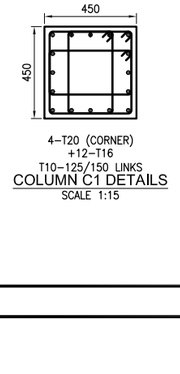
RAFT, COLUMN AND WALL LAYOUT PLAN
SCALE 1:150



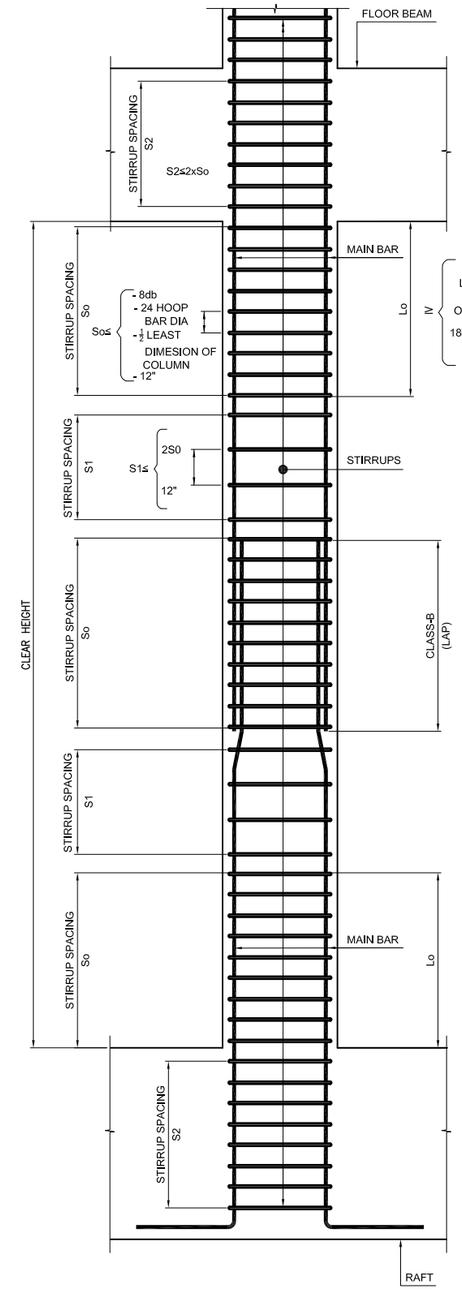
COLUMN C3 DETAILS
SCALE 1:15

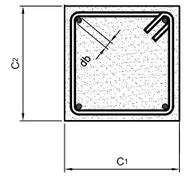


COLUMN C2 DETAILS
SCALE 1:15



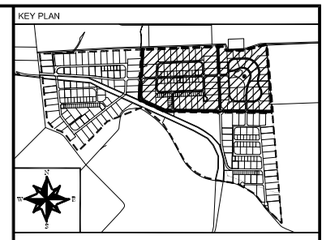
COLUMN C1 DETAILS
SCALE 1:15





TYP. ELEV. OF COLUMN
SCALE 1:25
* COLUMN LINKS ARE SPECIFIES AS NO@ So/S (Lo)

KEY PLAN



NOTE:

LEGEND:

1. ALL DIMENSIONS ARE IN MILIMETERS AND LEVELS ARE IN METER U.N.O.
2. ALL DRAWINGS MUST BE READ IN CONJUNCTION WITH PHED DRAWINGS.
3. ALL STEEL SHALL BE ASTM A–615 GRADE 60.
4. SULPHATE RESISTING CEMENT TO BE USED FOR ALL STRUCTURAL WORK.
5. APPROVED WATER PROOFING COATING ON ALL STRUCTURES.
6. FOR LEVELS REFER PHED
7. ALL LEVELS & DIMENSIONS MUST BE CONFIRMED BEFORE EXECUTION AT SITE.
8. CLEAR COVER SHALL BE AS FOLLOWS.
   *FOOTING\COLUMN = 3" INCH
   *BEAM = 2" INCH (T&B),2" INCH (SIDES)
9. CONCRETE MUST HAVE 28 DAYS OF CYLINDRICAL STRENGTH OF 4000 Psi
10. DE–WATERING SHALL BE CONTINUOUS UN TILL CASTING OF TOP SLAB AND BACK FILLING.
11. FOOTING HAS BEEN DESIGNED FOR BEARING CAPACITY OF 2.8TSF.
    THIS SHOULD BE VERIFIED PRIOR TO START OF CONSTRUCTION.
12. TOP SLAB TO BE CASTED BEFORE ADDITION OF INTERNAL WATER AND BACK FILLING.

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	FEB-2025

PROJECT:

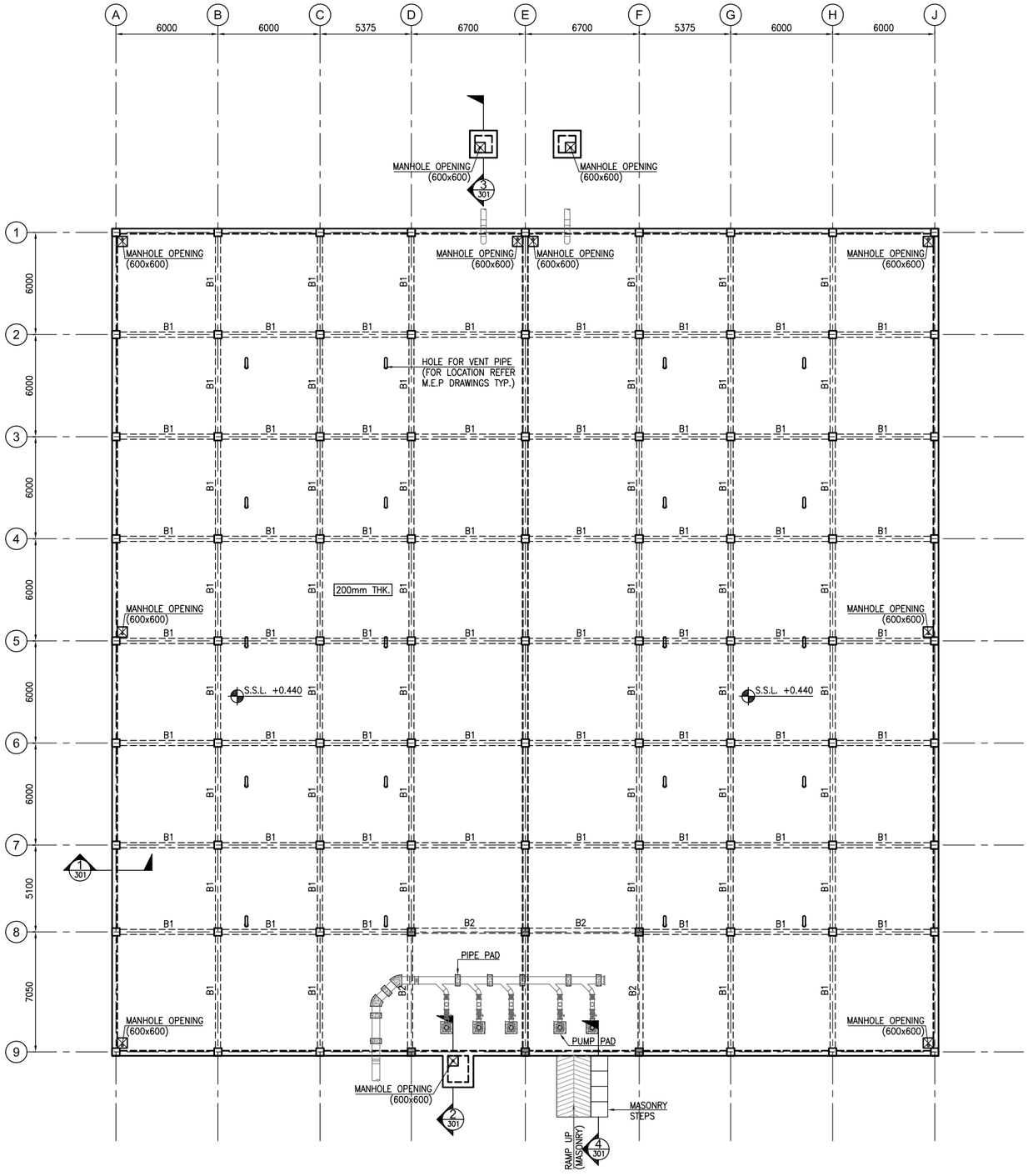
KARACHI INDUSTRIAL PARK SEZ

DRAWN	A.I	SCALE	AS SHOWN
DESIGN	A.A	DATE	FEB.2025
CHECKED	M.L	DESIGN STAGE	TD
APPROVED	M.S	ISSUE	TD
ACTUAL SHEET SIZE			A1

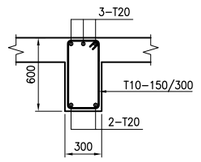
DRAWING TITLE:

UNDER GROUND TANK
RAFT AND COLUMN LAYOUT PLAN
(2.0_MGD)

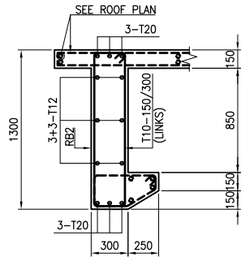
PROJ CODE	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-PS-S-101	0



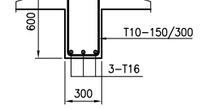
FRAMING PLAN AT GROUND LEVEL
SCALE 1:150



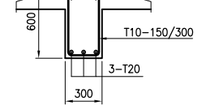
BEAM RB1 DETAILS
SCALE 1:25



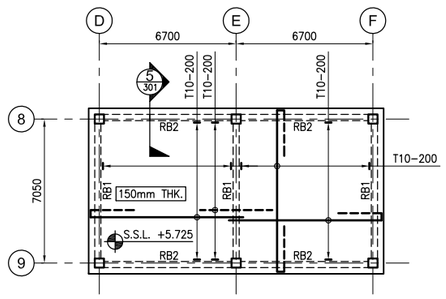
BEAM RB2 DETAILS
SCALE 1:25



BEAM B1 DETAILS
SCALE 1:25

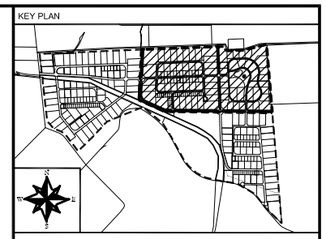


BEAM B2 DETAILS
SCALE 1:25



FRAMING PLAN AT PUMP ROOM ROOF
SCALE 1:150

KEY PLAN



NOTE:

LEGEND:

1. ALL DIMENSIONS ARE IN MILIMETERS AND LEVELS ARE IN METER U.N.O.
2. ALL DRAWINGS MUST BE READ IN CONJUNCTION WITH PHED DRAWINGS.
3. ALL STEEL SHALL BE ASTM A-615 GRADE 60.
4. SULPHATE RESISTING CEMENT TO BE USED FOR ALL STRUCTURAL WORK.
5. APPROVED WATER PROOFING COATING ON ALL STRUCTURES.
6. FOR LEVELS REFER PHED
7. ALL LEVELS & DIMENSIONS MUST BE CONFIRMED BEFORE EXECUTION AT SITE.
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10. DE-WATERING SHALL BE CONTINUOUS UN TILL CASTING OF TOP SLAB AND BACK FILLING.
11. THIS SHOULD BE VERIFIED PRIOR TO START OF CONSTRUCTION.
12. TOP SLAB TO BE CASTED BEFORE ADDITION OF INTERNAL WATER AND BACK FILLING.

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	FEB-2025

PROJECT:

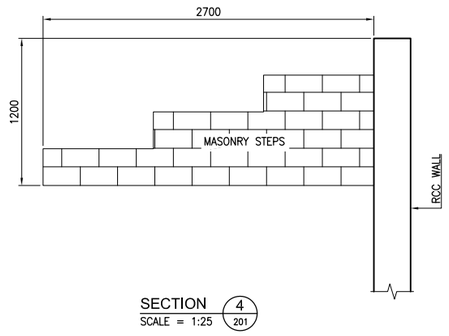
KARACHI INDUSTRIAL PARK SEZ

DRAWN	A.I	SCALE	AS SHOWN
DESIGN	A.A	DATE	FEB.2025
CHECKED	M.L	DESIGN STAGE	TD
APPROVED	M.S	ISSUE	TD
ACTUAL SHEET SIZE			A1

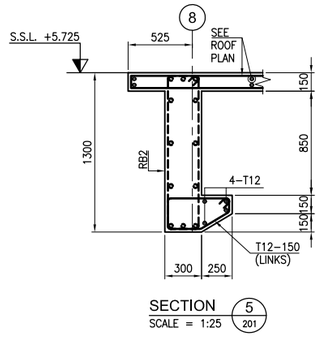
DRAWING TITLE:

UNDER GROUND TANK
GROUND AND ROOF FRAMING PLAN
(2.0_MGD)

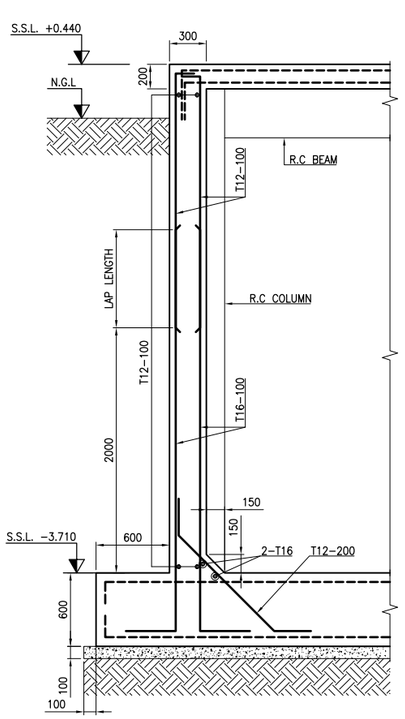
PROJ CODE	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-PS-S-201	0



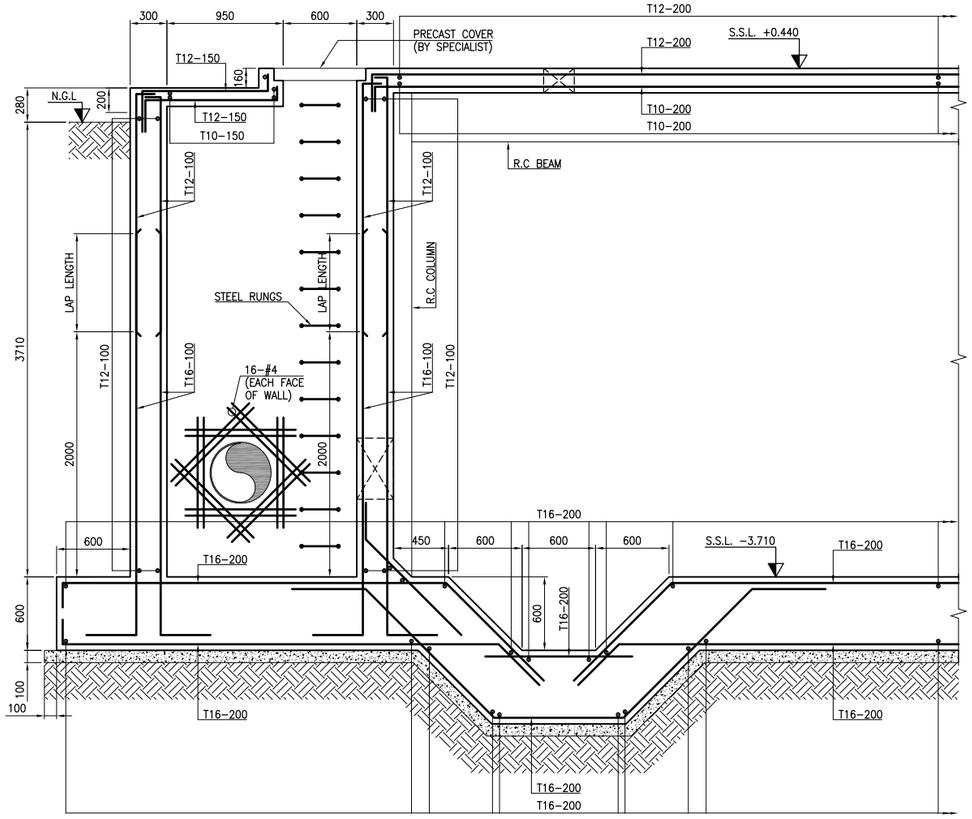
SECTION 4 / 201
SCALE = 1:25



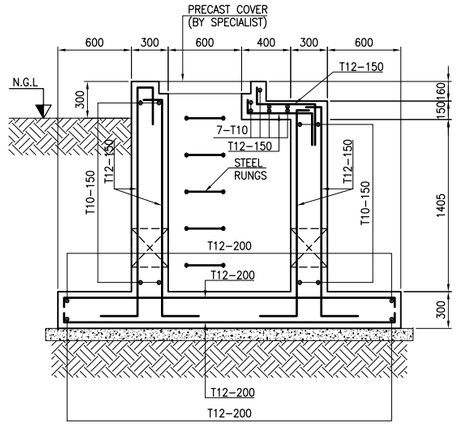
SECTION 5 / 201
SCALE = 1:25



SECTION 1 / 201
SCALE = 1:25

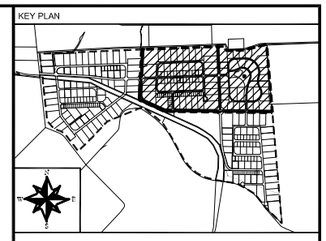


SECTION 2 / 201
SCALE = 1:25



SECTION 3 / 201
SCALE = 1:25

KEY PLAN



NOTE:

LEGEND:

1. ALL DIMENSIONS ARE IN MILIMETERS AND LEVELS ARE IN METER U.N.O.
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CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	FEB-2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	A.I	SCALE	AS SHOWN
DESIGN	A.A	DATE	FEB.2025
CHECKED	M.L	DESIGN STAGE	TD
APPROVED	M.S	ISSUE	TD
ACTUAL SHEET SIZE			A1

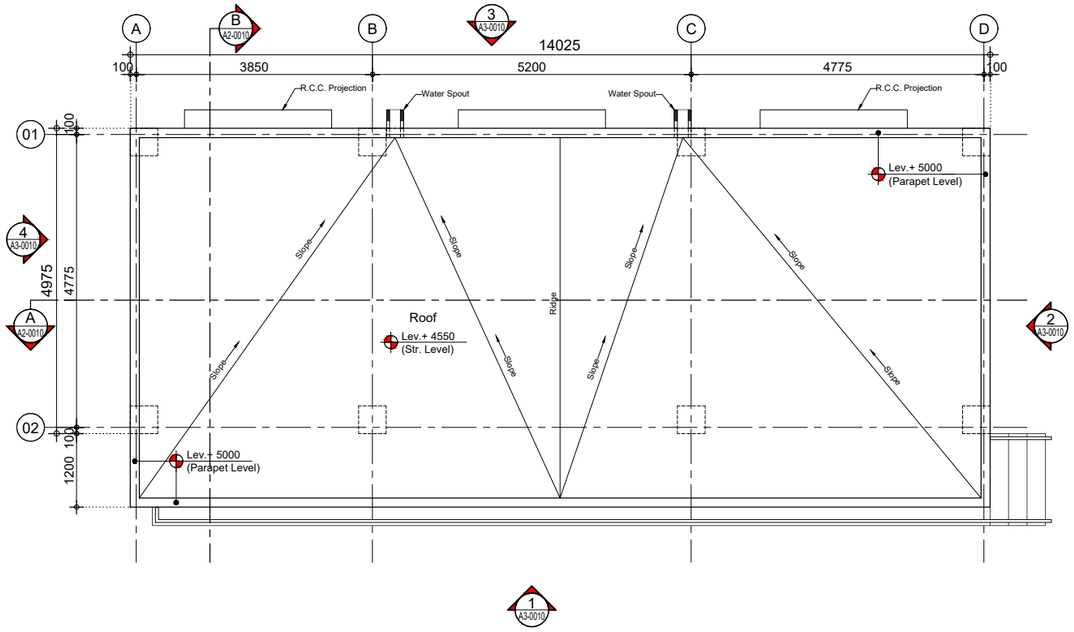
DRAWING TITLE:

UNDER GROUND TANK SECTIONS (2.0_MGD)

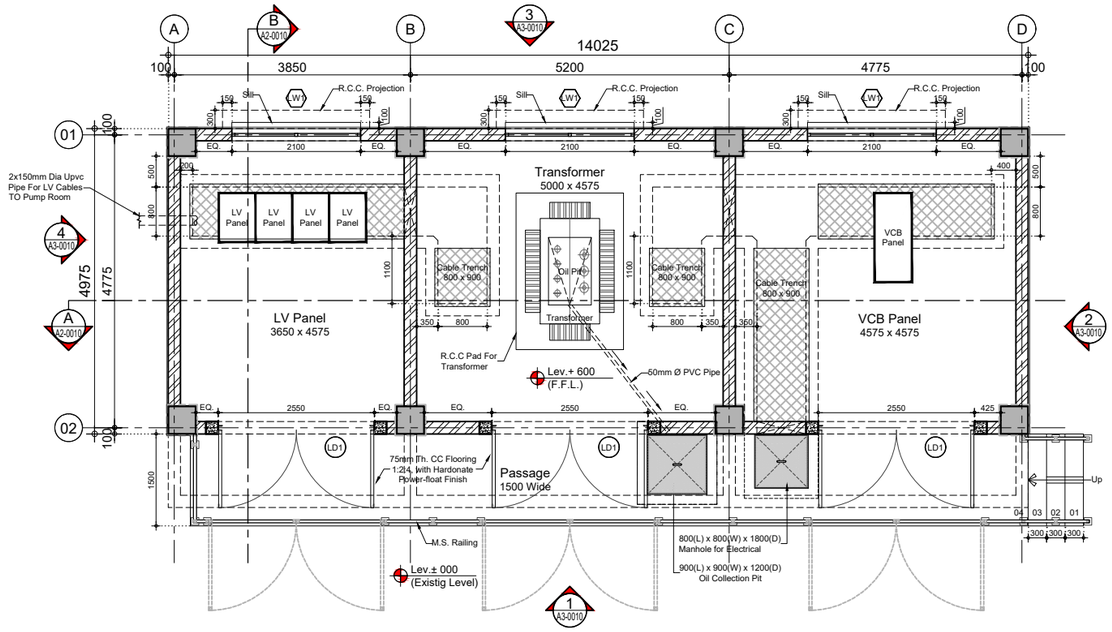
PROJ CODE	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-PS-S-301	0

SUB STATION

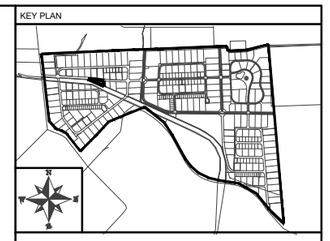
ROOF PLAN



GROUND FLOOR PLAN



KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	FEB, 2025

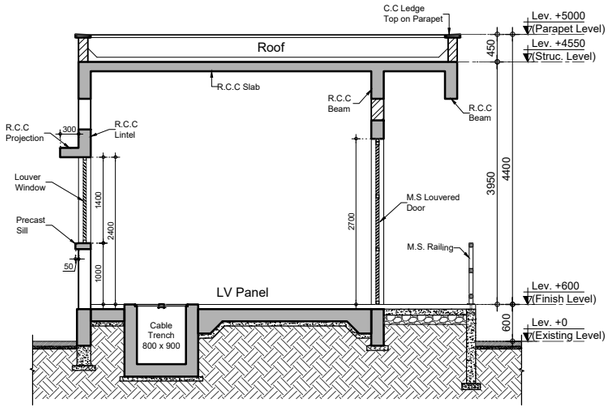
PROJECT:

KARACHI INDUSTRIAL PARK SEZ

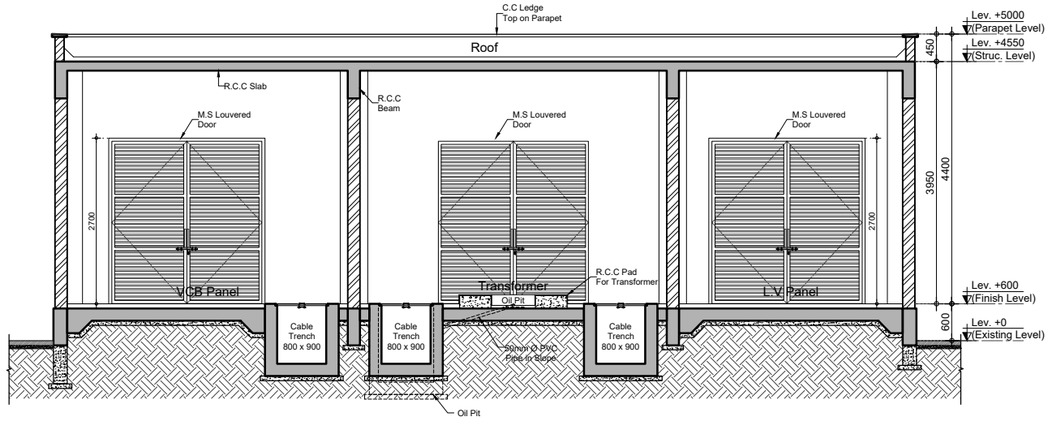
DRAWN	MT	SCALE	1:50
DESIGN	SAF	DATE	FEB, 2025
CHECKED	AM	DESIGN STAGE	TD
APPROVED	AM	ISSUE	TD
ACTUAL SHEET SIZE			A1

DRAWING TITLE: **SUB-STATION GROUND FLOOR & ROOF PLAN**

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-SS-A1-0100	0

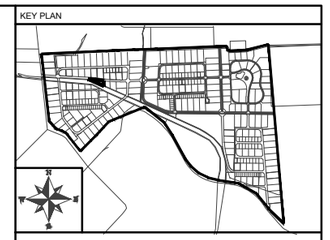


SECTION - BB



SECTION - AA

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	FEB, 2025

PROJECT:

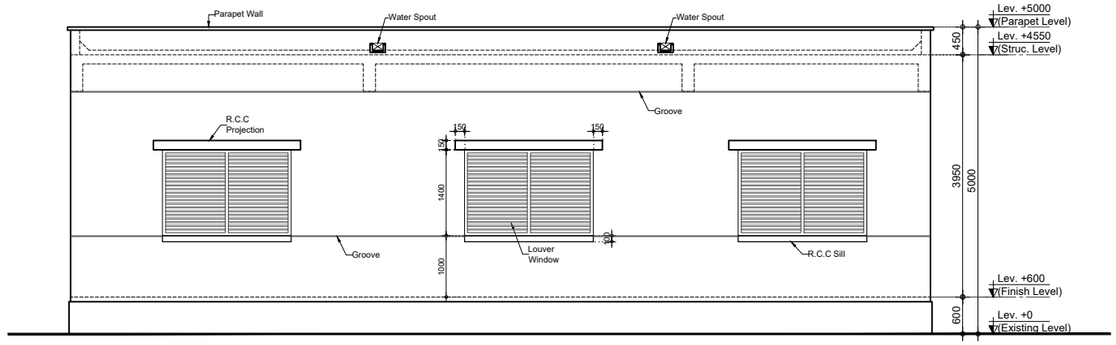
KARACHI INDUSTRIAL PARK SEZ

DRAWN	MT	SCALE	1:50
DESIGN	SAF	DATE	FEB, 2025
CHECKED	AM	DESIGN STAGE	TD
APPROVED	AM	ISSUE	TD
ACTUAL SHEET SIZE			A1

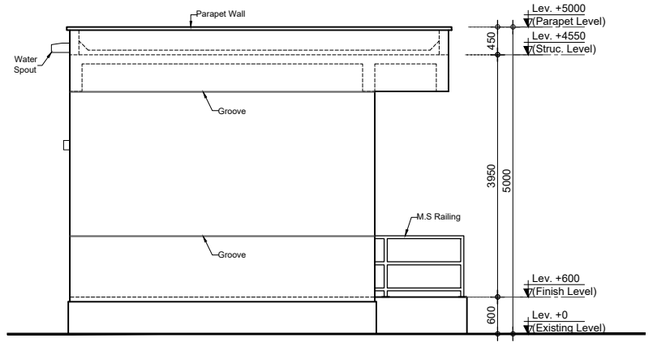
DRAWING TITLE:

SUB-STATION
SECTIONS - AA & BB

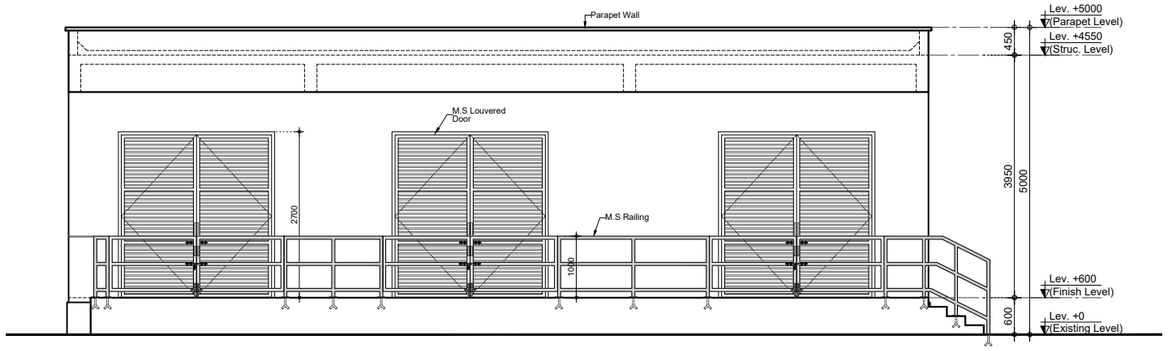
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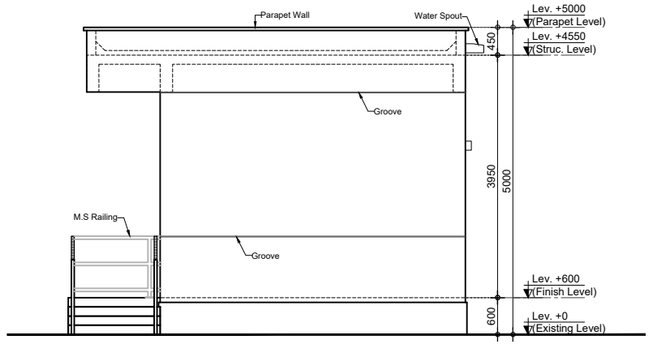
ELEVATION - 03



ELEVATION - 04

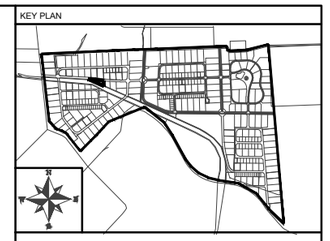


ELEVATION - 01



ELEVATION - 02

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	FEB, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	MT	SCALE	1:50
DESIGN	SAF	DATE	FEB, 2025
CHECKED	AM	DESIGN STAGE	TD
APPROVED	AM	ISSUE	TD
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

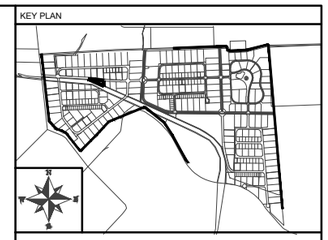
SUB-STATION ELEVATIONS

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-SS-A3-0010	0

S#	TITLE	FLOOR	SKIRTING / DADO	WALL	CEILING	COLOR	REMARKS
	GROUND FLOOR						
01	LV Panel	E.F	-	M.E.P	O.B.D	--	-
02	Transformer	E.F	-	M.E.P	O.B.D	--	-
03	VCB Panel	E.F	-	M.E.P	O.B.D	--	-

DESCRIPTION COMPOUND WORDS		
S#	**ABBREVIATION**	**MEANING**
01	E.F	Epoxy Flooring (Over 50mm Hardonite)
02	O.B.D	Oil Bond Distemper
03	MEP	Matt Enamel Paint

KEY PLAN



FINISHING SCHEDULE

NOTE:

WINDOWS

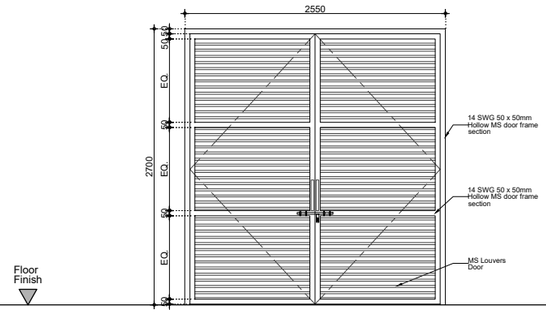
S.No.	Window Tags	Size Of Windows & Ventilators		Quantity		Glazing	Material	Finishes	Architrave	Chaukat	Chaukat Finish	Notes
		Width	Height	Ground Floor	Qty.							
01	LW1	2100	1400	03	03	Louvers	M.S	Epoxy Paint Finish	-	-	-	-

DOORS

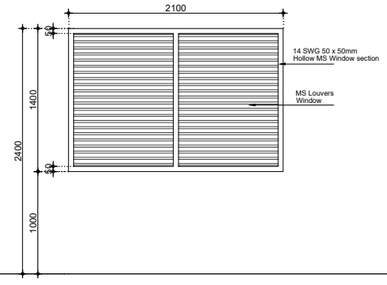
S.No.	Door Type	Size Of Doors		Quantity		Type	Material	Finishes	Chaukat	Chaukat Finish	Notes
		Width	Height	Ground Floor	Qty.						
01	LD1	2550	2700	03	03	Double	Metal Door As Specified	Epoxy Paint Finish	-	-	-

LEGEND:

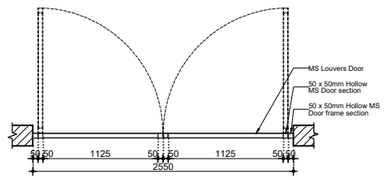
DOOR & WINDOW SCHEDULE

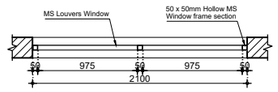


LD1 PLAN
2550x2700



V6 PLAN
2100 x 1400





DOOR & WINDOW ELEVATIONS

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	FEB, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	MT	SCALE	1:30
DESIGN	SAF	DATE	FEB, 2025
CHECKED	AM	DESIGN STAGE	TD
APPROVED	AM	ISSUE	TD
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

Finishing Schedule & Detail of Doors & Windows

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-SS-A6-0010	0

CONCRETE GENERAL NOTES

1. GENERAL

1.1 STRUCTURAL DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL OTHER DISCIPLINE DRAWINGS, DOCUMENTS, SPECIFICATIONS ETC. AS PART OF THE CONTRACT DOCUMENT OR. MAY BE ISSUED DURING THE COURSE OF THE CONTRACT.

1.2 DIMENSIONS SHALL NOT BE OBTAINED BY SCALING DRAWINGS.

1.3 FOR MAIN SETTING OUT LINES AND LEVELS REFER TO ARCHITECTURAL DRAWINGS.

1.4 THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THE SAFETY OF CONSTRUCTION AT ALL TIMES AND SHALL ENSURE THAT NO PART OF INTERMEDIATE COMPLETED CONSTRUCTION IS HAZARDOUS (FOR EXAMPLE: SIDES OF EXCAVATION, STARTER BARS ETC.)

1.5 THE CONTRACTOR SHALL PROVIDE TEMPORARY BRACING AND SHORING AGAINST LATERAL FORCES AND ALL CONSTRUCTION LOADS THROUGHOUT THE CONSTRUCTION PROCESS.

1.6 ALL ELEMENTS OF THE STRUCTURE DESIGNED BY THE CONTRACTOR SHALL BE SUBMITTED TO DESIGN CONSULTANT FOR REVIEW.

1.7 THE DESIGN CONSULTANT'S REVIEW PROCESS FOR ALL SUBMITTALS, DRAWINGS, METHOD STATEMENTS AND DOCUMENTS IS ONLY COMPLETE ONCE A STATUS OF 'NO OBJECTION' IS REACHED. THE SUBMITTAL SHALL BE REVIEWED BY THE DESIGN CONSULTANT FOR COMPLIANCE WITH THE DESIGN INTENT THIS DOES NOT RELIEVE THE CONTRACTOR FROM HIS CONTRACTUAL RESPONSIBILITIES.

1.8 FOR ALL BUILDERS WORK INFORMATION (OPENINGS IN STRUCTURAL ELEMENTS);- LIGHTING POINTS, GULLIES, CAST-IN PIPES, SLEEVES, ELECTRICAL TRENCHES, MANHOLES ETC, REFER TO MEP DRAWINGS FOR LOCATION. THE CONTRACTOR SHALL PREPARE COORDINATED SERVICES DRAWINGS IDENTIFYING STRUCTURAL, MEP AND ARCHITECTURAL ELEMENTS/DETAILS FOR CONSULTANT'S REVIEW BEFORE COMMENCEMENT OF CONSTRUCTION IN THE AREA CONCERNED.

1.9 ALL DESIGN, WORKMANSHIP AND MATERIAL SHALL BE IN ACCORDANCE WITH THE CURRENT ACI, UBC, IBC, AISC AND LOCAL AUTHORITY STANDARDS AND PROJECT DESIGN CRITERIA UNLESS NOTED OTHERWISE.

2. DESIGN CODE OF PRACTICE

2.1 1997 UNIFORM BUILDING CODE.

2.2 ACI-318 BUILDING CODE FOR STRUCTURAL CONCRETE AND COMMENTARY.

2.3 ASCE/SEI 7 MINIMUM DESIGN LOADS FOR BUILDING AND OTHER STRUCTURES.

2.4 ANSI/AISC 360 SPECIFICATION FOR STRUCTURAL STEEL BUILDING.

2.5 ANSI/AISC 341 SEISMIC PROVISIONS FOR STRUCTURAL STEEL BUILDING.

2.6 BCP-SP-2007 SEISMIC BUILDING CODE OF PAKISTAN.

2.7 ACI 360 DESIGN OF SLAB ON GRADE

3. FOUNDATIONS

3.1 THE CONTRACTOR SHALL READ AND FAMILIARIZE HIMSELF WITH THE GEOTECHNICAL INVESTIGATION REPORT AS WELL AS VISIT THE SITE AND BECOME THOROUGHLY FAMILIAR WITH THE SURFACE AND SUBSURFACE CONDITIONS.

3.2 LOOSE POCKETS OF SOIL WHICH ARE ENCOUNTERED SHALL BE REMOVED AND REPLACED WITH GOOD GRANULAR FILL MATERIAL TO ACHIEVE THE DESIRED BEARING PRESSURE.

3.3 ANY ADJACENT FOOTING IN THE VICINITY OF THE WORK SHALL BE PROPERLY PROTECTED BEFORE EXECUTION OF WORK.

3.4 FOUNDATION SHALL BE PLACED ON FIRM AND VIRGIN GROUND FROM EXISTING GROUND LEVEL AS PER SOIL INVESTIGATION REPORT CONDUCTED BY SOILMAT. BEFORE PLACING THE FOUNDATION CONCRETE, THE EXCAVATIONS SHOULD BE CAREFULLY INSPECTED TO ENSURE THAT COMPETENT BEARING STRATUM HAS BEEN REACHED AND FILL HAS BEEN CROSSED.

3.5 FOUNDATION IS DESIGN ON ASSUMED NET BEARING CAPACITY OF 160 KPA AT THE DEPTH OF 1.5m.

3.5 DEWATERING MUST BE STARTED RIGHT AFTER EXCAVATION AND CONTINUE UNTIL WHOLE STRUCTURE IS CONSTRUCTED.

4. REINFORCED CONCRETE

4.1 THE CONTRACTOR SHALL SUBMIT DETAILED RC DRAWINGS AND BAR BENDING SCHEDULES SHOWING BAR SIZES, SPACING, PLACEMENT AND SUPPORT DETAILS DOWELS AT EXPANSION JOINTS AND LAPS ETC. FOR REVIEW AND ACCEPTANCE OF THE DESIGN CONSULTANT. WORK SHALL NOT COMMENCE UNTIL THE SHOP DRAWINGS ARE REVIEWED AND ACCEPTED REVIEW OF SHOP DRAWINGS DOES NOT ALLEVIATE THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE THE INPUT OF ALL TRADES ON THE SHOP DRAWINGS.

4.2 REFER TO SPECIFICATIONS FOR QUALITY AND PERFORMANCE REQUIREMENTS OF CONCRETE.
(i) FOR THE TYPE OF CEMENT FOLLOW THE GEOTECHNICAL RECOMMENDATION

4.3 ALL CAST-IN-SITU CONCRETE SHALL HAVE A MINIMUM 28 DAYS CYLINDRICAL STRENGTH UNLESS NOTED OTHERWISE OR MENTIONED IN FOLLOWING TABLE:

COLUMNS = 28 Mpa (4000 Psi) 28 DAYS CYLINDRICAL STRENGTH,
WALLS, BEAMS, SLABS & FOUNDATIONS = 21 Mpa (3000 Psi) 28 DAYS CYLINDRICAL STRENGTH.

4.4 WATER CEMENT RATIO SHALL NOT EXCEED 0.5

4.5 MAXIMUM POSSIBLE WATER-SOLUBLE CHLORIDE ION (CL) CONTENT IN CONCRETE SHALL NOT EXCEED 0.15% BY WEIGHT OF CEMENT.

4.6 MAXIMUM SIZE OF COURSE AGGREGATE SHALL BE 25MM UNLESS NOTED OTHERWISE.

4.7 CONTRACTOR SHALL GET APPROVAL FROM DESIGN CONSULTANT OF A CONCRETE MIX DESIGN.

4.8 THE CONTRACTOR SHALL PERFORM AND SUBMIT FOR REVIEW INSTRUMENT SURVEYS OF FINISHED CONCRETE SLAB SURFACES, BOTH BEFORE AND AFTER REMOVAL OF FORM WORK AND/OR SHORING SYSTEM TO VERIFY AS-BUILT TOLERANCES.

4.9 REFER TO SPECIFICATIONS FOR REQUIREMENTS OF CONCRETE SURFACE FINISH AND CASTING TOLERANCE.

4.10 PROVIDE UPWARD CAMBER TO SLABS AND BEAMS AS NOTED ON STRUCTURAL DRAWINGS AND/OR SPECIFICATIONS CAMBER BOTH UNDERSIDE AND TOP OF CONCRETE TO MAINTAIN THE SLAB AND BEAM DEPTH SHOWN ON THE DRAWINGS UNLESS NOTED OTHERWISE.

4.11 BEAMS, SLABS, COLUMNS, WALLS AND FOUNDATION ELEMENTS SHALL NOT BE SLEEVED OR BOXED-OUT OR HAVE THE REINFORCEMENT INTERRUPTED EXCEPT AS INDICATED ON THE STRUCTURAL DRAWINGS.

4.12 ALL CONCRETE SHALL CONTAIN AN APPROVED WATER REDUCING, PLASTICIZING ADMIXTURE. APPROVED HIGH RANGE WATER REDUCING ADMIXTURE MAY BE UTILIZED AT THE CONTRACTOR'S OPTION. ALL CONCRETE PERMANENTLY EXPOSED TO WEATHER SHALL ALSO CONTAIN AN APPROVED AIR-ENTRAINING ADMIXTURE TO PROVIDE PERCENTAGE OF AIR REQUIRED FOR SEVERE EXPOSURE AS PER ACI 318.

4.13 ADMIXTURE/WATER CONTAINING CHLORIDE IONS SHELL NOT BE USED IN ANY CONCRETE.

4.14 THE FOLLOWING CONCRETE CLEAR COVER TO PRIMARY REINFORCEMENT SHALL BE PROVIDED, UNLESS LARGER COVER IS NOTED ON THE STRUCTURAL DRAWINGS.

ELEMENT	CONCRETE CLEAR COVER SCHEDULE	
	ABOVE GROUND INTERIOR ENVIRONMENT	ABOVE GROUND EXTERIOR ENVIRONMENT
COLUMNS(VERTICAL BARS)	40	50
BEAMS(LONGITUDINAL BARS)	40	50
WALLS	25	35
GRADE SLAB	25	35
SUSPENDED SLAB	25	35
EQUIPMENT PAD	25	35
WATER TANK	50	50

NOTE: - CLEAR COVER SHALL NOT BE LESS THAN ONE BAR DIA.
- CONCRETE COVER FOR SURFACE CAST AGAINST SOIL SHALL BE 75 AND FOR SURFACE INCONTACT WITH SOIL SHALL BE 50.

4.15 AGGREGATE FOR CONCRETE SHALL BE FROM APPROVED SOURCE AND SHALL COMPLY WITH THE SPECIFICATION REQUIREMENTS.

4.16 HORIZONTAL CONSTRUCTION JOINTS SHALL NOT BE MADE IN BEAMS UNLESS SHOWN OR REVIEWED BY DESIGN CONSULTANT. VERTICAL CONSTRUCTION JOINTS MAY BE MADE AT MIDSPAN OF BEAMS, OR SLABS HAVING NO POINT LOADS AT CENTER OF SPAN. UNLESS OTHERWISE NOTED OR SHOWN OR DIRECTED BY THE DESIGN CONSULTANT.

4.17 ALL CONCRETE SHALL BE COMPACTED USING ONLY MECHANICAL VIBRATION PROCESS.

4.18 ALL CONCRETE SHALL BE CURED IN ACCORDANCE WITH THE SPECIFICATIONS.

5. REINFORCEMENT

5.1 ALL REINFORCING BARS SHALL BE DEFORMED BARS WITH YIELD STRENGTH OF 414MPa CONFORMING TO ASTM A615.

5.2 EPOXY COATED REINFORCING BARS SHALL NOT BE PERMITTED.

5.3 ALL REINFORCING BARS SHALL BE DETAILED, FABRICATED, LABELED, SUPPORTED, SPACED IN FORMS AND SECURED IN PLACE IN ACCORDANCE WITH THE PROCEDURES AND REQUIREMENTS OUTLINED IN THE CURRENT ACI 318 AND ACI 315 UNLESS NOTED OTHERWISE ON THE STRUCTURAL DRAWINGS.

5.4 ALL STARTER BARS SHALL BE SURVEYED AND LOCATION CONFIRMED IN AS-BUILT CONDITION PRIOR TO PLACING WALL/COLUMN REINFORCEMENT AND ANY DISCREPANCIES SHALL BE REPORTED TO THE DESIGN CONSULTANT FOR INSTRUCTIONS.

5.5 PROVIDE STARTER BARS TO WALLS AND COLUMNS SIMILAR IN NUMBER AND SIZE AND SPACING TO THE VERTICAL BARS ABOVE UNLESS NOTED OTHERWISE.

5.6 WELDING AND/OR SITE CUTTING OF THE REINFORCING BARS SHALL NOT BE PERMITTED UNLESS REVIEWED AND ACCEPTED BY THE DESIGN CONSULTANT.

5.7 ALL PROPRIETARY FIXING SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.

5.8 ALL REINFORCING SPLICES SHALL BE CLASS B TENSION SPLICES IN ACCORDANCE WITH THE CURRENT ACI 318 UNLESS NOTED OTHERWISE. REFER TO SCHEDULE BELOW FOR SPLICE LENGTHS.

TENSION SPLICE LENGTH	
CLASS A	1.0X DEVELOPMENT LENGTH
CLASS B	1.3X DEVELOPMENT LENGTH

CLASS A = As PROVIDED ≥ 2 As REQUIRED AND PERCENTAGE As SPLIES < 50%
CLASS B = ALL OTHER CONDITIONS

5.9 ALL WIRE MESH REINFORCEMENT SHALL BE LAPPED AT LEAST 2 MESH PANELS AND SECURELY TIED. ALL REINFORCING DEVELOPMENT LENGTHS SHALL BE TENSION DEVELOPMENT LENGTHS IN ACCORDANCE WITH THE CURRENT ACI 318 UNLESS NOTED OTHERWISE. REFER TO SCHEDULE BELOW.

	TENSION DEVELOPMENT LENGTHS* FOR fc= 4ksi (28MPa)					
	T10	T12	T16	T20	T25	T32
CLEAR SPACING OF BARS BEING DEVELOPED OR SPLICED NOT LESS THAN DIA OF BAR, AND BEAM STRRUPS COLUMNS TIES THROUGHOUT SPACE LENGTH NOT LESS THAN THE CODE MINIMUM OR CLEAR SPACING OF BARS BEING DEVELOPED OR SPLICED NOT LESS THAN TWICE THE DIA OF BAR, AND CLEAR COVER NOT LESS THAN DIA OF BAR	385	465	615	925	1200	1550
OTHER CASES	575	690	925	1450	1800	2300
*ABOVE DEVELOPMENT LENGTH SHALL BE MULTIPLIED BY 1.3 WHERE HORIZONTAL REINFORCEMENT IS PLACED SUCH THAT MORE THEN 300mm OF FRESH CONCRETE IS CAST BELOW.						

	TENSION DEVELOPMENT LENGTHS* FOR fc= 21 Mpa (3 Ksi)					
	T10	T12	T16	T20	T25	T32
CLEAR SPACING OF BARS BEING DEVELOPED OR SPLICED NOT LESS THAN DIA OF BAR, AND BEAM STIRRUPSOR COLUMNS TIES THROUGHOUT SPACE LENGTH NOT LESS THAN THE CODE MINIMUM OR CLEAR SPACING OF BARS BEING DEVELOPED OR SPLICED NOT LESSTHAN TWICE THE DIA OF BAR, AND CLEAR COVER NOT LESS THAN DIA OF BAR	435	525	700	1075	1350	1725
OTHER CASES	655	790	1050	1650	2080	2665
*ABOVE DEVELOPMENT LENGTH SHALL BE MULTIPLIED BY 1,3 WHERE HORIZONTAL REINFORCEMENT IS PLACED SUCH THAT MORE THEN 300mm OF FRESH CONCRETE IS CAST BELOW.						

5.10 MECHANICAL SPLICING OF LARGE DIAMETER BARS MAY BE ACCEPTABLE SUBJECT TO REVIEW BY THE DESIGN CONSULTANT

5.11 FOR HOUSE KEEPING PADS AND FLOATING SLABS PROVIDE REINFORCEMENT IN ACCORDANCE WITH THE CURRENT ACI 318 UNLESS NOTED OTHERWISE OR SHOWN ON THE STRUCTURAL DRAWINGS.

5.12 COUPLERS TO BE PROVIDED COLUMN R/F EXCEEDS 3.0%.

6. ANCHORAGE OF BARS BY HOOKS:

* THE DIMENSIONS AND BENDING RADII FOR HOOKS TO BE USE AS STANDARDIZED IN THE ACI CODE:

6.1 A 180° BEND PLUS AN EXTENSION OF AT LEAST 4 BAR DIAMETERS, BUT NOT LESS THAN 2.5 IN AT THE FREE END OF BAR OR

6.2 A 90° BEND PLUS AN EXTENSION OF AT LEAST 12 BAR DIAMETERS AT THE FREE END OF THE BAR, OR

6.3 FOR STIRRUP AND TIE ANCHORAGE ONLY:

6.3.1 FOR NO. 5 BARS AND SMALER, A 90° BEND PLUS AN EXTENSION OF AT LEAST 6 BAR DIAMETERS AT THE FREE END OF THE BAR, OR

6.3.2 FOR NOS. 6,7 AND 8 BARS, A 90° BEND PLUS AN EXTENSION OF AT LEAST 12 BAR DIAMETERS AT THE FREE END OF THE BAR, OR

6.3.3 FOR NO. 8 BARS AND SMALLER, A 135° BEND PLUS AN EXTENSION OF AT LEAST 6 BAR DIAMETERS AT THE FREE END OF THE BAR.

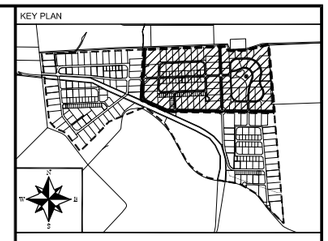
THE MINIMUM DIAMETER OF BEND, MEASURED ON THE INSIDE OF THE BAR, FOR STANDARD HOOKS OTHER THAN FOR STIRRUPS OR TIES IN SIZES NOS. 3 THROUGH 5, SHOULD NOT BE LESS THAN 6 BAR DIAMETER. FOR STIRRUP AND TIE HOOKS, FOR BAR SIZES NO.5 AND SMALLER, THE INSIDE DIAMETER OF BEND SHOULD NOT BE LESS THEN 4 BAR DIAMETERS, ACCORDING TO ACI CODE:



(a). MAIN REINFORCEMENT
r = 4db FOR db ≤T25
r = 5db FOR db >T25

(b). STIRRUPS AND TIES

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	FEB-2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	A.I	SCALE	AS SHOWN
DESIGN	A.A	DATE	FEB.2025
CHECKED	M.L	DESIGN STAGE	TD
APPROVED	M.S	ISSUE	TD
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

GENERAL NOTES

PROJ CODE	DRAWING NO.	REV.
01098	EA-1098-KIP-U-SS-S-001	0

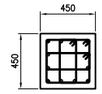
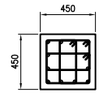
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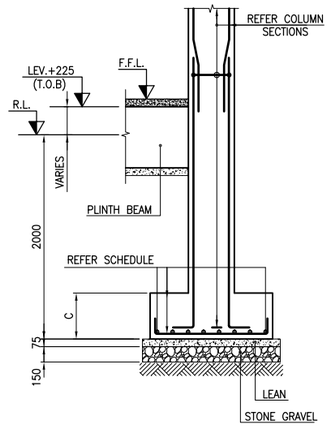
1. ALL DIMENSIONS ARE IN MILLIMETER AND ELEVATIONS ARE ALSO IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. GENERAL NOTES FOR CONCRETE WORK, REFER DWG NO. EA-1098-KIP-U-SS-S-001 UNLESS NOTED OTHERWISE.
3. IF EXCAVATION FOR FOUNDATIONS ARE REQUIRED TO CARRIED BELOW SPECIFIED LEVEL DUE TO LOOSE SOIL OR AS DIRECTED BY ENGINEERS, THE SURPLUS DEPTH SHALL BE FILLED IN WITH CONCRETE OF SAME GRADE AS OF BLINDING CONCRETE AT THE SOLE COST OF THE CONTRACTOR AS MENTIONED IN SPECIFICATION.
4. CONCRETE IN CONTACT WITH SOIL SHALL BE COATED WITH 2 COATS OF HOT BITUMEN AND ONE PRIMER COAT OF ASPHALT OIL.
5. DE-WATERING SHOULD BE DONE SO THAT THE WATER LEVEL SHOULD REMAIN AT 1.5M BELOW THE BOTTOM OF THE FOOTING.
6. PLINTH LEVEL SHOULD BE COORDINATED WITH ARCHITECTURE AND HIGHWAY DRAWINGS PRIOR TO EXECUTION.
7. SPECIFICATIONS SECTION-1600.
8. TYPE OF CEMENT FOR SUB-STRUCTURE REFER GEOTECHNICAL REPORT.
9. DEWATERING SHALL BE CONTINUED TILL THE CASTING OF GROUND FLOOR SLAB UP TO THE COMPLETION OF BACK FILLING AROUND THE STRUCTURE.

SCHEDULE OF FOOTING

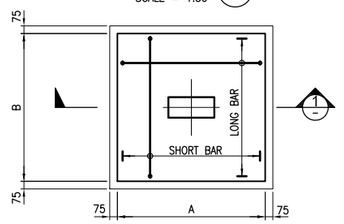
S.NO.	FOOTING	FOOTING SIZE		FOOTING THICKNESS	BOTTOM REINFORCEMENT		TOP REINFORCEMENT		REMARKS
		A	B	C	SHORT BAR	LONG BAR	SHORT BAR	LONG BAR	
1	F1	2000	2000	375	T12-150	T12-150	-	-	ISOLATED FOOTING

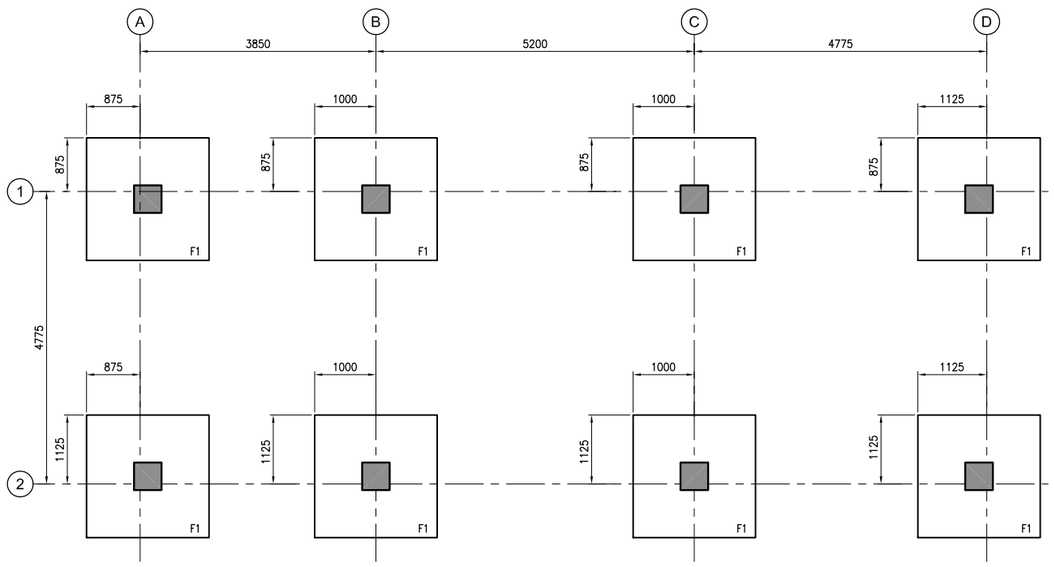
COLUMN SCHEDULE

ROOF TO PLINTH LEVEL	 BARS: 12-T16 RINGS: 3-T10-150	 BARS: 4-T16 RINGS: 1-T10-150
PLINTH LEVEL TO FOUNDATION	 BARS: 12-T16 RINGS: 3-T10-150	-
COLUMN MARK	C1	PC1

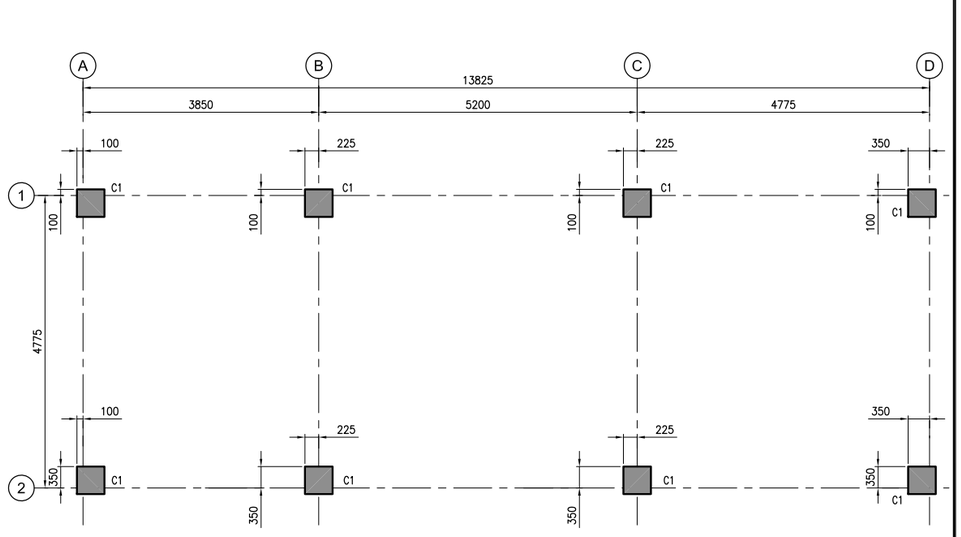


SECTION (1/-) SCALE = 1:30



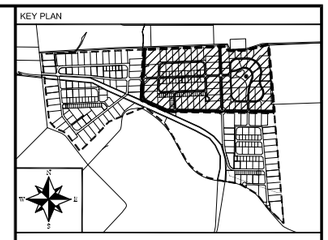


(A/-) FOUNDATION LAYOUT PLAN SCALE = 1:50



(B/-) COLUMN LAYOUT PLAN SCALE = 1:50

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	FEB-2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

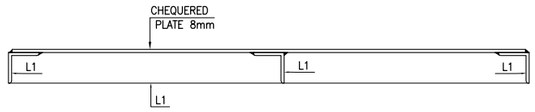
DRAWN	A.I	SCALE	AS SHOWN
DESIGN	A.A	DATE	FEB,2025
CHECKED	M.L	DESIGN STAGE	TD
APPROVED	M.S	ISSUE	TD
ACTUAL SHEET SIZE			A1

DRAWING TITLE: SUB-STATION COLUMN, FOUNDATION LAYOUT PLAN AND DETAILS

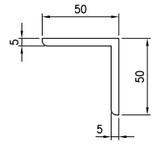
PROJ CODE	DRAWING NO.	REV.
01098	EA-1098-KIP-U-SS-S-101	0

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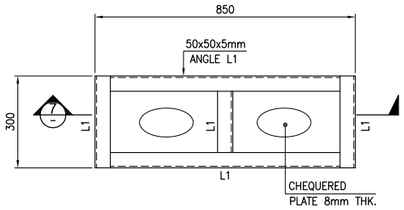
1. ALL DIMENSIONS ARE IN MILLIMETER AND ELEVATIONS ARE ALSO IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. FOR NOTES REFER DWG NO EA-1098-KIP-U-SS-S-001.
3. ALL STEEL SHALL BE ASTM A-615 GRADE 60.
4. SULPHATE RESISTING CEMENT TO BE USED FOR ALL STRUCTURAL WORK.
5. APPROVED WATER PROOFING COATING ON ALL STRUCTURES.



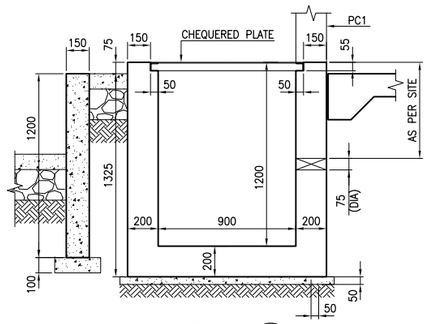
SECTION 7 / SCALE = 1:5



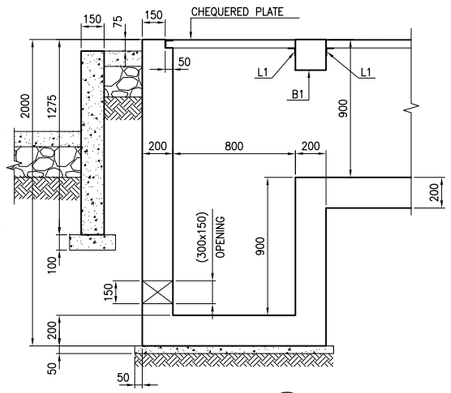
H / TYP. ANGLE L1
SCALE = 1:2



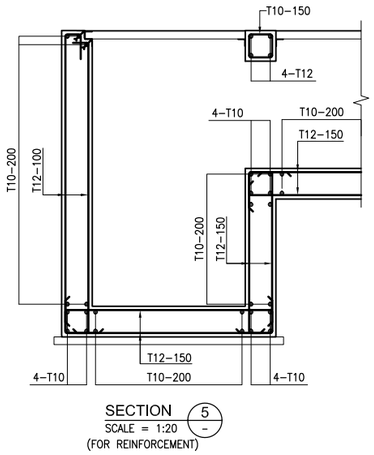
G / TYPICAL CHEQUERED PLATE PLAN
SCALE = 1:10



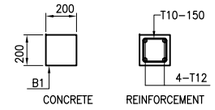
SECTION 4 / SCALE = 1:20



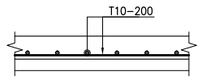
SECTION 5 / SCALE = 1:20 (FOR DIMENSIONS)



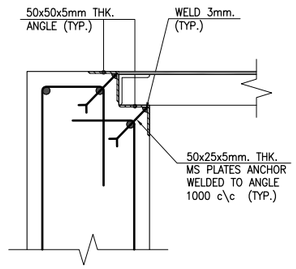
SECTION 5 / SCALE = 1:20 (FOR REINFORCEMENT)



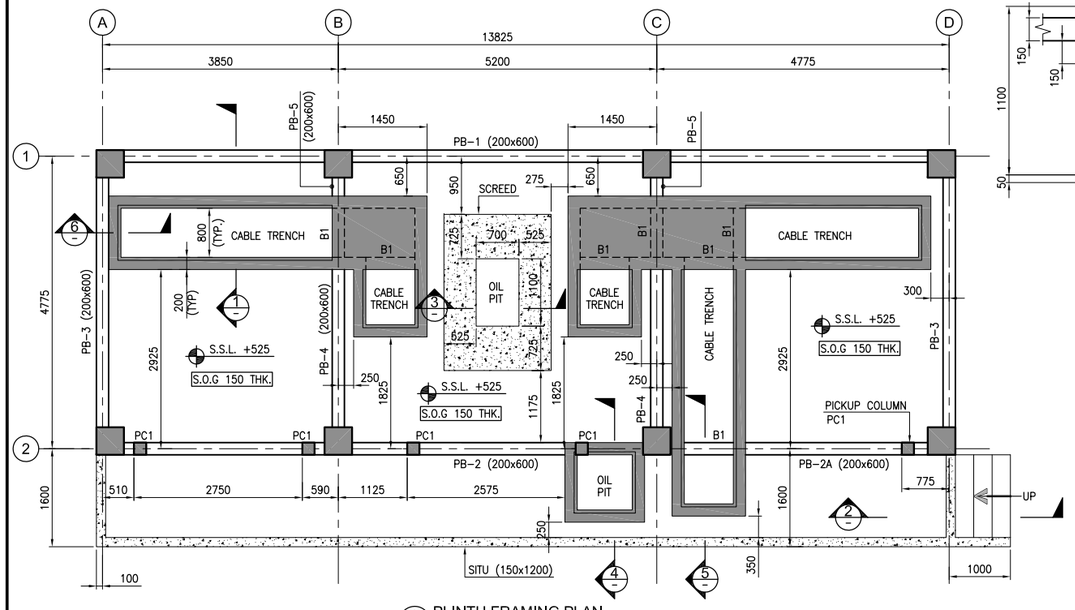
F / TYPICAL SECTION OF B1
SCALE = 1:20



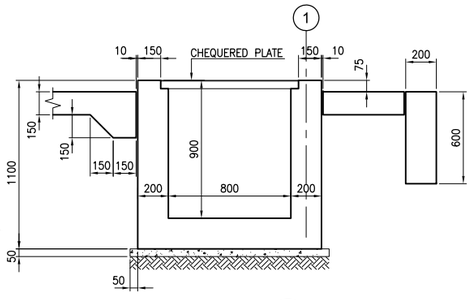
E / TYPICAL SECTION OF S.O.G REINFORCEMENT
SCALE = 1:20



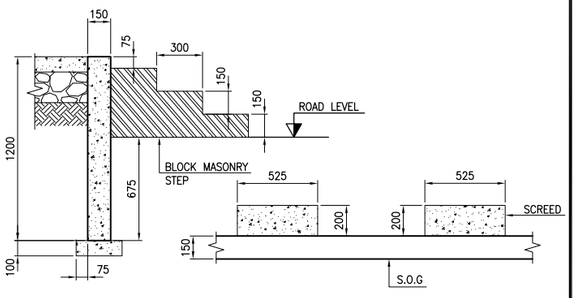
DETAIL A / SCALE = 1:5



A / PLINTH FRAMING PLAN
SCALE = 1:50

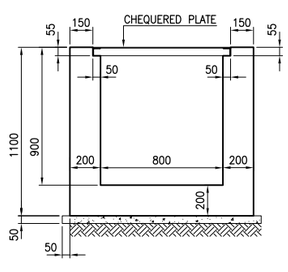


SECTION 1 / SCALE = 1:20

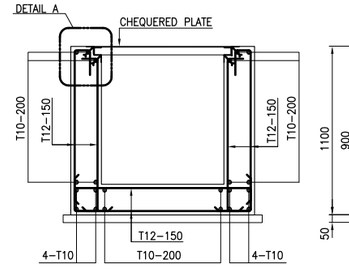


SECTION 2 / SCALE = 1:20

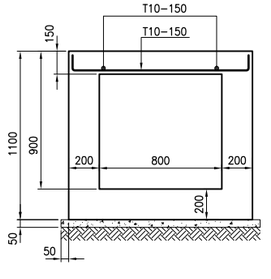
SECTION 3 / SCALE = 1:20



C / TYPICAL SECTION OF CABLE TRENCH
SCALE = 1:20 (WITHOUT SLAB)

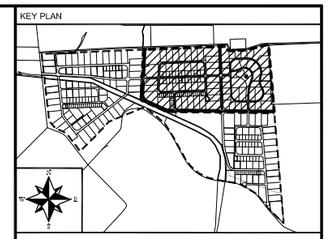


D / TYPICAL SECTION OF CABLE TRENCH & OIL PIT REINFORCEMENT
SCALE = 1:20 (WITHOUT SLAB)



E / TYPICAL SECTION OF CABLE TRENCH
SCALE = 1:20 (WITH SLAB)

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	FEB-2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

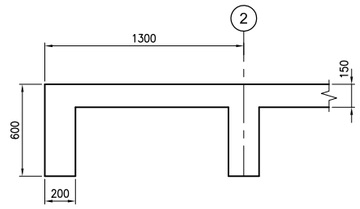
DRAWN	A.I	SCALE	AS SHOWN
DESIGN	A.A	DATE	FEB.2025
CHECKED	M.L	DESIGN STAGE	TD
APPROVED	M.S	ISSUE	TD
ACTUAL SHEET SIZE			A1

DRAWING TITLE: SUB-STATION
PLINTH FRAMING PLAN, SECTIONS & REINF. DETAILS

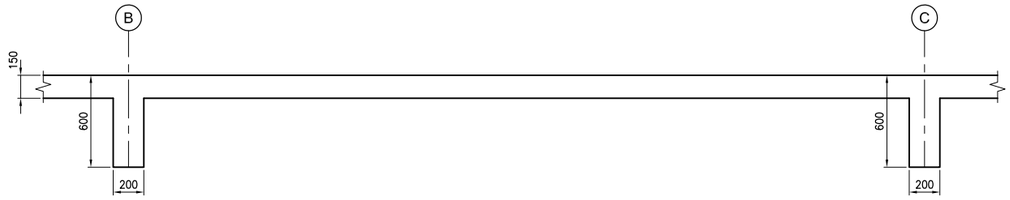
PROJ CODE	DRAWING NO.	REV.
01098	EA-1098-KIP-U-SS-S-102	0

NOTES:

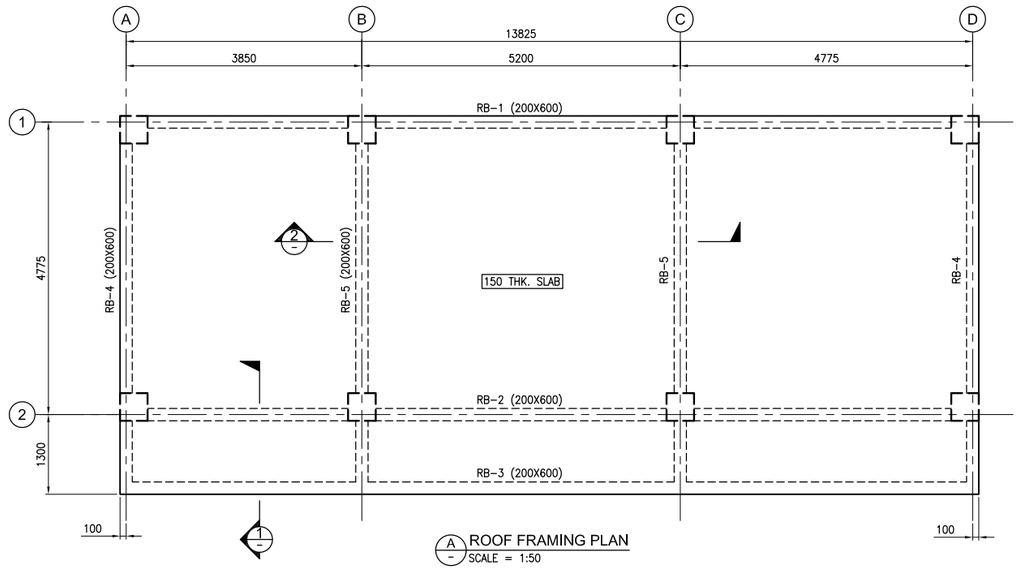
1. ALL DIMENSIONS ARE IN MILLIMETER AND ELEVATIONS ARE ALSO IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. FOR NOTES REFER DWG NO EA-1098-KIP-U-SS-S-001.
3. ALL STEEL SHALL BE ASTM A-615 GRADE 60.
4. CONCRETE MUST HAVE 28 DAYS OF CYLINDRICAL STRENGTH OF 4000 Psi



SECTION 1 / SCALE = 1:20

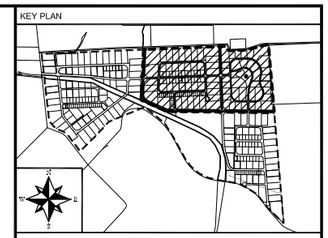


SECTION 2 / SCALE = 1:20



A / ROOF FRAMING PLAN
SCALE = 1:50

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	FEB-2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

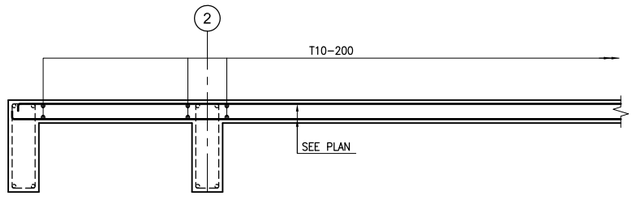
DRAWN	A.I	SCALE	AS SHOWN
DESIGN	A.A	DATE	FEB.2025
CHECKED	M.L	DESIGN STAGE	TD
APPROVED	M.S	ISSUE	TD
ACTUAL SHEET SIZE			A1

DRAWING TITLE: SUB-STATION ROOF FRAMING PLAN AND SECTIONS DETAIL

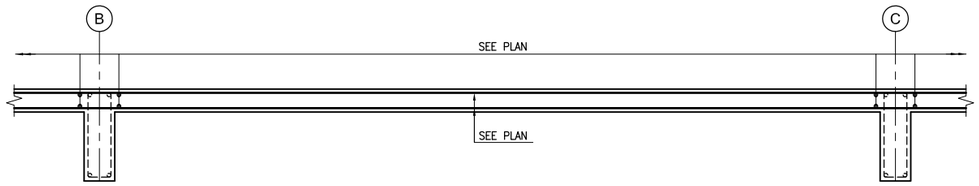
PROJ CODE	DRAWING NO.	REV.
01098	EA-1098-KIP-U-SS-S-103	0

NOTES:

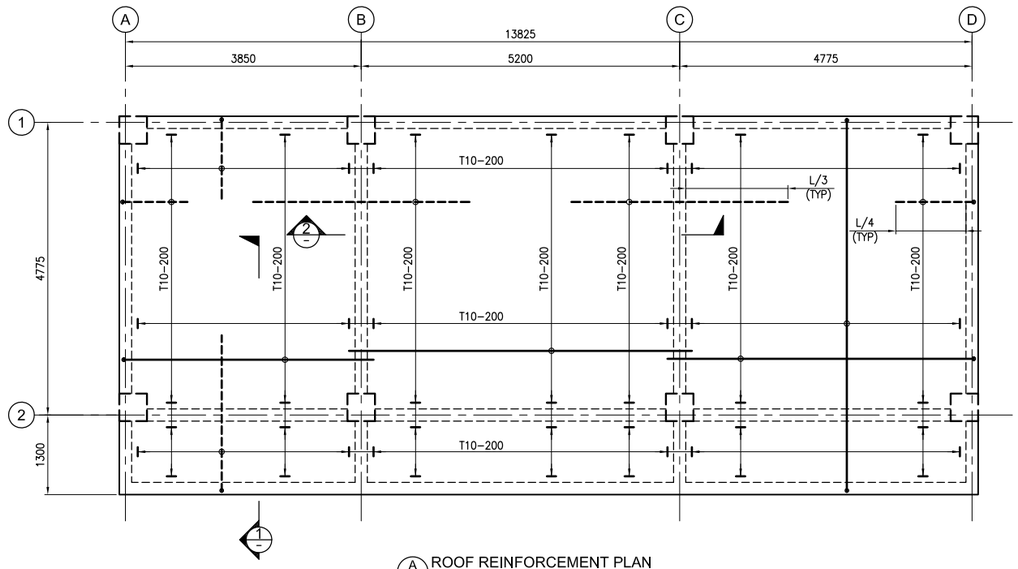
1. ALL DIMENSIONS ARE IN MILLIMETER AND ELEVATIONS ARE ALSO IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. FOR NOTES REFER DWG NO EA-1098-KIP-U-SS-S-001.
3. PROVIDED T10-300 TOP DISTRIBUTION BARS.
4. ALL STEEL SHALL BE ASTM A-615 GRADE 60.
5. CONCRETE MUST HAVE 28 DAYS OF CYLINDRICAL STRENGTH OF 4000 Psi.



SECTION 1/- SCALE = 1:20

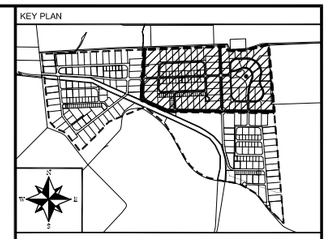


SECTION 2/- SCALE = 1:20



A/- ROOF REINFORCEMENT PLAN SCALE = 1:50

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	FEB-2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

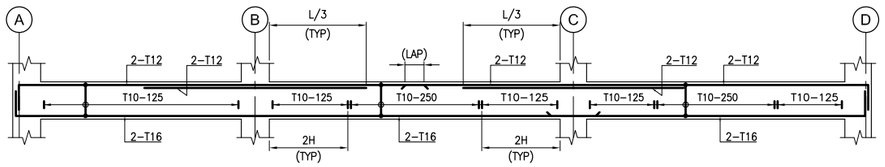
DRAWN	A.I	SCALE	AS SHOWN
DESIGN	A.A	DATE	FEB.2025
CHECKED	M.L	DESIGN STAGE	TD
APPROVED	M.S	ISSUE	TD
ACTUAL SHEET SIZE			A1

DRAWING TITLE: SUB-STATION ROOF REINFORCEMENT PLAN AND SECTIONS DETAIL

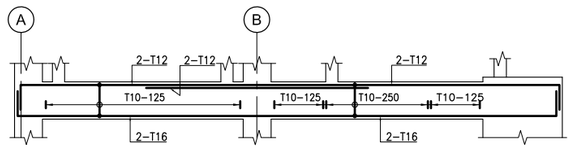
PROJ CODE	DRAWING NO.	REV.
01098	EA-1098-KIP-U-SS-S-104	0

NOTES:

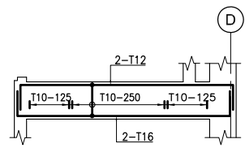
1. ALL DIMENSIONS ARE IN MILLIMETER AND ELEVATIONS ARE ALSO IN MIILLIMETERS UNLESS NOTED OTHERWISE.
2. FOR NOTES REFER DWG NO EA-1098-KIP-U-SS-S-001.
3. ALL STEEL SHALL BE ASTM A-615 GRADE 60.
4. CONCRETE MUST HAVE 28 DAYS OF CYLINDRICAL STRENGTH OF 4000 Psi



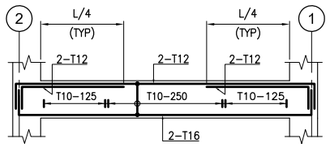
A ELEVATION OF BEAM PB1
SCALE = 1:50 (200x600)



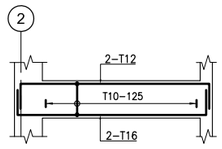
A ELEVATION OF BEAM PB2
SCALE = 1:50 (200x600)



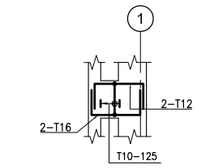
A ELEVATION OF BEAM PB2A
SCALE = 1:50 (200x600)



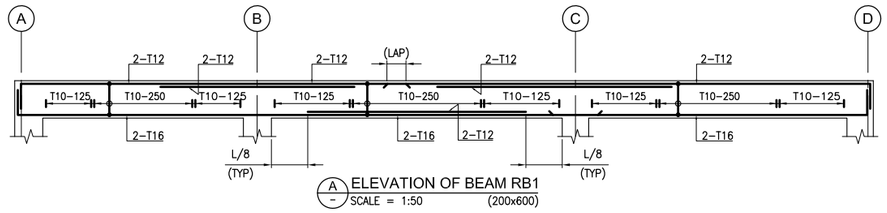
A ELEVATION OF BEAM PB3
SCALE = 1:50 (200x600)



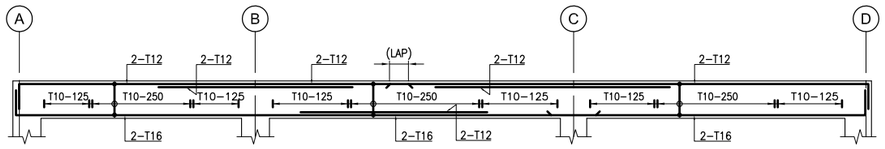
A ELEVATION OF BEAM PB4
SCALE = 1:50 (200x600)



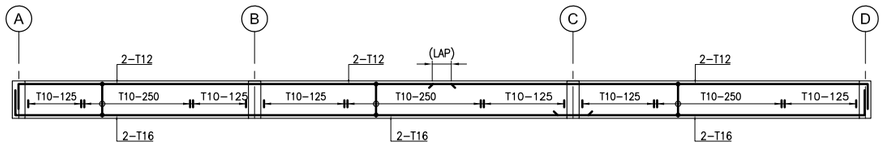
A ELEVATION OF BEAM PB5
SCALE = 1:50 (200x600)



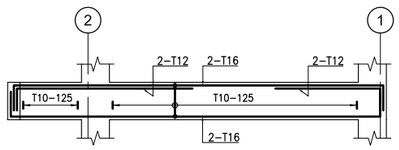
A ELEVATION OF BEAM RB1
SCALE = 1:50 (200x600)



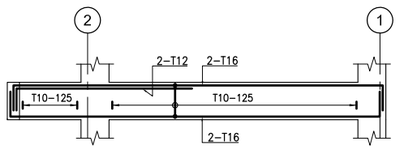
A ELEVATION OF BEAM RB2
SCALE = 1:50 (200x600)



A ELEVATION OF BEAM RB3
SCALE = 1:50 (200x600)

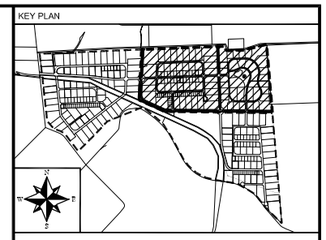


A ELEVATION OF BEAM RB4
SCALE = 1:50 (200x600)



A ELEVATION OF BEAM RB4
SCALE = 1:50 (200x600)

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	FEB-2025

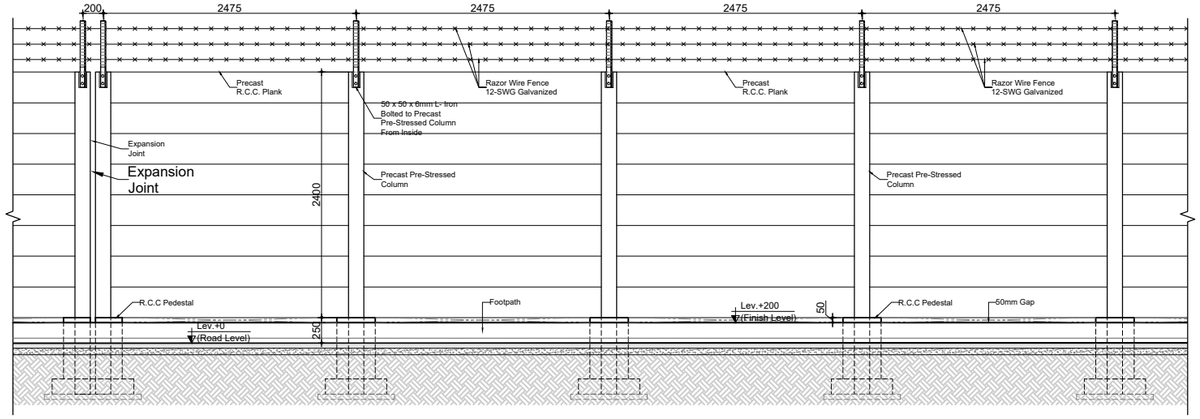
PROJECT:

KARACHI INDUSTRIAL PARK SEZ

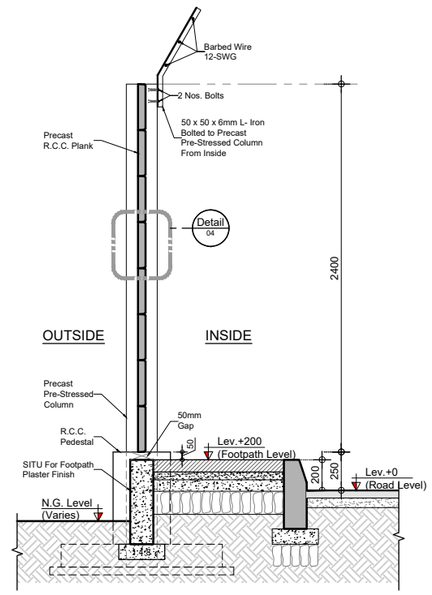
DRAWN	A.I	SCALE	AS SHOWN
DESIGN	A.A	DATE	FEB,2025
CHECKED	M.L	DESIGN STAGE	TD
APPROVED	M.S	ISSUE	TD
ACTUAL SHEET SIZE			A1

DRAWING TITLE: SUB-STATION PLINTH & ROOF BEAM ELEVATIONS

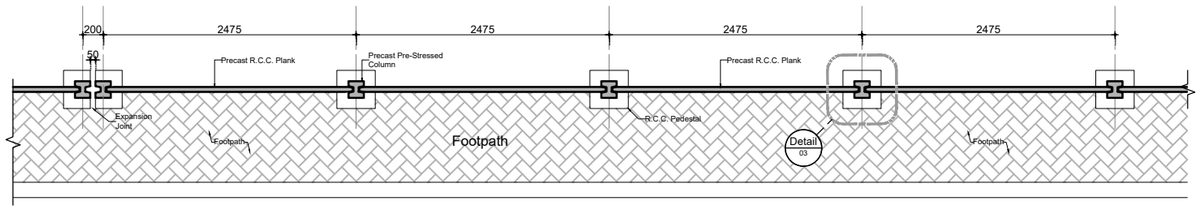
PROJ CODE	DRAWING NO.	REV.
01098	EA-1098-KIP-U-SS-S-105	0



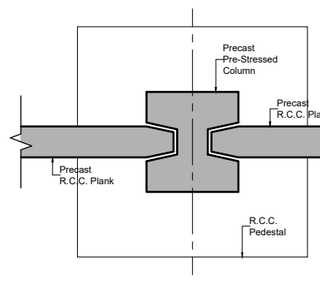
DETAIL - 02 (ELEVATION) Scale: 1:30



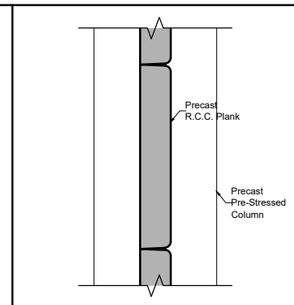
SECTION - C Scale: 1:20



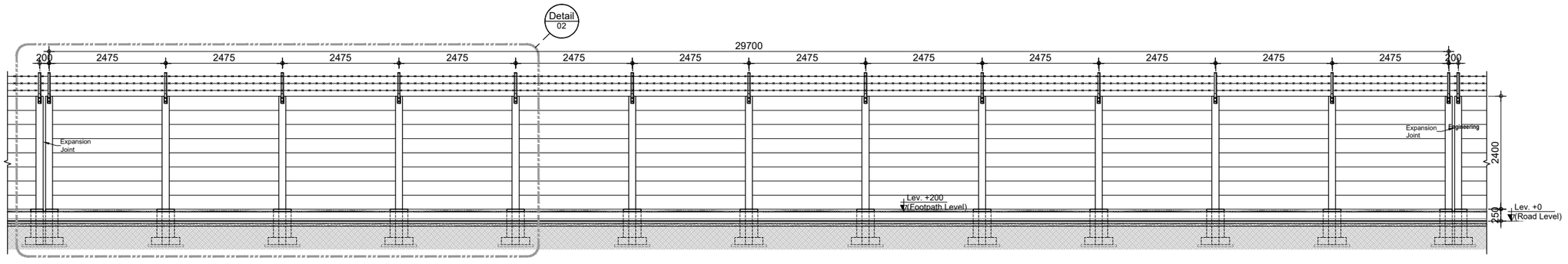
DETAIL - 01 (PLAN) Scale: 1:30



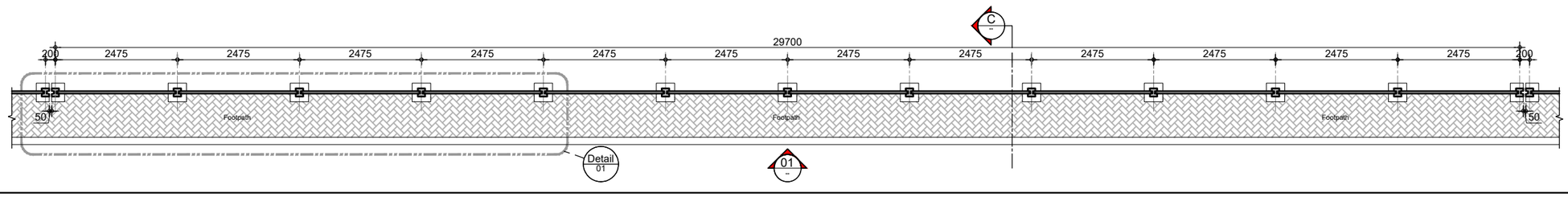
DETAIL - 03 Scale: 1:5



DETAIL - 04 Scale: 1:5

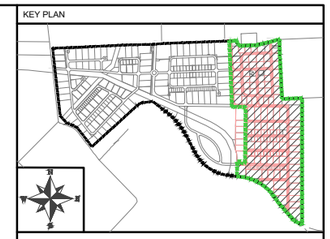


ELEVATION - 01 Scale: 1:50



PART PLAN OF BOUNDARY WALL (DT - 01) Scale: 1:50

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm JV-Team

REV.	DESCRIPTION	DATE
0	ISSUED FOR TENDER	JUNE, 2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	AF	SCALE	AS SHOWN
DESIGN	SAF	DATE	JUNE, 2025
CHECKED	AM	DESIGN STAGE	TENDER
APPROVED	AM	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

DETAIL OF BOUNDARY WALL R.C.C PRECAST PANEL

PROJ. CODE:	DRAWING NO.	REV.
01098	EA-1098-KIP-U-WS-BW-A1-0100	0

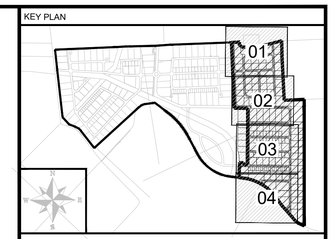
ELECTRICAL

S.#	DRAWING NO.	DRAWING TITLE	STATUS
	GE - GENERAL DRAWINGS		
1	EA-01098-KIP-GE-EL-0001	LIST OF DRAWINGS	✓
2	EA-01098-KIP-GE-EL-0002	ELECTRICAL STANDARD DETAILS SHEET-1	✓
3	EA-01098-KIP-GE-EL-0003	ELECTRICAL STANDARD DETAILS SHEET-2	✓
4	EA-01098-KIP-GE-EL-0004	MV POWER DISTRIBUTION - SINGLE LINE DIAGRAM - 1	
5	EA-01098-KIP-GE-EL-0005	MV POWER DISTRIBUTION - SINGLE LINE DIAGRAM - 2	
6	EA-01098-KIP-GE-EL-0006	MV POWER DISTRIBUTION - SINGLE LINE DIAGRAM - 3	
7	EA-01098-KIP-GE-EL-0007	MV POWER DISTRIBUTION - SINGLE LINE DIAGRAM - 4 (SUBSTATION-1)	✓
8	EA-01098-KIP-GE-EL-0008	MV POWER DISTRIBUTION - SINGLE LINE DIAGRAM - 5 (SUBSTATION-2)	✓
9	EA-01098-KIP-GE-EL-0009	ICT INFRASTRUCTURE LAYOUT - SINGLE LINE DIAGRAM	
10	EA-01098-KIP-GE-EL-0010	LCP SINGLE LINE DIAGRAM	✓
11	EA-01098-KIP-GE-EL-0011	SUBSTATION / ISP ROOM LIGHTING, POWER LAYOUTS & SINGLE LINE DIAGRAM	✓
			✓
	MV - MV CABLE LAYOUT PLAN		
1	EA-01098-KIP-MV-EL-0001	MASTER PLAN (OVERALL) MV CABLE ROUTE LAYOUT	✓
2	EA-01098-KIP-MV-EL-0002	MASTER PLAN (SHEET-1 OF 4) MV CABLE ROUTE LAYOUT	✓
3	EA-01098-KIP-MV-EL-0003	MASTER PLAN (SHEET-2 OF 4) MV CABLE ROUTE LAYOUT	✓
4	EA-01098-KIP-MV-EL-0004	MASTER PLAN (SHEET-3 OF 4) MV CABLE ROUTE LAYOUT	✓
5	EA-01098-KIP-MV-EL-0005	MASTER PLAN (SHEET-4 OF 4) MV CABLE ROUTE LAYOUT	✓
6	EA-01098-KIP-MV-EL-0006	MASTER PLAN (OVERALL) MV FEEDER CABLES ROUTE TO BQIP GRID STATION	✓
			✓
	LV - LV CABLE LAYOUT PLAN		
1	EA-01098-KIP-LV-EL-0001	MASTER PLAN (OVERALL) LV CABLE ROUTE LAYOUT	✓
2	EA-01098-KIP-LV-EL-0002	MASTER PLAN (SHEET-1 OF 4) LV CABLE ROUTE LAYOUT	✓
3	EA-01098-KIP-LV-EL-0003	MASTER PLAN (SHEET-2 OF 4) LV CABLE ROUTE LAYOUT	✓
4	EA-01098-KIP-LV-EL-0004	MASTER PLAN (SHEET-3 OF 4) LV CABLE ROUTE LAYOUT	✓
5	EA-01098-KIP-LV-EL-0005	MASTER PLAN (SHEET-4 OF 4) LV CABLE ROUTE LAYOUT	✓
	IT - FO CABLE ROUTE LAYOUT PLAN		
1	EA-01098-KIP-IT-EL-0001	MASTER PLAN (OVERALL) FO CABLE ROUTE LAYOUT	✓
2	EA-01098-KIP-IT-EL-0002	MASTER PLAN (SHEET-1 OF 4) FO CABLE ROUTE LAYOUT	✓
3	EA-01098-KIP-IT-EL-0003	MASTER PLAN (SHEET-2 OF 4) FO CABLE ROUTE LAYOUT	✓
4	EA-01098-KIP-IT-EL-0004	MASTER PLAN (SHEET-3 OF 4) FO CABLE ROUTE LAYOUT	✓
5	EA-01098-KIP-IT-EL-0005	MASTER PLAN (SHEET-4 OF 4) FO CABLE ROUTE LAYOUT	✓
			✓

ELECTRICAL

S.#	DRAWING NO.	DRAWING TITLE	STATUS
	RL - ROAD LIGHTING LAYOUT PLAN		
1	EA-01098-KIP-RL-EL-0001	MASTER PLAN (OVERALL) ROAD LIGHTING LAYOUT	✓
2	EA-01098-KIP-RL-EL-0002	MASTER PLAN (SHEET-1 OF 4) ROAD LIGHTING LAYOUT	✓
3	EA-01098-KIP-RL-EL-0003	MASTER PLAN (SHEET-2 OF 4) ROAD LIGHTING LAYOUT	✓
4	EA-01098-KIP-RL-EL-0004	MASTER PLAN (SHEET-3 OF 4) ROAD LIGHTING LAYOUT	✓
5	EA-01098-KIP-RL-EL-0005	MASTER PLAN (SHEET-4 OF 4) ROAD LIGHTING LAYOUT	✓
			✓
	SC - CCTV LAYOUT PLAN		
1	EA-01098-KIP-SC-EL-0001	MASTER PLAN (OVERALL) CCTV LAYOUT	
2	EA-01098-KIP-SC-EL-0002	MASTER PLAN (SHEET-1 OF 4) CCTV LAYOUT	
3	EA-01098-KIP-SC-EL-0003	MASTER PLAN (SHEET-2 OF 4) CCTV LAYOUT	
4	EA-01098-KIP-SC-EL-0004	MASTER PLAN (SHEET-3 OF 4) CCTV LAYOUT	
5	EA-01098-KIP-SC-EL-0005	MASTER PLAN (SHEET-4 OF 4) CCTV LAYOUT	
	ST - SECURITY TOWER LAYOUT PLAN		
1	EA-01098-KIP-ST-EL-0001	SECURITY TOWER - TYPICAL LIGHTING & POWER LAYOUT (GROUND, FIRST & ROOF)	✓
2	EA-01098-KIP-ST-EL-0002	SINGLE LINE DIAGRAM (SECURITY TOWER)	✓
	GH - GATE HOUSE LAYOUT PLAN		
1	EA-01098-KIP-GH-EL-0001	GATE HOUSE-01 - LIGHTING LAYOUT	✓
2	EA-01098-KIP-GH-EL-0002	GATE HOUSE-01 - POWER LAYOUT	✓
3	EA-01098-KIP-GH-EL-0003	GATE HOUSE-01 - ICT AND SECURITY LAYOUT	✓
4	EA-01098-KIP-GH-EL-0004	GATE HOUSE-01 - SINGLE LINE DIAGRAM	✓
	EGH - EMERGENCY GATE HOUSE LAYOUT PLAN		
1	EA-01098-KIP-EGH-EL-0001	GATE HOUSE-02 - LIGHTING LAYOUTS	✓
2	EA-01098-KIP-EGH-EL-0002	GATE HOUSE-02 - POWER LAYOUTS	✓
3	EA-01098-KIP-EGH-EL-0003	GATE HOUSE-02 - SINGLE LINE DIAGRAM	✓

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

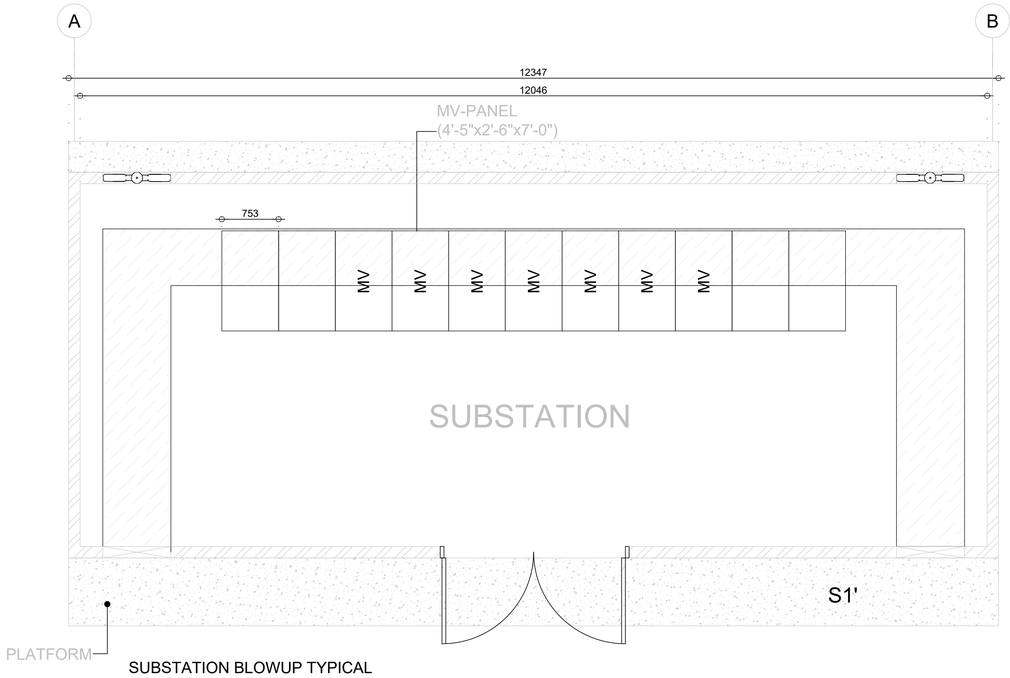
KARACHI INDUSTRIAL PARK SEZ

DRAWN	J.A	SCALE	N.T.S
DESIGN	F.A	DATE	FEB,2025
CHECKED	F.A	DESIGN STAGE	TENDER
APPROVED	M.I.A	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

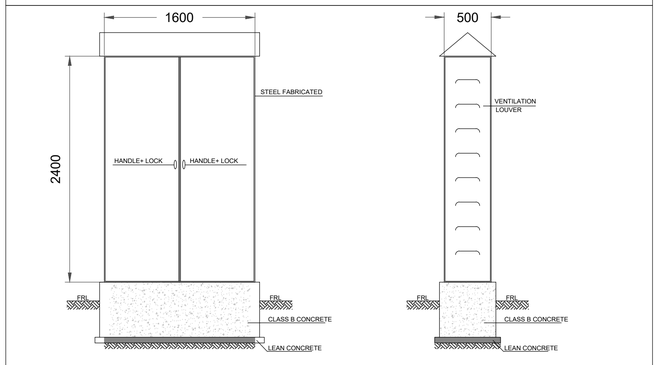
LIST OF DRAWINGS

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-GE-EL-0001	00



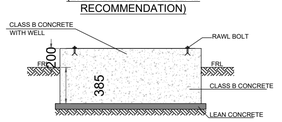
SUBSTATION BLOWUP TYPICAL

DETAIL-A

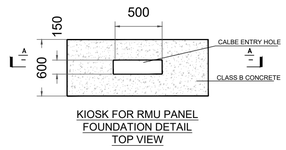


KIOSK FOR RMU PANEL
FRONT VIEW
(AS PER MANUFACTURER RECOMMENDATION)

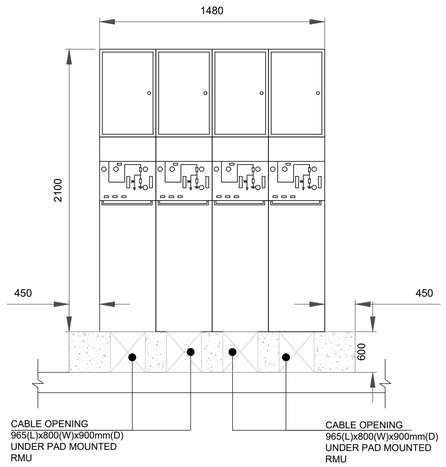
SIDE VIEW



SECTION A-A



KIOSK FOR RMU PANEL
FOUNDATION DETAIL
TOP VIEW



RING MAIN UNIT (Typical)

FOUNDATION DETAIL
(TOP VIEW)

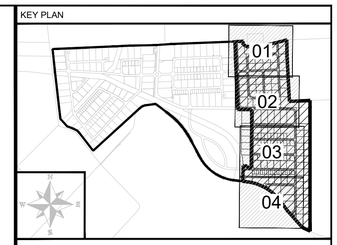
SECTION A–A

FRONT VIEW
(AS PER MANUFACTURER RECOMMENDATION)

SIDE VIEW

LCP DETAILS

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

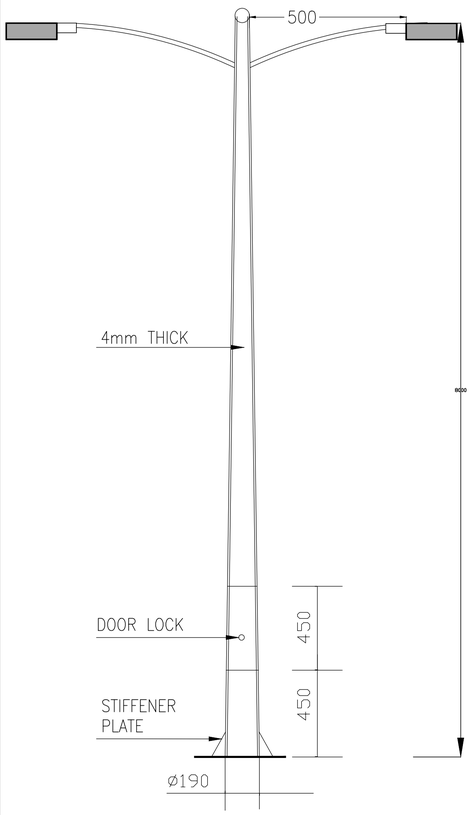
KARACHI INDUSTRIAL PARK SEZ

DRAWN	Z.N	SCALE	N.T.S
DESIGN	F.A	DATE	FEB,2025
CHECKED	F.A	DESIGN STAGE	TENDER
APPROVED	M.I.A	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

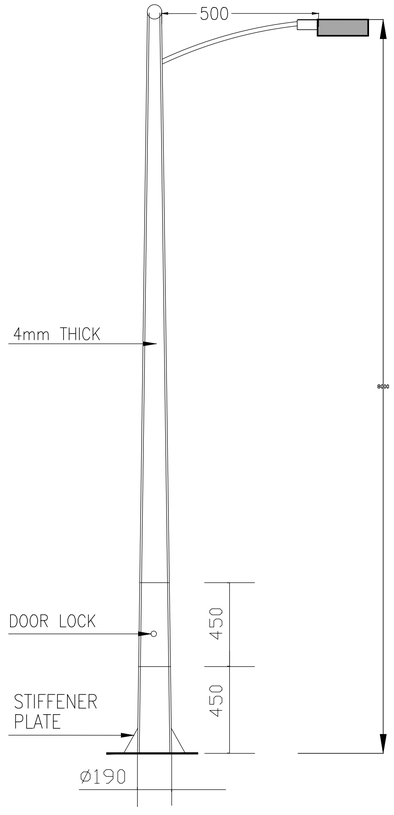
DRAWING TITLE:

ELECTRICAL STANDARD DETAILS SHEET - 1

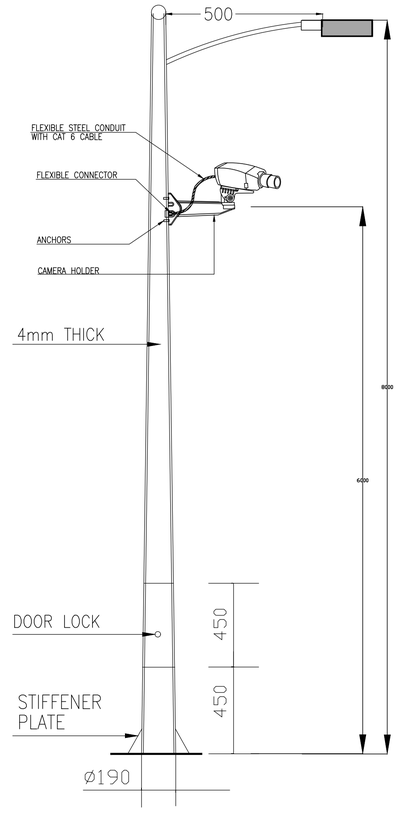
PROJ CODE	DRAWING NO.	REV.
01098	**EA-01098-KIP-GE-EL-0002**	00



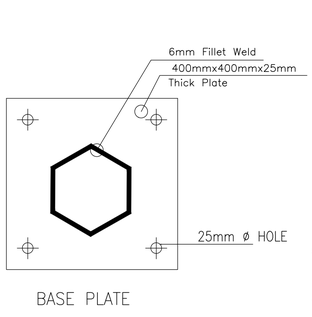
8M DOUBLE ARM OCTAGONAL POLE



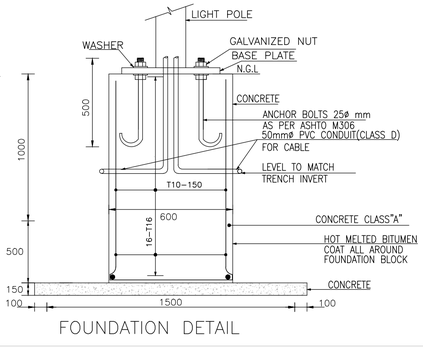
8M SINGLE ARM OCTAGONAL POLE



8M SINGLE ARM OCTAGONAL POLE



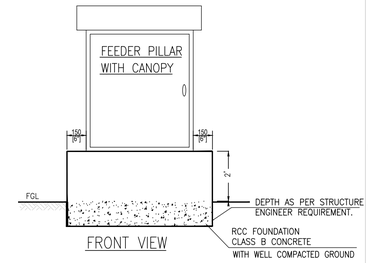
BASE PLATE



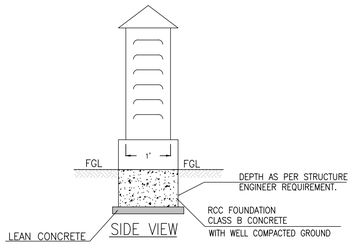
FOUNDATION DETAIL

LIGHTING POLE DETAILS

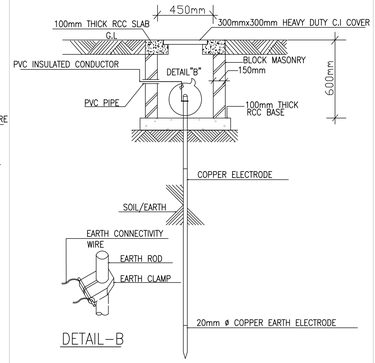
CAMERA DETAILS



FRONT VIEW

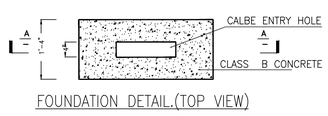


SIDE VIEW

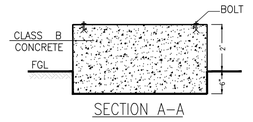


DETAIL-B

EARTHING PIT WITH EARTH ROD DETAIL

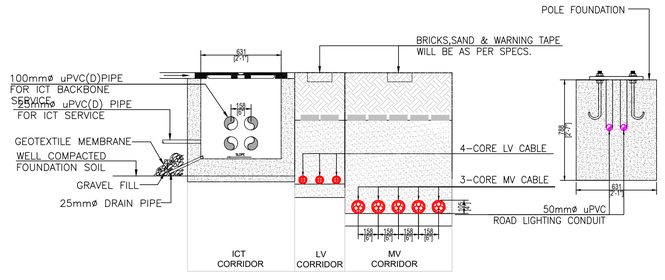


FOUNDATION DETAIL.(TOP VIEW)



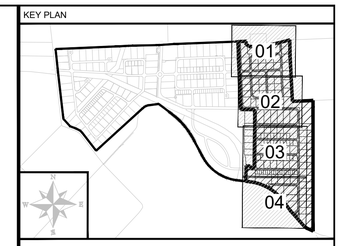
SECTION A-A

FEEDER PILLAR DETAILS



ELECTRICAL CABLES DETAIL

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

SURBANA JURONG · OMS · ICONSULT INNOVATION THROUGH EXCELLENCE

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

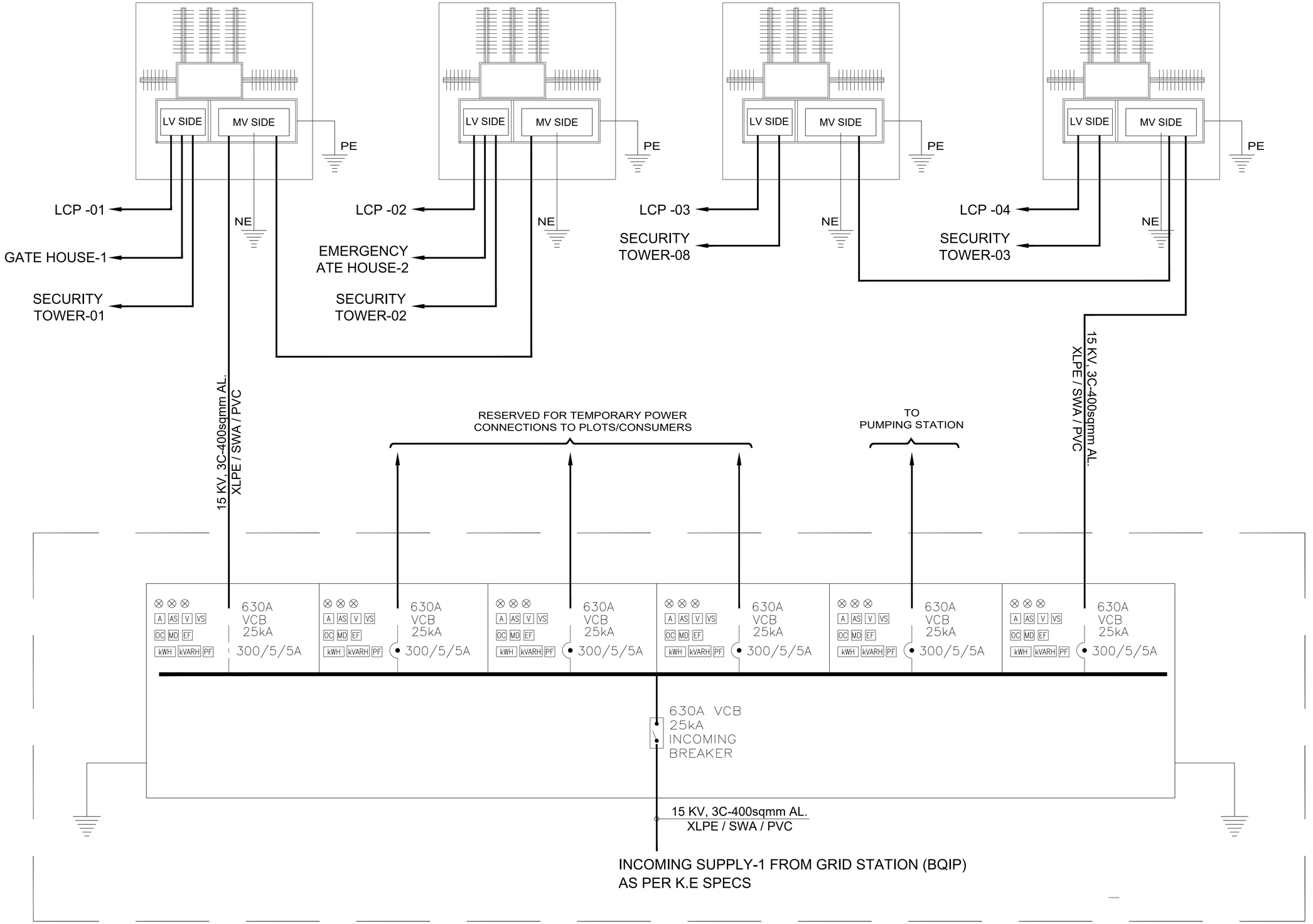
KARACHI INDUSTRIAL PARK SEZ

DRAWN	Z.N	SCALE	N.T.S
DESIGN	F.A	DATE	FEB,2025
CHECKED	F.A	DESIGN STAGE	TENDER
APPROVED	M.I.A	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

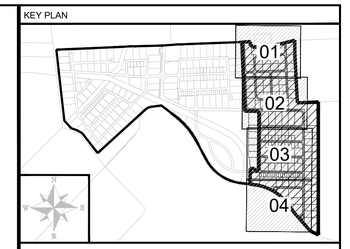
ELECTRICAL STANDARD DETAILS SHEET - 2

PROJ CODE	DRAWING NO.	REV.
01098	**EA-01098-KIP-GE-EL-0003**	00



SUBSTATION - 01
(Temporary Connection)

KEY PLAN



NOTE: **ELECTRICAL LEGENDS**

SYMBOLS	DESCRIPTION
	17.5KV, 25KA, 3-POLE, 630A – VACUUM CIRCUIT BREAKER - WITH SPRING CHARGED MECHANISM, PROTECTION RELAYS, CTs, PTs, INDICATIONS LAMPS, METERS, ETC.
	CURRENT TRANSFORMER, RESIN CAST, 11KV, FOR METERING & PROTECTION AS REQUIRED.
A	AMMETER, DIGITAL TYPE WITH CT INPUT.
AS	AMMETER SELECTOR SWITCH, 3-POSITION, FOR R-Y-B PHASES.
V	VOLTMETER, ANALOG/DIGITAL TYPE WITH PT INPUT.
VS	VOLTMETER SELECTOR SWITCH, 4-POSITION, R-Y, Y-B, B-R & OFF
OC	OVER CURRENT RELAY, IDMT TYPE, 3-PHASE PROTECTION.
EF	EARTH FAULT RELAY, IDMT TYPE, GROUND FAULT PROTECTION.
PF	POWER FACTOR METER, DIGITAL TYPE, 3-PHASE
kWH	KILOWATT HOUR METER
kVARH	REACTIVE KILO VOLT AMPERE HOUR METER
MD	MAXIMUM DEMAND INDICATOR, DIGITAL TYPE, DEMAND LOGGING.
	INDICATION LAMP, LED TYPE (COLOR AS REQUIRED
	EARTH PIT WITH INSPECTION CHAMBER
	17.5 kV EARTH SWITCH
	17.5 kV, 4-WAY RING MAIN UNIT (RMU), OUTDOOR KIOSK TYPE, 2 VCBs + 2 LBS, EXTENSIBLE TYPE.
	PAD MOUNTED UNIT, OUTDOOR, 11kV/0.415 kV, COMPACT TYPE WITH MV SWITCHGEAR, TRANSFORMER & LV COMPARTMENT.

LEGEND:

Note:
For Clarity, the protection relays, CTs, Inidcation, Meters, Etc. are not shown. However, each VCB and RMU shall be equipped with all accessories as required.

CLIENT:
PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:
SUKSANA JURONG · OMS · iCONSULT — INNOVATION THROUGH EXCELLENCE
Lead Firm _ JV-Team

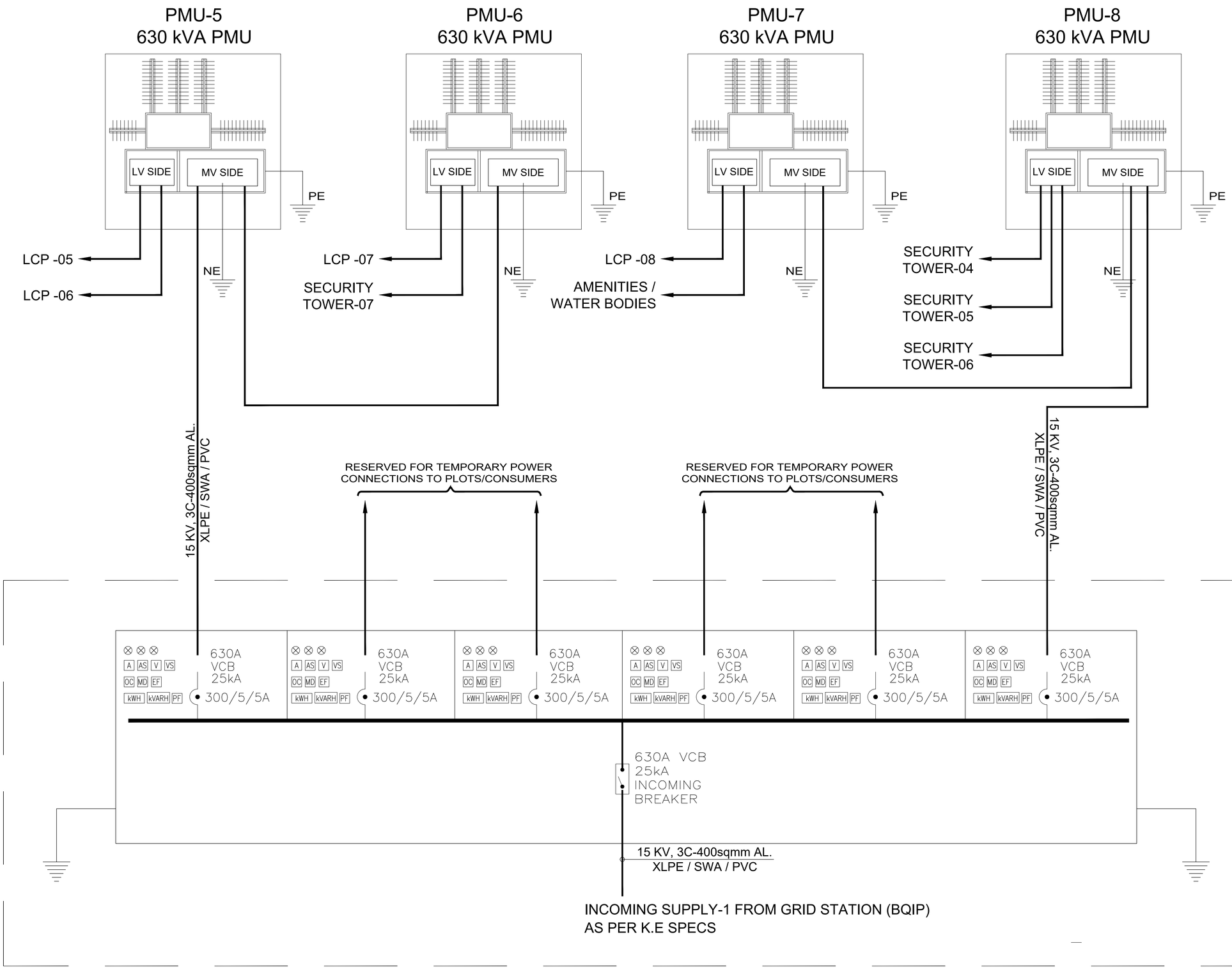
REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:
KARACHI INDUSTRIAL PARK SEZ

DRAWN	Z.N	SCALE	N.T.S
DESIGN	F.A	DATE	FEB,2025
CHECKED	F.A	DESIGN STAGE	TENDER
APPROVED	M.I.A	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

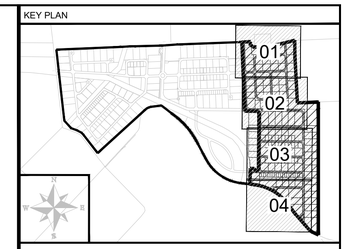
DRAWING TITLE:
MV SINGLE LINE DIAGRAM SUBSTATION#4

PROJ CODE	DRAWING NO.	REV.
01098	**EA-01098-KIP-GE-EL-0007**	00



SUBSTATION - 02
(Temporary Connection)

KEY PLAN



NOTE: **ELECTRICAL LEGENDS**

SYMBOLS	DESCRIPTION
	17.5KV, 25KA, 3-POLE, 630A – VACUUM CIRCUIT BREAKER - WITH SPRING CHARGED MECHANISM, PROTECTION RELAYS, CTs, PTs, INDICATIONS LAMPS, METERS, ETC.
	CURRENT TRANSFORMER, RESIN CAST, 11KV, FOR METERING & PROTECTION AS REQUIRED.
A	AMMETER, DIGITAL TYPE WITH CT INPUT.
AS	AMMETER SELECTOR SWITCH, 3-POSITION, FOR R-Y-B PHASES.
V	VOLTMETER, ANALOG/DIGITAL TYPE WITH PT INPUT.
VS	VOLTMETER SELECTOR SWITCH, 4-POSITION, R-Y, Y-B, B-R & OFF
OC	OVER CURRENT RELAY, IDMT TYPE, 3-PHASE PROTECTION.
EF	EARTH FAULT RELAY, IDMT TYPE, GROUND FAULT PROTECTION.
PF	POWER FACTOR METER, DIGITAL TYPE, 3-PHASE
kWH	KILOWATT HOUR METER
kVARH	REACTIVE KILO VOLT AMPERE HOUR METER
MD	MAXIMUM DEMAND INDICATOR, DIGITAL TYPE, DEMAND LOGGING.
	INDICATION LAMP, LED TYPE (COLOR AS REQUIRED
	EARTH PIT WITH INSPECTION CHAMBER
	17.5 kV EARTH SWITCH
	17.5 kV, 4-WAY RING MAIN UNIT (RMU), OUTDOOR KIOSK TYPE, 2 VCBs + 2 LBS, EXTENSIBLE TYPE.
	PAD MOUNTED UNIT, OUTDOOR, 11kV/0.415 kV, COMPACT TYPE WITH MV SWITCHGEAR, TRANSFORMER & LV COMPARTMENT.

LEGEND:

Note:
For Clarity, the protection relays, CTs, Inidcation, Meters, Etc. are not shown. However, each VCB and RMU shall be equipped with all accessories as required.

CLIENT:
PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:
SUBBANA JURONG | OMS | iCONSULT INNOVATION THROUGH EXCELLENCE

Lead Firm | JV-Team

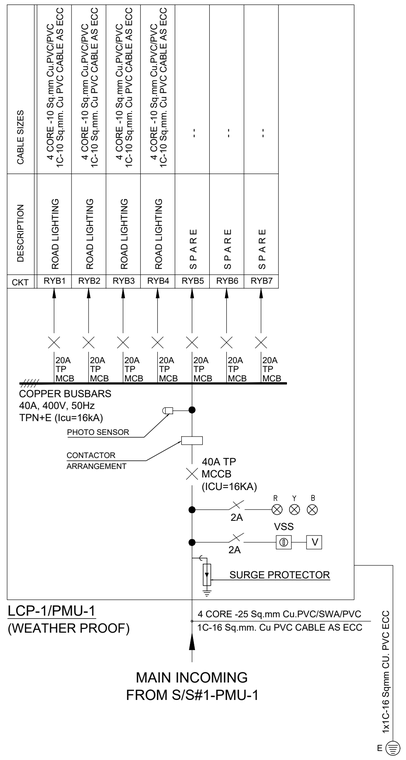
REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

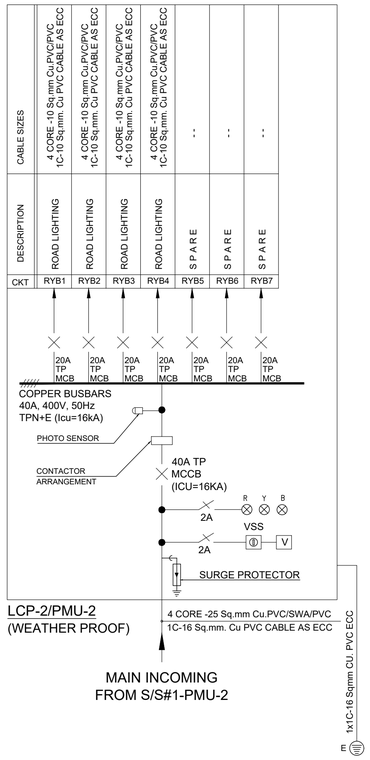
PROJECT:
KARACHI INDUSTRIAL PARK SEZ

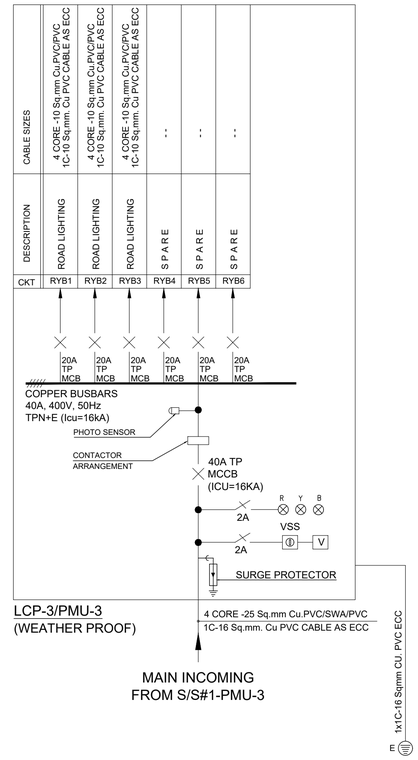
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DESIGN	F.A	DATE	FEB,2025
CHECKED	F.A	DESIGN STAGE	TENDER
APPROVED	M.I.A	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

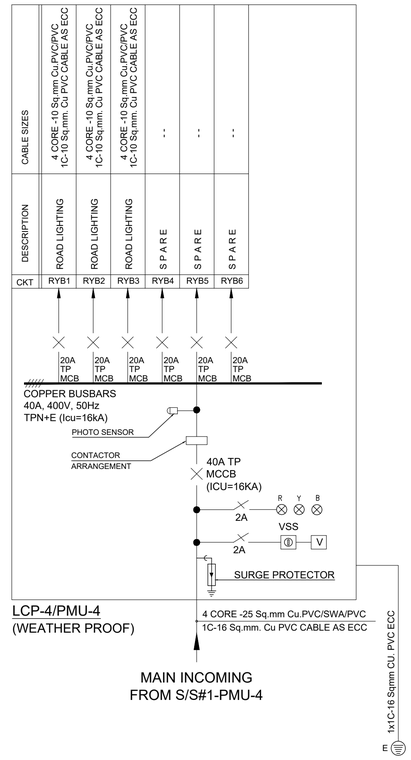
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MV SINGLE LINE DIAGRAM SUBSTATION#5

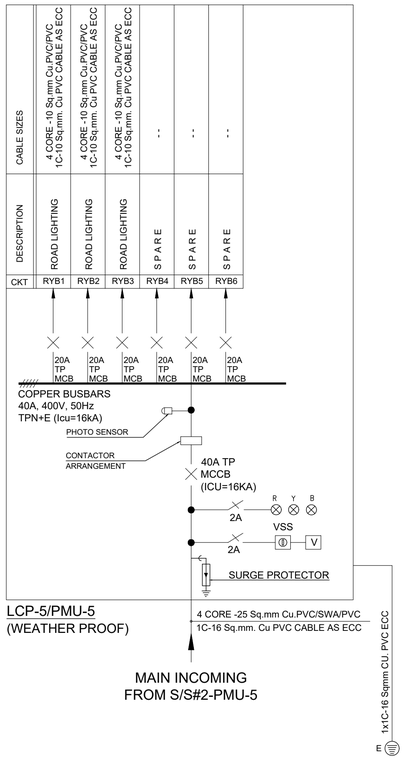
PROJ CODE	DRAWING NO.	REV.
01098	**EA-01098-KIP-GE-EL-0008**	00

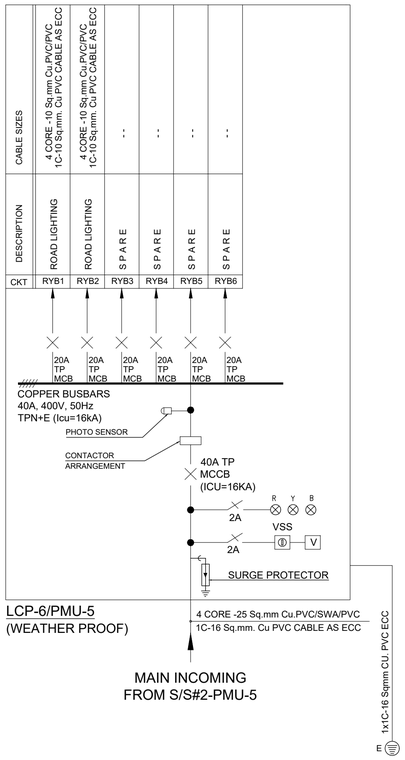


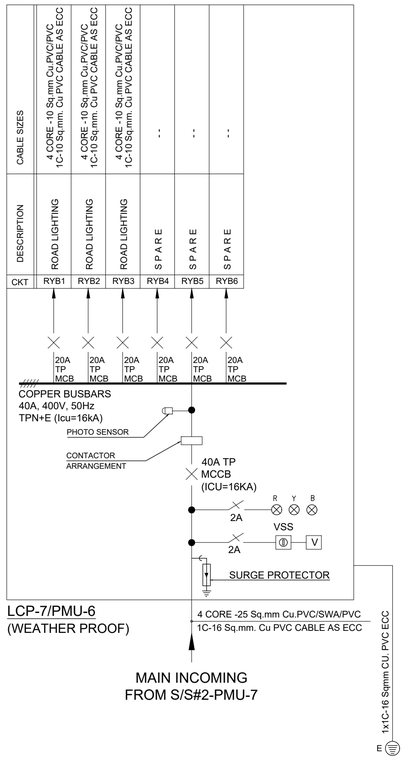


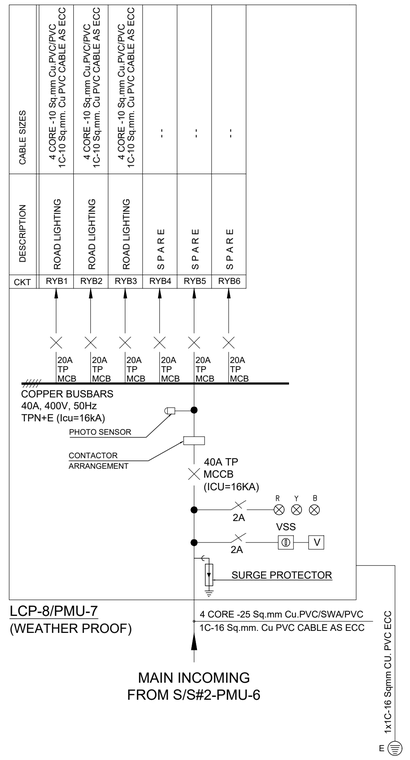




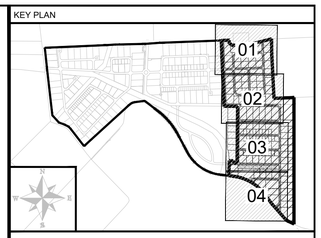








KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

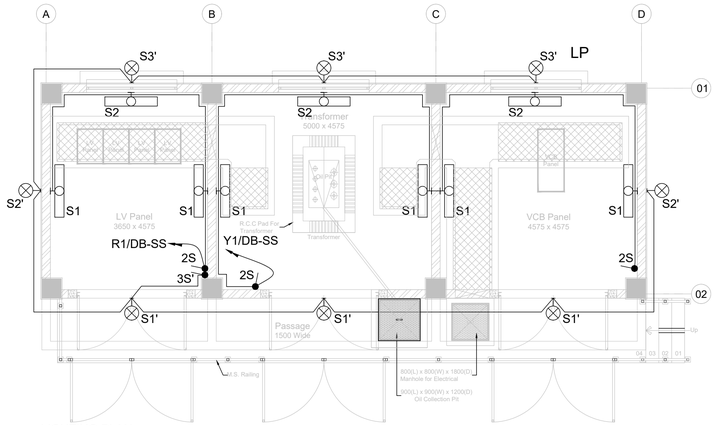
KARACHI INDUSTRIAL PARK SEZ

DRAWN	J.A	SCALE	N.T.S
DESIGN	F.A	DATE	FEB,2025
CHECKED	F.A	DESIGN STAGE	TENDER
APPROVED	M.I.A	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

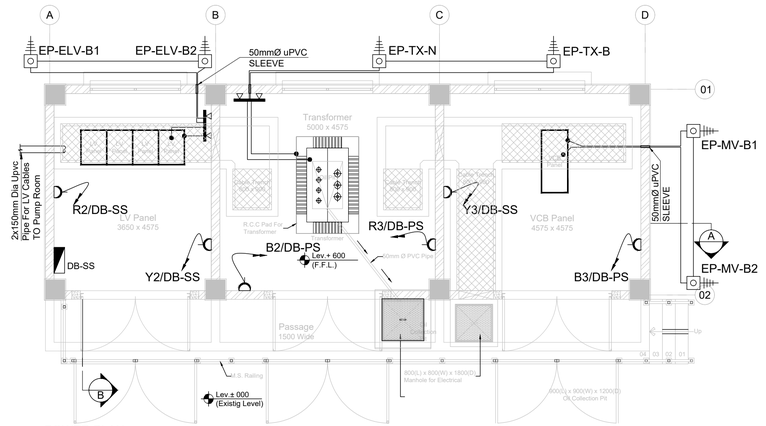
DRAWING TITLE:

LCP SINGLE LINE DIAGRAM

PROJ CODE	DRAWING NO.	REV.
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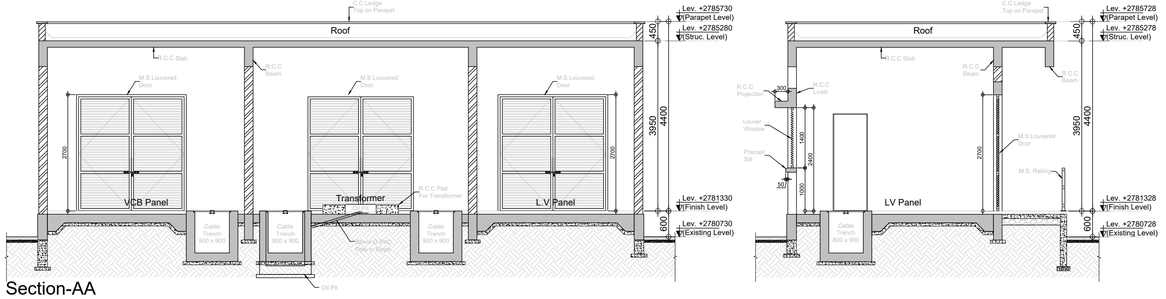
LIGHTING PLAN



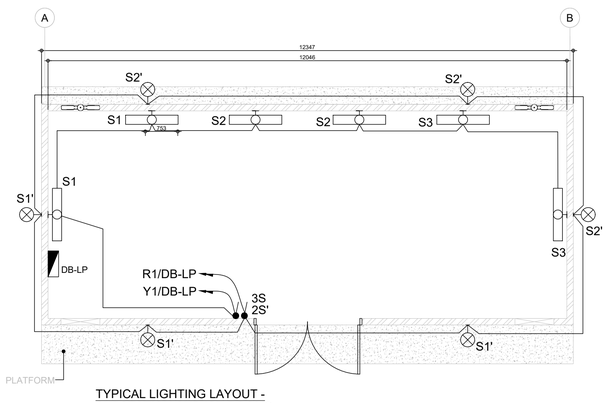
POWER PLAN

LEGEND

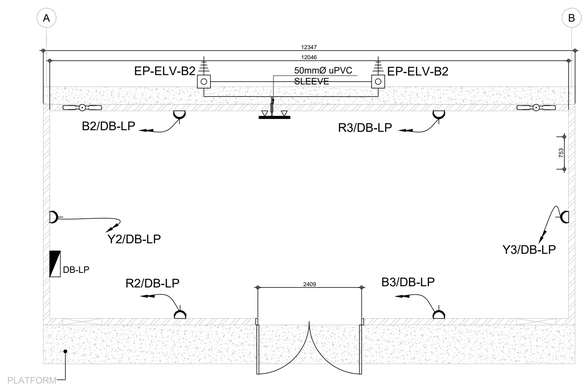
SYMBOLS	DESCRIPTIONS
	4' BATTEN LIGHT FIXTURE EXTRUDED POLYCARBONATE WITH CLEAR LENS 1x40W LED (IP-20)
	15W LED WALL LIGHT WEATHER PROOF LIGHT FIXTURE BODY MADE OF POLYCARBONATE (IP-55)
NS	LIGHTING CONTROL SWITCH (N GANG)
	15A 3 PIN SWITCHED SOCKET OUTLET
	DISTRIBUTION BOARD (DB)
	POWER MANHOLE (3'-0"x3'-0"x3'-0")
	EARTH PIT
	EARTH BAR WITH SINGLE DISCONNECTING LINK



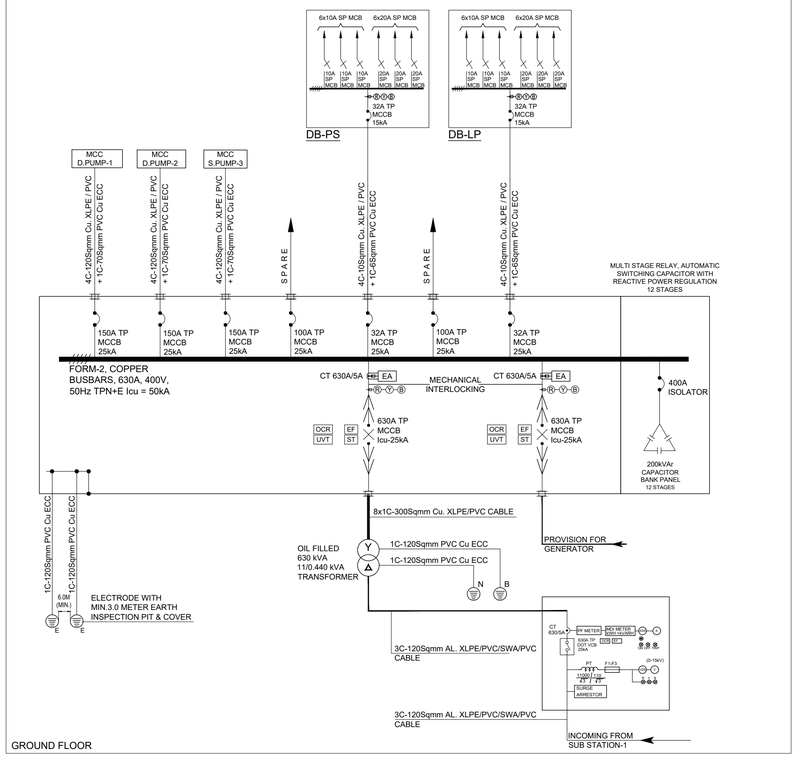
Section-AA



TYPICAL LIGHTING LAYOUT - SUBSTATION AND ISP ROOMS

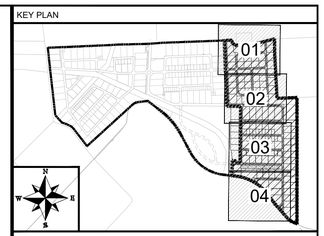


TYPICAL POWER LAYOUT - SUBSTATION AND ISP ROOMS



GROUND FLOOR

KEY PLAN



NOTE:

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm _ JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

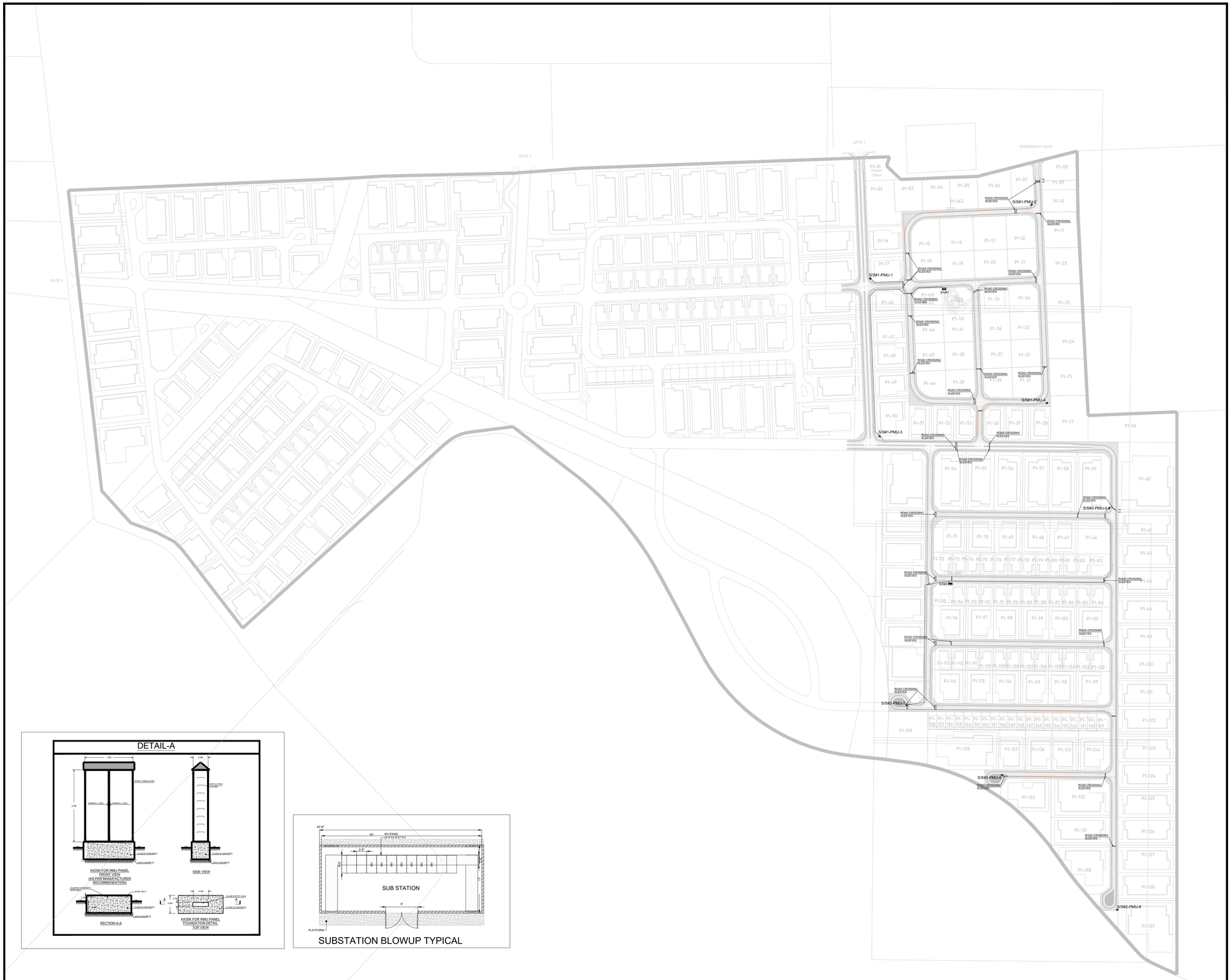
PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	J.A	SCALE	1:75
DESIGN	F.A	DATE	FEB,2025
CHECKED	F.A	DESIGN STAGE	TENDER
APPROVED	M.I.A	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

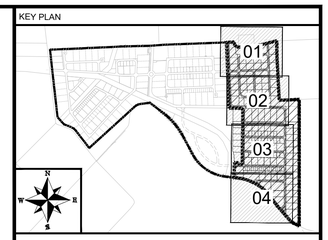
DRAWING TITLE: SUBSTATION / ISP ROOM LIGHTING, POWER LAYOUTS & SINGLE LINE DIAGRAM

PROJ CODE	DRAWING NO.	REV.
01098	**EA-01098-KIP-GE-EL-0011**	00



SUBSTATION BLOWUP TYPICAL

KEY PLAN



NOTE:

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   - Final engineering survey by contractor appointed by the Client
4. All dimensions are in meters unless specified otherwise.
5. The RMU (Ring Main Unit) will be configured as a 4-way unit:
   - 2 ways allocated for protection, equipped with 630A Vacuum Circuit Breakers (VCBs).
   - 2 ways equipped with Load Break Switches (LBS), rated for 95 BIL and type-tested.
6. Both the RMU and VCB must fully comply with IEC standards, specifically IAC AFLR 62271-200.
7. The RMU (Ring Main Unit) will be housed within a Kiosk. Refer to Detail "A" for specific enclosure details.
8. Contractor's Scope is till RMUs, Transformers will be part of consumer.

LEGEND:

SYMBOLS	DESCRIPTION
	PAD MOUNTED UNIT, OUTDOOR, 11kV/0.415 kV, COMPACT TYPE WITH MV SWITCHGEAR, TRANSFORMER & LV COMPARTMENT.
----------	3C-400 Sq.mm Al./XLPE/SWA/PVC 15kV MV Cable

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

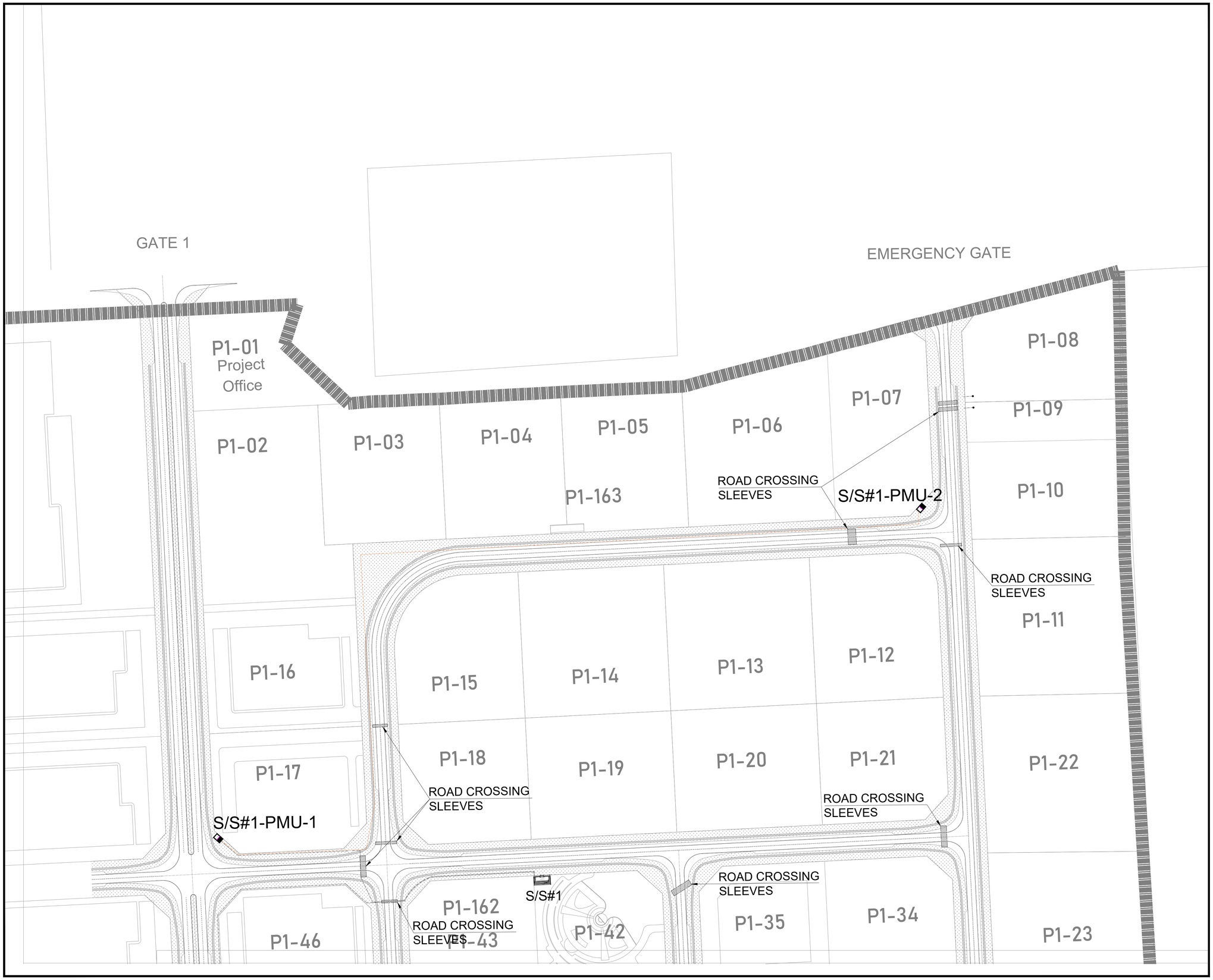
KARACHI INDUSTRIAL PARK SEZ

DRAWN	A.K	SCALE	1:1800
DESIGN	F.A	DATE	FEB,2025
CHECKED	F.A	DESIGN STAGE	TENDER
APPROVED	M.I.A	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

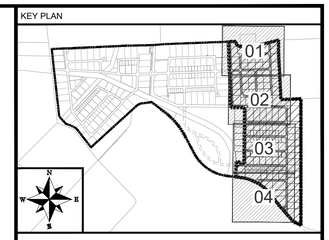
DRAWING TITLE:

MASTER PLAN (OVERALL)
MV CABLE ROUTE LAYOUT

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-MV-EL-0001	00



KEY PLAN



NOTE:

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   - 2 ways equipped with Load Break Switches (LBS), rated for 95 BIL and type-tested.
6. Both the RMU and VCB must fully comply with IEC standards, specifically IAC AFLR 62271-200.
7. The RMU (Ring Main Unit) will be housed within a Kiosk. Refer to Detail "A" for specific enclosure details.
8. Contractor's Scope is till RMUs, Transformers will be part of consumer.

LEGEND:

SYMBOLS	DESCRIPTION
	PAD MOUNTED UNIT, OUTDOOR, 11kV/0.415 kV, COMPACT TYPE WITH MV SWITCHGEAR, TRANSFORMER & LV COMPARTMENT.
----------	3C-400 Sq.mm Al./XLPE/SWA/PVC 15kV MV Cable

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	J.A	SCALE	1:1200
DESIGN	F.A	DATE	FEB,2025
CHECKED	F.A	DESIGN STAGE	TENDER
APPROVED	M.I.A	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

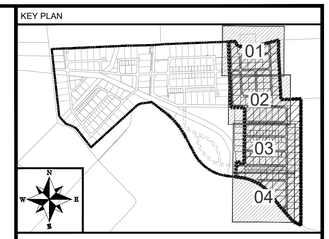
DRAWING TITLE:

MASTER PLAN (Sheet 1 OF 4)
MV CABLE ROUTE LAYOUT

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-MV-EL-0002	00



KEY PLAN



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   - Final engineering survey by contractor appointed by the Client
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   - 2 ways equipped with Load Break Switches (LBS), rated for 95 BIL and type-tested.
6. Both the RMU and VCB must fully comply with IEC standards, specifically IAC AFLR 62271-200.
7. The RMU (Ring Main Unit) will be housed within a Kiosk. Refer to Detail "A" for specific enclosure details.
8. Contractor's Scope is till RMUs, Transformers will be part of consumer.

LEGEND:

SYMBOLS	DESCRIPTION
	PAD MOUNTED UNIT, OUTDOOR, 11kV/0.415 kV, COMPACT TYPE WITH MV SWITCHGEAR, TRANSFORMER & LV COMPARTMENT.
----------	3C-400 Sq.mm Al./XLPE/SWA/PVC 15kV MV Cable

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	J.A	SCALE	1:1200
DESIGN	F.A	DATE	FEB,2025
CHECKED	F.A	DESIGN STAGE	TENDER
APPROVED	M.I.A	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

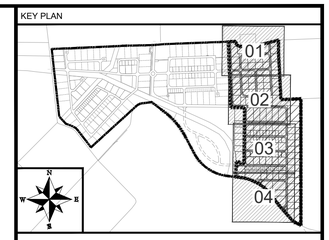
DRAWING TITLE:

MASTER PLAN (Sheet 2 OF 4)
MV CABLE ROUTE LAYOUT

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-MV-EL-0003	00



KEY PLAN



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   - 2 ways equipped with Load Break Switches (LBS), rated for 95 BIL and type-tested.
6. Both the RMU and VCB must fully comply with IEC standards, specifically IAC AFLR 62271-200.
7. The RMU (Ring Main Unit) will be housed within a Kiosk. Refer to Detail "A" for specific enclosure details.
8. Contractor's Scope is till RMUs, Transformers will be part of consumer.

LEGEND:

SYMBOLS	DESCRIPTION
	PAD MOUNTED UNIT, OUTDOOR, 11kV/0.415 kV, COMPACT TYPE WITH MV SWITCHGEAR, TRANSFORMER & LV COMPARTMENT.
----------	3C-400 Sq.mm Al./XLPE/SWA/PVC 15kV MV Cable

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

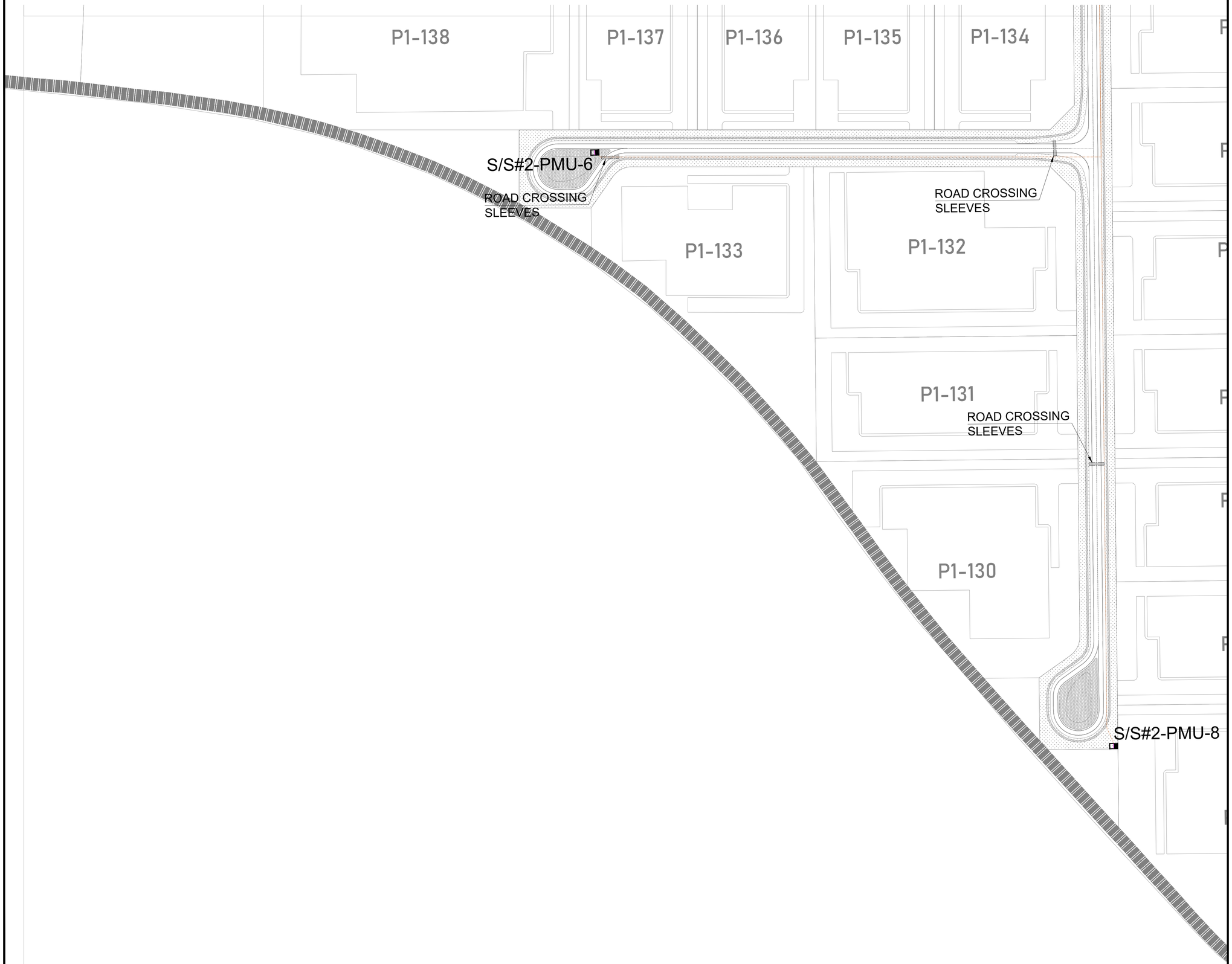
KARACHI INDUSTRIAL PARK SEZ

DRAWN	J.A	SCALE	1:1200
DESIGN	F.A	DATE	FEB,2025
CHECKED	F.A	DESIGN STAGE	TENDER
APPROVED	M.I.A	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

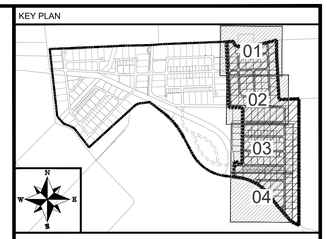
DRAWING TITLE:

MASTER PLAN (Sheet 3 OF 4)
MV CABLE ROUTE LAYOUT

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-MV-EL-0004	00



KEY PLAN



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7. The RMU (Ring Main Unit) will be housed within a Kiosk. Refer to Detail "A" for specific enclosure details.
8. Contractor's Scope is till RMUs, Transformers will be part of consumer.

LEGEND:

SYMBOLS	DESCRIPTION
	PAD MOUNTED UNIT, OUTDOOR, 11kV/0.415 kV, COMPACT TYPE WITH MV SWITCHGEAR, TRANSFORMER & LV COMPARTMENT.
----------	3C-400 Sq.mm Al./XLPE/SWA/PVC 15kV MV Cable

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN.2025

PROJECT:

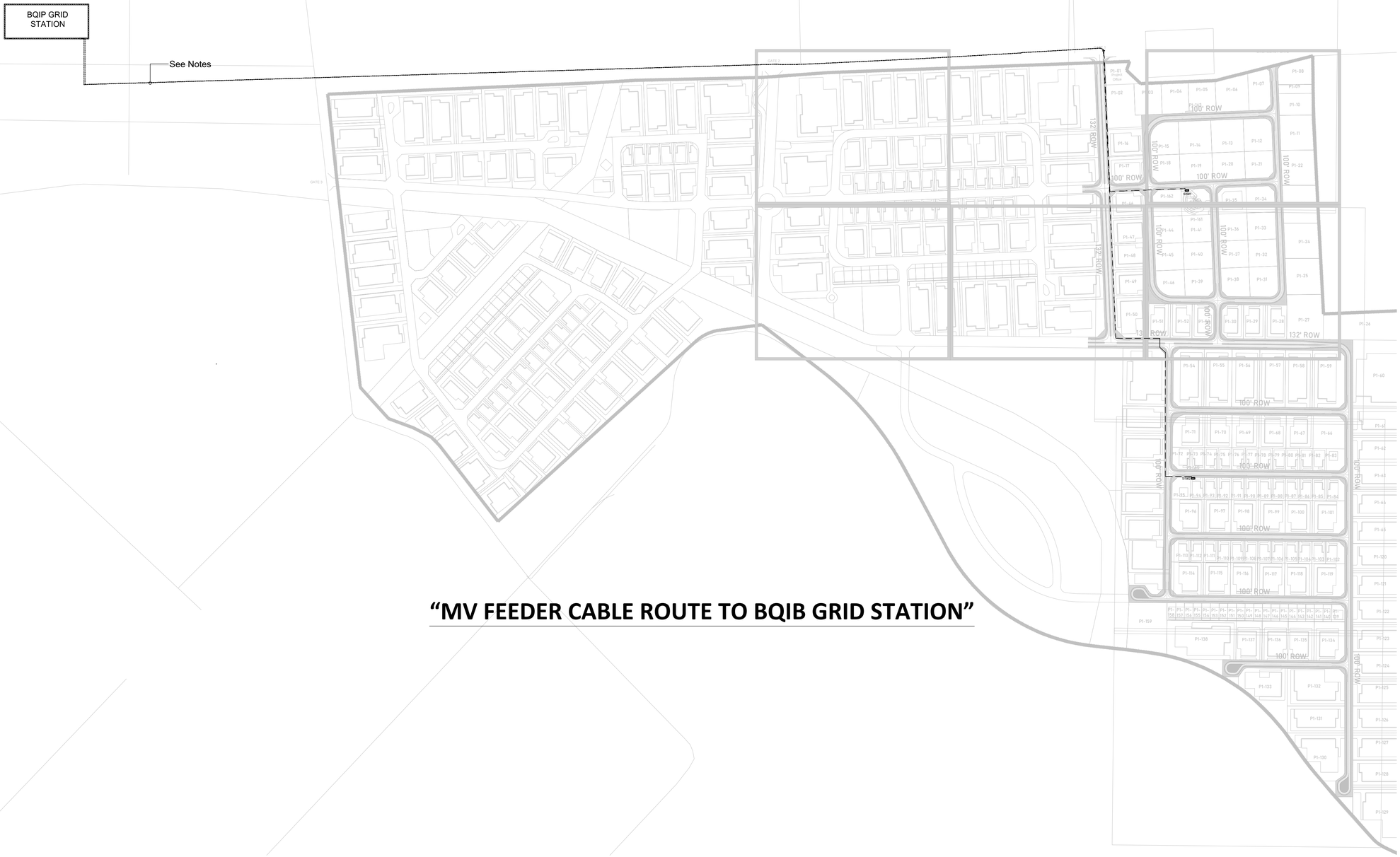
KARACHI INDUSTRIAL PARK SEZ

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DESIGN	F.A	DATE	FEB,2025
CHECKED	F.A	DESIGN STAGE	TENDER
APPROVED	M.I.A	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

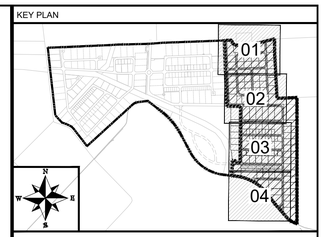
MASTER PLAN (Sheet 4 OF 4)
MV CABLE ROUTE LAYOUT

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-MV-EL-0005	00



"MV FEEDER CABLE ROUTE TO BQIB GRID STATION"

KEY PLAN



NOTE:
NOTES:

1. The Main Feeder Cable route shown beyond the project boundary is tentative and the contractor to conduct a detailed site survey for the cable route, identify obstacles, and assess alignment feasibility of all 11 kV Main feeder Cables ensuring compliance with project requirements and relevant standards.
2. Contractor to coordinate with the relevant grid station authorities to obtain necessary approvals for electrical power connections of the six (6) nos. 11 kV Main feeders, ensuring adherence to technical and safety regulations, submitting all required documentation, and following up until approvals are secured.
3. Contractor to coordinate with all concerned authorities to secure approvals for the proposed six (6) nos. 11 kV Main feeders cable route beyond the project boundary, obtain necessary permits before commencing works and execute to the satisfaction of Engineer in charge and all concerned authorities including reinstatement as required.
4. Contractor to prepare and submit shop drawings with complete routing details, trenching specifications, and cable laying methodology for engineer's approval.
5. Contractor to submit as-built drawings of all six (6) nos. 11 kV Main feeder cables for engineer's approval including proper records of all approvals for compliance and documentation.

LEGEND:

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

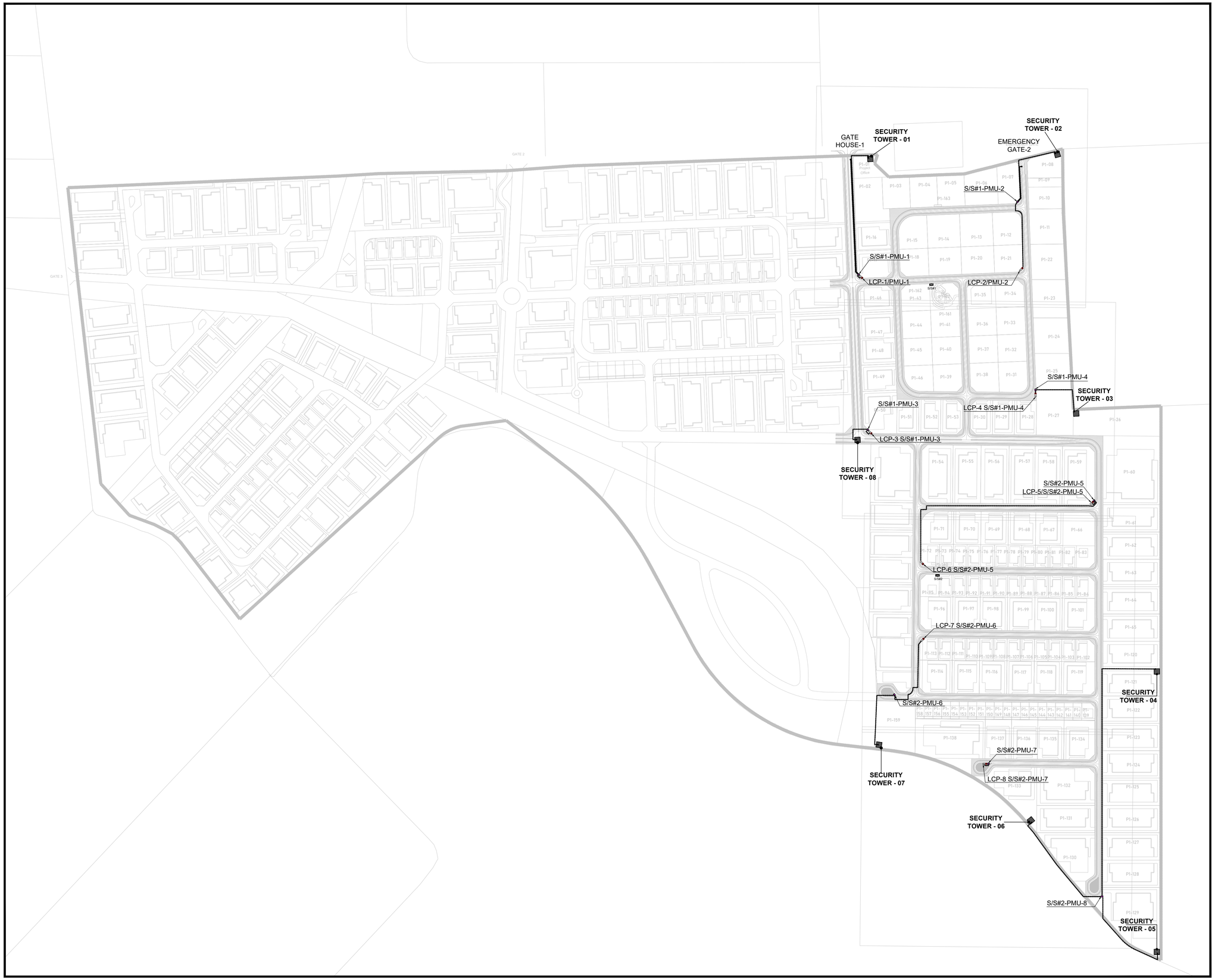
PROJECT:

KARACHI INDUSTRIAL PARK SEZ

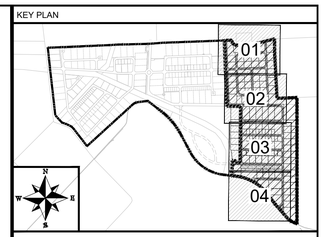
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DESIGN	F.A	DATE	FEB,2025
CHECKED	F.A	DESIGN STAGE	TENDER
APPROVED	M.I.A	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:
MASTER PLAN (OVERALL)
MV FEEDER CABLE ROUTE
TO BQIP GRID STATION

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-MV-EL-0006	00



KEY PLAN



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6. Both the RMU and VCB must fully comply with IEC standards, specifically IAC AFLR 62271-200.
7. The RMU (Ring Main Unit) will be housed within a Kiosk. Refer to Detail "A" for specific enclosure details.
8. Contractor's Scope is till RMUs, Transformers will be part of consumer.

LEGEND:

SYMBOLS	DESCRIPTION
	17.5 kV, 4-WAY RING MAIN UNIT (RMU), OUTDOOR KIOSK TYPE, 2 VCBs + 2 LBS, EXTENSIBLE TYPE.
	PAD MOUNTED UNIT, OUTDOOR, 11kV/0.415 kV, COMPACT TYPE WITH MV SWITCHGEAR, TRANSFORMER & LV COMPARTMENT.
	LV CABLE
LCP	LIGHTING CONTROL PANEL (LCP)

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm _ JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

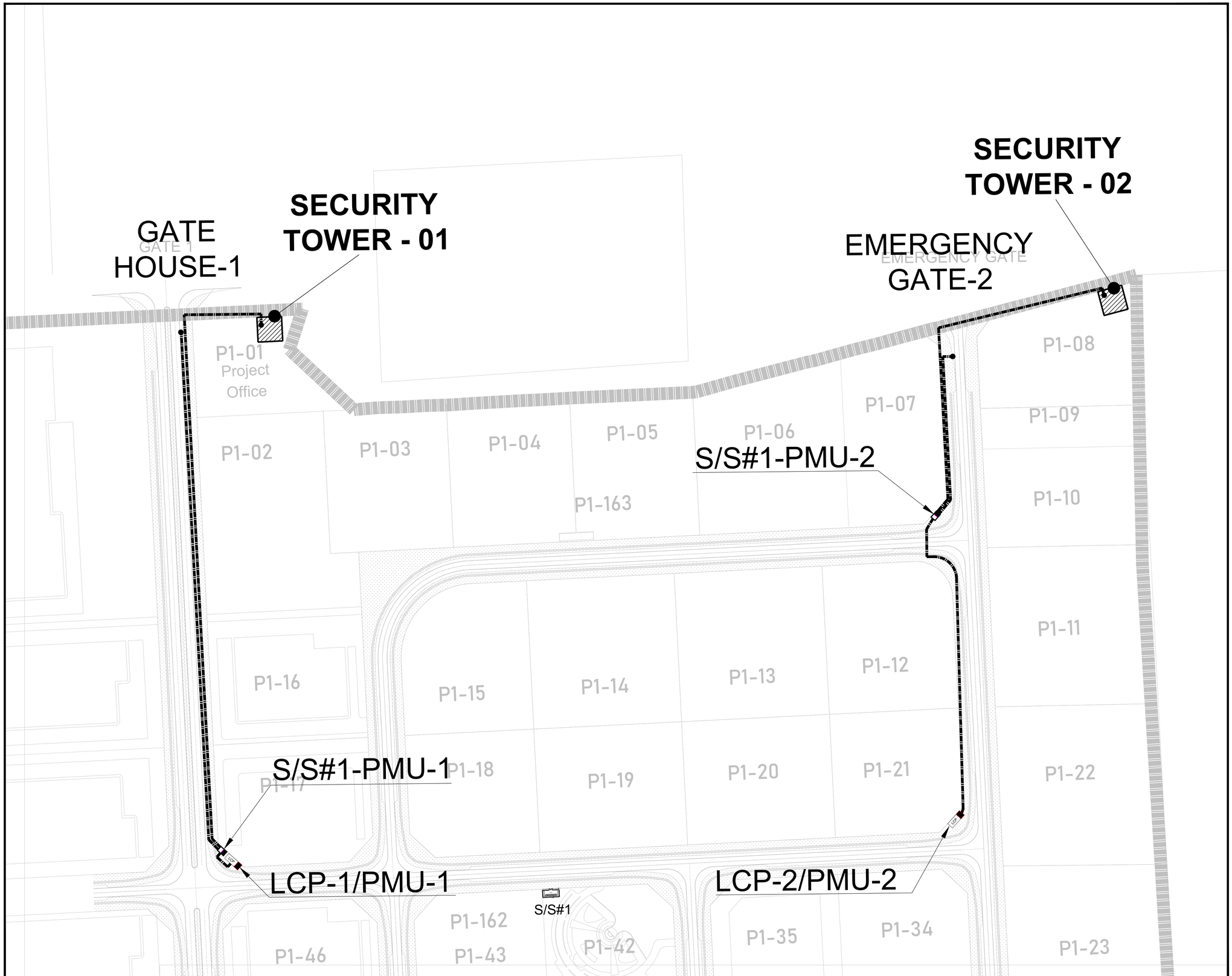
KARACHI INDUSTRIAL PARK SEZ

DRAWN	J.A	SCALE	1:1800
DESIGN	F.A	DATE	FEB,2025
CHECKED	F.A	DESIGN STAGE	TENDER
APPROVED	M.I.A	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

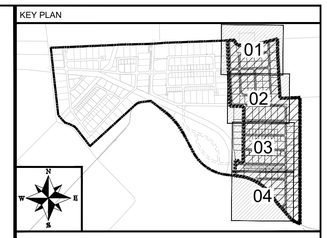
DRAWING TITLE:

MASTER PLAN (OVERALL)
LV CABLE ROUTE LAYOUT

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-LV-EL-0001	00



KEY PLAN



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LEGEND:

SYMBOLS	DESCRIPTION
	17.5 kV, 4-WAY RING MAIN UNIT (RMU), OUTDOOR KIOSK TYPE, 2 VCBs + 2 LBS, EXTENSIBLE TYPE.
	PAD MOUNTED UNIT, OUTDOOR, 11kV/0.415 kV, COMPACT TYPE WITH MV SWITCHGEAR, TRANSFORMER & LV COMPARTMENT.
	LV CABLE
LCP	LIGHTING CONTROL PANEL (LCP)

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	J.A	SCALE	1:1200
DESIGN	F.A	DATE	FEB,2025
CHECKED	F.A	DESIGN STAGE	TENDER
APPROVED	M.I.A	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

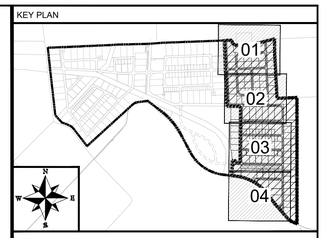
DRAWING TITLE:

MASTER PLAN (Sheet 1 OF 4)
LV CABLE ROUTE LAYOUT

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-LV-EL-0002	00

P1-161
P1-44
P1-41
P1-36
P1-33
P1-47
P1-24
P1-48
P1-45
P1-40
P1-37
P1-32
P1-49
P1-46
P1-39
P1-38
P1-31
P1-25
S/S#1-PMU-4
SECURITY
TOWER - 0
LCP
LCP-4 S/S#1-PMU-4
S/S#1-PMU-3
P1-50
P1-51
P1-52
P1-53
P1-30
P1-29
P1-28
P1-27
LCP
LCP-3 S/S#1-PMU-3
SECURITY
TOWER - 08
P1-54
P1-55
P1-56
P1-57
P1-58
P1-59
S/S#2-PMU-5
LCP-5/S/S#2-PMU-5
LCP

KEY PLAN



NOTE:

1. The drawing is for illustration purposes only.
2. All coordinates are indicative and survey confirmation is advised.
3. Plot boundary, road alignment, road reserves, service reservation, all dimensions and areas are subject to:
   - Further refinement during the detailed Infrastructure Planning stage
   - Approval from relevant authorities and services providers obtained by the Client.
   - Final engineering survey by contractor appointed by the Client
4. All dimensions are in meters unless specified otherwise.
5. The RMU (Ring Main Unit) will be configured as a 4-way unit:
   - 2 ways allocated for protection, equipped with 630A Vacuum Circuit Breakers (VCBs).
   - 2 ways equipped with Load Break Switches (LBS), rated for 95 BIL and type-tested.
6. Both the RMU and VCB must fully comply with IEC standards, specifically IAC AFLR 62271-200.
7. The RMU (Ring Main Unit) will be housed within a Kiosk. Refer to Detail "A" for specific enclosure details.
8. Contractor's Scope is till RMUs, Transformers will be part of consumer.

LEGEND:

SYMBOLS	DESCRIPTION
	17.5 kV, 4-WAY RING MAIN UNIT (RMU), OUTDOOR KIOSK TYPE, 2 VCBs + 2 LBS, EXTENSIBLE TYPE.
	PAD MOUNTED UNIT, OUTDOOR, 11kV/0.415 kV, COMPACT TYPE WITH MV SWITCHGEAR, TRANSFORMER & LV COMPARTMENT.
	LV CABLE
LCP	LIGHTING CONTROL PANEL (LCP)

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm _ JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	J.A	SCALE	1:1200
DESIGN	F.A	DATE	FEB,2025
CHECKED	F.A	DESIGN STAGE	TENDER
APPROVED	M.I.A	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

MASTER PLAN (Sheet 2 OF 4)
LV CABLE ROUTE LAYOUT

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-LV-EL-0003	00

P1-71 P1-70 P1-69 P1-68 P1-67 P1-66

P1-72 P1-73 P1-74 P1-75 P1-76 P1-77 P1-78 P1-79 P1-80 P1-81 P1-82 P1-83

P1-160

LCP-6 S/S#2-PMU-5

S/S#2

P1-95 P1-94 P1-93 P1-92 P1-91 P1-90 P1-89 P1-88 P1-87 P1-86 P1-85 P1-84

P1-96 P1-97 P1-98 P1-99 P1-100 P1-101

LCP-7 S/S#2-PMU-6

P1-113 P1-112 P1-111 P1-110 P1-109 P1-108 P1-107 P1-106 P1-105 P1-104 P1-103 P1-102

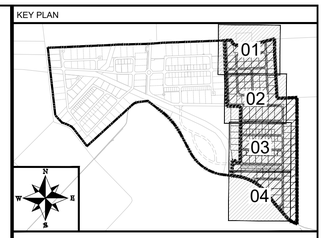
P1-114 P1-115 P1-116 P1-117 P1-118 P1-119

S/S#2-PMU-6

P1-158 P1-157 P1-156 P1-155 P1-154 P1-153 P1-152 P1-151 P1-150 P1-149 P1-148 P1-147 P1-146 P1-145 P1-144 P1-143 P1-142 P1-141 P1-140 P1-139

P1-159

KEY PLAN



NOTE:

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   - Final engineering survey by contractor appointed by the Client
4. All dimensions are in meters unless specified otherwise.
5. The RMU (Ring Main Unit) will be configured as a 4-way unit:
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   - 2 ways equipped with Load Break Switches (LBS), rated for 95 BIL and type-tested.
6. Both the RMU and VCB must fully comply with IEC standards, specifically IAC AFLR 62271-200.
7. The RMU (Ring Main Unit) will be housed within a Kiosk. Refer to Detail "A" for specific enclosure details.
8. Contractor's Scope is till RMUs, Transformers will be part of consumer.

LEGEND:

SYMBOLS	DESCRIPTION
	17.5 kV, 4-WAY RING MAIN UNIT (RMU), OUTDOOR KIOSK TYPE, 2 VCBs + 2 LBS, EXTENSIBLE TYPE.
	PAD MOUNTED UNIT, OUTDOOR, 11kV/0.415 kV, COMPACT TYPE WITH MV SWITCHGEAR, TRANSFORMER & LV COMPARTMENT.
	LV CABLE
LCP	LIGHTING CONTROL PANEL (LCP)

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

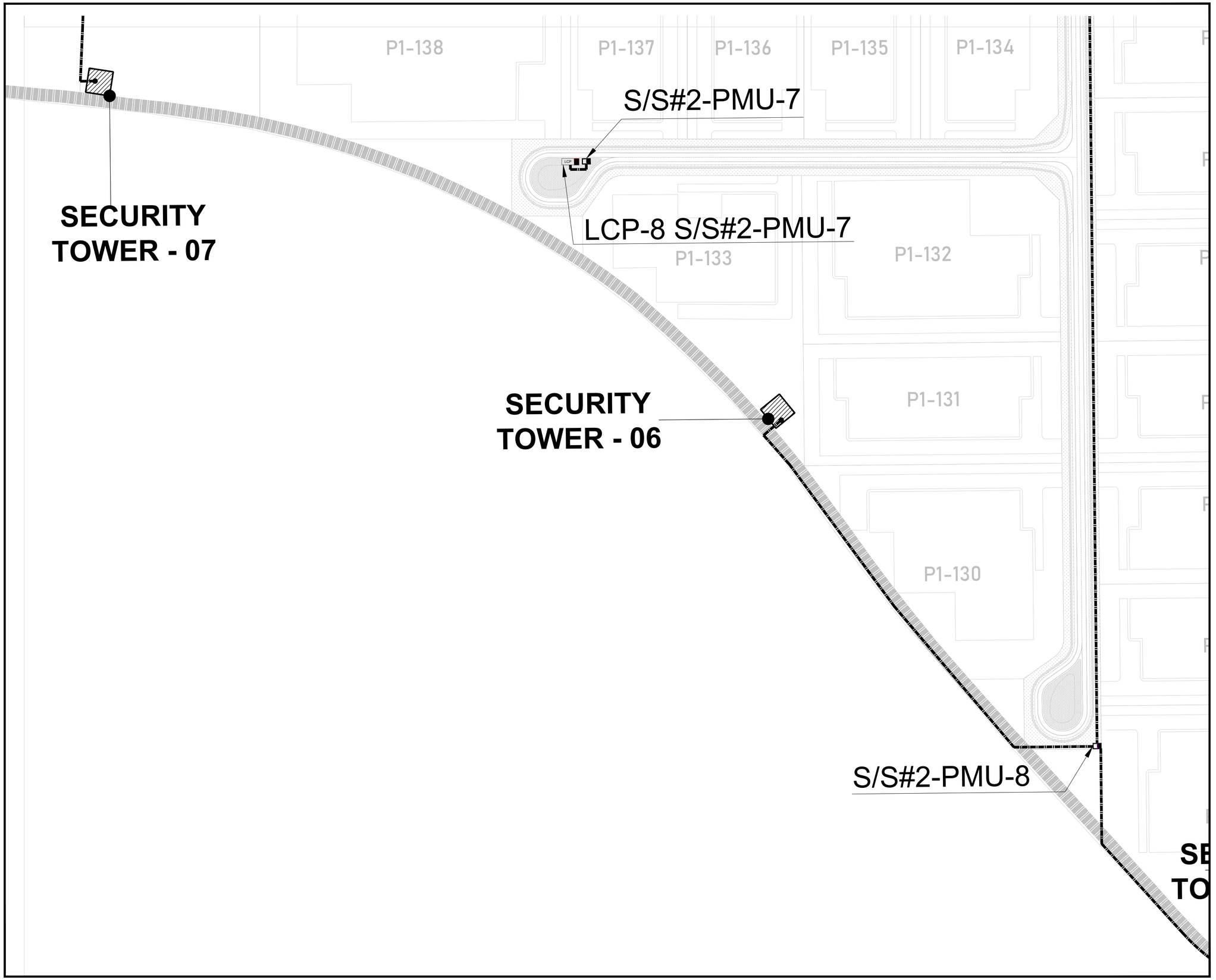
KARACHI INDUSTRIAL PARK SEZ

DRAWN	J.A	SCALE	1:1200
DESIGN	F.A	DATE	FEB,2025
CHECKED	F.A	DESIGN STAGE	TENDER
APPROVED	M.I.A	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

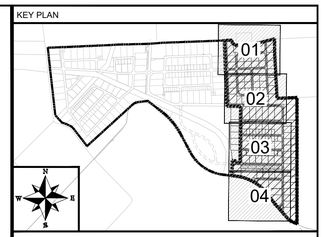
DRAWING TITLE:

MASTER PLAN (Sheet 3 OF 4)
LV CABLE ROUTE LAYOUT

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-LV-EL-0004	00



KEY PLAN



NOTE:

1. The drawing is for illustration purposes only.
2. All coordinates are indicative and survey confirmation is advised.
3. Plot boundary, road alignment, road reserves, service reservation, all dimensions and areas are subject to:
   - Further refinement during the detailed Infrastructure Planning stage
   - Approval from relevant authorities and services providers obtained by the Client.
   - Final engineering survey by contractor appointed by the Client
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   - 2 ways allocated for protection, equipped with 630A Vacuum Circuit Breakers (VCBs).
   - 2 ways equipped with Load Break Switches (LBS), rated for 95 BIL and type-tested.
6. Both the RMU and VCB must fully comply with IEC standards, specifically IAC AFLR 62271-200.
7. The RMU (Ring Main Unit) will be housed within a Kiosk. Refer to Detail "A" for specific enclosure details.
8. Contractor's Scope is till RMUs, Transformers will be part of consumer.

LEGEND:

SYMBOLS	DESCRIPTION
	17.5 kV, 4-WAY RING MAIN UNIT (RMU), OUTDOOR KIOSK TYPE, 2 VCBs + 2 LBS, EXTENSIBLE TYPE.
	PAD MOUNTED UNIT, OUTDOOR, 11kV/0.415 kV, COMPACT TYPE WITH MV SWITCHGEAR, TRANSFORMER & LV COMPARTMENT.
	LV CABLE
LCP	LIGHTING CONTROL PANEL (LCP)

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

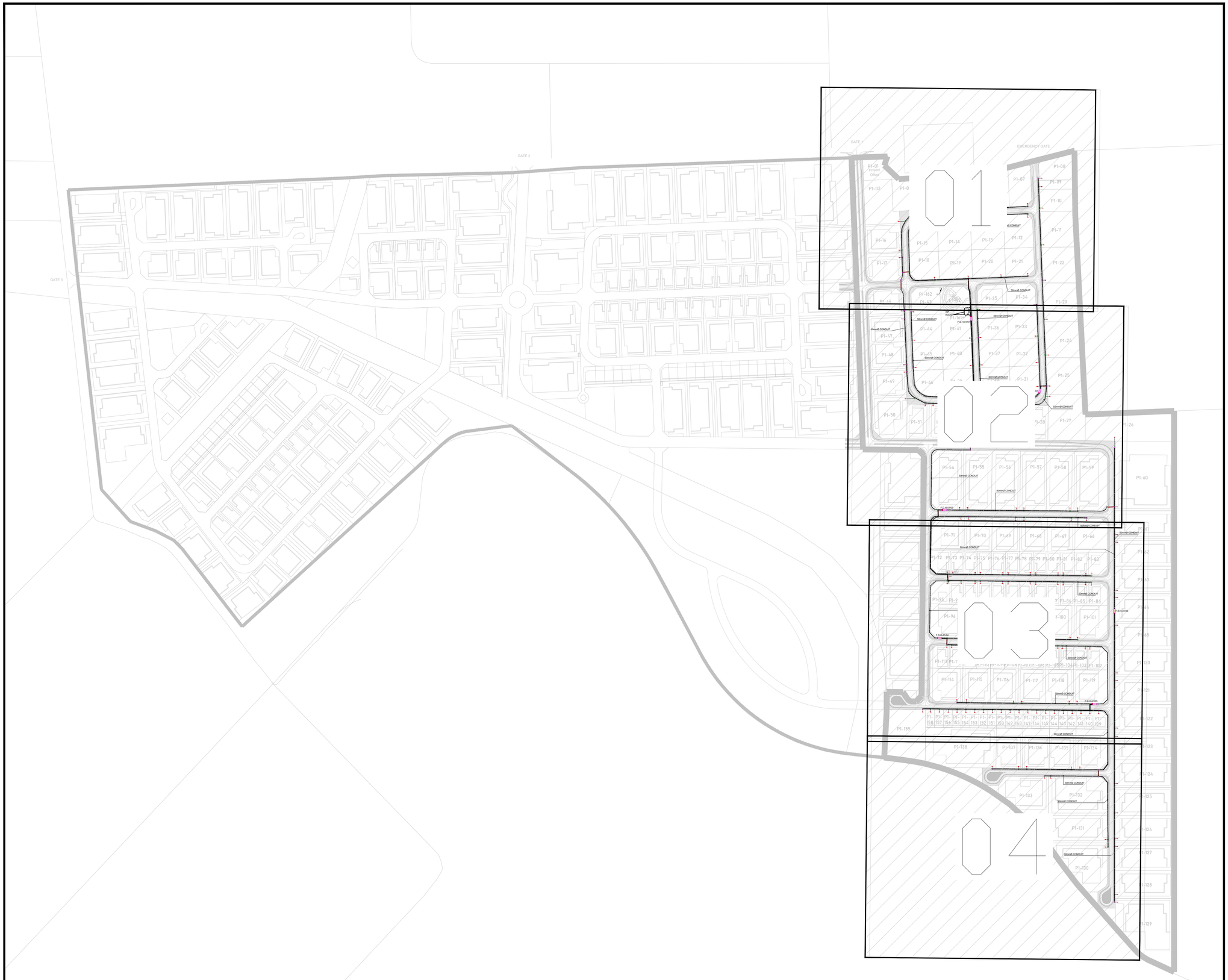
KARACHI INDUSTRIAL PARK SEZ

DRAWN	J.A	SCALE	1:1200
DESIGN	F.A	DATE	FEB,2025
CHECKED	F.A	DESIGN STAGE	TENDER
APPROVED	M.I.A	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

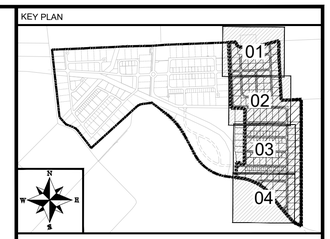
DRAWING TITLE:

MASTER PLAN (Sheet 4 OF 4)
LV CABLE ROUTE LAYOUT

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-LV-EL-0005	00



KEY PLAN



NOTE:

LEGEND:

LEGEND

SYMBOLS	DESCRIPTION
F.O.H	FEEDER DISTRIBUTION HUB
	8C-SINGLE MODE FIBER OPTIC CABLE
	2C-MULTIMODE FIBER OPTIC CABLE
	2x150mmØ uPVC ROAD CROSSING SLEEVES
	600mm(L) x 600mm(W) x 600mm(D) HANDHOLE

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm

JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

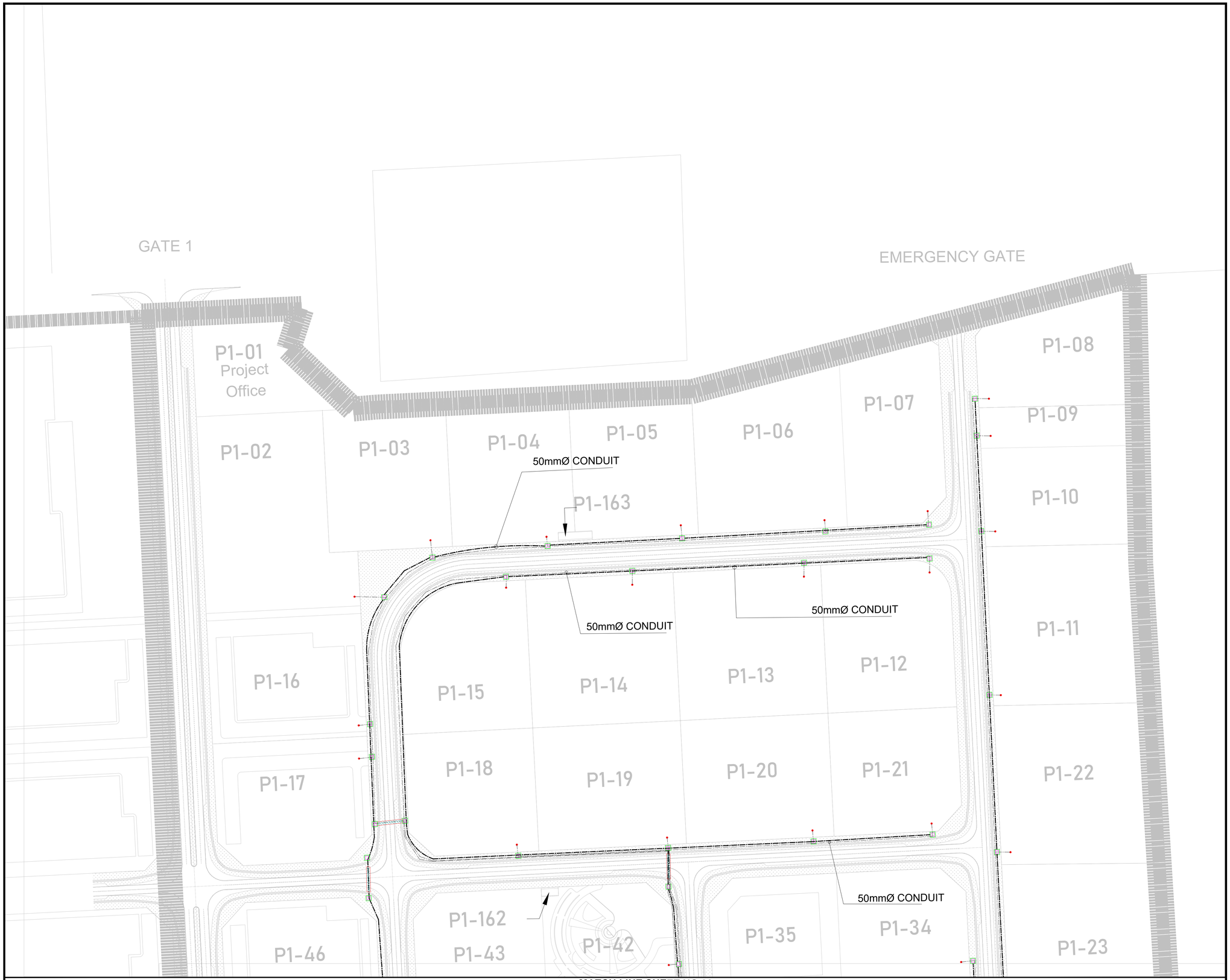
KARACHI INDUSTRIAL PARK SEZ

DRAWN	Z.N	SCALE	1 : 1800
DESIGN	F.A	DATE	FEB,2025
CHECKED	F.A	DESIGN STAGE	TENDER
APPROVED	M.I.A	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

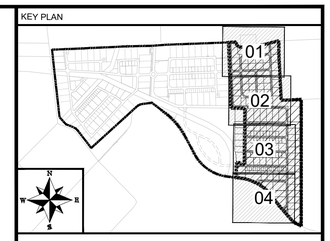
MASTER PLAN (OVERALL)
FO CABLE ROUTE LAYOUT
SHEET INDEX PLAN

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-IT-EL-0001	00



MATCH LINE SHEET NO.02

KEY PLAN



NOTE:

LEGEND:

LEGEND

SYMBOLS	DESCRIPTION
FDH	FEEDER DISTRIBUTION HUB
	8C-SINGLE MODE FIBER OPTIC CABLE
	2C-MULTIMODE FIBER OPTIC CABLE
	2x150mmØ uPVC ROAD CROSSING SLEEVES
	600mm(L) x 600mm(W) x 600mm(D) HANDHOLE

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

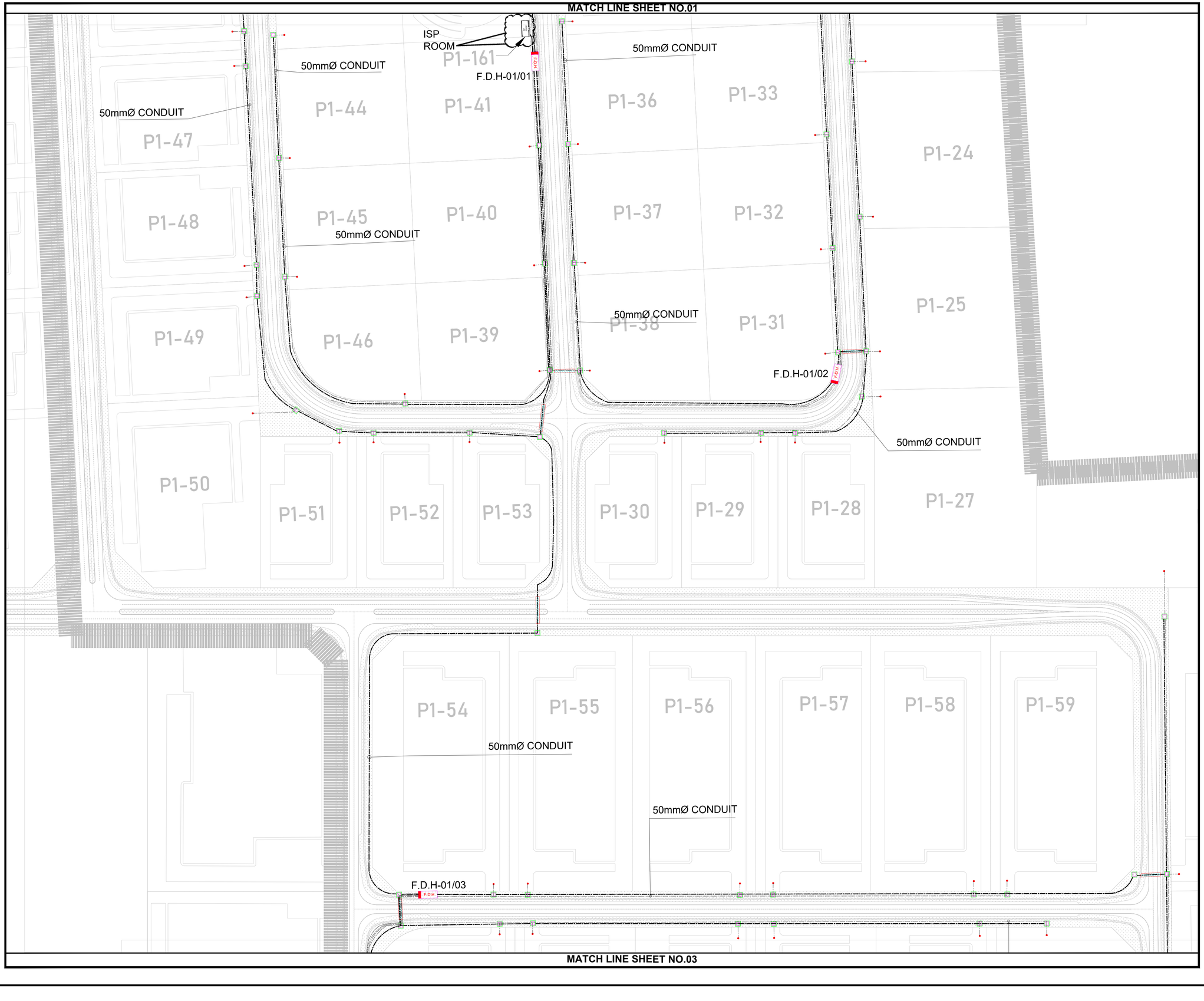
DRAWN	Z.N	SCALE	1 : 1200
DESIGN	F.A	DATE	FEB,2025
CHECKED	F.A	DESIGN STAGE	TENDER
APPROVED	M.I.A	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

MASTER PLAN (Sheet 1 OF 4)
FO CABLE ROUTE LAYOUT

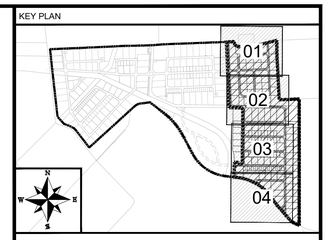
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-IT-EL-0002	00

MATCH LINE SHEET NO.01



MATCH LINE SHEET NO.03

KEY PLAN



NOTE:

LEGEND:

LEGEND

SYMBOLS	DESCRIPTION
FDH	FEEDER DISTRIBUTION HUB
	8C-SINGLE MODE FIBER OPTIC CABLE
	2C-MULTIMODE FIBER OPTIC CABLE
	2x150mmØ uPVC ROAD CROSSING SLEEVES
	600mm(L) x 600mm(W) x 600mm(D) HANDHOLE

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

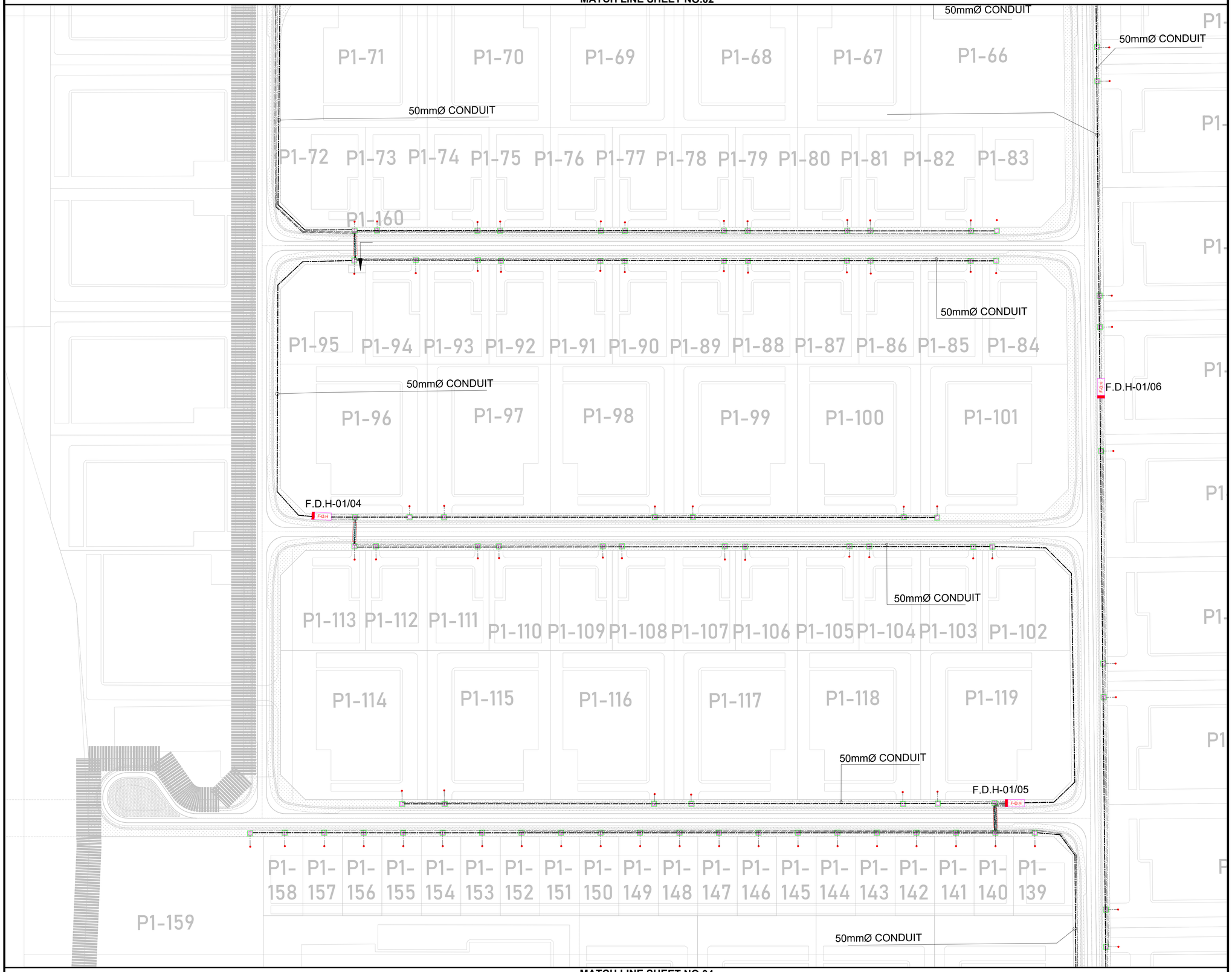
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DESIGN	F.A	DATE	FEB,2025
CHECKED	F.A	DESIGN STAGE	TENDER
APPROVED	M.I.A	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

MASTER PLAN (Sheet 2 of 4)
CCTV LAYOUT

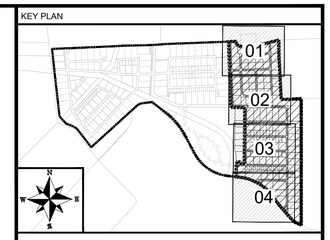
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-IT-EL-0003	00

MATCH LINE SHEET NO.02



MATCH LINE SHEET NO.04

KEY PLAN



NOTE:

LEGEND:

LEGEND

SYMBOLS	DESCRIPTION
F-D-H	FEEDER DISTRIBUTION HUB
	8C-SINGLE MODE FIBER OPTIC CABLE
	2C-MULTIMODE FIBER OPTIC CABLE
	2x150mmØ uPVC ROAD CROSSING SLEEVES
	600mm(L) x 600mm(W) x 600mm(D) HANDHOLE

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	Z.N	SCALE	1 : 1200
DESIGN	F.A	DATE	FEB,2025
CHECKED	F.A	DESIGN STAGE	TENDER
APPROVED	M.I.A	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

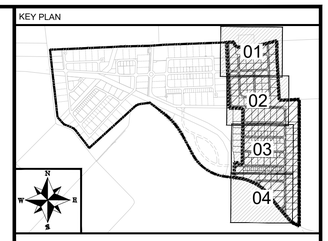
MASTER PLAN (Sheet 3 OF 4)
FO CABLE ROUTE LAYOUT

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-IT-EL-0004	00

MATCH LINE SHEET NO.03



KEY PLAN



NOTE:

LEGEND:

LEGEND

SYMBOLS	DESCRIPTION
FDH	FEEDER DISTRIBUTION HUB
	8C-SINGLE MODE FIBER OPTIC CABLE
	2C-MULTIMODE FIBER OPTIC CABLE
	2x150mmØ uPVC ROAD CROSSING SLEEVES
	600mm(L) x 600mm(W) x 600mm(D) HANDHOLE

CLIENT:

PIDC

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

SUKSANA JURONG · OMS · iCONSULT INNOVATION THROUGH EXCELLENCE

Lead Firm *JV-Team*

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	Z.N	SCALE	1 : 1200
DESIGN	F.A	DATE	FEB,2025
CHECKED	F.A	DESIGN STAGE	TENDER
APPROVED	M.I.A	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

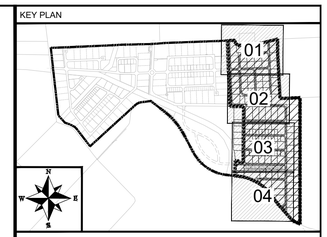
DRAWING TITLE:

MASTER PLAN (Sheet 4 OF 4)
FO CABLE ROUTE LAYOUT

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-IT-EL-0005	00



KEY PLAN



NOTE:

LEGEND:

- PAD MOUNTED UNIT (PMU)
- LCP — LIGHTING CONTROL PANEL (LCP)
- 2 Nos. STREET LIGHT WITH 160W LED LAMP (MIN.50,000 HOURS LIFE CYCLE),L70B10, MOUNTED ON 8M HIGH DOUBLE ARM LIGHTING POLE
- 1 No. STREET LIGHT WITH 160W LED LAMP (MIN.50,000 HOURS LIFE CYCLE),L70B10, MOUNTED ON 8M HIGH SINGLE ARM LIGHTING POLE
- LIGHTING CABLE
- 2NO's 150mm Ø ROAD CROSSING SLEEVES
- EARTH PIT

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

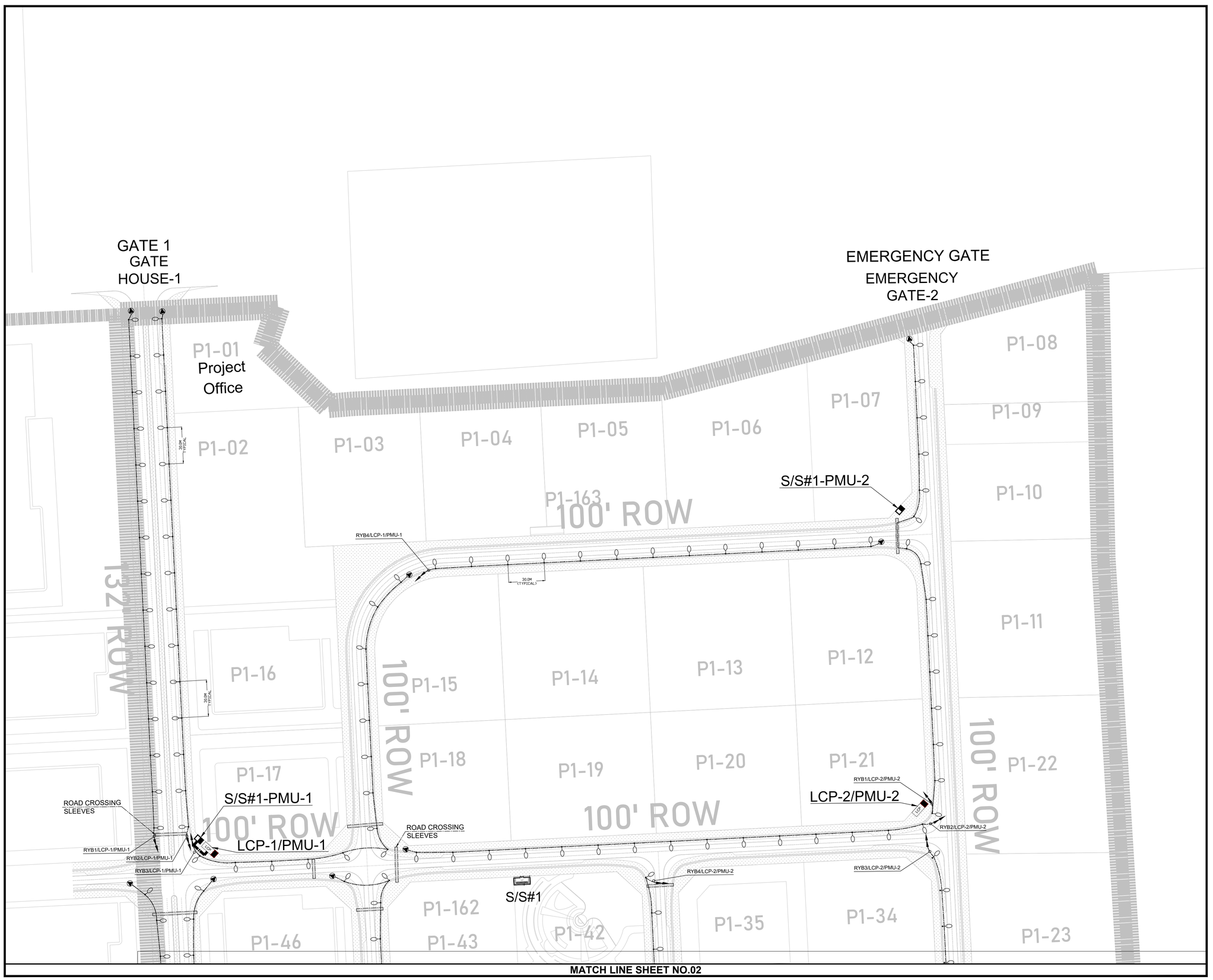
PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	J.A	SCALE	1:1800
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CHECKED	F.A	DESIGN STAGE	TENDER
APPROVED	M.I.A	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

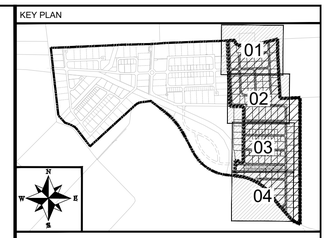
DRAWING TITLE: MASTER PLAN (OVERALL)
ROAD LIGHTING LAYOUT
SHEET INDEX PLAN

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-RL-EL-0001	00



MATCH LINE SHEET NO.02

KEY PLAN



NOTE:

LEGEND:

- PAD MOUNTED UNIT (PMU)
- LCP — LIGHTING CONTROL PANEL (LCP)
- 2 Nos. STREET LIGHT WITH 160W LED LAMP (MIN.50,000 HOURS LIFE CYCLE),L70B10, MOUNTED ON 8M HIGH DOUBLE ARM LIGHTING POLE
- 1 No. STREET LIGHT WITH 160W LED LAMP (MIN.50,000 HOURS LIFE CYCLE),L70B10, MOUNTED ON 8M HIGH SINGLE ARM LIGHTING POLE
- LIGHTING CABLE
- 2NO's 150mm Ø ROAD CROSSING SLEEVES
- EARTH PIT

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	J.A	SCALE	1 : 1200
DESIGN	F.A	DATE	FEB,2025
CHECKED	F.A	DESIGN STAGE	TENDER
APPROVED	M.I.A	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

MASTER PLAN (Sheet 1 OF 4)
ROAD LIGHTING LAYOUT

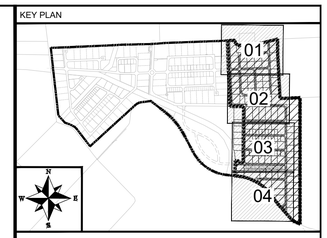
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-RL-EL-0002	00

MATCH LINE SHEET NO.01



MATCH LINE SHEET NO.03

KEY PLAN



NOTE:

LEGEND:

- PAD MOUNTED UNIT (PMU)
- LCP — LIGHTING CONTROL PANEL (LCP)
- 2 Nos. STREET LIGHT WITH 160W LED LAMP (MIN.50,000 HOURS LIFE CYCLE),L70B10, MOUNTED ON 8M HIGH DOUBLE ARM LIGHTING POLE
- 1 No. STREET LIGHT WITH 160W LED LAMP (MIN.50,000 HOURS LIFE CYCLE),L70B10, MOUNTED ON 8M HIGH SINGLE ARM LIGHTING POLE
- LIGHTING CABLE
- 2NO's 150mm Ø ROAD CROSSING SLEEVES
- EARTH PIT

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	J.A	SCALE	1 : 1200
DESIGN	F.A	DATE	FEB,2025
CHECKED	F.A	DESIGN STAGE	TENDER
APPROVED	M.I.A	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

MASTER PLAN (Sheet 2 OF 4)
ROAD LIGHTING LAYOUT

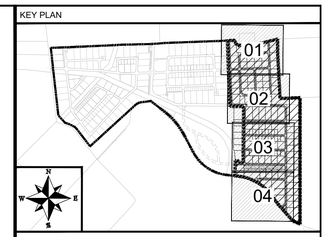
PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-RL-EL-0003	00

MATCH LINE SHEET NO.02



MATCH LINE SHEET NO.04

KEY PLAN



NOTE:

LEGEND:

- PAD MOUNTED UNIT (PMU)
- LCP — LIGHTING CONTROL PANEL (LCP)
- 2 Nos. STREET LIGHT WITH 160W LED LAMP (MIN.50,000 HOURS LIFE CYCLE),L70B10, MOUNTED ON 8M HIGH DOUBLE ARM LIGHTING POLE
- 1 No. STREET LIGHT WITH 160W LED LAMP (MIN.50,000 HOURS LIFE CYCLE),L70B10, MOUNTED ON 8M HIGH SINGLE ARM LIGHTING POLE
- LIGHTING CABLE
- 2NO's 150mm Ø ROAD CROSSING SLEEVES
- EARTH PIT

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

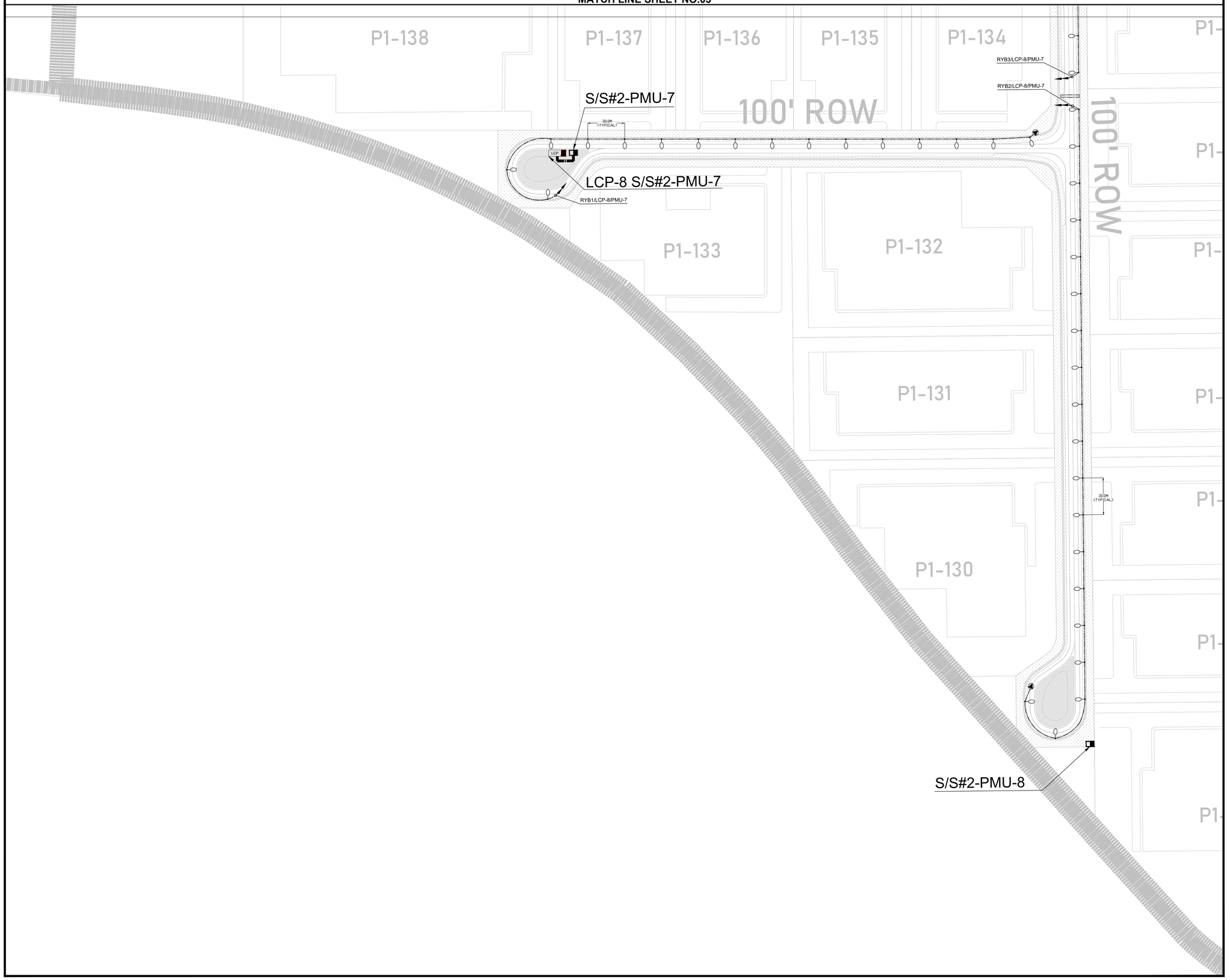
DRAWN	J.A	SCALE	1 : 1200
DESIGN	F.A	DATE	FEB,2025
CHECKED	F.A	DESIGN STAGE	TENDER
APPROVED	M.I.A	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

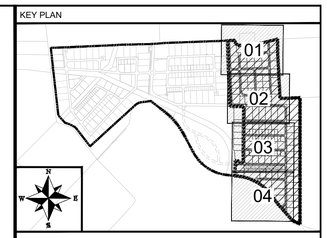
MASTER PLAN (Sheet 3 OF 4)
ROAD LIGHTING LAYOUT

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-RL-EL-0004	00

MATCH LINE SHEET NO.03



KEY PLAN



NOTE:

LEGEND:

- PAD MOUNTED UNIT (PMU)
- LCP — LIGHTING CONTROL PANEL (LCP)
- 2 Nos. STREET LIGHT WITH 160W LED LAMP (MIN.50,000 HOURS LIFE CYCLE),L70B10, MOUNTED ON 8M HIGH DOUBLE ARM LIGHTING POLE
- 1 No. STREET LIGHT WITH 160W LED LAMP (MIN.50,000 HOURS LIFE CYCLE),L70B10, MOUNTED ON 8M HIGH SINGLE ARM LIGHTING POLE
- LIGHTING CABLE
- 2NO's 150mm Ø ROAD CROSSING SLEEVES
- EARTH PIT

CLIENT:

PAKISTAN INDUSTRIAL DEVELOPMENT CORPORATION (PIDC)

CONSULTANT FOR MASTER PLAN:

Lead Firm — JV-Team

REV.	DESCRIPTION	DATE
00	ISSUED FOR TENDER	JUN,2025

PROJECT:

KARACHI INDUSTRIAL PARK SEZ

DRAWN	J.A	SCALE	1 : 1200
DESIGN	F.A	DATE	FEB,2025
CHECKED	F.A	DESIGN STAGE	TENDER
APPROVED	M.I.A	ISSUE	TENDER
ACTUAL SHEET SIZE			A1

DRAWING TITLE:

MASTER PLAN (Sheet 4 OF 4)
ROAD LIGHTING LAYOUT

PROJ CODE	DRAWING NO.	REV.
01098	EA-01098-KIP-RL-EL-0005	00