

**ISLAMIC REPUBLIC OF PAKISTAN
GOVERNMENT OF PUNJAB
LOCAL GOVERNMENT & COMMUNITY DEVELOPMENT
DEPARTMENT**



**LOAN 3562-PAK:
PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT
PROGRAM (PICIIP)**



BIDDING DOCUMENT

NCB-Works/PICIIP-15; PLGA Lala Musa Academy

PICIIP-15-PLGA Lala Musa

-Single-Stage: Two-Envelope Bidding Procedure-

PROGRAM MANAGEMENT UNIT

**Punjab Intermediate Cities Improvement Investment Program
Local Government & Community Development Department, Government of Pakistan**

Current Address: 40 B-1, Gulberg 3, MM Alam Road, Lahore Pakistan

After 9 October 2022 New Building Address: 71, C-3, Gulberg, III, Lahore

Email address: pmu.piciip@punjab.gov.pk

Telephone: +92 42 99268484

Fax Number: +92 42 99268483

Procurement of Works

BIDDING DOCUMENT for Procurement of

PICIIP-15-PLGA Lala Musa

Issued on: 29 May 2023
Invitation for Bids No.: PICIIP-15-PLGA Lala Musa
NCB No.: PICIIP-15-PLGA Lala Musa
Employer: Program Management Unit (PMU)
Punjab Intermediate Cities Improvement
Investment Program (PICIIP)
Local Government & Community Department
Punjab, Lahore
Country: Pakistan

Preface

This Bidding Document for the Procurement of Works has been prepared by **Program Management Unit (PMU), Punjab Intermediate Cities Improvement Investment Program (PICIP), Local Government & Community Development Department, Punjab Pakistan** and is based on the Standard Bidding Document for the Procurement of Works – Small (*SBD Works-Small*) issued by the Asian Development Bank dated **December 2016**.

ADB's *SBD Works* has the structure and the provisions of the Master Procurement Document entitled "Bidding Documents for the Procurement of Works", prepared by multilateral development banks and other public international financial institutions, except where ADB-specific considerations have required a change.

Table of Contents - Summary Description

PART I BIDDING PROCEDURES

Section 1 - Instructions to Bidders (ITB) -----	1-1
This Section specifies the procedures Bidders should follow when preparing and submitting their Bids. Information is also provided on the submission, opening, evaluation of bids, and on the award of contract.	
Section 2 - Bid Data Sheet (BDS) -----	2-1
This Section consists of provisions that are specific to each procurement and supplement the information or requirements included in Section 1 - Instructions to Bidders.	
Section 3 - Evaluation and Qualification Criteria (EQC) -----	3-1
This Section contains the criteria to determine the lowest evaluated bid and the qualifications of the Bidder to perform the contract.	
Section 4 - Bidding Forms (BDF) -----	4-1
This Section contains the forms which are to be completed by the Bidder and submitted as part of its Bid.	
Section 5 - Eligible Countries (ELC) -----	5-1
This Section contains the list of eligible countries.	

PART II REQUIREMENTS

Section 6 - Employer's Requirements (ERQ) -----	6-1
This Section contains the Specification, Drawings, Supplementary Information that describe the Works to be procured, Personnel Requirements, and Equipment Requirements.	

PART III CONDITIONS OF CONTRACT AND CONTRACT FORMS

Section 7 - General Conditions of Contract (GCC) -----	7-1
This Section contains the general clauses to be applied in all contracts. These Conditions are subject to the variations and additions set out in Section 8 (Particular Conditions of Contract).	
Section 8 - Particular Conditions of Contract (PCC) -----	8-1
This Section contains provisions which are specific to each contract and which modify or supplement the GCC. Whenever there is a conflict, the provisions herein shall prevail over those in the GCC.	
Section 9 - Contract Forms (COF) -----	9-1
This Section contains forms, which, once completed, will form part of the Contract. The forms for Performance Security and Advance Payment Security, when required, shall only be completed by the successful Bidder after contract award.	

Section 1 - Instructions to Bidders

Table of Contents

A. General	1-3
1. Scope of Bid	1-3
2. Source of Funds	1-3
3. Fraud and Corruption	1-3
4. Eligible Bidders	1-5
5. Eligible Materials, Equipment, and Services.....	1-6
B. Contents of Bidding Document	1-6
6. Sections of Bidding Document	1-6
7. Clarification of Bidding Document, Site Visit, Pre-Bid Meeting	1-7
8. Amendment of Bidding Document	1-8
C. Preparation of Bids	1-8
9. Cost of Bidding	1-8
10. Language of Bid	1-8
11. Documents Comprising the Bid	1-8
12. Letters of Bid and Schedules	1-9
13. Alternative Bids	1-9
14. Bid Prices and Discounts	1-10
15. Currencies of Bid and Payment	1-10
16. Documents Comprising the Technical Proposal	1-11
17. Documents Establishing the Qualifications of the Bidder	1-11
18. Period of Validity of Bids	1-11
19. Bid Security/Bid-Securing Declaration	1-11
20. Format and Signing of Bid	1-12
D. Submission and Opening of Bids	1-13
21. Sealing and Marking of Bids	1-13
22. Deadline for Submission of Bids	1-14
23. Late Bids	1-14
24. Withdrawal, Substitution, and Modification of Bids	1-14
25. Bid Opening	1-14
E. Evaluation and Comparison of Bids	1-16
26. Confidentiality.....	1-16
27. Clarification of Bids	1-16
28. Deviations, Reservations, and Omissions	1-17
29. Examination of Technical Bids.....	1-17
30. Responsiveness of Technical Bid	1-17

31. Nonmaterial Nonconformities	1-18
32. Qualification of the Bidder	1-18
33. Correction of Arithmetical Errors	1-18
34. Conversion to Single Currency.....	1-19
35. Margin of Preference	1-19
36. Evaluation of Price Bids	1-19
37. Comparison of Bids	1-20
38. Employer's Right to Accept Any Bid, and to Reject Any or All Bids.....	1-20
F. Award of Contract.....	1-20
39. Award Criteria.....	1-20
40. Notification of Award	1-20
41. Signing of Contract.....	1-20
42. Performance Security.....	1-21

Section 1 - Instructions to Bidders

A. General	
1. Scope of Bid	<p>1.1 In connection with the Invitation for Bids (IFB) indicated in the Bid Data Sheet (BDS), the Employer, as indicated in the BDS, issues this Bidding Document for the procurement of the Works as specified in Section 6 (Employer's Requirements). The name, identification, and number of contracts of this bidding are provided in the BDS.</p> <p>1.2 Throughout this Bidding Document,</p> <p>(a) the term "in writing" means communicated in written form and delivered against receipt;</p> <p>(b) except where the context requires otherwise, words indicating the singular also include the plural and words indicating the plural also include the singular; and</p> <p>(c) "day" means calendar day.</p>
2. Source of Funds	<p>2.1 The Borrower or Recipient (hereinafter called "Borrower") indicated in the BDS has applied for or received financing (hereinafter called "funds") from the Asian Development Bank (hereinafter called "ADB") toward the cost of the project named in the BDS. The Borrower intends to apply a portion of the funds to eligible payments under the contract(s) for which this Bidding Document is issued.</p> <p>2.2 Payments by ADB will be made only at the request of the Borrower and upon approval by ADB in accordance with the terms and conditions of the Financing Agreement between the Borrower and ADB (hereinafter called "Financing Agreement"), and will be subject in all respects to the terms and conditions of that Financing Agreement. No party other than the Borrower shall derive any rights from the Financing Agreement or have any claim to the funds.</p>
3. Fraud and Corruption	<p>3.1 ADB's Anticorruption Policy requires Borrowers (including beneficiaries of ADB-financed activity), as well as Bidders, Suppliers, and Contractors under ADB-financed contracts, observe the highest standard of ethics during the procurement and execution of such contracts. In pursuance of this policy, ADB</p> <p>(a) defines, for the purposes of this provision, the terms set forth below as follows:</p> <p>(i) "corrupt practice" means the offering, giving, receiving, or soliciting, directly or indirectly, anything of value to influence improperly the actions of another party;</p> <p>(ii) "fraudulent practice" means any act or omission, including a misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation;</p> <p>(iii) "coercive practice" means impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the</p>

	<p>actions of a party;</p> <p>(iv) "collusive practice" means an arrangement between two or more parties designed to achieve an improper purpose, including influencing improperly the actions of another party;</p> <p>(v) "obstructive practice" means (a) deliberately destroying, falsifying, altering, or concealing of evidence material to an ADB investigation; (b) making false statements to investigators in order to materially impede an ADB investigation; (c) failing to comply with requests to provide information, documents, or records in connection with an Office of Anticorruption and Integrity (OAI) investigation; (d) threatening, harassing, or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation; or (e) materially impeding ADB's contractual rights of audit or access to information; and</p> <p>(vi) "integrity violation" is any act which violates ADB's Anticorruption Policy, including (i) to (v) above and the following: abuse, conflict of interest, violations of ADB sanctions, retaliation against whistleblowers or witnesses, and other violations of ADB's Anticorruption Policy, including failure to adhere to the highest ethical standard.</p> <p>(b) will reject a proposal for award if it determines that the Bidder recommended for award has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations in competing for the Contract;</p> <p>(c) will cancel the portion of the financing allocated to a contract if it determines at any time that representatives of the Borrower or of a beneficiary of ADB financing engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations during the procurement or the execution of that contract, without the Borrower having taken timely and appropriate action satisfactory to ADB to remedy the situation;</p> <p>(d) will impose remedial actions on a firm or an individual, at any time, in accordance with ADB's Anticorruption Policy and Integrity Principles and Guidelines (both as amended from time to time), including declaring ineligible, either indefinitely or for a stated period of time, to participate¹ in ADB-financed, -administered, or -supported activities or to benefit from an ADB-financed, -administered, or -supported contract, financially or otherwise, if it at any time determines that the firm or individual has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations; and</p>
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¹ Whether as a Contractor, Nominated Subcontractor, Consultant, Manufacturer or Supplier, or Service Provider; or in any other capacity (different names are used depending on the particular Bidding Document). A Nominated Subcontractor is one that either has been (i) included by the Bidder in its prequalification application or bid because it brings specific and critical experience and know-how that are accounted for in the evaluation of the bidder's prequalification application or the bid; or (ii) appointed by the Employer.

	<p>(e) will have the right to require that a provision be included in bidding documents and in contracts financed by ADB, requiring Bidders, suppliers, and contractors to permit ADB or its representative to inspect their accounts and records and other documents relating to the bid submission and contract performance and to have them audited by auditors appointed by ADB.</p>
	<p>3.2 Furthermore, Bidders shall be aware of the provisions of GCC 28.3 and 73.2 (i).</p>
<p>4. Eligible Bidders</p>	<p>4.1 A Bidder may be a natural person, private entity, or government-owned enterprise subject to ITB 4.5 – or any combination of them with a formal intent to enter into an agreement or under an existing agreement in the form of a Joint Venture. In the case of a Joint Venture:</p> <p>(a) all partners shall be jointly and severally liable; and</p> <p>(b) the Joint Venture shall nominate a Representative who shall have the authority to conduct all business for and on behalf of any and all the parties of the Joint Venture during the bidding process and, in the event the Joint Venture is awarded the Contract, during contract execution.</p>
	<p>4.2 A Bidder, and all parties constituting the Bidder, shall have the nationality of an eligible country, in accordance with Section 5 (Eligible Countries). A Bidder shall be deemed to have the nationality of a country if the Bidder is a citizen or is constituted, incorporated, or registered, and operates in conformity with the provisions of the laws of that country. This criterion shall also apply to the determination of the nationality of proposed subcontractors or suppliers for any part of the Contract including related services.</p>
	<p>4.3 A Bidder shall not have a conflict of interest. All Bidders found to have a conflict of interest shall be disqualified. A Bidder may be considered to be in a conflict of interest with one or more parties in this bidding process if any of, including but not limited to, the following apply:</p> <p>(a) they have controlling shareholders in common; or</p> <p>(b) they receive or have received any direct or indirect subsidy from any of them; or</p> <p>(c) they have the same legal representative for purposes of this bid; or</p> <p>(d) they have a relationship with each other, directly or through common third parties, that puts them in a position to have access to material information about or improperly influence the Bid of another Bidder, or influence the decisions of the Employer regarding this bidding process; or</p> <p>(e) a Bidder participates in more than one bid in this bidding process, either individually or as a partner in a joint venture, except for alternative offers permitted under ITB 13 of the Bidding Document. This will result in the disqualification of all Bids in which it is involved. However, subject to any finding of a conflict of interest in terms of ITB 4.3 (a) - (d) above, this does not limit the participation of a Bidder as a Subcontractor in another Bid or of a firm as a</p>

	<p>Subcontractor in more than one Bid; or</p> <p>(f) a Bidder or any affiliated entity, participated as a Consultant in the preparation of the design or technical specifications of the works that are the subject of the Bid; or</p> <p>(g) a Bidder was affiliated with a firm or entity that has been hired (or is proposed to be hired) by the Employer or Borrower as Engineer for the contract.</p>
	<p>4.4 A firm shall not be eligible to participate in any procurement activities under an ADB-financed, -administered, or -supported project while under temporary suspension or debarment by ADB pursuant to its Anticorruption Policy (see ITB 3), whether such debarment was directly imposed by ADB, or enforced by ADB pursuant to the Agreement for Mutual Enforcement of Debarment Decisions. A bid from a temporary suspended or debarred firm will be rejected.</p>
	<p>4.5 Government-owned enterprises in the Employer's country shall be eligible only if they can establish that they (i) are legally and financially autonomous, (ii) operate under commercial law, and (iii) are not a dependent agency of the Employer.</p>
	<p>4.6 Bidders shall provide such evidence of their continued eligibility satisfactory to the Employer, as the Employer shall reasonably request.</p>
	<p>4.7 Firms shall be excluded if by an act of compliance with a decision of the United Nations Security Council taken under Chapter VII of the Charter of the United Nations, the Borrower's country prohibits any import of goods or contracting of works or services from that country or any payments to persons or entities in that country.</p>
	<p>4.8 In case a prequalification process has been conducted prior to the bidding process, this bidding is open only to prequalified Bidders.</p>
<p>5. Eligible Materials, Equipment and Services</p>	<p>5.1 The materials, equipment, and services to be supplied under the Contract shall have their origin in eligible source countries as defined in ITB 4.2 above and all expenditures under the Contract will be limited to such materials, equipment, and services. At the Employer's request, Bidders may be required to provide evidence of the origin of materials, equipment, and services.</p>
	<p>5.2 For purposes of ITB 5.1 above, "origin" means the place where the materials and equipment are mined, grown, produced, or manufactured, and from which the services are provided. Materials and equipment are produced when, through manufacturing, processing, or substantial or major assembling of components, a commercially recognized product results that differs substantially in its basic characteristics or in purpose or utility from its components.</p>
<p>B. Contents of Bidding Document</p>	
<p>6. Sections of Bidding Document</p>	<p>6.1 The Bidding Document consist of Parts I, II, and III, which include all the sections indicated below, and should be read in conjunction with</p>

	<p>any addenda issued in accordance with ITB 8.</p> <p>PART I Bidding Procedures Section 1 - Instructions to Bidders (ITB) Section 2 - Bid Data Sheet (BDS) Section 3 - Evaluation and Qualification Criteria (EQC) Section 4 - Bidding Forms (BDF) Section 5 - Eligible Countries (ELC)</p> <p>PART II Requirements Section 6 – Employer’s Requirements (ERQ)</p> <p>PART III Conditions of Contract and Contract Forms Section 7 - General Conditions of Contract (GCC) Section 8 - Particular Conditions of Contract (PCC) Section 9 - Contract Forms (COF)</p>
	6.2 The IFB issued by the Employer is not part of the Bidding Document.
	6.3 The Employer is not responsible for the completeness of the Bidding Document and their Addenda, if they were not obtained directly from the source stated by the Employer in the IFB.
	6.4 The Bidder is expected to examine all instructions, forms, terms, and specifications in the Bidding Document. Failure to furnish all information or documentation required by the Bidding Document may result in the rejection of the bid.
7. Clarification of Bidding Document, Site Visit, Pre-Bid Meeting	<p>7.1 A prospective Bidder requiring any clarification on the Bidding Document shall contact the Employer in writing at the Employer’s address indicated in the BDS or raise his inquiries during the pre-bid meeting if provided for in accordance with ITB 7.4. The Employer will respond in writing to any request for clarification, provided that such request is received prior to the deadline for submission of bids, within a period given in the BDS. The Employer shall forward copies of its response to all Bidders who have acquired the Bidding Document in accordance with ITB 6.3, including a description of the inquiry but without identifying its source. Should the Employer deem it necessary to amend the Bidding Document as a result of a request for clarification, it shall do so following the procedure under ITB 8 and ITB 22.2.</p> <p>7.2 The Bidder is advised to visit and examine the Site of Works and its surroundings and obtain for itself, on its own risk and responsibility, all information that may be necessary for preparing the Bid and entering into a contract for construction of the Works. The costs of visiting the Site shall be at the Bidder’s own expense.</p> <p>7.3 The Bidder and any of its personnel or agents will be granted permission by the Employer to enter its premises and lands for the purpose of such visit, but only upon the express condition that the Bidder, its personnel, and agents will release and indemnify the Employer and its 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 the inspection.</p>

	7.4 The Bidder's designated representative is invited to attend a pre-bid meeting, if provided for in the BDS. The purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage.
	7.5 The Bidder is requested to submit any questions in writing, to reach the Employer not later than 1 week before the meeting.
	7.6 Minutes of the pre-bid meeting, including the text of the questions raised, without identifying the source, and the responses given, together with any responses prepared after the meeting, will be transmitted promptly to all Bidders who have acquired the Bidding Document in accordance with ITB 6.3. Any modification to the Bidding Document that 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 ITB 8 and not through the minutes of the pre-bid meeting.
	7.7 Nonattendance at the pre-bid meeting will not be a cause for disqualification of a Bidder.
8. Amendment of Bidding Document	8.1 At any time prior to the deadline for submission of Bids, the Employer may amend the Bidding Document by issuing addenda.
	8.2 Any addendum issued shall be part of the Bidding Document and shall be communicated in writing to all who have obtained the Bidding Document from the Employer in accordance with ITB 6.3.
	8.3 To give prospective Bidders reasonable time in which to take an addendum into account in preparing their Bids, the Employer may, at its discretion, extend the deadline for the submission of Bids, pursuant to ITB 22.2.
C. Preparation of Bids	
9. Cost of Bidding	9.1 The Bidder shall bear all costs associated with the preparation and submission of its Bid, and the Employer shall in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.
10. Language of Bid	10.1 The Bid, as well as all correspondence and documents relating to the bid exchanged by the Bidder and the Employer, shall be written in the language specified in the BDS. Supporting documents and printed literature that are part of the Bid may be in another language provided they are accompanied by an accurate translation of the relevant passages in the language specified in the BDS, in which case, for purposes of interpretation of the Bid, such translation shall govern.
11. Documents Comprising the Bid	11.1 The Bid shall comprise two envelopes submitted simultaneously, one called the Technical Bid containing the documents listed in ITB 11.2 and the other the Price Bid containing the documents listed in ITB 11.3, both envelopes enclosed together in an outer single envelope.
	11.2 The Technical Bid shall comprise the following:

	<ul style="list-style-type: none"> (a) Letter of Technical Bid; (b) Bid Security or Bid-Securing Declaration, in accordance with ITB 19; (c) alternative Bids, at Bidder's option and if permissible, in accordance with ITB 13; (d) written confirmation authorizing the signatory of the Bid to commit the Bidder, in accordance with ITB 20.2; (e) documentary evidence in accordance with ITB 17, establishing the Bidder's qualifications to perform the contract; (f) Technical Proposal in accordance with ITB 16; (g) Any other document required in the BDS.
	<p>11.3 The Price Bid shall comprise the following:</p> <ul style="list-style-type: none"> (a) Letter of Price Bid; (b) completed Price Schedules, in accordance with ITB 12 and ITB 14, or as stipulated in the BDS; (c) alternative price Bids, at Bidder's option and if permissible, in accordance with ITB 13; (d) Any other document required in the BDS.
	<p>11.4 In addition to the requirements under ITB 11.2, Bids submitted by a Joint Venture shall include a copy of the Joint Venture Agreement entered into by all partners. Alternatively, a Letter of Intent to execute a Joint Venture Agreement in the event of a successful Bid shall be signed by all partners and submitted with the Bid, together with a copy of the proposed agreement.</p>
12. Letters of Bid and Schedules	<p>12.1 The Letters of Technical Bid and Price Bid, and the Schedules, and all documents listed under Clause 11, shall be prepared using the relevant forms furnished in Section 4 (Bidding Forms). The forms must be completed without any alterations to the text, and no substitutes shall be accepted. All blank spaces shall be filled in with the information requested and as required in the BDS.</p>
13. Alternative Bids	<p>13.1 Unless otherwise indicated in the BDS, alternative Bids shall not be considered.</p>
	<p>13.2 When alternative times for completion are explicitly invited, a statement to that effect will be included in the BDS, as will the method of evaluating different times for completion.</p>
	<p>13.3 When specified in the BDS pursuant to ITB 13.1, and subject to ITB 13.4 below, Bidders wishing to offer technical alternatives to the requirements of the Bidding Document must first price the Employer's design as described in the Bidding Document and shall further provide all information necessary for a complete evaluation of the alternative by the Employer, including drawings, design calculations, technical specifications, breakdown of prices, and proposed construction methodology and other relevant details. Only the technical alternatives, if any, of the lowest evaluated Bidder conforming to the basic technical requirements shall be considered by the Employer.</p>

	13.4 When specified in the BDS, Bidders are permitted to submit alternative technical solutions for specified parts of the Works. Such parts will be identified in the BDS and described in Section 6 (Employer's Requirements). The method for their evaluation will be stipulated in Section 3 (Evaluation and Qualification Criteria).
14. Bid Prices and Discounts	14.1 The prices and discounts quoted by the Bidder in the Letter of Price Bid and in the Schedules shall conform to the requirements specified below.
	14.2 The Bidder shall submit a bid for the whole of the works described in ITB 1.1 by filling in prices for all items of the Works, as identified in Section 4 (Bidding Forms). In case of admeasurement contracts, the Bidder 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 the Bidder will not be paid for by the Employer when executed and shall be deemed covered by the rates for other items and prices in the Bill of Quantities.
	14.3 The price to be quoted in the Letter of Price Bid shall be the total price of the Bid, excluding any discounts offered. Absence of the total bid price in the Letter of Price Bid may result in the rejection of the Bid.
	14.4 The Bidder shall quote any discounts and the methodology for their application in the Letter of Price Bid, in accordance with ITB 12.1.
	14.5 Unless otherwise provided in the BDS and the Conditions of Contract, the prices quoted by the Bidder shall be fixed. If the prices quoted by the Bidder are subject to adjustment during the performance of the Contract in accordance with the provisions of the Conditions of Contract, the Bidder shall furnish the indexes and weightings for the price adjustment formulas in the Table(s) of Adjustment Data in Section 4 (Bidding Forms) and the Employer may require the Bidder to justify its proposed indexes and weightings.
	14.6 If so indicated in ITB 1.1, bids are being invited for individual contracts or for any combination of contracts (packages). Bidders wishing to offer any price reduction for the award of more than one Contract shall specify in their bid the price reductions applicable to each package, or alternatively, to individual Contracts within the package. Price reductions or discounts shall be submitted in accordance with ITB 14.4, provided the Bids for all contracts are submitted and opened at the same time.
	14.7 All duties, taxes, and other levies payable by the Contractor under the Contract, or for any other cause, as of 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 the Bidder.
15. Currencies of Bid and Payment	15.1 The currency(ies) of the Bid and payment shall be as specified in the BDS.
	15.2 Bidders may be required by the Employer to justify, to the Employer's satisfaction, their local and foreign currency requirements, and to

	substantiate that the amounts included in the prices shown in the appropriate form(s) of Section 4, in which case a detailed breakdown of the foreign currency requirements shall be provided by Bidders.
16. Documents Comprising the Technical Proposal	16.1 The Bidder shall furnish a Technical Proposal including a statement of work methods, equipment, personnel, schedule, and any other information as stipulated in Section 4 (Bidding Forms), in sufficient detail to demonstrate the adequacy of the Bidders' proposal to meet the work requirements and the completion time.
17. Documents Establishing the Qualifications of the Bidder	17.1 To establish its qualifications to perform the Contract in accordance with Section 3 (Evaluation and Qualification Criteria) the Bidder shall provide the information requested in the corresponding information sheets included in Section 4 (Bidding Forms).
	17.2 Domestic Bidders, individually or in joint ventures, applying for eligibility for domestic preference shall supply all information required to satisfy the criteria for eligibility in accordance with ITB 35.
18. Period of Validity of Bids	18.1 Bids shall remain valid for the period specified in the BDS after the bid submission deadline date prescribed by the Employer. A bid valid for a shorter period shall be rejected by the Employer as nonresponsive.
	18.2 In exceptional circumstances, prior to the expiration of the bid validity period, the Employer may request Bidders to extend the period of validity of their Bids. The request and the responses shall be made in writing. If a bid security is requested in accordance with ITB 19, it shall also be extended 28 days beyond the deadline of the extended validity period. A Bidder may refuse the request without forfeiting its bid security. A Bidder granting the request shall not be required or permitted to modify its Bid.
19. Bid Security/Bid-Securing Declaration	19.1 Unless otherwise specified in the BDS, the Bidder shall furnish as part of its Bid, in original form, either a Bid-Securing Declaration or a bid security as specified in the BDS. In the case of a bid security, the amount and currency shall be as specified in the BDS.
	19.2 If a Bid-Securing Declaration is required pursuant to ITB 19.1, it shall use the form included in Section 4 (Bidding Forms). The Employer will declare a Bidder ineligible to be awarded a Contract for a specified period of time, as indicated in the BDS, if the Bid-Securing Declaration is executed.
	19.3 If a bid security is specified pursuant to ITB 19.1, the bid security shall be, at the Bidder's option, in any of the following forms: <ul style="list-style-type: none"> (a) an unconditional bank guarantee, (b) an irrevocable letter of credit, or (c) a cashier's or certified check, all from a reputable bank from an eligible country as described in Section 5 (Eligible Countries). In the case of a bank guarantee, the bid security shall be submitted either using the Bid Security Form included in Section 4 (Bidding Forms) or another form acceptable to the Employer. The form must include the complete name of the Bidder.

	<p>The bid security shall be valid for 28 days beyond the original validity period of the bid, or beyond any period of extension if requested under ITB 18.2.</p>
	<p>19.4 Unless otherwise specified in the BDS, any Bid not accompanied by a substantially compliant bid security or Bid-Securing Declaration, if one is required in accordance with ITB 19.1, shall be rejected by the Employer as nonresponsive.</p>
	<p>19.5 If a bid security is specified pursuant to ITB 19.1, the bid security of unsuccessful Bidders shall be returned as promptly as possible upon the successful Bidder's furnishing of the performance security pursuant to ITB 42.</p>
	<p>19.6 If a bid security is specified pursuant to ITB 19.1, the bid security of the successful Bidder shall be returned as promptly as possible once the successful Bidder has signed the Contract and furnished the required performance security.</p>
	<p>19.7 The bid security may be forfeited or the Bid-Securing Declaration executed</p> <ul style="list-style-type: none"> (a) if a Bidder withdraws its bid during the period of bid validity specified by the Bidder on the Letters of Technical Bid and Price Bid, except as provided in ITB 18.2; or (b) if the successful Bidder fails to <ul style="list-style-type: none"> (i) sign the Contract in accordance with ITB 41; (ii) furnish a performance security in accordance with ITB 42; (iii) accept arithmetical corrections in accordance with ITB 33; or (iv) furnish a domestic preference security, if applicable, in accordance with ITB 42.
	<p>19.8 The bid security or the Bid-Securing Declaration of a Joint Venture shall be in the name of the Joint Venture that submits the Bid. If the Joint Venture has not been legally constituted at the time of bidding, the bid security or the Bid-Securing Declaration shall be in the names of all future partners as named in the letter of intent mentioned in ITB 4.1.</p>
20. Format and Signing of Bid	<p>20.1 The Bidder shall prepare one original set of the Technical Bid and one original of the Price Bid comprising the Bid as described in ITB 11 and clearly mark it "ORIGINAL - TECHNICAL BID" and "ORIGINAL - PRICE BID." Alternative Bids, if permitted in accordance with ITB 13, shall be clearly marked "ALTERNATIVE." In addition, the Bidder shall submit copies of the Bid in the number specified in the BDS, and clearly mark each of them "COPY." In the event of any discrepancy between the original and the copies, the original shall prevail.</p>
	<p>20.2 The original and all copies of the Bid shall be typed or written in indelible ink and shall be signed by a person duly authorized to sign on behalf of the Bidder. This authorization shall consist of a written confirmation as specified in the BDS and shall be attached to the Bid. The name and position held by each person signing the authorization</p>

	<p>must be typed or printed below the signature. All pages of the Bid, except for unamended printed literature, shall be signed or initialed by the person signing the bid. If a Bidder submits a deficient authorization, the Bid shall not be rejected in the first instance. The Employer shall request the Bidder to submit an acceptable authorization within the number of days as specified in the BDS. Failure to provide an acceptable authorization within the prescribed period of receiving such a request shall cause the rejection of the Bid.</p>
	<p>20.3 Any amendments such as interlineations, erasures, or overwriting shall be valid only if they are signed or initialed by the person signing the Bid.</p>
<p>D. Submission and Opening of Bids</p>	
<p>21. Sealing and Marking of Bids</p>	<p>21.1 Bidders may always submit their Bids by mail or by hand. When so specified in the BDS, Bidders shall have the option of submitting their Bids electronically. Procedures for submission, sealing, and marking are as follows:</p> <p>(a) Bidders submitting Bids by mail or by hand shall enclose the original of the Technical Bid, the original of the Price Bid, and each copy of the Technical Bid and each copy of the Price Bid, in separate sealed envelopes, duly marking the envelopes as "ORIGINAL - TECHNICAL BID," "ORIGINAL - PRICE BID," and "COPY NO... - TECHNICAL BID," and "COPY NO.... - PRICE BID." These envelopes, the first containing the originals and the others containing copies, shall then be enclosed in one single envelope per set. If permitted in accordance with ITB 13, alternative Bids shall be similarly sealed, marked and included in the sets. The rest of the procedure shall be in accordance with ITB 21.2 and ITB 21.3.</p> <p>(b) Bidders submitting Bids electronically shall follow the electronic bid submission procedures specified in the BDS.</p>
	<p>21.2 The inner and outer envelopes shall</p> <p>(a) bear the name and address of the Bidder;</p> <p>(b) be addressed to the Employer as provided in BDS 22.1; and</p> <p>(c) bear the specific identification of this bidding process indicated in the BDS 1.1.</p>
	<p>21.3 The outer envelopes and the inner envelopes containing the Technical Bid shall bear a warning not to open before the time and date for the opening of Technical Bid, in accordance with ITB 25.1.</p>
	<p>21.4 The inner envelopes containing the Price Bid shall bear a warning not to open until advised by the Employer in accordance with ITB 25.7.</p>
	<p>21.5 If all envelopes are not sealed and marked as required, the Employer will assume no responsibility for the misplacement or premature opening of the Bid.</p>

22. Deadline for Submission of Bids	22.1 Bids must be received by the Employer at the address and no later than the date and time indicated in the BDS.
	22.2 The Employer may, at its discretion, extend the deadline for the submission of Bids by amending the Bidding Document in accordance with ITB 8, in which case all rights and obligations of the Employer and Bidders previously subject to the deadline shall thereafter be subject to the deadline as extended.
23. Late Bids	23.1 The Employer shall not consider any Bid that arrives after the deadline for submission of bids, in accordance with ITB 22. Any Bid received by the Employer after the deadline for submission of Bids shall be declared late, rejected, and returned unopened to the Bidder.
24. Withdrawal, Substitution, and Modification of Bids	<p>24.1 A Bidder may withdraw, substitute, or modify its Bid – Technical or Price – after it has been submitted by sending a written notice, duly signed by an authorized representative, and shall include a copy of the authorization in accordance with ITB 20.2, (except that withdrawal notices do not require copies). The corresponding substitution or modification of the Bid must accompany the respective written notice. All notices must be</p> <ul style="list-style-type: none"> (a) prepared and submitted in accordance with ITB 20 and ITB 21 (except that withdrawal notices do not require copies), and in addition, the respective envelopes shall be clearly marked "WITHDRAWAL," "SUBSTITUTION," "MODIFICATION;" and (b) received by the Employer prior to the deadline prescribed for submission of Bids, in accordance with ITB 22.
	24.2 Bids requested to be withdrawn in accordance with ITB 24.1 shall be returned unopened to the Bidders.
	24.3 No Bid may be withdrawn, substituted, or modified in the interval between the deadline for submission of Bids and the expiration of the period of bid validity specified by the Bidder on the Letters of Technical Bid and Price Bid or any extension thereof.
25. Bid Opening	25.1 The Employer shall open the Technical Bids in public at the address, on the date, and time specified in the BDS in the presence of Bidders' designated representatives and anyone who choose to attend. Any specific electronic bid opening procedures required if electronic bidding is permitted in accordance with ITB 21.1, shall be as specified in the BDS. The Price Bids will remain unopened and will be held in custody of the Employer until the specified time of their opening. If the Technical Bid and Price Bid are submitted together in one envelope, the Employer may reject the entire Bid. Alternatively, the Price Bid may be immediately resealed for later evaluation.
	25.2 First, envelopes marked "WITHDRAWAL" shall be opened and read out and the envelope with the corresponding Bid shall not be opened, but returned to the Bidder. No bid withdrawal shall be permitted unless the corresponding withdrawal notice contains a valid authorization to

	request the withdrawal and is read out at bid opening.
	<p>25.3 Second, outer envelopes marked "SUBSTITUTION" shall be opened. The inner envelopes containing the Substitution Technical Bid and/or Substitution Price Bid shall be exchanged for the corresponding envelopes being substituted, which are to be returned to the Bidder unopened. Only the Substitution Technical Bid, if any, shall be opened, read out, and recorded. Substitution Price Bid will remain unopened in accordance with ITB 25.1. No envelope shall be substituted unless the corresponding substitution notice contains a valid authorization to request the substitution and is read out and recorded at bid opening.</p>
	<p>25.4 Next, outer envelopes marked "MODIFICATION" shall be opened. No Technical Bid and/or Price Bid shall be modified unless the corresponding modification notice contains a valid authorization to request the modification and is read out and recorded at the opening of Technical Bids. Only the Technical Bids, both Original as well as Modification, are to be opened, read out, and recorded at the opening. Price Bids, both Original and Modification, will remain unopened in accordance with ITB 25.1.</p>
	<p>25.5 All other envelopes holding the Technical Bids shall be opened one at a time, and the following read out and recorded:</p> <ul style="list-style-type: none"> (a) the name of the Bidder; (b) whether there is a modification or substitution; (c) the presence of a bid security or a Bid-Securing Declaration, if required; and (d) any other details as the Employer may consider appropriate. <p>Only Technical Bids and alternative Technical Bids read out and recorded at bid opening shall be considered for evaluation. Unless otherwise specified in the BDS, all pages of the Letter of Technical Bid are to be initialed by at least three representatives of the Employer attending the bid opening. No Bid shall be rejected at the opening of Technical Bids except for late bids, in accordance with ITB 23.1.</p>
	<p>25.6 The Employer shall prepare a record of the opening of Technical Bids that shall include, as a minimum, the name of the Bidder and whether there is a withdrawal, substitution, or modification; alternative proposals; and the presence or absence of a bid security or a Bid-Securing Declaration, if one was required. The Bidders' representatives who are present shall be requested to sign the record. The omission of a Bidder's signature on the record shall not invalidate the contents and effect of the record. A copy of the record shall be distributed to all Bidders who submitted Bids on time, and posted online when electronic bidding is permitted.</p>
	<p>25.7 At the end of the evaluation of the Technical Bids, the Employer will invite bidders who have submitted substantially responsive Technical Bids and who have been determined as being qualified for award to attend the opening of the Price Bids. The date, time, and location of the opening of Price Bids will be advised in writing by the Employer. Bidders shall be given reasonable notice for the opening of Price Bids.</p>

	<p>25.8 The Employer will notify Bidders in writing who have been rejected on the grounds of their Technical Bids being substantially nonresponsive to the requirements of the Bidding Document and return their Price Bids unopened.</p>
	<p>25.9 The Employer shall conduct the opening of Price Bids of all Bidders who submitted substantially responsive Technical Bids, in the presence of Bidders' representatives who choose to attend at the address, on the date, and time specified by the Employer. The Bidder's representatives who are present shall be requested to sign a register evidencing their attendance.</p>
	<p>25.10 All envelopes containing Price Bids shall be opened one at a time and the following read out and recorded:</p> <ul style="list-style-type: none"> (a) the name of the Bidder; (b) whether there is a modification or substitution; (c) the Bid Prices, including any discounts and alternative offers; and (d) any other details as the Employer may consider appropriate. <p>Only Price Bids, discounts, and alternative offers read out and recorded during the opening of Price Bids shall be considered for evaluation. Unless otherwise specified in the BDS, all pages of the Letter of Price Bid and Schedules are to be initialed by at least three representatives of the Employer attending the bid opening. No Bid shall be rejected at the opening of Price Bids.</p>
	<p>25.11 The Employer shall prepare a record of the opening of Price Bids that shall include, as a minimum, the name of the Bidder, the Bid Price (per lot if applicable), any discounts, and alternative offers. The Bidders' representatives who are present shall be requested to sign the record. The omission of a Bidder's signature on the record shall not invalidate the contents and effect of the record. A copy of the record shall be distributed to all Bidders who submitted Bids on time, and posted online when electronic bidding is permitted.</p>
E. Evaluation and Comparison of Bids	
26. Confidentiality	<p>26.1 Information relating to the examination, evaluation, comparison, and postqualification of Bids and recommendation of contract award, shall not be disclosed to Bidders or any other persons not officially concerned with such process until information on Contract award is communicated to all Bidders.</p>
	<p>26.2 Any attempt by a Bidder to influence the Employer in the evaluation of the Bids or Contract award decisions may result in the rejection of its Bid.</p>
	<p>26.3 Notwithstanding ITB 26.2, from the time of bid opening to the time of Contract award, if any Bidder wishes to contact the Employer on any matter related to the bidding process, it may do so in writing.</p>
27. Clarification of	<p>27.1 To assist in the examination, evaluation, and comparison of the</p>

Bids	Technical and Price Bids, the Employer may, at its discretion, ask any Bidder for a clarification of its Bid. Any clarification submitted by a Bidder that is not in response to a request by the Employer shall not be considered. The Employer's request for clarification and the response shall be in writing. No change in the substance of the Technical Bid or prices in the Price Bid shall be sought, offered, or permitted, except to confirm the correction of arithmetic errors discovered by the Employer in the evaluation of the Price Bids, in accordance with ITB 33.
	27.2 If a Bidder does not provide clarifications of its Bid by the date and time set in the Employer's request for clarification, its Bid may be rejected.
28. Deviations, Reservations, and Omissions	28.1 During the evaluation of bids, the following definitions apply: (a) "Deviation" is a departure from the requirements specified in the Bidding Document; (b) "Reservation" is the setting of limiting conditions or withholding from complete acceptance of the requirements specified in the Bidding Document; and (c) "Omission" is the failure to submit part or all of the information or documentation required in the Bidding Document.
29. Examination of Technical Bids	29.1 The Employer shall examine the Technical Bid to confirm that all documents and technical documentation requested in ITB 11.2 have been provided, and to determine the completeness of each document submitted.
	29.2 The Employer shall confirm that the following documents and information have been provided in the Technical Bid. If any of these documents or information is missing, the offer shall be rejected. (a) Letter of Technical Bid; (b) written confirmation of authorization to commit the Bidder; (c) Bid Security or Bid-Securing Declaration, if applicable; and (d) Technical Proposal in accordance with ITB 16.
30. Responsiveness of Technical Bid	30.1 The Employer's determination of a Bid's responsiveness is to be based on the contents of the Bid itself, as defined in ITB 11.
	30.2 A substantially responsive Technical Bid is one that meets the requirements of the Bidding Document 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 specified in the Contract; or (ii) limit in any substantial way, inconsistent with the Bidding Document, 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.

	30.3 The Employer shall examine the technical aspects of the Bid submitted in accordance with ITB 16, Technical Proposal, in particular, to confirm that all requirements of Section 6 (Employer's Requirements) have been met without any material deviation, reservation, or omission.
	30.4 If a Bid is not substantially responsive to the requirements of the Bidding Document, it shall be rejected by the Employer and may not subsequently be made responsive by correction of the material deviation, reservation, or omission.
31. Nonmaterial Nonconformities	31.1 Provided that a Bid is substantially responsive, the Employer may waive any nonconformities in the Bid that do not constitute a material deviation, reservation, or omission.
	31.2 Provided that a Technical 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 Technical Bid related to documentation requirements. Requesting information or documentation on such nonconformities shall not be related to any aspect of the Price Bid. Failure of the Bidder to comply with the request may result in the rejection of its Bid.
	31.3 Provided that a Technical 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. The adjustment shall be made using the method indicated in Section 3 (Evaluation and Qualification Criteria).
32. Qualification of the Bidder	32.1 The Employer shall determine to its satisfaction during the evaluation of Technical Bids whether Bidders meet the qualifying criteria specified in Section 3 (Evaluation and Qualification Criteria).
	32.2 The determination shall be based upon an examination of the documentary evidence of the Bidder's qualifications submitted by the Bidder, pursuant to ITB 17.1.
	32.3 An affirmative determination shall be a prerequisite for the opening and evaluation of a Bidder's Price Bid. A negative determination shall result into the disqualification of the Bid, in which event the Employer shall return the unopened Price Bid to the Bidder.
33. Correction of Arithmetical Errors	33.1 During the evaluation of Price Bids, the Employer shall correct arithmetical errors on the following basis: (a) Only for unit price contracts, if there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected, unless in the opinion of the Employer there is an obvious misplacement of the decimal point in the unit price, in which case the total price as quoted shall govern and the unit price shall be corrected. (b) If there is an error in a total corresponding to the addition or

	<p>subtraction of subtotals, the subtotals shall prevail and the total shall be corrected.</p> <p>(c) If there is a discrepancy between the bid price in the Summary of Bill of Quantities and the bid amount in item (c) of the Letter of Price Bid, the bid price in the Summary of Bill of Quantities will prevail and the bid amount in item (c) of the Letter of Price Bid will be corrected.</p> <p>(d) If there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject to (a), (b) and (c) above.</p>
	33.2 If the Bidder that submitted the lowest evaluated bid does not accept the correction of errors, its Bid shall be disqualified and its bid security may be forfeited or its Bid-Securing Declaration executed.
34. Conversion to Single Currency	34.1 For evaluation and comparison purposes, the currency(ies) of the Bid shall be converted into a single currency as specified in the BDS.
35. Margin of Preference	35.1 Unless otherwise specified in the BDS, a margin of preference shall not apply.
36. Evaluation of Price Bids	36.1 The Employer shall use the criteria and methodologies listed in this Clause. No other evaluation criteria or methodologies shall be permitted.
	<p>36.2 To evaluate the Price Bid, the Employer shall consider the following:</p> <p>(a) the bid price, excluding Provisional Sums and the provision, if any, for contingencies in the Summary Bill of Quantities for admeasurement contracts, or Schedule of Prices for lump sum contracts, but including Daywork items, where priced competitively;</p> <p>(b) price adjustment for correction of arithmetic errors in accordance with ITB 33.1;</p> <p>(c) price adjustment due to discounts offered in accordance with ITB 14.4;</p> <p>(d) converting the amount resulting from applying (a) to (c) above, if relevant, to a single currency in accordance with ITB 34;</p> <p>(e) adjustment for nonconformities in accordance with ITB 31.3; and</p> <p>(f) application of all the evaluation factors indicated in Section 3 (Evaluation and Qualification Criteria).</p>
	36.3 The estimated effect of the price adjustment provisions of the Conditions of Contract, applied over the period of execution of the Contract, shall not be taken into account in bid evaluation.
	36.4 If this Bidding Document allows Bidders to quote separate prices for different contracts, and to award multiple contracts to a single Bidder, the methodology to determine the lowest evaluated price of the contract combinations, including any discounts offered in the Letter of Price Bid, is specified in Section 3 (Evaluation and Qualification

	Criteria).
	36.5 If the Bid for an admeasurement contract, which results in the lowest Evaluated Bid Price, is seriously unbalanced, front loaded or substantially below updated estimates in the opinion of the Employer, the Employer may require the Bidder to produce detailed price analyses for any or all items of the Bill of Quantities, to demonstrate the internal consistency of those prices with the construction methods and schedule proposed. After evaluation of the price analyses, taking into consideration the schedule of estimated Contract payments, the Employer may require that the amount of the performance security be increased at the expense of the Bidder to a level sufficient to protect the Employer against financial loss in the event of default of the successful Bidder under the Contract.
37. Comparison of Bids	37.1 The Employer shall compare all substantially responsive Bids to determine the lowest evaluated Bid, in accordance with ITB 36.2.
38. Employer's Right to Accept Any Bid, and to Reject Any or All Bids	38.1 The Employer reserves the right to accept or reject any Bid, and to annul the bidding process and reject all Bids at any time prior to contract award, without thereby incurring any liability to Bidders. In case of annulment, all Bids submitted and specifically, bid securities, shall be promptly returned to the Bidders.
F. Award of Contract	
39. Award Criteria	39.1 The Employer shall award the Contract to the Bidder whose offer has been determined to be the lowest evaluated Bid and is substantially responsive to the Bidding Document, provided further that the Bidder is determined to be qualified to perform the Contract satisfactorily.
40. Notification of Award	40.1 Prior to the expiration of the period of bid validity, the Employer shall notify the successful Bidder, in writing, that its Bid has been accepted. 40.2 At the same time, the Employer shall also notify all other Bidders of the results of the bidding. The Employer will publish in an English language newspaper or well-known freely accessible website the results identifying the bid and lot numbers and the following information: (i) name of each Bidder who submitted a Bid; (ii) bid prices as read out at bid opening; (iii) name and evaluated prices of each Bid that was evaluated; (iv) name of bidders whose bids were rejected and the reasons for their rejection; and (v) name of the winning Bidder, and the price it offered, as well as the duration and summary scope of the contract awarded. After publication of the award, unsuccessful Bidders may request in writing to the Employer for a debriefing seeking explanations on the grounds on which their Bids were not selected. The Employer shall promptly respond in writing to any unsuccessful Bidder who, after publication of contract award, requests a debriefing.
	40.3 Until a formal contract is prepared and executed, the notification of award shall constitute a binding Contract.
41. Signing of	41.1 Promptly after notification, the Employer shall send the successful

Contract	Bidder the Contract Agreement.
	41.2 Within 28 days of receipt of the Contract Agreement, the successful Bidder shall sign, date, and return it to the Employer.
42. Performance Security	42.1 Within 28 days of the receipt of notification of award from the Employer, the successful Bidder shall furnish the performance security in accordance with the Conditions of Contract, subject to ITB 36.5, using for that purpose the Performance Security Form included in Section 9 (Contract Forms), or another form acceptable to the Employer.
	42.2 Failure of the successful Bidder to submit the above-mentioned Performance Security or to sign the Contract Agreement shall constitute sufficient grounds for the annulment of the award and forfeiture of the bid security or execution of the Bid-Securing Declaration. In that event, the Employer may award the Contract to the next lowest evaluated Bidder whose offer is substantially responsive and is determined by the Employer to be qualified to perform the Contract satisfactorily.
	42.3 The above provision shall also apply to the furnishing of a domestic preference security, if so required.

Section 2 - Bid Data Sheet

A. General

ITB 1.1	The number of the Invitation for Bids (IFB) is NCB-Works/PICIIP-15; Upgradation of Punjab Local Government Academy (PLGA) campus at Lala Musa
ITB 1.1	The Employer is: Program Management Unit (PMU), Punjab Intermediate Cities Improvement Investment Program (PICIIP), Local Government & Community Development Department, Punjab, Pakistan
ITB 1.1	The name of the bidding process is: Upgradation of Punjab Local Government Academy (PLGA) campus at Lala Musa The identification number of the bidding process is NCB-Works/PICIIP-15
ITB 2.1	The Borrower is: Islamic Republic of Pakistan
ITB 2.1	The name of the Project is: Punjab Intermediate Cities Improvement Investment Program (PICIIP)

B. Contents of Bidding Documents

ITB 7.1	<p>For clarification purposes only, the Employer's address is:</p> <table border="1"> <tr> <td>Attention:</td> <td>Program Director Program Management Unit Punjab Intermediate Cities Improvement Investment Program (PICIIP), Local Government & Community Development Department, Punjab, Pakistan</td> </tr> <tr> <td>Street address:</td> <td>• 40 B-1, Gulberg 3, MM Alam Road.</td> </tr> <tr> <td>City:</td> <td>Lahore</td> </tr> <tr> <td>ZIP code:</td> <td>54000</td> </tr> <tr> <td>Country:</td> <td>Islamic Republic of Pakistan</td> </tr> <tr> <td>Telephone:</td> <td>+92 42 99268484</td> </tr> <tr> <td>Fax:</td> <td>+92 42 99268483</td> </tr> <tr> <td>E-mail address:</td> <td>pmu.piciip@punjab.gov.pk</td> </tr> </table> <p>Requests for clarification should be received by the Employer no later than: 10 days before the deadline for submission of the Bid.</p>	Attention:	Program Director Program Management Unit Punjab Intermediate Cities Improvement Investment Program (PICIIP), Local Government & Community Development Department, Punjab, Pakistan	Street address:	• 40 B-1, Gulberg 3, MM Alam Road.	City:	Lahore	ZIP code:	54000	Country:	Islamic Republic of Pakistan	Telephone:	+92 42 99268484	Fax:	+92 42 99268483	E-mail address:	pmu.piciip@punjab.gov.pk
Attention:	Program Director Program Management Unit Punjab Intermediate Cities Improvement Investment Program (PICIIP), Local Government & Community Development Department, Punjab, Pakistan																
Street address:	• 40 B-1, Gulberg 3, MM Alam Road.																
City:	Lahore																
ZIP code:	54000																
Country:	Islamic Republic of Pakistan																
Telephone:	+92 42 99268484																
Fax:	+92 42 99268483																
E-mail address:	pmu.piciip@punjab.gov.pk																
ITB 7.4	<p>A Pre-Bid meeting shall take place.</p> <table border="1"> <tr> <td>Date:</td> <td>09 June 2023</td> </tr> <tr> <td>Time:</td> <td>1100 Hours</td> </tr> <tr> <td>Place:</td> <td>Office of the Program Director Program Management Unit (PMU) Punjab Intermediate Cities Improvement Investment Program (PICIIP) Address: 40 B-1, Gulberg 3, MM Alam Road, Lahore, Pakistan</td> </tr> <tr> <td>City:</td> <td>Lahore</td> </tr> </table>	Date:	09 June 2023	Time:	1100 Hours	Place:	Office of the Program Director Program Management Unit (PMU) Punjab Intermediate Cities Improvement Investment Program (PICIIP) Address: 40 B-1, Gulberg 3, MM Alam Road, Lahore, Pakistan	City:	Lahore								
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City:	Lahore																

	Country:	Islamic Republic of Pakistan
	Telephone:	+92 42 99268484
<p>Keeping in mind the convenience of the bidder(s), the bidder(s) can also attend the said meeting through Zoom Link using the ID mentioned below:</p> <p>Zoom Link ID: https://pitb.zoom.us/j/98112028049</p> <p>All bidders are encouraged to physically attend the Pre-Bid Meeting; however, the online platform is also available to facilitate participation.</p> <p>A site visit conducted by the Employer will not be organized.</p>		

C. Preparation of Bids

ITB 10.1	<p>The language of the Bid is: English</p> <p>Bidders are required to submit documentary evidence of below documents in English language. If the documentary evidence are other than in the English language, then the bidder shall submit accurate translation of the relevant passages in the English language duly attested by the notary public of the Bidder's Country/similar legal instrument of authorization as applicable under the laws of the bidder's home country, (specifying the authority for such attestation as per law of the country). Certification by the Foreign Office of the country(ies) of origin of the Bidder(s) is acceptable.</p> <p>All the documentation to be submitted by the Bidder in order to substantiate the information requested in the corresponding Information Sheets, mentioned hereinbelow:</p> <ol style="list-style-type: none"> a) Form EQU: Equipment b) Form ELI – 1: Bidder's Information Sheet c) Form ELI – 2: Joint Venture Information Sheet d) Form FIN – 1: Historical Financial Performance e) Form FIN – 2: Average Annual Construction Turnover f) Form FIN – 3: Availability of Financial Resources g) Form FIN – 4: Financial Requirements for Current Contract Commitments h) Form EXP – 1: Contracts of Similar Size and Nature; as mentioned under Para 2.4.1, Section 3 of the Bidding Documents. i) Form EXP – 2: Construction Experience in Key Activities; as mentioned under Para 2.4.1, Section 3 of the Bidding Documents
ITB 11.2 (g)	Refer to "Technical Proposal" in Section 4 and "Documents (Submission Requirements)" in Section-3.
ITB 11.3 (b)	<p>In accordance with ITB 12 and ITB 14, the following schedules shall be submitted with the bid, including the priced Bill of Quantities for admeasurement contracts and Activity Schedule for lump sum contracts;</p> <p>Not Applicable</p>
ITB 11.3 (d)	The Bidder shall submit with its Price Bid the following additional documents:

	Not Applicable
ITB 12.1	The units and rates in figures entered into the Bill of Quantities and Daywork Schedule should be typewritten or if written by hand, must be in print form. Bill of Quantities and Daywork Schedule not presented accordingly may be considered nonresponsive.
ITB 13.1	Alternative Bids shall not be permitted.
ITB 13.2	Alternative times for completion shall not be permitted
ITB 13.4	Alternative technical solutions shall not be permitted for any part of the works
ITB 14.5	The price adjustment is Applicable
ITB 14.7	<i>For the purpose of clarity, it is elaborated that under this Section, the Bidder is expected to consider all applicable, provincial and federal, direct and indirect taxes, in accordance with the relevant laws of Pakistan, in their rates against each item of the Bill of Quantities (Section 4 of Bidding Documents) for example: Punjab Sales Tax (PRA), General Sales Tax (GST), etc.</i>
ITB 15.1	The unit rates and the prices shall be quoted by the Bidder entirely in: Local Currency i.e. Pakistani Rupee (PKR).
ITB 16.1	The Technical Proposal shall also include a Health and Safety COVID-19 Plan, in accordance with the relevant government regulations and guidelines on COVID-19 prevention and control issued by the Government of Pakistan (http://covid.gov.pk/guideline), or in the absence thereof, to international good practice guidelines, such as World Health Organization 2020, Considerations for public health and social measures in the workplace in the context of COVID-19, Geneva available here: https://www.who.int/publications-detail/considerations-for-public-health-and-social-measures-in-the-workplace-in-the-context-of-covid-19 . Absence of or incomplete submission may result in rejection of bid.
ITB 18.1	The bid validity period shall be 120 (one hundred and twenty) days.
ITB 19.1	A bid securing declaration shall not be applicable. The Bidder shall furnish a bid security of amount of: PKR 10 million Payable in the same currency in which it was submitted in favor of the Program Director (PD), Program Management Unit (PMU), Punjab Intermediate Cities Improvement Investment Program (PICIP), 40 B-1, M M Alam Road, Gulberg 3, Lahore, Pakistan.
ITB 19.2	The ineligibility period will be Not Applicable

ITB 19.3	<p>If the bid security is in the form of unconditional bank guarantee, it shall be issued by scheduled bank of Pakistan or a reputable foreign bank, using the Form included in Section 4 (Bidding Forms), in favour of the Employer. Aside from the forms given in ITB 19.3, other forms of bid security acceptable may be a Call Deposit / Pay Order / Demand Draft / Banker's Cheque / Cashier's Cheque in favour of the Employer.</p> <p>Bid security in the form of Certified Check and SWIFT message is not acceptable.</p>
ITB 19.4	<p>Subject to the succeeding sentences, any bid not accompanied by an irrevocable and callable bid security shall be rejected by the Employer as nonresponsive. If a Bidder submits a bid security that (i) deviates in form, amount, and/or period of validity, or (ii) does not provide sufficient identification of the Bidder (including, without limitation, failure to indicate the name of the Joint Venture or, where the Joint Venture has not yet been constituted, the names of all future Joint Venture Partners), the Employer shall request the Bidder to submit a compliant bid security within seven (07) days of receiving such a request. Failure to provide a compliant bid security within the prescribed period of receiving such a request shall cause the rejection of the Bid.</p>
ITB 20.1	<p>In addition to the original of the Bid (<i>technical and financial bids</i>), the number of hard copies of Bid is: Three (03).</p> <p><i>To facilitate evaluation, bidders are encouraged to submit soft copies [two CDs (Compact Disc) or DVD (Digital Versatile Disc) or USB] one each in PDF format with its Technical Bid and Price Bid (Price Bid & BOQs to be provided in excel format also). The soft copy (CD or DVD or USB) of the Technical Bid shall be enclosed in the envelope containing the hard copy of the Bidder's Original Technical Bid, and the soft copy (CD or DVD or USB) of the Price Bid shall be enclosed in the envelope containing the hard copy of the Bidder's Original Price Bid.</i></p> <p><i>If there is any discrepancy between the data/information in the soft copy (CD or DVD or USB) of the Bidder's Technical Bid and the hard copy of the Bidder's Technical Bid and between the price indicated in the hard copy of the Bidder's Original Price Bid, and in the soft copy (CD or DVD or USB) of the Bidder's Price Bid, the data and information indicated in the hard copy of the Original Technical Bid and the Original Price Bid shall prevail.</i></p> <p>Note: Submission of the CD/DVD/USB is only for reference and shall not constitute electronic bid submission as stipulated in ITB 21.1(b) and its provision in the Data Sheet.</p>
ITB 20.2	<p>The written confirmation of authorization to sign on behalf of the Bidder shall consist of a board resolution or its equivalent, or power of attorney, which should either be:</p> <ol style="list-style-type: none"> a) notarized, or b) attested to by an appropriate authority in the Bidder's home country, specifying the representative's authority to sign the bid on behalf of the bidder. <p><i>If the bidder is an intended or existing joint venture, such authorization should be signed by all parties and specify the representative's authority to sign the bid on behalf of the intended or existing joint venture.</i></p> <p><i>If the joint venture has not yet been formed, also include written evidence from all proposed members of joint venture of their intent to enter into a joint venture in</i></p>

	<p><i>the event of a contract award.</i></p> <p><i>Only priced Bill of Quantities section must be submitted in typed written form. The remaining parts of the bid shall be typed or written in indelible ink.</i></p>
ITB 20.2	The Bidder shall submit an acceptable authorization within seven (07) days .

D. Submission and Opening of Bids

ITB 21.1	Bidders do not have the option of submitting their Bids electronically.														
ITB 21.1 (b)	If Bidders shall have the option of submitting their Bids electronically, the electronic bidding submission procedures shall be: Not Applicable .														
ITB 22.1	<p>For bid submission purposes only, the Employer's address is:</p> <table border="1"> <tr> <td>Attention:</td> <td>Program Director Program Management Unit (PMU) Punjab Intermediate Cities Improvement Investment Program (PICIIP), Local Government & Community Development Department, Punjab</td> </tr> <tr> <td>Street address:</td> <td>40 / B-1 • Gulberg 3, MM Alam Road, Lahore, Pakistan</td> </tr> <tr> <td>City:</td> <td>Lahore</td> </tr> <tr> <td>ZIP code:</td> <td>54000</td> </tr> <tr> <td>Country:</td> <td>Islamic Republic of Pakistan</td> </tr> </table> <p>The deadline for bid submission is:</p> <table border="1"> <tr> <td>Date:</td> <td>05 July 2023</td> </tr> <tr> <td>Time:</td> <td>1530 Hours</td> </tr> </table>	Attention:	Program Director Program Management Unit (PMU) Punjab Intermediate Cities Improvement Investment Program (PICIIP), Local Government & Community Development Department, Punjab	Street address:	40 / B-1 • Gulberg 3, MM Alam Road, Lahore, Pakistan	City:	Lahore	ZIP code:	54000	Country:	Islamic Republic of Pakistan	Date:	05 July 2023	Time:	1530 Hours
Attention:	Program Director Program Management Unit (PMU) Punjab Intermediate Cities Improvement Investment Program (PICIIP), Local Government & Community Development Department, Punjab														
Street address:	40 / B-1 • Gulberg 3, MM Alam Road, Lahore, Pakistan														
City:	Lahore														
ZIP code:	54000														
Country:	Islamic Republic of Pakistan														
Date:	05 July 2023														
Time:	1530 Hours														
ITB 25.1	<p>The opening of Technical Bid shall take place at:</p> <table border="1"> <tr> <td colspan="2">Office of the Program Director Program Management Unit (PMU) Punjab Intermediate Cities Improvement Investment Program (PICIIP) Local Government & Community Development Department, Punjab</td> </tr> <tr> <td>Street address:</td> <td>• 40, B-1, Gulberg III, MM Alam Road, Lahore, Pakistan</td> </tr> <tr> <td>City:</td> <td>Lahore</td> </tr> <tr> <td>ZIP code:</td> <td>54000</td> </tr> <tr> <td>Country:</td> <td>Islamic Republic of Pakistan</td> </tr> <tr> <td>Date:</td> <td>05 July 2023</td> </tr> <tr> <td>Time:</td> <td>The technical bids shall be opened immediately after the bid submission deadline.</td> </tr> </table>	Office of the Program Director Program Management Unit (PMU) Punjab Intermediate Cities Improvement Investment Program (PICIIP) Local Government & Community Development Department, Punjab		Street address:	• 40, B-1, Gulberg III, MM Alam Road, Lahore, Pakistan	City:	Lahore	ZIP code:	54000	Country:	Islamic Republic of Pakistan	Date:	05 July 2023	Time:	The technical bids shall be opened immediately after the bid submission deadline.
Office of the Program Director Program Management Unit (PMU) Punjab Intermediate Cities Improvement Investment Program (PICIIP) Local Government & Community Development Department, Punjab															
Street address:	• 40, B-1, Gulberg III, MM Alam Road, Lahore, Pakistan														
City:	Lahore														
ZIP code:	54000														
Country:	Islamic Republic of Pakistan														
Date:	05 July 2023														
Time:	The technical bids shall be opened immediately after the bid submission deadline.														
ITB 25.1	Electronic bid opening procedure shall be as follows: Not Applicable														
ITB 25.5	The Letter of Technical Bid shall be initialed by at least three (03) representatives of the Employer attending Bid opening.														
ITB 25.10	The Letter of Price Bid and Bill of Quantities shall be initialed by at least three (03) representatives of the Employer attending Bid opening														

E. Evaluation and Comparison of Bids

ITB 32.2	Qualifications of other firms such as the Bidder's subsidiaries, parent entities, affiliates, subcontractors (other than Specialist Subcontractors permitted in Para 2.4.2 Section 3 of the Bidding document) shall not be permitted .
ITB 34.1	The currency that shall be used for bid evaluation and comparison purposes to convert all bid prices expressed in various currencies into single currency is: Not Applicable
ITB 35.1	A margin of preference shall not apply.

Section 3 - Evaluation and Qualification Criteria

Table of Criteria

1. Evaluation	3-2
1.1 Adequacy of Technical Proposal	3-2
1.2 Completion Time	3-2
1.3 Technical Alternatives	3-2
1.4 Quantifiable Nonconformities and Omissions	3-2
1.5 Margin of Preference	3-2
1.6 Multiple Contracts	3-3
1.7 Other Criteria	3-3
2. Qualification	3-4
2.1 Eligibility	3-4
2.1.1 Nationality	3-4
2.1.2 Conflict of Interest.....	3-4
2.1.3 ADB Eligibility	3-4
2.1.4 Government-Owned Enterprise.....	3-4
2.1.5 United Nations Eligibility	3-4
2.1.6 Registration with Pakistan Engineering Council (PEC).....	3-5
2.2 Pending Litigation and Arbitration	3-6
2.2.1 Pending Litigation and Arbitration	3-6
2.3 Financial Situation	3-7
2.3.1 Historical Financial Performance.....	3-7
2.3.2 Average Annual Construction Turnover	3-7
2.3.3 Financial Resources	3-8
2.4 Construction Experience	3-9
2.4.1 Contracts of Similar Size and Nature	3-9
2.4.2 Construction Experience in Key Activities	3-10

1. Evaluation

In addition to the criteria listed in ITB 36.2 (a)–(e), other relevant factors are as follows:

1.1 Adequacy of Technical Proposal

Evaluation of the Bidder's Technical Proposal will include an assessment of the Bidder's technical capacity to mobilize key equipment and personnel for the contract consistent with its proposal regarding work methods, scheduling, and material sourcing in sufficient detail and fully in accordance with the requirements stipulated in Section 6 (Employer's Requirements).

Non-compliance with equipment and personnel requirements described in Section 6 (Employer's Requirements) shall not normally be a ground for bid rejection and such non-compliance will be subject to clarification during bid evaluation and rectification prior to contract award.

1.2 Completion Time

An alternative Completion Time, if permitted under ITB 13.2, will be evaluated as follows:

– *Not Applicable* –

1.3 1.3 Technical Alternatives

Technical alternatives, if permitted under ITB 13.4, will be evaluated as follows:

– *Not Applicable* –

1.4 Quantifiable Nonconformities and Omissions

Subject to ITB 14.2 and ITB 36.2, the evaluated cost of quantifiable nonconformities including omissions, is determined as follows:

Pursuant to ITB 31.3, the cost of all quantifiable nonmaterial nonconformities shall be evaluated, including omissions in Daywork where competitively priced but excluding omission of prices in the Bill of Quantities. The Employer will make its own assessment of the cost of any nonmaterial nonconformities and omissions for the purpose of ensuring fair comparison of bids.

1.5 Margin of Preference (Applicable for ICB only)

If a margin of preference shall apply under ITB 35.1, the procedure will be as follows as:

– *Not Applicable* –

1.6 Multiple Contracts

– *Not Applicable* –

1.7 Other Criteria

The Employer will take into account the quality of the Health and Safety COVID -19 Plan ('the Plan') attached to the Technical Proposal in its evaluation of the Adequacy of the Technical Proposal.

The bidder should demonstrate in the Plan the health and safety measures they will put in place on site in relation to COVID-19 prevention and controls, including but not limited to, PPE requirements, site set up, training, induction and mobilization of new personnel, equipment and plants cleaning and other hazard management measures while undertaking site work activities, site visitors health and safety protocols, as well as the approach to the monitoring and reporting of the Plan. The Plan should be fit for purpose for the particular construction works of this contract and be aligned with any relevant government regulations and guidelines on COVID-19 prevention and controls, as well as workplace safety requirements, or in the absence thereof, to international good practice guidelines such as World Health Organization 2020. Considerations for public health and social measures in the workplace in the context of COVID-19 Geneva available here: <https://www.who.int/publicationsdetail/considerations-for-public-health-and-social-measures-in-the-workplacein-the-context-of-covid-19>.

2. Qualification

It is the legal entity or entities comprising the Bidder, and not the Bidder's parent companies, subsidiaries, or affiliates, that must satisfy the qualification criteria described below.

2.1 Eligibility

Criteria Requirement	Compliance Requirements			Documents Submission Requirements	
	Single Entity	Joint Venture			
		All Partners Combined	Each Partner	One Partner	

2.1.1 Nationality

Nationality in accordance with ITB Subclause 4.2.	must meet requirement	must meet requirement	must meet requirement	not applicable	Forms ELI - 1; ELI - 2 with attachments
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2.1.2 Conflict of Interest

No conflicts of interest in accordance with ITB Subclause 4.3.	must meet requirement	must meet requirement	must meet requirement	not applicable	Letter of Technical Bid
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2.1.3 ADB Eligibility

Not having been declared ineligible by ADB, as described in ITB Subclause 4.4.	must meet requirement	must meet requirement	must meet requirement	not applicable	Letter of Technical Bid
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2.1.4 Government-Owned Enterprise

Bidder required to meet conditions of ITB Subclause 4.5.	must meet requirement	must meet requirement	must meet requirement	not applicable	Forms ELI - 1, ELI - 2 with attachments
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2.1.5 United Nations Eligibility

Not having been excluded by an act of compliance with a United Nations Security Council resolution in accordance with ITB Subclause 4.7.	must meet requirement	must meet requirement	must meet requirement	not applicable	Letter of Technical Bid
--	-----------------------	-----------------------	-----------------------	----------------	-------------------------

2.1.6 Registration with Pakistan Engineering Council (PEC)

<p>National Bidder must be registered with Pakistan Engineering Council (PEC) and shall have a valid registration Certificate (2022) in category for C-3 or above with Specialization in CE10 at the time of bid submission. <i>If the winning bidder includes local firm whose registration expires prior to contract award, the firm shall be given reasonable time to extend such registration.</i></p>	must meet requirement	not applicable	JV partner must meet requirement as per their respective JV share	must meet requirement	Forms ELI - 1; ELI - 2 with attachments
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2.2 Pending Litigation and Arbitration

Pending litigation and arbitration criterion shall apply.

2.2.1 Pending Litigation and Arbitration

Criteria	Compliance Requirements			Documents	
Requirement	Single Entity	Joint Venture		Submission Requirements	
		All Partners Combined	Each Partner		One Partner
<p>All pending litigation and arbitration, initiated against the Bidder, if any, shall be treated as resolved against the Bidder and so shall in total not represent more than fifty percent (50%) of the Bidder's net worth calculated as the difference between total assets and total liabilities.</p>	must meet requirement by itself or as partner to past or existing Joint Venture	not applicable	must meet requirement by itself or as partner to past or existing Joint Venture	not applicable	Form LIT - 1

2.3 Financial Situation

2.3.1 Historical Financial Performance

Criteria Requirement	Compliance Requirements				Documents Submission Requirements
	Single Entity	Joint Venture			
		All Partners Combined	Each Partner	One Partner	
Submission of audited financial statements or, if not required by the law of the Bidder's country, other financial statements acceptable to the Employer, for years 2020, 2021 & 2022 or the latest three years audited financial statement to demonstrate the current soundness of the Bidder's financial position. As a minimum, the Bidder's net worth for the last year calculated as the difference between total assets and total liabilities should be positive.	must meet requirement	not applicable	must meet requirement	not applicable	Form FIN - 1 with attachments

2.3.2 Average Annual Construction Turnover

Criteria Requirement	Compliance Requirements				Documents Submission Requirements
	Single Entity	Joint Venture			
		All Partners Combined	Each Partner	One Partner	
Minimum average annual construction turnover of the amount mentioned below calculated as total certified payments received for contracts in progress or completed, within the last three (03) years : PKR 523 million	must meet requirement	must meet requirement	must meet 25% of the requirement	must meet 40% of the requirement	Form FIN - 2

2.3.3 Financial Resources

Criteria Requirement	Compliance Requirements				Documents Submission Requirements
	Single Entity	Joint Venture			
		All Partners Combined	Each Partner	One Partner	
<p>For Single Entities:</p> <p>The Bidder must demonstrate that its financial resources defined in FIN - 3, less its financial obligations for its current contract commitments defined in FIN - 4, meet or exceed the total requirement for the Contracts of:</p> <p>PKR 87 million</p>	must meet requirement	not applicable	not applicable	not applicable	<p>Form FIN - 3 and Form FIN - 4</p> <p>If the Bidder want to make use of line of credit to meet financial resource requirement, the bidder shall provide dedicated line of credit from the issuing bank by clearly indicating the name of this project.</p>
<p>For Joint Ventures:</p> <p>(1) One partner must demonstrate that its financial resources defined in FIN - 3, less its financial obligations for its own current contract commitments defined in FIN - 4, meet or exceed its required share of amount mentioned below from the total requirement for the Subject Contract:</p> <p>PKR 34 million</p> <p>AND</p>	not applicable	not applicable	not applicable	must meet requirement	<p>Form FIN - 3 and Form FIN - 4</p> <p>If the Bidder want to make use of line of credit to meet financial resource requirement, the bidder shall provide dedicated line of credit from the issuing bank by clearly indicating the name of this project.</p>
<p>(2) Each partner must demonstrate that its financial resources defined in FIN - 3, less its financial obligations for its own current contract commitments defined in FIN - 4, meet or exceed its required share of amount mentioned below from the total requirement for the Subject Contract.</p> <p>PKR 21 million</p> <p>AND</p>	not applicable	not applicable	must meet requirement	not applicable	<p>Form FIN - 3 and Form FIN - 4</p> <p>If the Bidder want to make use of line of credit to meet financial resource requirement, the bidder shall provide dedicated line of credit from the issuing bank by clearly indicating the name of this project.</p>
<p>(3) The joint venture must demonstrate that the combined financial resources of all partners defined in FIN - 3, less all the</p>	not applicable	must meet requirement	not applicable	not applicable	<p>Form FIN - 3 and Form FIN - 4</p> <p>If the Bidder want to make use of line of credit to meet</p>

Criteria	Compliance Requirements				Documents
	Single Entity	Joint Venture			
		All Partners Combined	Each Partner	One Partner	
Requirement					Submission Requirements
<p>partners' total financial obligations for the current contract commitments defined in FIN - 4, meet or exceed the total requirement for the contracts mentioned below:</p> <p>PKR 87 million</p>					<p>financial resource requirement, the bidder shall provide dedicated line of credit from the issuing bank by clearly indicating the name of this project.</p>

2.4 Construction Experience

2.4.1 Contracts of Similar Size and Nature

Criteria	Compliance Requirements				Documents
	Single Entity	Joint Venture			
		All Partners Combined	Each Partner	One Partner	
Requirement					Submission Requirements
<p>Participation as a contractor, Joint Venture partner, or Subcontractor, in at least one contract that has been successfully or substantially completed within the last five (05) years and that is similar to the proposed works, where the value of the Bidder's participation in the contract exceeds the amount mentioned below. The similarity of the Bidder's participation shall be based on details/characteristics as described in Section 6 "Employer's Requirements" having a minimum cost of.</p> <p>PKR 261 Million</p>	must meet requirement	not applicable	not applicable	must meet requirement	<p>Form EXP – 1</p> <p>Completion, or Taking Over or substantial completion certificate from the Employer or by the Engineer indicating Employer's name, contract name, value and completion time to demonstrate compliance with the requirements.</p> <p>If the participation was through a JV or as subcontractor, only the respective share will be considered. Also, Using Form EXP-1, the Bidders must specify percent and amount of participation of total contract amount. The Bidders may also provide pertinent information such as JV/subcontract agreement and payment receipts.</p>

2.4.2 Construction Experience in Key Activities

(May be complied with by the Bidder or by Specialist Subcontractor. If Specialist Subcontractors are proposed by the Bidder for key activities, each Specialist Subcontract must have experience in related key activity as a single entity.

If the key activity is to be undertaken by a Specialist Subcontractor, the Employer shall require evidence of the subcontracting agreement from the Bidder.)

Criteria Requirement	Compliance Requirements				Documents Submission Requirements
	Single Entity	Joint Venture			
		All Partners Combined	Each Partner	One Partner	
For the above or other contracts executed during the period stipulated in 2.4.1 above, a minimum construction experience in the following key activities:	must meet requirements	must meet requirements	not applicable	not applicable	Form EXP – 2 IPCs or Completion/Substantial completion / taking over certificate or certificate of execution of activities from the Employer of completed / substantially completed projects to substantiate experience in Key Activities
(i) Civil works including Renovation/Rehabilitation of existing buildings, roads, boundary wall, OHR and Tubewell amounting to a minimum PKR 50 million					
(ii) Supply and Installation of Solar System for different buildings of capacity range minimum 20KW. (the bidder can propose through a specialized Sub-Contractor as mentioned above)					

In the case of a joint venture bidder, at least one of the partners must have experience in the key activity if the bidder itself (not its subcontractor) will carry out the relevant activity.

Section 4 - Bidding Forms

Table of Forms

Letter of Technical Bid	4-2
Letter of Price Bid	4-4
Bid Security	4-6
Bid-Securing Declaration	4-7
Technical Proposal	4-9
Personnel.....	4-8
Form PER – 1: Proposed Personnel	4-8
Form PER – 2: Resume of Proposed Personnel	4-9
Equipment	4-10
Site Organization	4-11
Method Statement.....	4-11
Mobilization Schedule	4-11
Construction Schedule.....	4-11
Bidder's Qualification	4-12
Form ELI - 1: Bidder's Information Sheet.....	4-13
Form ELI - 2: Joint Venture Information Sheet	4-14
Form LIT - 1: Pending Litigation and Arbitration.....	4-15
Form FIN - 1: Historical Financial Performance	4-16
Form FIN - 2: Average Annual Construction Turnover	4-17
Form FIN - 3: Availability of Financial Resources.....	4-18
Form FIN - 4: Financial Requirement for Current Contract Commitments.....	4-19
Form FIN - 5: Self-Assessment Tool for Bidder's Compliance to Financial Resources	4-20
Form EXP - 1: Contracts of Similar Size and Nature.....	4-21
Form EXP - 2: Construction Experience in Key Activities.....	4-22
Schedules	4-23
Schedule of Payment Currencies.....	4-23
Tables of Adjustment Data.....	4-24
Activity Schedule.....	4-25
Bill of Quantities	4-26
List of Materials for Secured Advance	4-28

Letter of Technical Bid

-Note-

The bidder must accomplish the Letter of Technical Bid on its letterhead clearly showing the bidder's complete name and address.

Date: _____

NCB No.: **PICIIP-15**Invitation for Bid No.: **NCB-Works/PICIIP-15**

To:

Program Director (PD)
Program Management Unit (PMU)
Punjab Intermediate City Improvement Investment Program (PICIIP)
Local Government & Community Development Department, Punjab,
40, B-1, Gulberg III, Lahore 54000
Islamic Republic of Pakistan
Phone: +92 42 99268484, +92 42 99268483
Email: pmu.piciip@punjab.gov.pk

We, the undersigned, declare that:

- (a) We have examined and have no reservations to the Bidding Documents, including Addenda issued in accordance with Instructions to Bidders (ITB) 8.
- (b) We offer to execute in conformity with the Bidding Documents the following Works:
"NCB-Works/PICIIP-15; Upgradation of Punjab Local Government Academy (PLGA) campus at Lala Musa"
- (c) Our Bid consisting of the Technical Bid and the Price Bid shall be valid for a period of **120 (one hundred and twenty) days** from the date fixed for the bid submission deadline in accordance with the Bidding Documents, and it shall remain binding upon us and may be accepted at any time before the expiration of that period.
- (d) Our firm, including any Subcontractors or Suppliers for any part of the Contract, have nationalities from eligible countries in accordance with ITB 4.2.
- (e) We, including any Subcontractors or Suppliers for any part of the contract, do not have any conflict of interest in accordance with ITB 4.3.
- (f) We are not participating, as a Bidder in more than one Bid in this bidding process in accordance with ITB 4.3(e), other than alternative offers submitted in accordance with ITB 13.
- (g) Our firm, its affiliates or subsidiaries, including any Subcontractors or Suppliers for any part of the contract, has not been declared ineligible by ADB, under the Employer's country laws or official regulations or by an act of compliance with a decision of the United Nations Security Council.

- (h) [We are not a government-owned enterprise] / [We are a government-owned enterprise but meet the requirements of ITB 4.5].¹
- (i) We agree to permit ADB or its representative to inspect our accounts and records and other documents relating to the bid submission and to have them audited by auditors appointed by ADB.
- (j) If our Bid is accepted, we commit to mobilizing key equipment and personnel in accordance with the requirements set forth in Section 6 (Employer's Requirements) and our technical proposal, or as otherwise agreed with the Employer.

Name

In the capacity of

Signed

Duly authorized to sign the Bid for and on behalf of

Date

¹ Use one of the two options as appropriate.

Letter of Price Bid

-Note-

The bidder must accomplish the Letter of Price Bid on its letterhead clearly showing the bidder's complete name and address.

Date: _____

NCB No.: **PICIIP-15**

Invitation for Bid No.: **NCB-Works/PICIIP-15**

To:

**Program Director (PD)
Program Management Unit (PMU)
Punjab Intermediate City Improvement Investment Program (PICIIP)
Local Government & Community Development Department, Punjab,
40, B-1, Gulberg III, Lahore 54000
Islamic Republic of Pakistan
Phone: +92 42 99268484, +92 42 99268483
Email: pmu.piciip@punjab.gov.pk**

We, the undersigned, declare that:

(a) We have examined and have no reservations to the Bidding Documents, including Addenda issued in accordance with instructions to Bidders (ITB) 8.

(b) We offer to execute in conformity with the Bidding Documents the following Works:

"NCB-Works/PICIIP-15; Upgradation of Punjab Local Government Academy (PLGA) campus at Lala Musa"

(c) The total price of our Bid, excluding any discounts offered in item (d) below is:

(d) [amount of foreign currency in words], [amount in figures], and [amount of local currency in words], [amount in figures]

The total bid price from the Summary of Bill of Quantities for admeasurement contracts or Activity Schedule for lump sum contracts should be entered by the bidder inside this box. Absence of the total bid price in the Letter of Price Bid may result in the rejection of the bid.

counts offered and the methodology for their application are as follows: [. . . insert discounts and methodology for their application if any . . .]

(e) Our Bid shall be valid for a period of **120 (one hundred and twenty) days** from the date fixed for the bid submission deadline in accordance with the Bidding Documents, and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

(f) If our Bid is accepted, we commit to obtain a performance security in accordance with the Bidding Documents.

(g) We have paid, or will pay the following commissions, gratuities, or fees with respect to the bidding process or execution of the Contract: ¹

Name of Recipient	Address	Reason	Amount
.....
.....

(h) We understand that this bid, together with your written acceptance thereof included in your notification of award, shall constitute a binding contract between us, until a formal contract is prepared and executed.

(i) We understand that you are not bound to accept the lowest evaluated bid or any other bid that you may receive.

(j) We agree to permit ADB or its representative to inspect our accounts and records and other documents relating to the bid submission and to have them audited by auditors appointed by ADB.

Name

In the capacity of

Signed

Duly authorized to sign the Bid for and on behalf of

Date

¹ If none has been paid or is to be paid, indicate "None".

Bid Security

Bank Guarantee

Bank's name, and address of issuing branch or office¹

Beneficiary: *Name and address of the employer*

Date:

Bid Security No.:

We have been informed that *name of the bidder* (hereinafter called "the Bidder") has submitted to you its bid dated (hereinafter called "the Bid") for the execution of *name of contract* under Invitation for Bids No. ("the IFB").

Furthermore, we understand that, according to your conditions, bids must be supported by a bid guarantee.

At the request of the Bidder, we *name of bank* hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of *amount in words* (..... *amount in figures*) upon receipt by us of your first demand in writing accompanied by a written statement stating that the Bidder is in breach of its obligation(s) under the bid conditions, because the Bidder

- (a) has withdrawn its Bid during the period of bid validity specified by the Bidder in the Letter of Technical Bid and Letter of Price Bid; or
- (b) does not accept the correction of errors in accordance with the Instructions to Bidders (hereinafter "the ITB"); or
- (c) having been notified of the acceptance of its Bid by the Employer during the period of bid validity, (i) fails or refuses to execute the Contract Agreement, or (ii) fails or refuses to furnish the Performance Security, in accordance with the ITB, or (iii) fails or refuses to furnish the domestic preference security, if required.

This guarantee will expire (a) if the Bidder is the successful Bidder, upon our receipt of copies of the Contract Agreement signed by the Bidder and the Performance Security issued to you upon the instruction of the Bidder; and (b) if the Bidder is not the successful Bidder, upon the earlier of (i) our receipt of a copy your notification to the Bidder of the name of the successful Bidder, or (ii) 28 days after the expiration of the Bidder's bid.

Consequently, any demand for payment under this guarantee must be received by us at the office on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees, ICC Publication No. 458.²

..... *Authorized signature(s) and bank's seal (where appropriate)*

Note

In case of a joint venture, the bid security must be in the name of all partners to the joint venture that submits the bid.

¹ All italicized text is for use in preparing this form and shall be deleted from the final document.

² Or 758 as applicable.

Bid-Securing Declaration

Date: *[insert date (as day, month and year)]*

Bid No.: *[insert number of bidding process]*

Alternative No.: **[insert identification No if this is a bid for an alternative]**

To: **[insert complete name of the employer]**

We, the undersigned, declare that

We understand that, according to your conditions, bids must be supported by a Bid-Securing Declaration.

We accept that we will automatically be suspended from being eligible for bidding in any contract with the Employer for the period of time of *[insert the number of months or years]*

[9.2 of the BDS] starting on the date that we receive a notification from the Employer, if we are in breach of our obligation(s) under the bid conditions, because we

(a) have withdrawn our Bid during the period of bid validity specified in the Letter of Technical Bid and Letter of Price Bid; or

(b) do not accept the correction of errors in accordance with the Instruction to Bidders (hereinafter "the ITB"); or

(c) having been notified of the acceptance of our Bid by the Employer during the period of bid validity, (i) fail or refuse to execute the Contract, if required, (ii) fail or refuse to furnish the Performance Security, in accordance with the ITB, or (iii) fail or refuse to furnish the Domestic Preference Security, if required.

We understand this Bid-Securing Declaration shall expire if we are not the successful Bidder, upon the earlier of (i) our receipt of your notification to us of the name of the successful Bidder; or (ii) 28 days after the expiration of our Bid.

Signed: *[insert signature of person whose name and capacity are shown]*

In the capacity of *[insert legal capacity of person signing the Bid-Securing Declaration]*

Name: *[insert complete name of person signing the Bid-Securing Declaration]*

Duly authorized to sign the bid for and on behalf of *[insert complete name of the bidder]*

Dated on _____ day of _____, _____

Corporate Seal [where appropriate]

- Note -

In case of a joint venture, the Bid-Securing Declaration must be in the name of all partners to the joint venture that submits the bid.

Technical Proposal

Personnel

Form PER – 1: Proposed Personnel

Bidder should provide the details of the proposed personnel and their experience record in the relevant Information Forms below for each candidate:

1.	Title of position*
	Name
2.	Title of position*
	Name
3.	Title of position*
	Name
4.	Title of position*
	Name
etc.	Title of position*
	Name

-- Note --

* As listed in Section 6 (Employer's Requirements).

Form PER – 2: Resume of Proposed Personnel

The Bidder shall provide all the information requested below. Use one form for each position.

Position		
Personnel information	Name	Date of birth
	Professional qualifications	
Present employment	Name of employer	
	Address of employer	
	Telephone	Contact (manager / personnel officer)
	Fax	E-mail
	Job title	Years with present employer

Summarize professional experience in reverse chronological order. Indicate particular technical and managerial experience relevant to the project.

From	To	Company / Project / Position / Relevant Technical and Management Experience

Equipment

Form EQU: Equipment

The Bidder shall provide adequate information and details to demonstrate clearly that it has the capability to meet the equipment requirements indicated in Section 6 (Employer's Requirements), using the Forms below. A separate Form shall be prepared for each item of equipment listed, or for alternative equipment proposed by the Bidder.

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 <input type="checkbox"/> Owned <input type="checkbox"/> Rented <input type="checkbox"/> Leased <input type="checkbox"/> Specially manufactured	

Omit the following information 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	

Technical Proposal

Personnel

Equipment

Site Organization

Method Statement

Traffic Diversion Plan

Mobilization Schedule

Construction Schedule

COVID-19 Specific Site Health and Safety Management Plan in accordance with ITB 16.1

NOTE: The bidder should demonstrate in the Plan the health and safety measures they will put in place on site in relation to COVID-19 prevention and controls, including but not limited to, PPE requirements, site set up, training, induction and mobilization of new personnel, equipment and plants cleaning and other hazard management measures while undertaking site work activities, site visitors health and safety protocols, as well as the approach to the monitoring and reporting of the Plan. The Plan should be fit for purpose for the particular construction works of this contract and be aligned with any relevant government regulations and guidelines on COVID-19 prevention and controls, as well as workplace safety requirements, or in the absence thereof, to international good practice guidelines such as World Health Organization 2020. Considerations for public health and social measures in the workplace in the context of COVID- 19 Geneva available here:

<https://www.who.int/publicationsdetail/considerations-for-public-health-and-social-measures-in-the-workplacein-the-context-of-covid-19>.

Other Documents in accordance with ITB 11.2(g) of Section 2-Bid Data Sheet, as under:

- (i) Quality Control Methods for Building Construction & Steel Structure Works
- (ii) Health & Safety management plan.
- (iii) Environment safety plan.
- (iv) Bidders are encouraged to submit colored photographs of project sites as optional.

Bidders Qualification

To establish its qualifications to perform the contract in accordance with Section 3 (Evaluation and Qualification Criteria) the Bidder shall provide the information requested in the corresponding Information Sheets included hereunder.

Form ELI - 1: Bidder's Information Sheet

Bidder's Information	
Bidder's legal name	
In case of a Joint Venture, legal name of each partner	
Bidder's country of constitution	
Bidder's year of constitution	
Bidder's legal address in country of constitution	
Bidder's authorized representative (name, address, telephone number(s), fax number(s), e-mail address)	
<p>Attached are copies of the following documents.</p> <p><input type="checkbox"/> 1. In case of a single entity, articles of incorporation or constitution of the legal entity named above, in accordance with ITB 4.1 and ITB 4.2.</p> <p><input type="checkbox"/> 2. Authorization to represent the firm or Joint Venture named above, in accordance with ITB 20.2.</p> <p><input type="checkbox"/> 3. In case of a Joint Venture, a letter of intent to form a Joint Venture or Joint Venture agreement, in accordance with ITB 4.1.</p> <p><input type="checkbox"/> 4. In case of a government-owned enterprise, any additional documents not covered under 1 above required to comply with ITB 4.5.</p> <p><input type="checkbox"/> 5. In case of National Bidder, License of Pakistani Constructor / Operator, issued by PEC as per Para 2.1.6 of Section 3 of the Bidding Documents.</p>	

Form ELI - 2: Joint Venture Information Sheet

Each member of the Joint Venture and Specialist Subcontractor must fill out this form separately.

Joint Venture / Specialist Subcontractor Information	
Bidder's legal name	
Joint Venture Partner's or Specialist Subcontractor's legal name	
Joint Venture Partner's or Specialist Subcontractor's country of constitution	
Joint Venture Partner's or Specialist Subcontractor's year of constitution	
Joint Venture Partner's or Specialist Subcontractor's legal address in country of constitution	
Joint Venture Partner's or Specialist Subcontractor's authorized representative information (name, address, telephone number(s), fax number(s), e-mail address)	
<p>Attached are copies of the following documents.</p> <p><input type="checkbox"/> 1. Articles of incorporation or constitution of the legal entity named above, in accordance with ITB 4.1 and ITB 4.2.</p> <p><input type="checkbox"/> 2. Authorization to represent the firm named above, in accordance with ITB 20.2.</p> <p><input type="checkbox"/> 3. In the case of a government-owned enterprise, documents establishing legal and financial autonomy and compliance with commercial law, in accordance with ITB 4.5.</p> <p><input type="checkbox"/> 4. In case of National Bidder, License of Pakistani Constructor / Operator, issued by PEC as per Para 2.1.6 of Section 3 of the Bidding Documents.</p>	

A Specialist Subcontractor is a specialist enterprise engaged for highly specialized processes that cannot be provided by the main Contractor.

Form LIT – 1: Pending Litigation and Arbitration

Each Bidder must fill out this form if so required under Criterion 2.2 of Section 3 (Evaluation and Qualification Criteria) to describe any pending litigation or arbitration formally commenced against it.

In case of a Joint Venture, each Joint Venture Partner must fill out this form separately and provide the Joint Venture Partner's name below:

Joint Venture Partner: _____

Pending Litigation and Arbitration			
<p>Choose one of the following:</p> <p><input type="checkbox"/> No pending litigation and arbitration.</p> <p><input type="checkbox"/> Below is a description of all pending litigation and arbitration involving the Bidder (or each Joint Venture member if Bidder is a Joint Venture).</p>			
Year	Matter in Dispute	Value of Pending Claim in PKR Equivalent	Value of Pending Claim as a Percentage of Net Worth
	<p><i>Following information to be provided against each dispute:</i></p> <p>Contract Identification: <i>[indicate complete contract name/ number, and any other identification]</i></p> <p>Name of Employer: <i>[insert full name]</i></p> <p>Address of Employer: <i>[insert street/city/country]</i></p> <p>Matter of Dispute: <i>[indicate full description of dispute]</i></p> <p>Party who initiated the dispute: <i>[indicate "Employer" or "Contractor"]</i></p> <p>Status: <i>[indicate status of dispute]</i></p>		

- Note -

This form shall only be included if Criterion 2.2 of Section 3 (Evaluation and Qualification Criteria) is applicable.

Form FIN - 1: Historical Financial Performance

Each Bidder must fill out this form.

In case of a Joint Venture, each Joint Venture Partner must fill out this form separately and provide the Joint Venture Partner's name below:

Joint Venture Partner: _____

Financial Data for Previous ___ Years [PKR]		
Year 1:	Year 2:	Year 3:

Information from Balance Sheet

Total Assets (TA)			
Total Liabilities (TL)			
Net Worth = TA - TL			
Current Assets (CA)			
Current Liabilities (CL)			
Working Capital = CA - CL			

Most Recent Working Capital		To be obtained for most recent year and carried forward to FIN - 3 Line 1; in case of Joint Ventures, to the corresponding Joint Venture Partner's FIN - 3.
-----------------------------	--	---

Information from Income Statement

Total Revenues			
Profits Before Taxes			
Profits After Taxes			

- Attached are copies of financial statements (balance sheets including all related notes, and income statements) for the last ___ years, as indicated above, complying with the following conditions.
- Unless otherwise required by Section 3 of the Bidding Document, all such documents reflect the financial situation of legal entity or entities comprising the Bidder and not the Bidder's parent companies, subsidiaries, or affiliates.
 - Historical financial statements must be audited by a certified accountant.
 - Historical financial statements must be complete, including all notes to the financial statements.
 - Historical financial statements must correspond to accounting periods already completed and audited (no statements for partial periods shall be requested or accepted).

Form FIN - 2: Average Annual Construction Turnover

Each Bidder must fill out this form.

The information supplied should be the Annual Turnover of the Bidder or each member of a Joint Venture in terms of the amounts billed to clients for each year for work in progress or completed.

In case of a Joint Venture, each Joint Venture Partner must fill out this form separately and provide the Joint Venture Partner's name below:

Joint Venture Partner: _____

Annual Turnover Data for the Last ___ Years (Construction only)			
Year	Amount Currency	Exchange Rate	PKR
Average Annual Construction Turnover			

Form FIN – 3: Availability of Financial Resources

Bidder must demonstrate sufficient financial resources, usually comprising of Working Capital supplemented by credit line statements or overdraft facilities and others to meet the Bidder's financial requirements for

- (a) its current contract commitments, and
- (b) the subject contract.

In case of a Joint Venture, each Joint Venture Partner must fill out this form separately and provide the Joint Venture Partner's name below:

Joint Venture Partner: _____

Financial Resources		
No.	Source of financing	Amount (PKR)
1	Working Capital (to be taken from FIN - 1)	
2	Credit Line*	
3	Other Financial Resources	
	Total Available Financial Resources	

* To be substantiated by a letter from the bank issuing the line of credit. Line of credited (specific to this project) confirmed by issuing bank within last one month (prior to submission of the bid) clearly indicating the name of this project. I.e NCB-Works/PICIIIP-15

"NCB-Works/PICIIIP-15; Upgradation of Punjab Local Government Academy (PLGA) campus at Lala Musa"

Form FIN- 4: Financial Resources Requirement

Bidders (or each Joint Venture partner) 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.**

In case of a Joint Venture, each Joint Venture Partner must fill out this form separately and provide the Joint Venture Partner's name below:

Joint Venture Partner: _____

Current Contract Commitments						
No.	Name of Contract	Employer's Contact (Address, Tel, Fax)	Contract Completion Date	Outstanding Contract Value (X) ^a	Remaining Contract Period in months (Y) ^b	Monthly Financial Resources Requirement (X / Y)
1						
2						
3						
4						
Total Monthly Financial Requirements for Current Contract Commitments						PKR

^a Remaining outstanding contract values to be calculated from 28 days prior to the bid submission deadline (PKR).

^b Remaining contract period to be calculated from 28 days prior to bid submission deadline.

Form FIN - 5: Self-Assessment Tool for Bidder's Compliance to Financial Resources (Criterion 2.3.3 of Section 3)

This form requires the same information submitted in Forms FIN - 3 and FIN - 4. All conditions of "Available Financial Resources Net of CCC \geq Requirement for the Subject Contract" must be satisfied to qualify.

Form FIN - 5A: For Single Entities

For Single Entities: (A)	Total Available Financial Resources from FIN - 3 (B)	Total Monthly Financial Requirement for Current Contract Commitments (CCC) from FIN - 4 (C)	Available Financial Resources Net of CCC $D = (B - C)$	Requirement for the Subject Contract (E)	Results: Yes or No [D must be greater than or equal to E] (F)
_____ (Name of Bidder)				

Form FIN - 5B: For Joint Ventures

For Joint Ventures: (A)	Total Available Financial Resources from FIN - 3 (B)	Total Monthly Financial Requirement for Current Contract Commitments (CCC) from FIN - 4 (C)	Available Financial Resources Net of CCC $D = (B - C)$	Requirement for the Subject Contract (E)	Results: Yes or No [D must be greater than or equal to E] (F)
One Partner:					
_____ (Name of Partner)				
Each Partner:					
_____ (Name of Partner 1)				
_____ (Name of Partner 2)				
_____ (Name of Partner 3)				
All partners combined	$\Sigma D =$ Sum of available financial resources net of current contract commitments for all partners		$\Sigma D =$ _____	

- Note -

Form FIN - 5 is made available for use by the bidder as a self-assessment tool, and by the employer as an evaluation work sheet, to determine compliance with the financial resources requirement as stated in 2.3.3. Failure to submit Form FIN - 5 by the Bidder shall not lead to bid rejection.

Form EXP – 1: Contracts of Similar Size and Nature

Fill up one (1) form per contract.

Contract of Similar Size and Nature			
Contract No of	Contract Identification		
Award Date		Completion Date	
Total Contract Amount	PKR		
If partner in a Joint Venture or subcontractor, specify participation of total contract amount	Percent of Total	Amount	
Employer's Name Address Telephone/Fax Number E-mail			
Description of the Similarity in Accordance with Criterion 2.4.1 of Section 3 (Evaluation and Qualification Criteria)			
<p>Participation as a contractor, Joint Venture partner, or Subcontractor, in at least one contract that has been successfully or substantially completed within the last five (05) years and that is similar to the proposed works, where the value of the Bidder's participation in the contract exceeds the amount mentioned below. The similarity of the Bidder's participation shall be based on details/characteristics as described in Section 6 "Employer's Requirements" having a minimum cost of.</p> <p>PKR 261 Million</p>	<p>Documentary evidences may include the following, as mentioned in Para 2.4.1. of the Section 3 of the Bidding Documents:</p> <p><i>Completion, or Taking Over or substantial completion certificate from the Employer or by the Engineer indicating Employer's name, contract name, value and completion time to demonstrate compliance with the requirements.</i></p> <p><i>If the participation was through a JV or as subcontractor, only the respective share will be considered. Also, Using Form EXP-1, the Bidders must specify percent and amount of participation of total contract amount. The Bidders may also provide pertinent information such as JV/subcontract agreement and payment receipts.</i></p>		

Form EXP - 2: Construction Experience in Key Activities

Fill up one (1) form per contract

Contract with Similar Key Activities			
Contract No of	Contract Identification		
Award Date		Completion Date	
Total Contract Amount	PKR		
If partner in a Joint Venture or subcontractor, specify participation of total contract amount	Percent of Total	Amount	
Employer's Name Address Telephone Number Fax Number E-mail			
Description of the Key Activities in Accordance with Criterion 2.4.2 of Section 3 (Evaluation and Qualification Criteria)			
(i) Civil works including Renovation/Rehabilitation of existing buildings, roads, boundary wall, OHR and Tubewell amounting to a minimum PKR 50 million	<p>Documentary evidences may include the following, as mentioned in Para 2.4.2. of the Section 3 of the Bidding Documents:</p> <p><i>IPCs or Completion/Substantial completion / taking over certificate or certificate of execution of activities from the Employer of completed / substantially completed projects to substantiate experience in Key Activities.</i></p>		
(ii) Supply and Installation of Solar System for different buildings of capacity range minimum 20KW. <u>(bidder can propose through specialized Sub-Contractor as mentioned above)</u>			

Schedules

Schedule of Payment Currencies

Forinsert name of Section of the Works

Separate tables may be required if the various sections of the Works (or of the Bill of Quantities) will have substantially different foreign and local currency requirements. In such a case, the Employer should prepare separate tables for each Section of the Works.

	A	B	C	D
Name of Payment Currency	Amount of Currency	Rate of Exchange to Local Currency	Local Currency Equivalent $C = A \times B$	Percentage of Net Bid Price (NBP) $\frac{100 \times C}{NBP}$
Local Currency		1.00		
Foreign Currency #1				
Foreign Currency #2				
Foreign Cur				
Net Bid Price				100.00
Provisional Sums Expressed in Local Currency		1.00		
BID PRICE				

Not Applicable

-- Note --

The rates of exchange shall be the selling rates 28 days prior to the deadline for submission of bids published by the source specified in BDS 15.

Table(s) of Adjustment Data (Lot-3)

Table A - Local Currency

Sr. No.	Description	Unit	Weightages	Applicable Index
1	2	3	4	5
(i)	Fixed Portion	-	0.67	-
(ii)	High Speed Diesel [for all types of fuel]	Liter	0.07	Input rates notified by Govt. of Punjab, Pakistan
(iii)	Labour Unskilled	Day (Per Day)	0.15	Input rates notified by Govt. of Punjab, Pakistan
(iv)	Cement (Ordinary Portland Cement) [for all types of Cement]	Per Bag	0.05	Input rates notified by Govt. of Punjab, Pakistan
(v)	Bricks (New first class)	1000 Nos.	0.03	Input rates notified by Govt. of Punjab, Pakistan
(vi)	Deformed M.S. Bars (G-60) [for all types of Steel elements]	Metric Ton	0.03	Input rates notified by Govt. of Punjab, Pakistan
	Total		1.000	

Note:

1. Base prices of Specified Materials shall be as of actually prevailing on the base date notified by the Engineer with the approval of the Employer after the award of works. "Base Date" means the date 28 days prior to the deadline for bid submission".
2. The basic prices are meant to be ex-factory prices and inclusive of all kinds of taxes and duties that can be levied at source.
3. Adjustment of increase / decrease shall only be admissible for the materials listed above.
4. Value of work done for price adjustment purpose shall be value of permanent works (Excluding Bill for General Items & Provisional Sums).
5. All Amounts in Pak Rupees only.

Table B - Foreign Currency (NOT APPLICABLE)

Name of Currency:

Insert name of currency. If the bidder wishes to quote in more than one foreign currency, insert more than three, this table should be repeated for each foreign currency.

To be entered by the bidder

Index Code	Index Description	Bidder's Proposed Weighting (coefficient)
		a: (by Employer) b: _____ c: _____ d: _____ e: _____
Total		1.00

Not Applicable

-- Note --

"Base Date" means the date 28 days prior to the deadline for submission of bids.

Tables of Adjustment Data shall only be included if prices are to be quoted as adjustable prices in accordance with ITB 14.5.

Bill of Quantities

A. Preamble

1. The Bill of Quantities shall be read in conjunction with the Instructions to Bidders, General and Particular Conditions of Contract, Technical Specifications, and Drawing
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 Project Manager and valued at the rates and prices entered in the priced Bill of Quantities, where applicable, and otherwise at such rates and prices as the Project Manager may fix as per the Contract.
3. The rates and prices entered in the priced Bill of Quantities shall, except insofar as it is otherwise provided under the Contract include all costs of Contractor's plant, labour, supervision, materials, execution, insurance, profit, taxes and duties, together with all general risks, liabilities and obligations set out or implied in the Contract. Furthermore, all duties, taxes and other levies payable by the Contractor under the Contract, or for any other cause, as on the date 28 days prior to deadline for submission of Bids, shall be included in the rates and prices and the total Bid Price submitted by the Bidder.
4. A rate or price shall be entered against each item in the priced Bill of Quantities, whether quantities are stated or not. The cost of items against which the Contractor has failed to enter a rate or price shall be deemed covered by other rates and prices entered in the Bill of Quantities. The units and rates in figures entered into the Bill of Quantities should be typewritten or if written by hand, must be in print form. Bill of Quantities not presented accordingly may be considered nonresponsive
5. The whole cost of complying with the provisions of the Contract shall be included in the items provided in the priced Bill of Quantities, and where no items are provided, the cost shall be deemed to be distributed among the rates and prices entered for the related items of the Works.
6. Complete description of items of works in the Bill of Quantities, general directions, conditions and limitations of works, location and place of works, applicable methods, means to be adopted, type and quality of materials, use of tools, plant, and machinery are not necessarily repeated not summarized in the Bill of Quantities. Reference to the relevant sections of the Contract documentation, Technical Specifications and Drawings shall be made before entering prices against each item in the priced Bill of Quantities
7. Provisional sums if included and so designated in the Bill of Quantities shall be expended in whole or in part at the direction and discretion of the Project Manager in accordance with the Conditions of Contract.
8. The "Ref Specs" mentioned in the Bill of Quantities indicates the Technical Specifications section number(s) which are to be followed during execution of item of work in accordance with the applicable drawings.
9. Unless otherwise stated in the text of the priced Bill of Quantities, the quantities have to be measured and paid in accordance with the Measurement and Payment Clauses given in

the relevant Technical Specifications or in accordance with implied meaning of the specifications. Any special method of measurement stated in the text of priced Bill of Quantities is limited to the concerned items only.

10. All rates and amounts are in **Pakistani Rupees**. *For the purpose of clarity, it is elaborated that serial no. 03 of Preamble to this Bill of Quantities, the Contractor is expected to consider all applicable, provincial and federal, direct and indirect taxes, in accordance with the relevant laws of Pakistan, in their rates against each item of the Bill of Quantities for example: Punjab Sales Tax (PRA), General Sales Tax (GST), Duties, Levies etc.*

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)			
UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA			
01. ADMINISTRATION BLOCK			
Sub-Summary			
Sr. No.	Description	Total Amount (Rs)	Remarks
1	Administration Block		
A	Civil Works		
B	Electrical Works		
C	IT Equipments		
D	Electronics		
E	Allied Items		
F	Furniture		
	Total =		

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

01. ADMIN BLOCK

BILL OF QUANTITIES (ELECTRICAL WORKS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	24/105	Supply, insatllation, commissioning and testing of oil cooled type, Step down Power Transformer of specified rating,11/0.415 kV, i/c the cost of lifting hooks, thermometers, LT & HT bushing 5-steps, tap changer, imported double float buchholz relay, 2 earthing terminals, roller wheels, connecting terminals for cables M.S box on transformer in order to cover complete L.T side, all necessary materials required for connections on H.T & L.T side, rated voltage 11000/415/240 V impedance 6.25% or as specified by WAPDA/IEC system earth: Delta / Star, neutral solidly earthed, i/c Wapda testing charges,complete in all respects made of PEL, Siemens, as approved and directed by the Engineer Incharge (ix) 630 KVA	Each	1			
		ELECTRICAL WORKS					
		Scheduled Items (A)					
		Excavation					
2	3/21	Excavation in foundation of building, bridges and other structures, including dagbelling, dressing, refilling around structure with excavated earth, watering and ramming lead upto one chain (30 m) and lift upto 5 ft. (1.5 m)					
		a) By Manual					
		ii) in ordinary soil.	%oCft	2.30			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

01. ADMIN BLOCK

BILL OF QUANTITIES (ELECTRICAL WORKS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		RCC Foundation for Poles					
3	6/6	Providing and laying reinforced cement concrete (including prestressed concrete), using coarse sand and screened graded and washed aggregate, in required shape and design, including forms, moulds, shuttering, lifting, compacting, curing, rendering and finishing exposed surface, complete (but excluding the cost of steel reinforcement, its fabrication and placing in position, etc.):-					
		(a)(iii) Reinforced cement concrete in slab of rafts / strip foundation, base slab of column and retaining walls; etc and footing beams, other structural members other than those mentioned in 6(a) (i)&(ii) above not requiring form work (i.e. horizontal shuttering) complete in all respects:-					
		3) Type C (nominal mix 1: 2: 4)	Cft	1,800.00			
		Steel Work					
4	6/12/b	Fabrication of mild steel reinforcement for cement concrete, including cutting, bending, laying in position, making joints and fastenings, including cost of binding wire and labour charges for binding of steel reinforcement (also includes removal of rust from bars):-					
		(b) Deformed bars (Grade-40)	100Kg	45.00			
5	24/6	Supply and erection PVC pipe for recessed wiring (main and sub-main) purpose, including bends, specials, etc. in floor, wall or trenches:-					
		i) 50 mm i/d	Rft	7,700.00			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

01. ADMIN BLOCK

BILL OF QUANTITIES (ELECTRICAL WORKS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
6	24/12	Supply and erection of single core PVC insulated, PVC sheathed copper conductor, 660/1100 volts grade cable, in prelaid G.I. pipe/M.S. conduits /PVC pipe/G.I. wire/ trenches, etc (rate for cable only):-					
		ii) 6 mm sq (7/0.044")	Rft	12,750.00			
		iii) 10.00 mm sq (7/0.052")	Rft	400.00			
7	24/13	Supply and erection of copper conductor cables for service connection, in prelaid pipe/G.I. wire / trenches, etc. (rate for cable only):-					
		b) PVC insulated, PVC sheathed 3 core, 660/1100 volt cable:-					
		v) 7/1.12 mm (7/0.044")	Rft	3,000.00			
		c) PVC insulated, PVC sheathed 4 core, 660/1100 volt non armoured cable:-					
		vi) 10 mm (7/0.052")	Rft	200.00			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

01. ADMIN BLOCK

BILL OF QUANTITIES (ELECTRICAL WORKS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
8	24/68	Supplying, installation testing and commissioning of Octagonal shape electric street light pole, made of hot dipped 4.5 mm thick (7 SWG) galvanized steel ,tapered from 225 mm at bottom to 100 mm at top,with 1500 mmx60 mm dia. arm for luminaire installation, duly G.I.welded with 470x470x20 mm base plate with the help of 4 no triangular stiffeners 100x350x20 mm of GI sheet,with built in junction box with shutter,i/c the cost of nuts & J-rag bolts, duly fixed in prelaid concrete foundation, foundation will be paid additionally as approved and directed by the Engineer Incharge.					
		a) Single Arm					
		(i) 10 mtr height	Each	75.00			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

01. ADMIN BLOCK

BILL OF QUANTITIES (ELECTRICAL WORKS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
9	24/69/c	Supplying, installation and commissioning of LED Cobra-head Luminaries of specified wattage and lumens conforming to IP 66 & IK 08 or above Philips/ Osram/ Thorn or equivalent with corrosion resistant die casted Aluminum housing, silicon gasket in special groove, UV stable & scratch resistant synthetic materials, thermally hardened glass complete with LED Chip (Philips Lumiled /Cree/ Nichia /Osram make or equivalent), programmable LED driver (Harvard /TCI/ Lumotech /Philips /VOSSLOH Schwabe /Lightech make or equivalent), minimum 10kV surge protection rating i/c the cost of all accessories/ components required for proper operation, fully flexible for future upgradation and easy replacements for maintenance purposes, bucket elevator charges as approved and directed by the Engineer Incharge.					
		c) 120 Lm/Watt					
		(vi) 120 Watt with 14400 Lumens	Each	75.00			
10	24/70	Earthing of iron clad/aluminum switches, etc. with G.I. wire No. 8 SWG in G.I. pipe 15 mm (½") dia, recessed or on surface of wall and floor, complete with 1.5 metre long G.I. pipe, 50 mm (2") dia with reducing socket 4 to 5 metre below ground level, and 2 metre away from building plinth.	Job	1.00			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)**UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA****01. ADMIN BLOCK****BILL OF QUANTITIES (ELECTRICAL WORKS)**

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
11	NS-33	Fabrication, Supply, testing and commissioning of following Light control panels (LCP), floor standing weather proof, IP 65 Rated of appropriate size, made of MS Sheet 16 SWG with hinged door, handle, catcher, 2 coats of antirust and powder coated paint of approved colour, AC3 megnatic contactor, photocell for automatic operation of lights, CBs, Hand/Off/Auto switch, push button and all necessary accessories complete in all respects. LCP shall be manufactured as per specifications, single line diagram complete in all respect up to the satisfaction of Engineer incharge.					
	(a)	LCP-3 Phase	No.	1.00			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

01. ADMIN BLOCK

BILL OF QUANTITIES (ELECTRICAL WORKS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
12	NS-81	Providing and fixing Solar on-Grid 20Kw Tier A Monocrystalline, Half Cut PV Modules 20 kW (Jinko/Canadian/Longi/Trina or equivalent) Maintenance Free Grid Tied Three Phase Inverters 20 kW (GoodWe or equivalent) Wireless Remote Monitoring via 4G Dongle Device for inverter & string performances 1 Distribution Box: Chint/ABB/Eqv. MCCB AC Breaker, Surge Protection Devices 1 Structure: Galvanized Iron Fixed Tilt Roof Mounted Structures, Stainless Steel Nut bolts, Civil Works - 20 kW DC Wire: 4mm ² XLPE/PVC/Tin Coated Copper Single Core 600/1000V DC (As per Actual) AC Wire: XLPE/PVC Aluminum AC Wire for Inverter & Bus Bar Connections (As per Actual) Electrical Installation: Cable Conduits, Cable Ties etc. PVC Bends, Ducts, Flexible Pipes, MC4 connectors etc (Job) Earthing bores, Earthing wire, Copper wire & Lightning Arrestors (1) Net Meter documentation, installation & all dealings with respective DISCO 1	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

01. ADMIN BLOCK

BILL OF QUANTITIES (ELECTRICAL WORKS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
13	NS-85	Providing and fixing Solar Hybrid 20Kw Tier A Monocrystalline, Half Cut PV Modules 20 kW (Jinko/Canadian/Longi/Trina Solar or equivalent) T10-HV Hybrid Maintenance Free Three Phase Inverters 1 (Alpha ESS Smile or equivalent) Batteries: Smile BAT 8.2 kWh Li-Ion Storage Modules with 90% recommended DOD 1 Structure: GI fixed tilt roof mounted structure, Stainless Steel Nut bolts, Civil works 20 kW DC Wire: 4mm ² XLPE/PVC/Tin Coated Copper Single Core 600/1000V DC (As per Actual) AC Wire: XLPE/PVC AC Wire for Inverter & Bus Bar Connections (As per Actual) Electrical Installation: Cable Conduits, Cable Ties etc, PVC Bends, Ducts, Flexible Pipes, MC4 connectors etc Job Earthing Bores, Copper Wire, Grounding Wire & Lightning Arrestors 1 Net Meter documentation, installation & all dealings with respective DISCO 1	No.	1			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

01. ADMINISTRATION BLOCK

BILL OF QUANTITIES (IT EQUIPMENTS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	NS-01	LED Screen (75") Technology Type: UHD Android TV, Display Resolution: 4K, Panel Resolution: 3840 x 2160, Screen Size: 75", Speaker: 2 Operating System: Android or Tizen CPU: Quantum or equivalent HDR10, Contrast Ratio: 5000:1 (typ.), Audio Video IN, Headphone, HDMI x 2 or more USB: 2 or higher, Bluetooth Connectivity: Bluetooth 5.0, Wi-Fi Connectivity: Internet Link: 2.4GHz Wi-Fi 802.11 b/g/n 2T2R Ethernet Network (RJ45), Accessories: Stand, Cables and mountings, Warranty: 1 year	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

01. ADMINISTRATION BLOCK

BILL OF QUANTITIES (IT EQUIPMENTS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
2	NS-06	Laptop for Graphics Purpose Processor: 11th Gen Intel Core i7, upto 4.2Ghz, 12 MB L3 cache, (6 cores 12 threads)/ AMD Ryzen 7 4800H (8 cores 16 thread) + NVIDIA GeForce GTX 1660 (4GB or higher) Memory: 32GB (16 x2) DDR4 3200mhz Hard Drive: 1TB SSD Display: 15.6-inch FHD (1920 x 1080) Display Battery: 4-6 Cell battery Connectivity Standards Gigabit Ethernet, Wifi 802.11, Bluetooth or higher Camera & Mic: 720P HD Camera & Mic Ports: 1x USB 3.1 or higher, 1x HDMI, 1x RJ45, 1x USB 3.0 or higher, 1 x Headset/mic combo jack or Higher Accessories: 1. Standard charger 2. Carrying Case of Same Brand With Part # 3. Wireless mouse branded With Part # 4. Mouse Pad Warranty: 1 year local/ onsite Software: All laptop and desktop computers shall come with the following original/ licensed software pre-installed: 1. Operating System: Windows 11 Pro 64 bit for Laptop and Desktop 2. Office Suite: Microsoft Office Home & Business 2019 for Laptop and Desktop 3. Antivirus: TrendMicro Smart Protection OR Equivalent for 2 Years	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

01. ADMINISTRATION BLOCK

BILL OF QUANTITIES (IT EQUIPMENTS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
3	NS-07	Laptops Type: Processor: 12th Gen Intell Core i7, upto 4.7Ghz (Max Turbo Frequency) or higher Memory: 16GB DDR4 Hard Drive 512 GB SSD Display: 14- 15.6 inch FHD (1920 x 1080) Display Battery: 4 Cell battery with 3-4 hours battery backup or higher Connectivity Standards Gigabit Ethernet, Wifi 802.11, Bluetooth or higher Camera & Mic: 720P HD Camera & Mic Ports: 1x USB 3.1 or higher, 1x HDMI, 1x RJ45 1x USB 3.0 or higher, 1 x Headset/mic combo jack or Higher Accessories: 1. Standard charger 2. Carrying Case of Same Brand with Part # 3. Wireless mouse branded with Part # 4. Mouse Pad Warranty: 1 year local/ onsite Software: All laptop and desktop computers shall come with the following original/ licensed software pre-installed: 1. Operating System: Windows 11 Pro 64 bit for Laptop and Desktop 2. Office Suite: Microsoft Office Home & Business 2019 for Laptop and Desktop	No.	6			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

01. ADMINISTRATION BLOCK

BILL OF QUANTITIES (IT EQUIPMENTS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
4	NS-08	Providing USB (64 GB) USB 3.0 Branded	No.	24			
5	NS-09	Providing External Hard Disk (2 TB) Description: USB Type: micro USB to USB Type A Connection Interface: USB 3.1 Gen 1 Capacity: 2 TB Storage Media: 2.5" HDD Warranty: Two-year Limited Warranty Operating System: Microsoft Windows 7, Microsoft Windows 8, Microsoft Windows 10, Mac OS X 10.7 or later & Linux Kernel 2.6.31 or later With all accessories	No.	2			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

01. ADMINISTRATION BLOCK

BILL OF QUANTITIES (IT EQUIPMENTS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
6	NS-10	Desktop Computers Form Factor: Standard Tower Processor: Intel 12th Generation Core i7 processor 4.9 GHz (Max Turbo Frequency) or higher Graphics: Integrated Audio: Integrated HD Audio Controller Memory: 16GB DDR4 or higher Hard Disk Drives: 1) 1TB SATA HDD + 2) 128 SSD Network: Integrated Gigabit Ethernet, Wireless 802.11 standard compatible connectivity Ports: 3xUSB 3.1, 1x RJ-45, 1xHDMI, 2xUSB 2.0 or higher, DP, Audio Combo Jack or better Keyboard: Key Board Same brand Monitor: 18.5" LED or Higher Power Supply: Manufacturer Standard Warranty: 1 Year on site Accessories: 1. Mouse & Mouse Pad: a) USB Mouse Same Brand, b) Branded Mouse Pad 2. All relevant cables for desktop functioning Software: All laptop and desktop computers shall come with the following original/ licensed software pre-installed: 1. Operating System: Windows 11 Pro 64 bit for Laptop and Desktop 2. Office Suite: Microsoft Office Home & Business 2019 for Laptop and Desktop	No.	3			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

01. ADMINISTRATION BLOCK

BILL OF QUANTITIES (IT EQUIPMENTS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
7	NS-11	Providing and fixing UPS for Computers (650VA) (APC, Deutshe or equivalent) Capacity: 650VA or Higher Form Factor: Small / Mini Tower Topology: Line Interactive Surge Protection: Required Backup Time: 5 Minutes on 70% Load Power Factor: 0.7 or higher Typical Recharge Time: Maximum 6-8 Hours Battery: Maintenance Free Dry Batteries Status Display: LED / LCD Status Display Alarm Required: Should indicate Battery in Use, Battery Discharged, UPS Fault / overload	No.	3			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

01. ADMINISTRATION BLOCK

BILL OF QUANTITIES (IT EQUIPMENTS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
8	NS-12	Printer (Laser Black & White) Print Technology: Laser Print Speed: Up to 40ppm (A4) Processor: 600 MHz or higher Memory: 256 MB Printing: Duplex Automatic Black Print Resolution: 1200 x 1200 dpi Monthly Duty Cycle: Up to 40,000 pages Supported Paper Size: A4, Letter, Legal, Connectivity: standard 1 Hi-Speed USB, Gigabit Ethernet 10/100/1000BASE-T network; Wireless (Wi-Fi) Compatibility: Supported Operating System, MacOS, Windows-7,8, 10, 11. Accessories: Cables: 1 x USB, 1 x Power Cord Warranty: 1 Year	No.	2			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

01. ADMINISTRATION BLOCK

BILL OF QUANTITIES (IT EQUIPMENTS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
9	NS-13	Printer (Laser Colour) Color Network Printer - (Heavy Duty) Print Technology: Laser Print Speed (Color Normal): Upto 40 PPM Print Speed (Black Normal): Upto 40 PPM Monthly Duty Cycle: Up to 4,000 pages Printer Memory: 512MB or higher Processor: 1.2 Ghz Color Cartridges: 4 (1 each black, cyan, magenta, yellow) or equivalent Paper Trays: 2 Trays (1 Manual Bypass+ 1 Auto Feed) Supported Paper Size: A4, Letter, Legal. Networking: Required, RJ-45 Connectivity: 2 Hi-Speed USB; 1 Gigabit/Fast Ethernet 10/100/1000Base-TX; Supported Operating System: Windows-7, 8, 10 Accessories: Cables: 1 x USB, 1 x Ethernet Patch Cord, 1 x Power Cord Warranty: 1 year	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

01. ADMINISTRATION BLOCK

BILL OF QUANTITIES (IT EQUIPMENTS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
10	NS-15	Providing Photocopier Black & White Photocopier HP, Xerox or equivalent Function Copy, Print, Scan. Speed: 35PPM Duty Cycle: Up to 300,000 pages Print resolution 1200 x 1200 dpi Copy resolution: 600dpi x 600dpi Input Capacity: 2 x 500-sheet input tray Output Capacity: 500 sheet face-down output bin Duplex print options Duplex Automatic Media Size A3, A4, A5, letter, legal, executive Memory 6 GB Hard Drive 320 GB Connectivity: Ethernet 10/100/1000 Base-T, High-speed USB 3.0) Scanner 600 x 600 dpi Network Printing Yes Scan technology Flatbed; ADF Print technology Laser Interface Touch Screen Paper tray and trolley 100-sheet multi-purpose tray, 2 x 500-sheet input tray, 100 sheet ADF; Operating System Windows 10, Windows 7, Windows 8/8.1 Mac Warranty 3 Year On-site Warranty Toner Price Yield 48,000 pages Drum Price Yield 200,000 pages	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

01. ADMINISTRATION BLOCK

BILL OF QUANTITIES (IT EQUIPMENTS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
					11	NS-25	

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

01. ADMINISTRATION BLOCK

BILL OF QUANTITIES (IT EQUIPMENTS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
12	NS-26	<p>Providing Servers, Core Router, Access switch, Core switch, Ups Servers (1),Form Factor: 2U Rack Mounted,Processor: Intel Xeon Silver 4310, 2.1GHz, Turbo, 12 Cores or higher processor,CPU (Installed / Max): 2 /2,Memory: 4x 32GB DDR4 Memory, required minimum 24xDIMM slots,RAID controller: RAID Controller, 12Gbps, 2GB Cache or more,Support RAID 0,1,5,6,Hard Disk Drives: 3x 2.4TB SAS 10K HDD Hot Plug,Optical Drives: Super Drive (Internal/External),Network: 4x 1G Base-T Network Ports,Graphics: Integrated Graphics,Ports: Required 1x VGA, At least 4 x USB 3.0 and USB 2.0 ports, Dedicated USB port for Server Management ,Keyboard & Mouse: Branded Standard USB,Monitor: Same Brand LED 18.5" or higher, Power Supply: 2xHot-plug compatible Redundant Power Supply, 2m PDU style Power Cords,System Management: Embedded Remote Management with dedicated RJ45 port, license must include Pre-OS virtual remote KVM (Keyboard Video, Mouse) functionality to see server boot process remotely or to perform Bios, RAID controller settings etc tasks. Accessories: Server Rack Mounting Kit with sliding rails and Cable Management Accessory,Warranty: Proposed Server should be quoted with minimum 3 years Hardware warranty and onsite support. .Operating System:Licensed Windows Server 2022 standard edition minimum 24 cores.,Services:.a. Assembly of Server (If required),b. Configuration of Raid 1and 5,c. Disk Partitioning ,d. Installation of Operating System,e. Rack Mounting,f. Volume /LUNs creation.,Font Panel: Quick removable front panel / cover,Expansion Slots: Required min 3xEmpty PCIe slots other than occupied, upgradable up to Eight PCI-Express 3.0 slots,Cooling Minimum: 6xRedundant Hot Plug Fans or higher,Drive Slots: Chassis with 8x2.5 inch HDD slots, must support/upgradable up to 24 SFF drives,Server must support Red Hat Enterprise Linux, SUSE Linux Enterprise Server, VMware ESXi),Core Router + Firewall WAN 2 Units,Device Type: Firewall,Form Factor: 1U or above Rack Mounted ,Ports: 1 USB, 1 Console, 2x GE RJ45 MGMT/DMZ Port, 4x GE RJ45 WAN Ports, 12x GE RJ45 Ports, 2x 10 GE SFP, 4x GE SFP Slots, 4x GE RJ45/SFP Shared Media Pairs ,Firewall throughput: 20 Gbps,IPS throughput: 2.6 Gbps,NGFW throughput: 1.6 Gbps,IPsec VPN throughput (512 bytes): 11.5 Gbps,SSL VPN throughput: 1 Gbps,Threat protection: 1 Gbps,Features: Firewall should support UTM features IPS, antivirus, URL filtering, Web content filtering, Web Application Protection, Email Protection, Encryption,Concurrent sessions: 1.5 Million,New sessions / Second: 56,000,SSL inspection throughput (IPS, avg. HTTPS): 1 Gbps,Application control throughput: 2.2 Gbps,Accessories: Rack Cable, Rack Mounts, Console Cable.,AC Power Supply: 100 -240V AC, 50 – 60 Hz,Access Switch 26 Units,● 24 ports of Gigabit Ethernet (GbE) 10/100/1000 desktop connectivity,● 1 GbE Small Form-Factor Pluggable (SFP) uplinks,● 24 x 10/100/1000Base-T - RJ-45 PoE ports,● 1 x USB Type A , 1 x console /USB/RJ 45 for management,● 4 x SFP (mini-GBIC),Core Switch 4 Units,Device Type: Switch – 24 Ports- L3-managed - stackable,Form Factor: 1U or above Rack Mounted ,Ports: 24 x 10/100/1000 ports, 4 x 10 Gigabit Ethernet (2 x 10GBase-T/SFP+combo + 2 x SFP+), Multimode 1G (SFP+) upto 500M,DRAM Memory: 256 MB (installed) or above ,Flash Memory: 32 MB (installed) or above. Switching Capacity: Up to 128 Gbps or higher,Bandwidth Capacity: Up to 70 Mpps or higher,Management Protocol: Internet Group Management Protocol (IGMP) supports 4K multicast groups and Routing Information Protocol (RIPv2),VLAN: Up to 4094,Features: Flow control, layer 2 switching, VLAN support, IPv6 support, Spanning Tree Protocol (STP) support, Rapid Spanning Tree Protocol (RSTP) support, Multiple Spanning Tree Protocol (MSTP) support, Access Control List (ACL) support, Quality of Service (QoS), reset button, LACP support, Energy Efficient Ethernet, Dynamic VLAN Support (GVRP),MAC Table: Up to 16k entries or above a,Network Security: DHCP snooping, Dynamic ARP, IP/MC/Port Binding, Poet Security, PVE,Management: SNA, SNMP, RMON,Licensing: Relevant licensed IOS to support the afore mentioned features. ,Accessories: Rack Cable, Rack Mounts, Console Cable.,5KVAx 3000W UPS (1)</p>	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

01. ADMINISTRATION BLOCK

BILL OF QUANTITIES (IT EQUIPMENTS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
13	NS-27	<p>Providing and fixing IP Camera (Security System, Camera, LED and accessories)</p> <p>Outdoor IP Camera: 64 Units,Resolution: 4 MP (2560 x 1440) ,2.8 mm / 100° lens,IR illuminator with range up to 50 m ,H.265+/H.265/H.264+/H.264/MPEG video compression,3D-DNR, DWDR, BLC video processing functions,Access via application,Region of interest (ROI),Mechanically switching IR filter,IP67 rating,Power: 12 VDC or PoE (802.3af),Indoor IP Camera: 64 Units,Resolution: 4 MP (2560 x 1440) ,2.8 mm / 12 mm lens,IR illuminator with range up to 30 m ,H.265+/H.265/H.264+/H.264/MPEG video compression,3D-DNR, DWDR, BLC video processing functions,Access via application,Region of interest (ROI),Mechanically switching IR filter,IP67 rating,Power: 12 VDC or PoE (802.3af),Network Video Recorder (NVR): Video/ Audio input: 64 Channels,Network: Incoming bandwidth:320Mbps,Video/Audio Output:HDMI Output:1-ch, resolution: 4K(3840*2160)/60Hz, 4K(3840*2160)/30Hz, 1920*1080P/60Hz, 1600*1200/60Hz, 1280*1024/60Hz, 1280*720/60Hz, 1024*768/60Hz Recording Resolution:12MP/MP/6MP/5MP/4MP/3MP/1080p/UXGA/720p/VGA/4CIF/DCIF/2CIF/CIF/QCIF VGA Output:1-ch, resolution: 1920*1080P/60Hz, 1280*1024/60Hz, 1280*720/60Hz, 1024*768/60Hz,Decoding: 2Units,Capability:8-ch@ 1080P,Live view ,Playback: ,MP/6MP/5MP/3MP/1080p/UXGA/720p/VGA/4CIF/DCIF/2CIF/CIF/QCIF,Hard Disk:8 SATA interfaces with 8 HDDs Capacity with pre installed 6 TBx8 HDDs,Switch: 1 Unit• Core Switch Layer – 2 Managed- 12 Port SFP Switch with SFP Modules upto 5Km Complete• Camera Cabling CAT 6 Including Ducting Cat 6 UTP /STP 23AWG 3M, Schneider, or Equivalent. Transmission Frequency: 250Mhz including PVC Pipe etc 1600ft,• Optical Fiber • Optical Fiber: Single Mode 8 Core • Cabling and related accessories including Digging, laying ODF Boxes, Patch cords , splicing etc with in PVC or HDPE pipe wherever required, • Patch Panel: 24 Ports Patch Panel with loaded IO's • Tagging: Tagging of IO, Patch Panel Ports, Cables (All Ends) 3000ft• Data Rack (30U) Branded• UPS 3kVA APC Branded with 2 x 150 A Dry Batteries,LED 55' (2)</p>	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

01. ADMINISTRATION BLOCK

BILL OF QUANTITIES (IT EQUIPMENTS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
14	NS-28	Providing and fixing Networking Solution (Cable + Wi-Fi) LAN Cabling: CAT 6 Including Ducting Cat 6 UTP /STP 23AWG 3M, D-Link, Schneider, or Equivalent. 16,000ft Transmission Frequency: 250Mhz including PVC pipe etc Face Plates & Back Boxes: Dual I/O. 128 I/O: CAT6 I/O Patch Cord: 3 Meter 64 Patch Cord: 1 Meter 64 Ducting: PVC Pipe / Dura Duct, Flexible Pipe 8000ft Patch Panels: 24 Ports Patch Panel 6 Tagging: Tagging of I/O, Patch Panel Ports, Cables (All Ends) 1 Job Data Rack (42U) Branded 1 unit Related Services: • Ducting and Cabling of LAN • Installation of Switches, Patch Panels, Data Rack, I/O and RJ45 Connectors. • All services related to commissioning of LAN and Internet. • Fluke testing must be performed by supplier to verify the length and quality of cable. 6 core Single Mod Fiber complete is all aspect including splicing fiber patch cords digging etc Warranty: 1 Year	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

01. ADMINISTRATION BLOCK

BILL OF QUANTITIES (IT EQUIPMENTS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
15	NS-29	<p>Providing and fixing Wireless LAN Controller: Should support 5 Gbps or higher throughput. 2 or higher 10G ports with compatible SFP modules, 8 or higher GE ports. Support of MAC based authentication, 802.1X authentication, Portal authentication, should be able to support at least 100 Aps on single controller (Licenses of 35APs included). Should support at least 1000 users on single controller. Support of WPA, WEP, TKIP. Built-in server for portal/802.1x authentication. Support of dynamic routing protocols OSPF, BGP etc., LACP. URL filtering, support of IDS/IPS, should be able to mitigate Trojan horse, worms and buffer overflow. Should support configuration management through CLI, web based as well as SSH. Should support SNMPv1/v2/v3. Should support wireless performance monitoring of APs, wireless controller. Should be able to support both 2.4Ghz and 5Ghz frequency. Controller should be able to enable/disable SSID on periodic basis. Should support secure guest access through portal.</p> <p>Note: Wireless LAN controller must not have EOL/EOS in next 5 years. WLAN Access Point (PoE) (Qty 35): Enterprise model fully comply IEEE802.11a/b/g/n/ac or 802.11ax, 3X3 MIMO or higher. Should be able to operate with quoted Wireless Lan Controller as well as stand-alone in case WLC is not functional. Data rate: 5.75Gbps or higher. working in both 2.4GHz and 5GHz, Min. Antenna Gain: 1 dBi or higher on 2.4GHz and 3dBi on 5GHz. Built in antennas, MAC address authentication. 1X1GE port or higher. support of 16 SSIDs or more. Should support of 512 or more users per AP. 802.3at/af POE Power Supply (POE injector included). DHCP Snooping, WIDS, WIPS, Rouge Device Detection, AP Blacklisting and Whitelisting and other standard features. warranty: 3 years</p>	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

01. ADMINISTRATION BLOCK

BILL OF QUANTITIES (IT EQUIPMENTS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
16	NS-30	Providing and fixing IP Telephone Exchange, 4 Input lines x 64 Output Lines (1 Unit) Supports up to 500 users and up to 75 concurrent calls • Zero configuration provisioning of SIP endpoints • Built-in Instant Messaging (IM), Audio Conferencing & Web Meetings platform that supports access from computers, mobile devices, and SIP endpoints communications using desktops, Web, and Android/ iOS devices • API available for third-party integrations, including CRM and PMS platforms • Advanced security protection with secure boot, unique certificate and random default password to protect calls and accounts • Three Gigabit auto-sensing RJ45 network ports with integrated PoE+ and support NAT router,• Automated NAT firewall traversal service facilitates secure remote connections,• Enhanced reliability with support for Hot Standby High Availability and local dual deployment,• Supports Full-Band Opus voice codec, jitter resilience up to 50% packet loss,Product Specifications • Analog Telephone FXS Ports: (4) RJ11 ports,• (3) Self-adaptive Gigabit ports with PoE+ • Maximum Call Capacity: • Users: 500 • Concurrent Calls (G 711): 75 • Max. concurrent SRTP calls (G 711): 75 • Maximum Attendees of Conference Badges: 5 meeting rooms and up to 75 parties IP Telephone (PoE) (8 reception Sets, 56 normal sets with CLI) ,2 SIP accounts, 2 line keys, 3-way conferencing, Dual-switched 10/100 mbps ports, integrated PoE ,HD audio on speakerphone and handset support for headsets,Up to 1000 contacts, call history up to 200 records,Networking (IP Telephony Cabling) 64 Units,LAN Cabling: CAT 6 Including Ducting Cat 6 UTP /STP 23AWG 3M, D-Link, Schneider, or Equivalent. Transmission Frequency: 250Mhz including PVC pipe etc ,Face Plates & Back Boxes: Dual I/O. 10,000 Feet I/O: CAT6 I/O 64,Patch Cord: 3 Meter 32,Patch Cord: 1 Meter 32,Ducting: PVC Pipe / Dura Duct, Flexible Pipe 5000 Tagging: Tagging of I/O, Patch Panel Ports, Cables (All Ends)	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

01. ADMINISTRATION BLOCK

BILL OF QUANTITIES (IT EQUIPMENTS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
17	NS-31	Providing and fixing Biometric attendance machine Makes (Zkteco and approved equivalent) with: Display: 4.3-Inch Touch Screen Face capacity: 3,000 Fingerprint capacity: 4,000 Card capacity: 10,000 (Optional) Logs capacity: 100,000 Communication: TCP/IP, USB Host, Standard Functions: Automatic Status Switch, Self-Service Query, Work Code, SMS, DST, T9 Input, 9 Digit User ID, Scheduled Bell, Photo ID, Wiegand Out Optional Functions: ID/MiFare/HID Card, 3G, ADMS, 2000mAH Backup Battery, External Printer and Bell	No.	1			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)							
UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA							
01. ADMINISTRATION BLOCK							
BILL OF QUANTITIES (ELECTRONICS)							
Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	NS-35	Providing and fixing Inverter ACs make (Gree, Dawlance, Haier or approved equivalent) (Inverter ACs 1.5 tons) DC Inverter Technology mounted (front flow) Capacity >18000 BTU Power supply 220+10%/1 PH/50Hz Power Input (cooling/Heating) <1900 watt Running Current <9AMP Energy Saving 60% or above Low voltage function 150 or below Air Circulation (Indoor / Outdoor) >800/2500 CMH Noise level (Indoor / Outdoor) < (45/55) dB Panel display LCD Remote controlled LCD Temperature control thermostat or equivalent Auto air swing Speed setting cooling/Fan/Auto On/off timer Auto restart Refrigerant R410 / R410 Cooling coil (Inner Grooved copper anti-corrosive fine (or better), 1 year warranty and after sale service 10 year compressor warranty.	No.	10			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)							
UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA							
01. ADMINISTRATION BLOCK							
BILL OF QUANTITIES (ELECTRONICS)							
Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
2	NS-37	Providing Refrigerator 20 Cubic Feet Invertor make (Homage, Pel, Haier, Dawlance and approved equivalent) with: 20 Cu-Ft Capacity, smart invertor, Operating voltage/ Frequency 220/50, electronic control, Power consumption 160watt maximum, Adjustable thermostat (Temperature Control), interior Light LED, Low voltage operation upto 150v, Refrigerant R-134a or R600a, Evaporator Roll Bond, Auto Defrost function, Copper Condenser, Tow Door, Shelves/Trays/Scrapper/Door Pocket, 1 year warranty and after sale service.	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)							
UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA							
01. ADMINISTRATION BLOCK							
BILL OF QUANTITIES (ELECTRONICS)							
Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
3	NS-44	Providing Microwave Oven 30 Liter make (Dawlance, Ecostar, Haier or approved equivalent) with: 30 liter capacity, Voltage 220 - 240, Latest Model, Rated input power 1400W maximum, Rated output power 900W approximately, LED display, Electronic (Touch Panel) control type & 1 year warranty and after sale services.	No.	1			
4	NS-45	Providing Water Dispensers make (Homeage, Pell, Haier, Orient and approved equivalent) with: 3 Tab Operation I.e. Hot, Cold and Normal, Refrigerator Cabinet 20 liters, Energy Saving, 1L or above cold water Capacity, 3.5L or above hot water Capacity, Cooling power input 1-year complete part warranty, 1 Year after sale service	No.	1			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

01. ADMINISTRATION BLOCK

BILL OF QUANTITIES (ALLIED ITEMS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	NS-51	Providing Crokery, 12 Person set 54 pieces, Pyrex	No.	2.00			
2	NS-52	Providing Cutleries 12 Person set 52 pieces, Material Stainless steel	No.	2.00			
3	NS-75	Providing and fixing Fire Extinguishers 1. DCP type 2. CO2	No.	5.00			
4	NS-76	Providing Fire Blanket	No.	5.00			
5	NS-77	Providing First Aid Kits	No.	1.00			
6	NS-86	Providing and fixing Black out Roller Blinds: Blackout roller blinds are room darkening blinds perfect choice for sunlight control, TV glare, Bleaching furniture, Privacy issues and heat and insulation in any room either its your office or home. Ideal choice use by pairing with curtains or alone. Fit perfectly.	Sft	579.00			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

01. ADMINISTRATION BLOCK

BILL OF QUANTITIES (FURNITURE)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	NS-F01	<p>OFFICER TABLE WITH DRAWER TROLLEY Size: 1200 x 600 x 760 mm Structure made of 25 x 50 mm mild steel rectangular pipe. Finished with black powder coating. Top & Back made MDF pressed with lamination on both sides. Edges covered with matching 1 mm pvc.</p> <p>b. DRAWER TROLLEY Standard size: All made of MDF pressed with lamination on both sides. Having 1 drawer and 1 cabinet for box file. 1 Set (1 Tabe + 1 Drawer Trolley)</p>	No	12			
2	NS-F02	<p>OFFICER TABLE WITH SIDE RACK & DRAWER TROLLEY Size: 1200 x 600 x 760 mm Structure made of 25 x 50 mm mild steel rectangular pipe. Finished with black powder coating. Top & Back made MDF pressed with lamination on both sides. Edges covered with matching 1 mm pvc. With one drawer.</p> <p>b. SIDE RACK Size: 820 x 390 x 760 mm Complete structure made of MDF pressed with lamination on both sides. With one door and one shelf. 1 Set (1 Tabe + 1 Side Rack)</p>	No	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

01. ADMINISTRATION BLOCK

BILL OF QUANTITIES (FURNITURE)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
3	NS-F03	U-SHAPE MEETING ROOM TABLE FOR 40 PERSONS Size: 40' x 6.5' x 2.5' Top/back made of MDF pressed with lamination on both sides. Edges covered with matching PVC. Structure made of 18 guage rectangular mild steel pipe. Finished with black powder coating. With 10 electric sockets.	No	1			
4	NS-F09	ROUND TABLE FOR 6 PERSONS (ACTIVITY ROOM) Size: 4 Ø Structure made of 38x38 mm mild steel sq. pipe Top made of high density chipboard pressed with one side formica and other side sh.veneer.	No	8			
5	NS-F12	RECEPTION DESK Size: 6' x 3' x 4' Top / structure made of MDF pressed with lamination on both sides. Edges covered with matching PVC.	No	1			
6	NS-F17	REVOLVING CHAIR MOD. WSC/B-9 Seat cushioned 1st quality foam covered with leatherite & back with black mesh. Complete with high quality revolving pedestal. With arms. Low back chair.	No	55			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

01. ADMINISTRATION BLOCK

BILL OF QUANTITIES (FURNITURE)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
7	NS-F18	OFFICER REVOLVING CHAIR MOD. 0.39-PP High back chair with PP arms. Seat & cushioned with black leatherite. Completed with high quality revolving pedestal.	No	3			
8	NS-F20	ACTIVITY CHAIR MOD.0.34 ARMLESS (CUSHIONED) Structure made of 20/20 mm mild steel square pipe. Finished with silver paint. Seat/back made of solid seasoned shisham wood, cushioned with leatherite	No	48			
9	NS-F34	ROSTRUM MOD. SPECIAL Size: 620 x 550 x 1170 mm (H) Structure made of high density chipboard pressed with sh. veneer on both sides. With one shelf. Finished with N.C. lacquer TEVTA	No	1			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)			
UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA			
02. OMER ADMIN BLOCK			
Sub-Summary			
Sr. No.	Description	Total Amount (Rs)	Remarks
2	Omer Admin Block		
A	Civil Works		
B	Electrical Works		
C	IT Equipments		
D	Electronics		
E	Allied Items		
F	Furniture		
	Total =		

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

02. OMER ADMIN BLOCK

BILL OF QUANTITIES (IT EQUIPMENT)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	NS-03	LED Screen (55") Technology Type: UHD Andriod TV, Display Resolution: 4K, Panel Resolution: 3840 x 2160, Screen Size: 55", Speaker: 2 Operating System: Android or Tizen CPU: Quantum or Equivalent HDR10, Contrast Ratio: 5000:1 (typ.), HDMI x 2 or higher Audio Video IN, Headphone, USB: 2 or higher, BlueTooth Connectivity: BlueTooth 5.0, Wi-Fi Connectivity: Internet Link: 2.4GHz Wi-Fi 802.11 b/g/n or ac Ethernet Network (RJ45), Accessories: Stand, Cables and mountings, Warranty: 1 year	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

02. OMER ADMIN BLOCK

BILL OF QUANTITIES (IT EQUIPMENT)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
2	NS-07	Laptops Type: Processor: 12th Gen Intell Core i7, upto 4.7Ghz (Max Turbo Frequency) or higher Memory: 16GB DDR4 Hard Drive 512 GB SSD Display: 14- 15.6 inch FHD (1920 x 1080) Display Battery: 4 Cell battery with 3-4 hours battery backup or higher Connectivity Standards Gigabit Ethernet, Wifi 802.11, Bluetooth or higher Camera & Mic: 720P HD Camera & Mic Ports: 1x USB 3.1 or higher, 1x HDMI, 1x RJ45 1x USB 3.0 or higher, 1 x Headset/mic combo jack or Higher Accessories: 1. Standard charger 2. Carrying Case of Same Brand with Part # 3. Wireless mouse branded with Part # 4. Mouse Pad Warranty: 1 year local/ onsite Software: All laptop and desktop computers shall come with the following original/ licensed software pre-installed: 1. Operating System: Windows 11 Pro 64 bit for Laptop and Desktop 2. Office Suite: Microsoft Office Home & Business 2019 for Laptop and Desktop	No.	2			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

02. OMER ADMIN BLOCK

BILL OF QUANTITIES (IT EQUIPMENT)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
3	NS-12	Printer (Laser Black & White) Print Technology: Laser Print Speed: Up to 40ppm (A4) Processor: 600 MHz or higher Memory: 256 MB Printing: Duplex Automatic Black Print Resolution: 1200 x 1200 dpi Monthly Duty Cycle: Up to 40,000 pages Supported Paper Size: A4, Letter, Legal, Connectivity: standard 1 Hi-Speed USB, Gigabit Ethernet 10/100/1000BASE-T network; Wireless (Wi-Fi) Compatibility: Supported Operating System, MacOS, Windows-7,8, 10, 11. Accessories: Cables: 1 x USB, 1 x Power Cord Warranty: 1 Year	No.	2			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

02. OMER ADMIN BLOCK

BILL OF QUANTITIES (IT EQUIPMENT)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
4	NS-13	Printer (Laser Colour) Color Network Printer - (Heavy Duty) Print Technology: Laser Print Speed (Color Normal): Upto 40 PPM Print Speed (Black Normal): Upto 40 PPM Monthly Duty Cycle: Up to 4,000 pages Printer Memory: 512MB or higher Processor: 1.2 Ghz Color Cartridges: 4 (1 each black, cyan, magenta, yellow) or equivalent Paper Trays: 2 Trays (1 Manual Bypass+ 1 Auto Feed) Supported Paper Size: A4, Letter, Legal. Networking: Required, RJ-45 Connectivity: 2 Hi-Speed USB; 1 Gigabit/Fast Ethernet 10/100/1000Base-TX; Supported Operating System: Windows-7, 8, 10 Accessories: Cables: 1 x USB, 1 x Ethernet Patch Cord, 1 x Power Cord Warranty: 1 year	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

02. OMER ADMIN BLOCK

BILL OF QUANTITIES (IT EQUIPMENT)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
5	NS-15	Providing Photocopier Black & White Photocopier HP, Xerox or equivalent Function Copy, Print, Scan, Speed: 35PPM Duty Cycle: Up to 300,000 pages Print resolution 1200 x 1200 dpi Copy resolution: 600dpi x 600dpi Input Capacity: 2 x 500-sheet input tray Output Capacity: 500 sheet face-down output bin Duplex print options Duplex Automatic Media Size A3, A4, A5, letter, legal, executive Memory 6 GB Hard Drive 320 GB Connectivity: Ethernet 10/100/1000 Base-T, High-speed USB 3.0) Scanner 600 x 600 dpi Network Printing Yes Scan technology Flatbed; ADF Print technology Laser Interface Touch Screen Paper tray and trolley 100-sheet multi-purpose tray, 2 x 500-sheet input tray, 100 sheet ADF; Operating System Windows 10, Windows 7, Windows 8/8.1 Mac Warranty 3 Year On-site Warranty Toner Price Yield 48,000 pages Drum Price Yield 200,000 pages	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

02. OMER ADMIN BLOCK

BILL OF QUANTITIES (IT EQUIPMENT)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
6	NS-31	Providing and fixing Biometric attendance machine Makes (Zkteco and approved equivalent) with: Display: 4.3-Inch Touch Screen Face capacity: 3,000 Fingerprint capacity: 4,000 Card capacity: 10,000 (Optional) Logs capacity: 100,000 Communication: TCP/IP, USB Host, Standard Functions: Automatic Status Switch, Self-Service Query, Work Code, SMS, DST, T9 Input, 9 Digit User ID, Scheduled Bell, Photo ID, Wiegand Out Optional Functions: ID/MiFare/HID Card, 3G, ADMS, 2000mAH Backup Battery, External Printer and Bell	No.	1			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

02. OMER ADMIN BLOCK

BILL OF QUANTITIES (ELECTRONICS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	NS-35	Providing and fixing Inverter ACs make (Gree, Dawlance, Haier or approved equivalent) (Inverter ACs 1.5 tons) DC Inverter Technology mounted (front flow) Capacity >18000 BTU Power supply 220+10%/1 PH/50Hz Power Input (cooling/Heating) <1900 watt Running Current <9AMP Energy Saving 60% or above Low voltage function 150 or below Air Circulation (Indoor / Outdoor) >800/2500 CMH Noise level (Indoor / Outdoor) < (45/55) dB Panel display LCD Remote controlled LCD Temperature control thermostat or equivalent Auto air swing Speed setting cooling/Fan/Auto On/off timer Auto restart Refrigerant R410 / R410 Cooling coil (Inner Grooved copper anti-corrosive fine (or better), 1 year warranty and after sale service 10 year compressor warranty.	No.	8			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

02. OMER ADMIN BLOCK

BILL OF QUANTITIES (ELECTRONICS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
2	NS-37	Providing Refrigerator 20 Cubic Feet Invertor make (Homage, Pel, Haier, Dawlance and approved equivalent) with: 20 Cu-Ft Capacity, smart invertor, Operating voltage/ Frequency 220/50, electronic control, Power consumption 160watt maximum, Adjustable thermostat (Temperature Control), interior Light LED, Low voltage operation upto 150v, Refrigerant R-134a or R600a, Evaporator Roll Bond, Auto Defrost function, Copper Condenser, Tow Door, Shelves/Trays/Scrapper/Door Pocket, 1 year warranty and after sale service.	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

02. OMER ADMIN BLOCK

BILL OF QUANTITIES (ELECTRONICS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
3	NS-44	Providing Microwave Oven 30 Liter make (Dawlance, Ecostar, Haier or approved equivalent) with: 30 liter capacity, Voltage 220 - 240, Latest Model, Rated input power 1400W maximum, Rated output power 900W approximately, LED display, Electronic (Touch Panel) control type & 1 year warranty and after sale services.	No.	1			
4	NS-45	Providing Water Dispensers make (Homeage, Pell, Haier, Orient and approved equivalent) with: 3 Tab Operation I.e. Hot, Cold and Normal, Refrigerator Cabinet 20 liters, Energy Saving, 1L or above cold water Capacity, 3.5L or above hot water Capacity, Cooling power input 1-year complete part warranty, 1 Year after sale service	No.	2			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

02. OMER ADMIN BLOCK

BILL OF QUANTITIES (ALLIED ITEMS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	NS-39	Providing Stove Super Asia Gas Hob SHB-133 or equivalent: a) Stainless steel surface b) Cast iron support c) Burner with safety device d) SKU (20253070-PK-1401870352)	No.	1			
2	NS-51	Providing Crokery, 12 Person set 54 pieces, Pyrex	No.	2			
3	NS-52	Providing Cuttleries 12 Person set 52 pieces, Material Stainless steel	No.	2			
4	NS-75	Providing and fixing Fire Extinguishers 1. DCP type 2. CO2	No.	3			
5	NS-76	Providing Fire Blanket	No.	3			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

02. OMER ADMIN BLOCK

BILL OF QUANTITIES (ALLIED ITEMS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
6	NS-86	Providing and fixing Black out Roller Blinds: Blackout roller blinds are room darkening blinds perfect choice for sunlight control, TV glare, Bleaching furniture, Privacy issues and heat and insulation in any room either its your office or home. Ideal choice use by pairing with curtains or alone. Fit perfectly.	SFT	576			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

02. OMER ADMIN BLOCK

BILL OF QUANTITIES (FURNITURE)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	NS-F01	OFFICER TABLE WITH DRAWER TROLLEY Size: 1200 x 600 x 760 mm Structure made of 25 x 50 mm mild steel rectangular pipe. Finished with black powder coating. Top & Back made MDF pressed with lamination on both sides. Edges covered with matching 1 mm pvc. b. DRAWER TROLLEY Standard size: All made of MDF pressed with lamination on both sides. Having 1 drawer and 1 cabinet for box file. 1 Set (1 Tabe + 1 Drawer Trolley)	No	3			
2	NS-F02	OFFICER TABLE WITH SIDE RACK & DRAWER TROLLEY Size: 1200 x 600 x 760 mm Structure made of 25 x 50 mm mild steel rectangular pipe. Finished with black powder coating. Top & Back made MDF pressed with lamination on both sides. Edges covered with matching 1 mm pvc. With one drawer. b. SIDE RACK Size: 820 x 390 x 760 mm Complete structure made of MDF pressed with lamination on both sides. With one door and one shelf. 1 Set (1 Tabe + 1 Side Rack)	No	7			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

02. OMER ADMIN BLOCK

BILL OF QUANTITIES (FURNITURE)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
3	NS-F06	MEETING ROOM TABLE FOR 12 PERSONS Size: 12' x 6' x 2.5' Top / structure made of MDF pressed with lamination on both sides. Edges covered with matching PVC.	No	2			
4	NS-F17	REVOLVING CHAIR MOD. WSC/B-9 Seat cushioned 1st quality foam covered with leatherite & back with black mesh. Complete with high quality revolving pedestal. With arms. Low back chair.	No	1			
5	NS-F19	VISITOR / MEETING CHAIR WITH ARM MOD.0.30 NEW MF Structure made of 25/25 mm mild steel square pipe. Finished with N.C. paint. Seat and back made of solid seasoned wood cushioned with leatherite. With arms 20	No	14			
6	NS-F34	ROSTRUM MOD. SPECIAL Size: 620 x 550 x 1170 mm (H) Structure made of high density chipboard pressed with sh. veneer on both sides. With one shelf. Finished with N.C. lacquer	No	1			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)			
UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA			
03. USMAN ACADEMIC BLOCK			
Sub-Summary			
Sr. No.	Description	Total Amount (Rs)	Remarks
3	Usman Academic Block		
A	Civil Works		
B	Electrical Works		
C	IT Equipments		
D	Electronics		
E	Allied Items		
F	Furniture		
	Total =		

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

03. USMAN ACADEMIC BLOCK

BILL OF QUANTITIES (ELECTRICAL WORKS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	NS-85	Providing and fixing Solar Hybrid 20Kw Tier A Monocrystalline, Half Cut PV Modules 20 kW (Jinko/Canadian/Longi/Trina Solar or equivalent) T10-HV Hybrid Maintenance Free Three Phase Inverters 1 (Alpha ESS Smile or equivalent) Batteries: Smile BAT 8.2 kWh Li-Ion Storage Modules with 90% recommended DOD 1 Structure: GI fixed tilt roof mounted structure, Stainless Steel Nut bolts, Civil works 20 kW DC Wire: 4mm ² XLPE/PVC/Tin Coated Copper Single Core 600/1000V DC (As per Actual) AC Wire: XLPE/PVC AC Wire for Inverter & Bus Bar Connections (As per Actual) Electrical Installation: Cable Conduits, Cable Ties etc, PVC Bends, Ducts, Flexible Pipes, MC4 connectors etc Job Earthing Bores, Copper Wire, Grounding Wire & Lightning Arrestors 1 Net Meter documentation, installation & all dealings with respective DISCO 1	No.	1			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

03. USMAN ACADEMIC BLOCK

BILL OF QUANTITIES (IT EQUIPMENT)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	RA-01	LED Screen (75") Technology Type: UHD Android TV, Display Resolution: 4K, Panel Resolution: 3840 x 2160, Screen Size: 75", Speaker: 2 Operating System: Android or Tizen CPU: Quantum or equivalent HDR10, Contrast Ratio: 5000:1 (typ.), Audio Video IN, Headphone, HDMI x 2 or more USB: 2 or higher, Bluetooth Connectivity: Bluetooth 5.0, Wi-Fi Connectivity: Internet Link: 2.4GHz Wi-Fi 802.11 b/g/n 2T2R Ethernet Network (RJ45), Accessories: Stand, Cables and mountings, Warranty: 1 year	No.	4			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

03. USMAN ACADEMIC BLOCK

BILL OF QUANTITIES (IT EQUIPMENT)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
2	NS-07	Laptops Type: Processor: 12th Gen Intell Core i7, upto 4.7Ghz (Max Turbo Frequency) or higher Memory: 16GB DDR4 Hard Drive 512 GB SSD Display: 14- 15.6 inch FHD (1920 x 1080) Display Battery: 4 Cell battery with 3-4 hours battery backup or higher Connectivity Standards Gigabit Ethernet, Wifi 802.11, Bluetooth or higher Camera & Mic: 720P HD Camera & Mic Ports: 1x USB 3.1 or higher, 1x HDMI, 1x RJ45 1x USB 3.0 or higher, 1 x Headset/mic combo jack or Higher Accessories: 1. Standard charger 2. Carrying Case of Same Brand with Part # 3. Wireless mouse branded with Part # 4. Mouse Pad Warranty: 1 year local/ onsite Software: All laptop and desktop computers shall come with the following original/ licensed software pre-installed: 1. Operating System: Windows 11 Pro 64 bit for Laptop and Desktop 2. Office Suite: Microsoft Office Home & Business 2019 for Laptop and Desktop	No.	6			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

03. USMAN ACADEMIC BLOCK

BILL OF QUANTITIES (IT EQUIPMENT)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
3	NS-12	Printer (Laser Black & White) Print Technology: Laser Print Speed: Up to 40ppm (A4) Processor: 600 MHz or higher Memory: 256 MB Printing: Duplex Automatic Black Print Resolution: 1200 x 1200 dpi Monthly Duty Cycle: Up to 40,000 pages Supported Paper Size: A4, Letter, Legal, Connectivity: standard 1 Hi-Speed USB, Gigabit Ethernet 10/100/1000BASE-T network; Wireless (Wi-Fi) Compatibility: Supported Operating System, MacOS, Windows-7,8, 10, 11. Accessories: Cables: 1 x USB, 1 x Power Cord Warranty: 1 Year	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

03. USMAN ACADEMIC BLOCK

BILL OF QUANTITIES (IT EQUIPMENT)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
4	NS-17	Multimedia Projection System: DLP/LCD Full HD 1080p Resolution, 4000 ANSI lumens, Contrast Ratio: 15000:1 HDMI x 2 Up to 20,000 hours lamp life (SuperEco + mode), Aspect Ratio: 16:9 or higher Zoom: 1.1x or higher I/ O Connection: VGA-In, Audio-In(RCA), Audio-In (Mini jack), Audio- Out , Microphone, USB Type A, 1x RJ45, 1 x Type A USB Accessories: Remote Control, AC Power Cord, 30M HDMI Cable Compatible with projector, Ceiling mount Kit	No.	2			
5	NS-18	Automatic remote controll Sliding Screen for multimedia Wall or Ceiling Mount, Non-Tensioned, 120" Diagonal, Matte White Finish, Front Projection, With Low Voltage Controller, 120V, 60Hz. Accessories: All recommended accessories.	No.	1			
6	NS-19	Providing Screen for multimedia with Tripod Stand (6x8) 120" Diagonal, Matte White Finish, Front Projection	No.	2			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

03. USMAN ACADEMIC BLOCK

BILL OF QUANTITIES (IT EQUIPMENT)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
7	NS-20	Providing and fixing Interactive LED 65" Display Backlight D-LED Backlight (Resolution: 3840*2160) Brightness: 350 cd (Contrast: 4000:1) -Screen Size: 1428.5*803.5 Aspect Ratio 16:9 View Angle 178° Screen Mode 16:9/4:3/dot to dot/full Color Dep: 10bit, 1.07Billion colors Panel Response Time: 8ms Support Resolution 1280*960/1280*1024/1360*768/1440*900/1600*1200/1920*1080/3840*2160 @60HZ Android Specification Android 8.0 2 x ARM Cortex-A73@1.5GHz 2 x ARM Cortex-A53@1.5GHz ARM Mali-G51450MHz Ram: 4G Storage: 32G Front: USB2.0*3 (support both PC and Android) , HDMI1.4 (Max support 1920*1080/60Hz)*1, Touch USB B Type*1 Accessories Pen*2, HDMI Cable*1, Touch USB, Power Cable*1, Software CD*1, Remoter*1	No.	2			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

03. USMAN ACADEMIC BLOCK

BILL OF QUANTITIES (IT EQUIPMENT)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
8	NS-21	Providing MIC (Chairman/ Delegate Unit) (Qty=29+1) Speak and Request indication ,Built-in loudspeaker, volume control, GSM immunity. Speak and Request indication. Built-in loudspeaker, volume control, GSM immunity. 30 cm or higher microphone stem. Configurable either as a participant or chairperson's device or separate chairperson unit in addition to 29 delegate units. Connections: Female connector with cable locking recess – for loop through connection of Discussion and chairperson's Devices. 1 x 3.5 mm stereo headphones socket on device. 1 compatible x 2 m cable with male connector with cable lock .Control Unit (Qty = 01),Plug-and-play functionality. control to turn on or off Delegate Units. Open microphone control. Should support upto 80 or higher delegate units. Built-in digital recorder with internal memory of 256 MB or higher and to record discussion and USB/Memory Card recording. Discussion control. Open mode, Override mode, Voice activation mode, Push to talk (PTT) mode. Built-in monitor loudspeaker, Controls and Indicators Buttons: Mains power on/off button, buttons/control for setting the volume range of all connected Devices, Microphone-mode button/Control for selecting one of the microphone operating modes, Open microphone button/Control for selecting the number of microphones that can be activated at the same time ,Note: Mic and Control Unit must be of same brand and vendor will install the audio system on sites .Speaker (Qty Mention as per requirement Max Qty 4);,Power: 20W or higher. Rated power :30 W or better. Power tapping: 30/15/7.5/3.75 W. Sound pressure level: 105/90 dB (SPL) or better. Effective frequency: 100 Hz to 18 kHz or better. Rated impedance: 8/163/333 ohm. Include other accessories/ cables/ hardware to connect with Projector for audio output.,Mixer Amplifier 120Watt (Qty 1),02 or higher microphone/line inputs and volume knobs. 01 or higher music source inputs, Call station input with priority. zones and announcement only output. Voice activated emergency override. 120-Watt Power. LED/LCD for output. Master volume Control. Frequency response: 50 Hz to 20 kHz or better,Note: Speaker and Amplifier must be of same brand and vendor will install the system on sites.,2x 3.5mm comatible in and out cables of atleast 10 meter each for integration should be included in the system	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

03. USMAN ACADEMIC BLOCK

BILL OF QUANTITIES (IT EQUIPMENT)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
9	NS-22	Providing Conference System (5 persons mike+2 cordless mike+Collar Mike) Mixer Amplifier 60Watt (Qty 1) 02 or higher microphone/line inputs and volume knobs. 01 or higher music source inputs. Call station input with priority. zones and announcement only output. Voice activated emergency override. 120-Watt Power. LED/LCD for output. Master volume Control. Frequency response: 50 Hz to 20 kHz or better Note: Speaker and Amplifier must be of same brand and vendor will install the system on sites.,2x 3.5mm comatible in and out cables of atleast 10 meter each for integration should be included in the system,Speaker (Qty 2);.Power: 20W or higher. Rated power :30 W or better. Power tapping: 30/15/7.5/3.75 W. Sound pressure level: 105/90 dB (SPL) or better. Effective frequency: 100 Hz to 18 kHz or better. Rated impedance: 8/163/333 ohm. Include other accessories/ cables/ hardware to connect with Projector for audio output. MIC (Chairman/ Delegate Unit) (Qty=4+1),Speak and Request indication , Built-in loudspeaker, volume control, GSM immunity. Speak and Request indication. Built-in loudspeaker, volume control, GSM immunity. 30 cm or higher microphone stem. Configurable either as a participant or chairperson's device or separate chairperson unit in addition to 29 delegate units. Connections: Female connector with cable locking recess – for loop through connection of Discussion and chairperson's Devices. 1 x 3.5 mm stereo headphones socket on device. 1 compatible x 2 m cable with male connector with cable lock,Wireless Collar Microphone & Receiver(Qty 1),PLL synthesized Technology,Selectable UHF channels,Wireless Collar microphone,.Frequency deviation ±48 kHz , S/N ratio >102 dB,,Dynamic range >110 dB, Frequency response 50 Hz to 15 KHz,12 hours or more operation on batteries. Display. With batteries or chargeable Wireless Microphone Receiver,Wireless Handheld Microphone & Receiver (Qty 2),PLL synthesized Technology,Selectable UHF channels,Hand held Wireless microphone, Frequency deviation ±48 kHz , S/N ratio >102 dB, o Dynamic range >110 dB, Frequency response 50 Hz to 15 KHz o 12 hours or more operation on batteries, LCD, With batteries or chargeable Wireless Microphone Receiver	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

03. USMAN ACADEMIC BLOCK

BILL OF QUANTITIES (IT EQUIPMENT)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
10	NS-23	Recording System	No.	1			
11	NS-25	Providing DSLR Camera with kit lens Sensor: Effective Pixels 24MP CMOS Sensor or higher Optics and Focus: Autofocus manual focus Other Features: Shutter Speed 1/4000- 30 sec, ISO range 100 – 20,000 or higher, TFT LCD Screen 3.0” diagonal or higher Storage: SD/SDHC/SDXC, 32GB (Class 10, 95 MB transfer rate) Lens: 18-55mm kit lens Battery: Li-ion Rechargeable battery Bag: Strong and Stylish bag pack with rain cover Tripod: 3-way adjustable head, Moveable horizontal and vertical length, tilt(right/left/forward/backward)	No.	1			
12	NS-31	Providing and fixing Biometric attendance machine Makes (Zkteco and approved equivalent) with: Display: 4.3-Inch Touch Screen Face capacity: 3,000 Fingerprint capacity: 4,000 Card capacity: 10,000 (Optional) Logs capacity: 100,000 Communication: TCP/IP, USB Host, Standard Functions: Automatic Status Switch, Self-Service Query, Work Code, SMS, DST, T9 Input, 9 Digit User ID, Scheduled Bell, Photo ID, Wiegand Out Optional Functions: ID/MiFare/HID Card, 3G, ADMS, 2000mAH Backup Battery, External Printer and Bell	No.	1			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

03. USMAN ACADEMIC BLOCK

BILL OF QUANTITIES (ELECTRONICS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	NS-35	Providing and fixing Inverter ACs make (Gree, Dawlance, Haier or approved equivalent) (Inverter ACs 1.5 tons) DC Inverter Technology mounted (front flow) Capacity >18000 BTU Power supply 220+10%/1 PH/50Hz Power Input (cooling/Heating) <1900 watt Running Current <9AMP Energy Saving 60% or above Low voltage function 150 or below Air Circulation (Indoor / Outdoor) >800/2500 CMH Noise level (Indoor / Outdoor) < (45/55) dB Panel display LCD Remote controlled LCD Temperature control thermostat or equivalent Auto air swing Speed setting cooling/Fan/Auto On/off timer Auto restart Refrigerant R410 / R410 Cooling coil (Inner Grooved copper anti-corrosive fine (or better), 1 year warranty and after sale service 10 year compressor warranty.	No.	6			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

03. USMAN ACADEMIC BLOCK

BILL OF QUANTITIES (ELECTRONICS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
2	NS-36	Providing and fixing Cabinet Inverter ACs make (Gree, Dawlance, Haier or approved equivalent) with: Cabinet DC Inverter Technology Capacity 2400BTU Power supply 220+10%/1 PH/50Hz Power Input (cooling/Heating) <2600watt Running Current <15AMP Energy Saving 75% or above Low voltage function 150 or below Air Circulation (Indoor / Outdoor) >1000/2500 CMH Noise level (Indoor / Outdoor) < (45/55) dB Panel display LCD Remote controlled LCD Temperature control thermostat or equivalent Auto air swing Speed setting cooling/Fan/Auto On/off timer Auto restart Refrigerant R410 / R410 Cooling coil (Inner Grooved copper anti-corrosive fine (or better), 1 year warranty and after sale service 10 year compressor warranty.	No.	4			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

03. USMAN ACADEMIC BLOCK

BILL OF QUANTITIES (ELECTRONICS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
3	NS-45	Providing Water Dispensers make (Homeage, Pell, Haier, Orient and approved equivalent) with: 3 Tab Operation I.e. Hot, Cold and Normal, Refrigerator Cabinet 20 liters, Energy Saving, 1L or above cold water Capacity, 3.5L or above hot water Capacity, Cooling power input 1-year complete part warranty, 1 Year after sale service	No.	4			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

03. USMAN ACADEMIC BLOCK

BILL OF QUANTITIES (ALLIED ITEMS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	NS-75	Providing and fixing Fire Extinguishers 1. DCP type 2. CO2	No.	8			
2	NS-76	Providing Fire Blanket	No.	8			
3	NS-77	Providing First Aid Kits	No.	1			
4	NS-86	Providing and fixing Black out Roller Blinds: Blackout roller blinds are room darkening blinds perfect choice for sunlight control, TV glare, Bleaching furniture, Privacy issues and heat and insulation in any room either its your office or home. Ideal choice use by pairing with curtains or alone. Fit perfectly.	SFT	420			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

03. USMAN ACADEMIC BLOCK

BILL OF QUANTITIES (FURNITURE)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	NS-F04	U-SHAPE MEETING ROOM TABLE FOR 30 PERSONS Size: 30' x 6.5' x 2.5' Top/back made of MDF pressed with lamination on both sides. Edges covered with matching PVC. Structure made of 18 guage rectangular mild steel pipe. Finished with black powder coating. With digital box 10 Nos.	No	2.00			
2	NS-F09	ROUND TABLE FOR 6 PERSONS (ACTIVITY ROOM) Size: 4 Ø Structure made of 38x38 mm mild steel sq. pipe Top made of high density chipboard pressed with one side formica and other side sh.veneer.	No	8.00			
3	NS-F20	ACTIVITY CHAIR MOD.0.34 ARMLESS (CUSHIONED) Structure made of 20/20 mm mild steel square pipe. Finished with silver paint. Seat/back made of solid seasoned shisham wood, cushioned with leatherite.	No	48.00			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

04. HAIDER ACADEMIC BLOCK (NEW BUILDING)

BILL OF QUANTITIES (ELECTRICAL WORKS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
					1	NS-81	

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

04. HAIDER ACADEMIC BLOCK (NEW BUILDING)

BILL OF QUANTITIES (ELECTRICAL WORKS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
					2	NS-84	

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

04. HAIDER ACADEMIC BLOCK (NEW BUILDING)

BILL OF QUANTITIES (ELECTRICAL WORKS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
					3	NS-85	
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

04. HAIDER ACADEMIC BLOCK (NEW BUILDING)

BILL OF QUANTITIES (IT EQUIPMENTS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	NS-01	LED Screen (75") Technology Type: UHD Android TV, Display Resolution: 4K, Panel Resolution: 3840 x 2160, Screen Size: 75", Speaker: 2 Operating System: Android or Tizen CPU: Quantum or equivalent HDR10, Contrast Ratio: 5000:1 (typ.), Audio Video IN, Headphone, HDMI x 2 or more USB: 2 or higher, Bluetooth Connectivity: Bluetooth 5.0, Wi-Fi Connectivity: Internet Link: 2.4GHz Wi-Fi 802.11 b/g/n 2T2R Ethernet Network (RJ45), Accessories: Stand, Cables and mountings, Warranty: 1 year	No.	7			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

04. HAIDER ACADEMIC BLOCK (NEW BUILDING)

BILL OF QUANTITIES (IT EQUIPMENTS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
2	NS-02	LED Screen (65") Technology Type: UHD Andriod TV, Display Resolution: 4K, Panel Resolution: 3840 x 2160, Screen Size: 65", Speaker: 2 Operating System: Android, or Tizen CPU:Quantum or equivalent HDR10, Contrast Ratio: 5000:1 (typ.), HDMI x2 or higher Audio Video IN, Headphone, USB: 2 or higher, BlueTooth Connectivity: BlueTooth 5.0, Wi-Fi Connectivity: Internet Link: 2.4GHz Wi-Fi 802.11 b/g/n or ac Ethernet Network (RJ45), Accessories: Stand, Cables and mountings, Warranty: 1 year	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

04. HAIDER ACADEMIC BLOCK (NEW BUILDING)

BILL OF QUANTITIES (IT EQUIPMENTS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
3	NS-03	LED Screen (55") Technology Type: UHD Andriod TV, Display Resolution: 4K, Panel Resolution: 3840 x 2160, Screen Size: 55", Speaker: 2 Operating System: Android or Tizen CPU: Quantum or Equivalent HDR10, Contrast Ratio: 5000:1 (typ.), HDMI x 2 or higher Audio Video IN, Headphone, USB: 2 or higher, BlueTooth Connectivity: BlueTooth 5.0, Wi-Fi Connectivity: Internet Link: 2.4GHz Wi-Fi 802.11 b/g/n or ac Ethernet Network (RJ45), Accessories: Stand, Cables and mountings, Warranty: 1 year	No.	2			
4	NS-05	LEDs Screen for conference room table 162B9T Philips + hp dell or equilent ci5 10gen or heigher 8gb 10gb(4 ms, 60 Hz, LFT LCD (TN) Panel, HD (1366 x 768), Touch Glass Hardness: 7H, Low-Blue mode, SPEAKER 2W x 2. (VGA, DVI-D, HDMI & Display Port), (Adjustments: Folding, Height & Tilt))	No.	30			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

04. HAIDER ACADEMIC BLOCK (NEW BUILDING)

BILL OF QUANTITIES (IT EQUIPMENTS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
5	NS-07	Laptops Type: Processor: 12th Gen Intell Core i7, upto 4.7Ghz (Max Turbo Frequency) or higher Memory: 16GB DDR4 Hard Drive 512 GB SSD Display: 14- 15.6 inch FHD (1920 x 1080) Display Battery: 4 Cell battery with 3-4 hours battery backup or higher Connectivity Standards Gigabit Ethernet, Wifi 802.11, Bluetooth or higher Camera & Mic: 720P HD Camera & Mic Ports: 1x USB 3.1 or higher, 1x HDMI, 1x RJ45 1x USB 3.0 or higher, 1 x Headset/mic combo jack or Higher Accessories: 1. Standard charger 2. Carrying Case of Same Brand with Part # 3. Wireless mouse branded with Part # 4. Mouse Pad Warranty: 1 year local/ onsite Software: All laptop and desktop computers shall come with the following original/ licensed software pre-installed: 1. Operating System: Windows 11 Pro 64 bit for Laptop and Desktop 2. Office Suite: Microsoft Office Home & Business 2019 for Laptop and Desktop	No.	6			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

04. HAIDER ACADEMIC BLOCK (NEW BUILDING)

BILL OF QUANTITIES (IT EQUIPMENTS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
6	NS-10	Desktop Computers Form Factor: Standard Tower Processor: Intel 12th Generation Core i7 processor 4.9 GHz (Max Turbo Frequency) or higher Graphics: Integrated Audio: Integrated HD Audio Controller Memory: 16GB DDR4 or higher Hard Disk Drives: 1) 1TB SATA HDD + 2) 128 SSD Network: Integrated Gigabit Ethernet, Wireless 802.11 standard compatible connectivity Ports: 3xUSB 3.1, 1x RJ-45, 1xHDMI, 2xUSB 2.0 or higher, DP, Audio Combo Jack or better Keyboard: Key Board Same brand Monitor: 18.5" LED or Higher Power Supply: Manufacturer Standard Warranty: 1 Year on site Accessories: 1. Mouse & Mouse Pad: a) USB Mouse Same Brand, b) Branded Mouse Pad 2. All relevant cables for desktop functioning Software: All laptop and desktop computers shall come with the following original/ licensed software pre-installed: 1. Operating System: Windows 11 Pro 64 bit for Laptop and Desktop 2. Office Suite: Microsoft Office Home & Business 2019 for Laptop and Desktop	No.	52			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

04. HAIDER ACADEMIC BLOCK (NEW BUILDING)

BILL OF QUANTITIES (IT EQUIPMENTS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
					7	NS-11	

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

04. HAIDER ACADEMIC BLOCK (NEW BUILDING)

BILL OF QUANTITIES (IT EQUIPMENTS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
8	NS-12	Printer (Laser Black & White) Print Technology: Laser Print Speed: Up to 40ppm (A4) Processor: 600 MHz or higher Memory: 256 MB Printing: Duplex Automatic Black Print Resolution: 1200 x 1200 dpi Monthly Duty Cycle: Up to 40,000 pages Supported Paper Size: A4, Letter, Legal, Connectivity: standard 1 Hi-Speed USB, Gigabit Ethernet 10/100/1000BASE-T network; Wireless (Wi-Fi) Compatibility: Supported Operating System, MacOS, Windows-7,8, 10, 11. Accessories: Cables: 1 x USB, 1 x Power Cord Warranty: 1 Year	No.	8			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

04. HAIDER ACADEMIC BLOCK (NEW BUILDING)

BILL OF QUANTITIES (IT EQUIPMENTS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
9	NS-13	Printer (Laser Colour) Color Network Printer - (Heavy Duty) Print Technology: Laser Print Speed (Color Normal): Upto 40 PPM Print Speed (Black Normal): Upto 40 PPM Monthly Duty Cycle: Up to 4,000 pages Printer Memory: 512MB or higher Processor: 1.2 Ghz Color Cartridges: 4 (1 each black, cyan, magenta, yellow) or equivalent Paper Trays: 2 Trays (1 Manual Bypass+ 1 Auto Feed) Supported Paper Size: A4, Letter, Legal. Networking: Required, RJ-45 Connectivity: 2 Hi-Speed USB; 1 Gigabit/Fast Ethernet 10/100/1000Base-TX; Supported Operating System: Windows-7, 8, 10 Accessories: Cables: 1 x USB, 1 x Ethernet Patch Cord, 1 x Power Cord Warranty: 1 year	No.	2			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

04. HAIDER ACADEMIC BLOCK (NEW BUILDING)

BILL OF QUANTITIES (IT EQUIPMENTS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
10	NS-14	Printer Cum Scanner (3 in 1) Print/Scan/Copy/Fax Print Speed: 35PPM or higher Manual Double Sided Printing Up to 1,200 x 1,200 dpi Print USB, Network, Wireless & Wi-Fi Direct 150 Sheet Input Tray or above 600MHz Processor 256MB RAM or above Scan Mode: Flatbed/ADF Scan Speed: 20iPM (B/W) or higher Scan Resolution: 600 x 600 dpi Copy Speed: 30CPM or higher Copy Resolution: 600 x 600 dpi or higher. Other standard features: LCD/LED display, print cancel button, etc., Drivers: Microsoft windows 7/8/10 supportive. Along with USB 2.0 cable and other accessories	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

04. HAIDER ACADEMIC BLOCK (NEW BUILDING)

BILL OF QUANTITIES (IT EQUIPMENTS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
11	NS-15	Providing Photocopier Black & White Photocopier HP, Xerox or equivalent Function Copy, Print, Scan, Speed: 35PPM Duty Cycle: Up to 300,000 pages Print resolution 1200 x 1200 dpi Copy resolution: 600dpi x 600dpi Input Capacity: 2 x 500-sheet input tray Output Capacity: 500 sheet face-down output bin Duplex print options Duplex Automatic Media Size A3, A4, A5, letter, legal, executive Memory 6 GB Hard Drive 320 GB Connectivity: Ethernet 10/100/1000 Base-T, High-speed USB 3.0) Scanner 600 x 600 dpi Network Printing Yes Scan technology Flatbed; ADF Print technology Laser Interface Touch Screen Paper tray and trolley 100-sheet multi-purpose tray, 2 x 500-sheet input tray, 100 sheet ADF; Operating System Windows 10, Windows 7, Windows 8/8.1 Mac Warranty 3 Year On-site Warranty Toner Price Yield 48,000 pages Drum Price Yield 200,000 pages	No.	2			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

04. HAIDER ACADEMIC BLOCK (NEW BUILDING)

BILL OF QUANTITIES (IT EQUIPMENTS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
12	NS-17	Multimedia Projection System: DLP/LCD Full HD 1080p Resolution, 4000 ANSI lumens, Contrast Ratio: 15000:1 HDMI x 2 Up to 20,000 hours lamp life (SuperEco + mode), Aspect Ratio: 16:9 or higher Zoom: 1.1x or higher I / O Connection: VGA-In, Audio-In(RCA), Audio-In (Mini jack), Audio- Out , Microphone, USB Type A, 1x RJ45, 1 x Type A USB Accessories: Remote Control, AC Power Cord, 30M HDMI Cable Compatible with projector, Ceiling mount Kit	No.	2			
13	NS-18	Automatic remote controll Sliding Screen for multimedia Wall or Ceiling Mount, Non-Tensioned, 120" Diagonal, Matte White Finish, Front Projection, With Low Voltage Controller, 120V, 60Hz. Accessories: All recommended accessories.	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

04. HAIDER ACADEMIC BLOCK (NEW BUILDING)

BILL OF QUANTITIES (IT EQUIPMENTS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
14	NS-20	Providing and fixing Interactive LED 65" Display Backlight D-LED Backlight (Resolution: 3840*2160) Brightness: 350 cd (Contrast: 4000:1) -Screen Size: 1428.5*803.5 Aspect Ratio 16:9 View Angle 178° Screen Mode 16:9/4:3/dot to dot/full Color Dep: 10bit, 1.07Billion colors Panel Response Time: 8ms Support Resolution 1280*960/1280*1024/1360*768/1440*900/1600*1200/1920*1080/3840*2160@60HZ Android Specification Android 8.0 2 x ARM Cortex-A73@1.5GHz 2 x ARM Cortex-A53@1.5GHz ARM Mali-G51450MHz Ram: 4G Storage: 32G Front: USB2.0*3 (support both PC and Android) , HDMI1.4 (Max support 1920*1080/60Hz)*1, Touch USB B Type*1 Accessories Pen*2, HDMI Cable*1, Touch USB, Power Cable*1, Software CD*1, Remoter*1	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

04. HAIDER ACADEMIC BLOCK (NEW BUILDING)

BILL OF QUANTITIES (IT EQUIPMENTS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
15	NS-21	<p>Providing MIC (Chairman/ Delegate Unit) (Qty=29+1) Speak and Request indication Built-in loudspeaker, volume control, GSM immunity. Speak and Request indication. Built-in loudspeaker, volume control, GSM immunity. 30 cm or higher microphone stem. Configurable either as a participant or chairperson's device or separate chairperson unit in addition to 29 delegate units. Connections: Female connector with cable locking recess – for loop through connection of Discussion and chairperson's Devices. 1 x 3.5 mm stereo headphones socket on device. 1 compatible x 2 m cable with male connector with cable lock Control Unit (Qty = 01) Plug-and-play functionality. control to turn on or off Delegate Units. Open microphone control. Should support upto 80 or higher delegate units. Built-in digital recorder with internal memory of 256 MB or higher and to record discussion and USB/Memory Card recording. Discussion control, Open mode, Override mode, Voice activation mode, Push to talk (PTT) mode. Built-in monitor loudspeaker Controls and Indicators Buttons: Mains power on/off button, buttons/control for setting the volume range of all connected Devices, Microphone-mode button/Control for selecting one of the microphone operating modes, Open microphone button/Control for selecting the number of microphones that can be activated at the same time Note: Mic and Control Unit must be of same brand and vendor will install the audio system on sites Speaker (Qty Mention as per requirement Max Qty 4): Power: 20W or higher. Rated power :30 W or better. Power tapping: 30/15/7.5/3.75 W. Sound pressure level: 105/90 dB (SPL) or better. Effective frequency: 100 Hz to 18 kHz or better. Rated impedance: 8/163/333 ohm.</p>	No.	6			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

04. HAIDER ACADEMIC BLOCK (NEW BUILDING)

BILL OF QUANTITIES (IT EQUIPMENTS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		<p>Include other accessories/ cables/ hardware to connect with Projector for audio output.</p> <p>Mixer Amplifier 120Watt (Qty 1)</p> <p>02 or higher microphone/line inputs and volume knobs. 01 or higher music source inputs. Call station input with priority. zones and announcement only output. Voice activated emergency override. 120-Watt Power. LED/LCD for output. Master volume Control. Frequency response: 50 Hz to 20 kHz or better</p> <p>Note: Speaker and Amplifier must be of same brand and vendor will install the system on sites.</p> <p>2x 3.5mm comatible in and out cables ot atleast 10 meter each for integration should be included in the system</p>					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

04. HAIDER ACADEMIC BLOCK (NEW BUILDING)

BILL OF QUANTITIES (IT EQUIPMENTS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
16	NS-24	Providing USB based Video Conferencing System: Camera: Sensor: High Quality HD CMOS Sensor, Optical Lens: 10X or Higher, Rotation Angle: (Pan = 125 Tilt: 30) Degree or Higher, Auto/One push/Manual focus, 2D & 3D DNR, Brightness, color, sharpness, contrast adjustment. MJPG/H.264/H.265 video compression Microphone/Speaker: Speaker frequency response: 100Hz-11KHz or higher Speaker volume: 80dB or higher, Microphone frequency response: 100Hz-11KHz or higher. Acoustic Echo Cancellation, noise compression Omni Directional, 360 Degree coverage. Microphone sound-pickup diameter: 6 meters extendable. external microphones supported Hub: 2x Mini DIN6 interface. Mini USB Interface. Power switch and interface. 2x mini DIN6 Data cables of at least 5 meter or higher. USB cable of at least 3 meter or higher Other Features: Support Windows, Android, IOS and Linux. Automatic recognition of cameras, microphones and speakers. wired and Bluetooth connection. USB plug-and-play, supports various online conference software platforms i.e., Zoom, MS Teams, Skype and other web conferencing platforms External Mic: 2xCompatible External microphones of same brand	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

04. HAIDER ACADEMIC BLOCK (NEW BUILDING)

BILL OF QUANTITIES (IT EQUIPMENTS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
17	NS-25	Providing DSLR Camera with kit lens Sensor: Effective Pixels 24MP CMOS Sensor or higher Optics and Focus: Autofocus manual focus Other Features: Shutter Speed 1/4000- 30 sec, ISO range 100 – 20,000 or higher, TFT LCD Screen 3.0” diagonal or higher Storage: SD/SDHC/SDXC, 32GB (Class 10, 95 MB transfer rate) Lens: 18-55mm kit lens Battery: Li-ion Rechargeable battery Bag: Strong and Stylish bag pack with rain cover Tripod: 3-way adjustable head, Moveable horizontal and vertical length, tilt(right/left/forward/backward)	No.	2			
18	NS-31	Providing and fixing Biometric attendance machine Makes (Zkteco and approved equivalent) with: Display: 4.3-Inch Touch Screen Face capacity: 3,000 Fingerprint capacity: 4,000 Card capacity: 10,000 (Optional) Logs capacity: 100,000 Communication: TCP/IP, USB Host, Standard Functions: Automatic Status Switch, Self-Service Query, Work Code, SMS, DST, T9 Input, 9 Digit User ID, Scheduled Bell, Photo ID, Wiegand Out Optional Functions: ID/MiFare/HID Card, 3G, ADMS, 2000mAH Backup Battery, External Printer and Bell	No.	2			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

04. HAIDER ACADEMIC BLOCK (NEW BUILDING)

BILL OF QUANTITIES (ELECTRONICS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	NS-35	Providing and fixing Inverter ACs make (Gree, Dawlance, Haier or approved equivalent) (Inverter ACs 1.5 tons) DC Inverter Technology mounted (front flow) Capacity >18000 BTU Power supply 220+10%/1 PH/50Hz Power Input (cooling/Heating) <1900 watt Running Current <9AMP Energy Saving 60% or above Low voltage function 150 or below Air Circulation (Indoor / Outdoor) >800/2500 CMH Noise level (Indoor / Outdoor) < (45/55) dB Panel display LCD Remote controlled LCD Temperature control thermostat or equivalent Auto air swing Speed setting cooling/Fan/Auto On/off timer Auto restart Refrigerant R410 / R410 Cooling coil (Inner Grooved copper anti-corrosive fine (or better), 1 year warranty and after sale service 10 year compressor warranty.	No.	34			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

04. HAIDER ACADEMIC BLOCK (NEW BUILDING)

BILL OF QUANTITIES (ELECTRONICS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
2	NS-36	Providing and fixing Cabinet Inverter ACs make (Gree, Dawlance, Haier or approved equivalent) with: Cabinet DC Inverter Technology Capacity 2400BTU Power supply 220+10%/1 PH/50Hz Power Input (cooling/Heating) <2600watt Running Current <15AMP Energy Saving 75% or above Low voltage function 150 or below Air Circulation (Indoor / Outdoor) >1000/2500 CMH Noise level (Indoor / Outdoor) < (45/55) dB Panel display LCD Remote controlled LCD Temperature control thermostat or equivalent Auto air swing Speed setting cooling/Fan/Auto On/off timer Auto restart Refrigerant R410 / R410 Cooling coil (Inner Grooved copper anti-corrosive fine (or better), 1 year warranty and after sale service 10 year compressor warranty.	No.	8			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

04. HAIDER ACADEMIC BLOCK (NEW BUILDING)

BILL OF QUANTITIES (ELECTRONICS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
3	NS-37	Providing Refrigerator 20 Cubic Feet Invertor make (Homage, Pel, Haier, Dawlance and approved equivalent) with: 20 Cu-Ft Capacity, smart invertor, Operating voltage/ Frequency 220/50, electronic control, Power consumption 160watt maximum, Adjustable thermostat (Temperature Control), interior Light LED, Low voltage operation upto 150v, Refrigerant R-134a or R600a, Evaporator Roll Bond, Auto Defrost function, Copper Condenser, Tow Door, Shelves/Trays/Scraper/Door Pocket, 1 year warranty and after sale service.	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

04. HAIDER ACADEMIC BLOCK (NEW BUILDING)

BILL OF QUANTITIES (ELECTRONICS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
4	NS-44	Providing Microwave Oven 30 Liter make (Dawlance, Ecostar, Haier or approved equivalent) with: 30 liter capacity, Voltage 220 ~ 240, Latest Model, Rated input power 1400W maximum, Rated output power 900W approximately, LED display, Electronic (Touch Panel) control type & 1 year warranty and after sale services.	No.	1			
5	NS-45	Providing Water Dispensers make (Homeage, Pell, Haier, Orient and approved equivalent) with: 3 Tab Operation I.e. Hot, Cold and Normal, Refrigerator Cabinet 20 liters, Energy Saving, 1L or above cold water Capacity, 3.5L or above hot water Capacity, Cooling power input 1-year complete part warranty, 1 Year after sale service	No.	8			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

04. HAIDER ACADEMIC BLOCK (NEW BUILDING)

BILL OF QUANTITIES (ELECTRONICS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
6	NS-46	Providing and fixing Ceiling Fan make (Super Asia, GFC, SK, Indus, Royal and approved equivalent) with: size 56" copper motor, Double "Z" Ball Bearing, Aerodynamically designed blades & Silicon steel lamination.	No.	70			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

04. HAIDER ACADEMIC BLOCK (NEW BUILDING)

BILL OF QUANTITIES (ALLIED ITEMS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	NS-39	Providing Stove Super Asia Gas Hob SHB-133 or equivalent: a) Stainless steel surface b) Cast iron support c) Burner with safety device d) SKU (20253070-PK-1401870352)	No.	1			
2	NS-51	Providing Crokery, 12 Person set 54 pieces, Pyrex	No.	4			
3	NS-52	Providing Cutleries 12 Person set 52 pieces, Material Stainless steel	No.	4			
4	NS-75	Providing and fixing Fire Extinguishers 1. DCP type 2. CO2	No.	9			
5	NS-76	Providing Fire Blanket	No.	3			
6	NS-77	Providing First Aid Kits	No.	3			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

04. HAIDER ACADEMIC BLOCK (NEW BUILDING)

BILL OF QUANTITIES (ALLIED ITEMS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
					7	NS-86	
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

04. HAIDER ACADEMIC BLOCK (NEW BUILDING)

BILL OF QUANTITIES (FURNITURE)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	NS-F04	U-SHAPE MEETING ROOM TABLE FOR 30 PERSONS Size: 30' x 6.5' x 2.5' Top/back made of MDF pressed with lamination on both sides. Edges covered with matching PVC. Structure made of 18 guage rectangular mild steel pipe. Finished with black powder coating. With digital box 10 Nos.	No	5			
2	NS-F07	MEETING ROOM TABLE FOR 8 PERSONS Size: 8' x 6' x 2.5' Top / structure made of MDF pressed with lamination on both sides. Edges covered with matching PVC.	No	1			
3	NS-F09	ROUND TABLE FOR 6 PERSONS (ACTIVITY ROOM) Size: 4 Ø Structure made of 38x38 mm mild steel sq. pipe Top made of high density chipboard pressed w	No	20			
4	NS-F12	RECEPTION DESK 2 Size: 6' x 3' x 4' Top / structure made of MDF pressed with lamination on both sides. Edges covered with matching PVC.	No	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

04. HAIDER ACADEMIC BLOCK (NEW BUILDING)

BILL OF QUANTITIES (FURNITURE)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
5	NS-F13	CENTRE TABLE MOD. WSC/RI/2013 C.T Size: - 1200x600x450 mm (H). Structure made of high density chipboard, pressed with shisham veneer on both sides. With solid seasoned sh. wood beading. With Glass top. Finished with N.C. lacquer.	No	1			
6	NS-F17	REVOLVING CHAIR MOD. WSC/B-9 Seat cushioned 1st quality foam covered with leatherite & back with black mesh. Complete with high quality revolving pedestal. With arms. Low back chair.	No	260			
7	NS-F20	ACTIVITY CHAIR MOD.0.34 ARMLESS (CUSHIONED) Structure made of 20/20 mm mild steel square pipe. Finished with silver paint. Seat/back made of solid seasoned shisham wood, cushioned with leatherite.	No	120			
8	NS-F34	ROSTRUM MOD. SPECIAL 7 Size: 620 x 550 x 1170 mm (H) Structure made of high density chipboard pressed with sh. veneer on both sides. With one shelf. Finished with N.C. lacquer	No	5			
9	NS-F35	5-SEATER SOFA MOD. WSC/RI/2013 Inner structure made of solid seasoned wood. Fully cushioned with foam covered with leatherite. 1 Set (2 single seater + one 3 seater)	No	1			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

05. ABU-BAKAR HOSTEL

BILL OF QUANTITIES (CIVIL WORKS)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
<i>Schedule Item (Civil Works)</i>							
1	9/13	Providing & Fixing corrugated galvanized iron sheets with G.I. bolts, on nuts, limpet and bitumen washers, wind ties, complete in all respects without valleys and ridges:-					
		a) 20 BWG	100 Sft	47.25			
<i>Non- Schedule Item (Civil Works)</i>							
2	NS-98	Removing of corrugated galvanized iron sheets with G.I. as directed by Engineer's / Incharge. Complete in all respect.	100 Sft	47.25			
3	N.S	Deduction of used corrugated galvanized Sheet from original quantity.	Kg	2,363			
		Sub Total =					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

05. ABU-BAKAR HOSTEL

Bill of Quantities (Electrical Works)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	NS-82	Providing and fixing Solar on-Grid 30Kw Tier A Monocrystalline, Half Cut PV Modules 30 kW (Jinko/Canadian/Longi/Trina or equivalent) Maintenance Free Grid Tied Three Phase Inverters 30 kW (GoodWe or equivalent) Wireless Remote Monitoring via 4G Dongle Device for inverter & string performances 1 Distribution Box: Chint/ABB/Eqv. MCCB AC Breaker, Surge Protection Devices 1 Structure: Galvanized Iron Fixed Tilt Roof Mounted Structures, Stainless Steel Nut bolts, Civil Works - 30 kW DC Wire: 4mm ² XLPE/PVC/Tin Coated Copper Single Core 600/1000V DC (As per Actual) AC Wire: XLPE/PVC Aluminum AC Wire for Inverter & Bus Bar Connections (As per Actual) Electrical Installation: Cable Conduits, Cable Ties etc. PVC Bends, Ducts, Flexible Pipes, MC4 connectors etc (Job) Earthing bores, Earthing wire, Copper wire & Lightning Arrestors (1) Net Meter documentation, installation & all dealings with respective DISCO 1	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

05. ABU-BAKAR HOSTEL

Bill of Quantities (Electrical Works)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
2	NS-84	Providing and fixing Solar Hybrid 10Kw Tier A Monocrystalline, Half Cut PV Modules 10 kW (Jinko/Canadian/Longi/Trina Solar or equivalent) T10-HV Hybrid Maintenance Free Three Phase Inverters 1 (Alpha ESS Smile or equivalent) Batteries: Smile BAT 8.2 kWh Li-Ion Storage Modules with 90% recommended DOD 1 Structure: GI fixed tilt roof mounted structure, Stainless Steel Nut bolts, Civil works 10 kW DC Wire: 4mm ² XLPE/PVC/Tin Coated Copper Single Core 600/1000V DC (As per Actual) AC Wire: XLPE/PVC AC Wire for Inverter & Bus Bar Connections (As per Actual) Electrical Installation: Cable Conduits, Cable Ties etc, PVC Bends, Ducts, Flexible Pipes, MC4 connectors etc Job Earthing Bores, Copper Wire, Grounding Wire & Lightning Arrestors 1 Net Meter documentation, installation & all dealings with respective DISCO 1	No.	1			
		Sub Total =					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

05. ABU-BAKAR HOSTEL

Bill of Quantities (IT Equipments)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	NS-03	LED Screen (55") Technology Type: UHD Andriod TV, Display Resolution: 4K, Panel Resolution: 3840 x 2160, Screen Size: 55", Speaker: 2 Operating System: Android or Tizen CPU: Quantum or Equivalent HDR10, Contrast Ratio: 5000:1 (typ.), HDMI x 2 or higher Audio Video IN, Headphone, USB: 2 or higher, BlueTooth Connectivity: BlueTooth 5.0, Wi-Fi Connectivity: Internet Link: 2.4GHz Wi-Fi 802.11 b/g/n or ac Ethernet Network (RJ45). Accessories: Stand, Cables and mountings, Warranty: 1 year	No.	2			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

05. ABU-BAKAR HOSTEL

Bill of Quantities (IT Equipments)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
					2	NS-04	

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

05. ABU-BAKAR HOSTEL

Bill of Quantities (IT Equipments)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
3	NS-07	Laptops Type: Processor: 12th Gen Intell Core i7, upto 4.7Ghz (Max Turbo Frequency) or higher Memory: 16GB DDR4 Hard Drive 512 GB SSD Display: 14- 15.6 inch FHD (1920 x 1080) Display Battery: 4 Cell battery with 3-4 hours battery backup or higher Connectivity Standards Gigabit Ethernet, Wifi 802.11, Bluetooth or higher Camera & Mic: 720P HD Camera & Mic Ports: 1x USB 3.1 or higher, 1x HDMI, 1x RJ45 1x USB 3.0 or higher, 1 x Headset/mic combo jack or Higher Accessories: 1. Standard charger 2. Carrying Case of Same Brand with Part # 3. Wireless mouse branded with Part # 4. Mouse Pad Warranty: 1 year local/ onsite Software: All laptop and desktop computers shall come with the following original/ licensed software pre-installed: 1. Operating System: Windows 11 Pro 64 bit for Laptop and Desktop 2. Office Suite: Microsoft Office Home & Business 2019 for Laptop and Desktop	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

05. ABU-BAKAR HOSTEL

Bill of Quantities (IT Equipments)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
4	NS-12	Printer (Laser Black & White) Print Technology: Laser Print Speed: Up to 40ppm (A4) Processor: 600 MHz or higher Memory: 256 MB Printing: Duplex Automatic Black Print Resolution: 1200 x 1200 dpi Monthly Duty Cycle: Up to 40,000 pages Supported Paper Size: A4, Letter, Legal, Connectivity: standard 1 Hi-Speed USB, Gigabit Ethernet 10/100/1000BASE-T network; Wireless (Wi-Fi) Compatibility: Supported Operating System, MacOS, Windows-7,8, 10, 11. Accessories: Cables: 1 x USB, 1 x Power Cord Warranty: 1 Year	No.	1			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

05. ABU-BAKAR HOSTEL

Bill of Quantities (Electronics)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	NS-34	Providing and fixing Inverter ACs make (Gree, Dawlance, Haier, Pell or equivalen DC Inverter Technology mounted (front flow) Capacity >12000 BTU Power supply 220+10%/1 PH/50Hz Power Input (cooling/Heating) <1900 watt Running Current <9AMP Energy Saving 60% or above Low voltage function 150 or below Air Circulation (Indoor / Outdoor) >800/2500 CMH Noise level (Indoor / Outdoor) < (45/55) dB Panel display LCD Remote controlled LCD Temperature control thermostat or equivalent Auto air swing Speed setting cooling/Fan/Auto On/off timer Auto restart Refrigerant R410 / R410 Cooling coil (Inner Grooved copper anti-corrosive fine (or better), 1 year warranty and after sale service 10 year compressor warranty.	No.	20			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

05. ABU-BAKAR HOSTEL

Bill of Quantities (Electronics)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
2	NS-35	Providing and fixing Inverter ACs make (Gree, Dawlance, Haier or approved equivalent) (Inverter ACs 1.5 tons) DC Inverter Technology mounted (front flow) Capacity >18000 BTU Power supply 220+10%/1 PH/50Hz Power Input (cooling/Heating) <1900 watt Running Current <9AMP Energy Saving 60% or above Low voltage function 150 or below Air Circulation (Indoor / Outdoor) >800/2500 CMH Noise level (Indoor / Outdoor) < (45/55) dB Panel display LCD Remote controlled LCD Temperature control thermostat or equivalent Auto air swing Speed setting cooling/Fan/Auto On/off timer Auto restart Refrigerant R410 / R410 Cooling coil (Inner Grooved copper anti-corrosive fine (or better), 1 year warranty and after sale service 10 year compressor warranty.	No.	14			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

05. ABU-BAKAR HOSTEL

Bill of Quantities (Electronics)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
3	NS-37	Providing Refrigerator 20 Cubic Feet Invertor make (Homage, Pel, Haier, Dawlance and approved equivalent) with: 20 Cu-Ft Capacity, smart invertor, Operating voltage/ Frequency 220/50, electronic control, Power consumption 160watt maximum, Adjustable thermostat (Temperature Control), interior Light LED, Low voltage operation upto 150v, Refrigerant R-134a or R600a, Evaporator Roll Bond, Auto Defrost function, Copper Condenser, Tow Door, Shelves/Trays/Scraper/Door Pocket, 1 year warranty and after sale service.	No.	2			
4	NS-38	Providing Double Door Freezer, Inverter 15 Cu.ft/ 410 ltr, Convertible 4 in 1, LED top light, Static cooling technology, 1 Year Warranty,	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

05. ABU-BAKAR HOSTEL

Bill of Quantities (Electronics)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
5	NS-44	Providing Microwave Oven 30 Liter make (Dawlance, Ecostar, Haier or approved equivalent) with: 30 liter capacity, Voltage 220 - 240, Latest Model, Rated input power 1400W maximum, Rated output power 900W approximately, LED display, Electronic (Touch Panel) control type & 1 year warranty and after sale services.	No.	3			
6	NS-45	Providing Water Dispensers make (Homeage, Pell, Haier, Orient and approved equivalent) with: 3 Tab Operation I.e. Hot, Cold and Normal, Refrigerator Cabinet 20 liters, Energy Saving, 1L or above cold water Capacity, 3.5L or above hot water Capacity, Cooling power input 1-year complete part warranty, 1 Year after sale service	No.	4			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

05. ABU-BAKAR HOSTEL

Bill of Quantities (Electronics)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
7	NS-46	Providing and fixing Ceiling Fan make (Super Asia, GFC, SK, Indus, Royal and approved equivalent) with: size 56" copper motor, Double "Z" Ball Bearing, Aerodynamically designed blades & Silicon steel lamination.	No.	45			
8	NS-47	Providing Pedestal Fan (56") Copper Wire, Ball Bearing Motor, Full Metal, Energy Efficient, High RPM.	No.	4			
9	24/102	Providing and fixing Copper winded Exhaust fan with louver and shutter made of Pak/Younas/G.F.C. i/c the cost of necessary cable and hardware for connection from ceiling rose complete as approved and directed by Engineer Incharge. (a) Plastic body (ii) 12 " dia	Each	5			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

05. ABU-BAKAR HOSTEL

Bill of Quantities (Electronics)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
10	NS-49	Providing Washing Machine make (Homage, PEL., Haier, Kenwood, Super Asia or approved equivalent) with: Copper Motor, Washing Capacity 20Kg, Energy saver, Rust proof painted metal body, Steel drum with double storm pulsator.	No.	2			
11	NS-50	Providing Dry Iron make (Panasonic, WestPoint, National and approved equivalent) with: Power 1000W, Non-Stick Soleplate, Voltage 220 ~ 240, Adjustable Swivel Cord & Temperature setting guide.	No.	5			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

05. ABU-BAKAR HOSTEL

Bill of Quantities (Gym Items)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
					1	NS-58	
2	NS-59	Providing Elliptical: ELLIPTICAL GYM AND FITNESS MACHINE a) Frame: Stride length = 20, Fly wheel = 8.5kgs b) Computer Display: 6.5 LCD c) Resistance type: ECB, 32 LEVELS d) Incline level: Power, 20 levels e) Cooling Fan & Hand pulse rate measurement f) Max. User weight: 150 Kg	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

05. ABU-BAKAR HOSTEL

Bill of Quantities (Gym Items)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
					3	NS-60	
4	NS-61	Providing Gym Floor Mats Rubber Hard material.	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

05. ABU-BAKAR HOSTEL

Bill of Quantities (Gym Items)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
5	NS-62	Providing Plates Rubber 230kg, - 10 Plates 2.5Kg (Total= 25kg) - 10 Plates 5kg (Total= 50kg) - 5 Plates 10kg (Total = 50kg) - 3 Plates 15kg (Total = 45kg) - 3 Plates 20kg (Total = 60kg) Dumble Rubber 125Kg: - 4 sets 1Kg (Total= 4kg) - 4 sets 2kg (Total= 8kg) - 4 sets 3kg (Total = 12kg) - 4 sets 4kg (Total = 16kg) - 4 sets 5kg (Total = 20kg) - 2 sets 7.5kg (Total = 15kg) - 2 sets 10kg (Total = 20kg) - 2 sets 15kg (Total =30kg) Dumble Steel Rod weight and lock 100Kg: - 4 sets each with total 25Kg Plates (Total= 100kg) Rods 247kg, Locks 25kg.	No.	1			
6	NS-63	Providing Bench 3 in 1 Abdominal Bench,	No.	1			
7	NS-64	Providing Stool, Back seat stool.	No.	4			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

05. ABU-BAKAR HOSTEL

Bill of Quantities (Gym Items)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
8	NS-65	Providing Multi Function four station, 1) Bi &Tri, 2) leg pull 3) Rowing 4) Flying	No.	1			
9	NS-66	Providing Arobic Equipments Jumping ropes 12 Yoga mat 6mm 12 Weight machine digital 2	No.	1			
10	NS-67	Providing Leg Extention / Leg Curl a) Triceps Pushdown b) Lat Pull down c) Leg Extensions d) Standing Arm Curl e) Standing Triceps Extension f) Butterfly g) Weight stack: 100 LBS	No.	1			
11	NS-68	Providing Badminton rackets. Steel frame made in Taiwan. (Rs. 5000 pair) Plastic shuttle cocks. Taiwan/ china made. Average category, (Rs. 2500 per Dozan) Badminton approved floor (15 meter x 7.1 meter) (Rs. 500,000). Net pole + Net (Rs. 10,000)	No.	2			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

05. ABU-BAKAR HOSTEL

Bill of Quantities (Gym Items)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
12	NS-69	Providing Table tennis table Table tennis made in china table frame with tyres 15mm thickness. Table Tennis Nett & post set. Table Tennis rackets Club standard, made in china. (3 pairs per table) Table Tennis balls Made in china. (2 per dozen per table)	No.	2			
13	NS-70	Providing Snooker table size 4.5ft* 9ft. Marble top approximately 1inch thickness. Solid Wood frame. Cloth, balls & rubber set Taiwan. Playing cues 4 no. included.	No.	1			
14	NS-78	Providing Wheel Chairs, Chromed Steel Fram, Fixed Armrest, Fixed Footrest, Aluminum Foot Plate, 8" PVC Solid Front Castor, 46CM seat width, 24" Spoking Solid Wheel / Solid Mag Rear Wheel Stainless Steel Plate, PVC seat and Back	No.	2			
15	NS-79	Providing Strechers Stretcher Type: Simple stainless steel Straight Stretcher Trolley: Chromed Steel side guard & cylinder holder.	No.	1			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

05. ABU-BAKAR HOSTEL

Bill of Quantities (Allied Items)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	NS-40	Providing Cooking Range Welcome 3 Burner Gas Cooking Range WC-555 or equivalent: a) Stainless Steel Burner Top b) 3 Standard Burners c) Two Way Thermostat d) Single Door e) Metal Top f) Tempered Oven Glass g) Baking Roasting and Grilling Oven h) Width 27,Depth 20, Height 32	No.	1			
2	NS-41	Providing Stove for Daig Local material for 20 Kg daig.	No.	3			
3	NS-42	Providing Daig Silver Daig with cover knob, Capacity 10kg,	No.	3			
4	NS-43	Providing Gas cylinder LPG Gas Cylinder, Capacity 12Kg, Standered Quility material.	No.	2			
5	NS-51	Providing Crokery, 12 Person set 54 pieces, Pyrex	No.	8			
6	NS-52	Providing Cuttleries 12 Person set 52 pieces, Material Stainless steel	No.	8			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)							
UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA							
05. ABU-BAKAR HOSTEL							
Bill of Quantities (Allied Items)							
Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
7	NS-53	Providing One set: Two Bedsheets + Two Pellow + Two Pellow Covers: Bed sheet with 2 covers a) T-150 b) Non- Iron c) Wrinkle Resistance d) High Strength e) Durable Pillows a) Cover material: same as bedsheet b) Size : 18 x 25 Inches c) Filling : 100% Polyster Ball Fiber d) Allergic Free Long Lasting Plush & Comfy Feel e) Made of soft to touch fabric	No.	80			
8	NS-54	Providing Blankets Double Bed Blanket Ply: 2 Ply Size: 220x240 Cm	No.	80			
9	NS-55	Providing Quilt with cover 1. Single person quilt polyester 2. Cover	No.	80			
10	NS-56	Providing Chadar, Single person cotton, Good Quality.	No.	80			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)							
UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA							
05. ABU-BAKAR HOSTEL							
Bill of Quantities (Allied Items)							
Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
11	NS-75	Providing and fixing Fire Extinguishers 1. DCP type 2. CO2	No.	10			
12	NS-76	Providing Fire Blanket	No.	5			
13	NS-77	Providing First Aid Kits	No.	3			
14	NS-87	Providing and fixing Curtain Blinds (Zebra) Modern style blinds. Horizontal style. Double fabric. Overlapping/transition options. block 95% light. easy to operate. Beautiful design. Cassette/ shutter with matching fabric on front.100% privacy	SFT	1,920			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

05. ABU-BAKAR HOSTEL

Bill of Quantities (Furniture)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	NS-F06	MEETING ROOM TABLE FOR 12 PERSONS Size: 12' x 6' x 2.5' Top / structure made of MDF pressed with lamination on both sides. Edges covered with matching PVC	No	9			
2	NS-F13	CENTRE TABLE MOD. WSC/RI/2013 C.T Size: - 1200x600x450 mm (H). Structure made of high density chipboard, pressed with shisham veneer on both sides. With solid seasoned sh. wood beading. With Glass top. Finished with N.C. lacquer.	No	2			
3	NS-F16	STUDY TABLE MOD.0.8080 MF FORMICA Size: 1200 x 600 x 760 mm (H) Top made of high density chipboard pressed with one side formica and other side veneer. Structure made of 25/25 mm mild steel square pipe. Finished with N.C. silver paint.	No	49			
4	NS-F17	REVOLVING CHAIR MOD. WSC/B-9 Seat cushioned 1st quality foam covered with leatherite & back with black mesh. Complete with high quality revolving pedestal. With arms. Low back chair.	No	157			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

05. ABU-BAKAR HOSTEL

Bill of Quantities (Furniture)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
					5	NS-F36	
6	NS-F38	SINGLE BED MATTRESS (MOLTY ORTHO 4")	No	76			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

06. FATIMA JINNAH HOSTEL

Bill of Quantities (IT Equipments)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	NS-03	LED Screen (55") Technology Type: UHD Andriod TV, Display Resolution: 4K, Panel Resolution: 3840 x 2160, Screen Size: 55", Speaker: 2 Operating System: Android or Tizen CPU: Quantum or Equivalent HDR10, Contrast Ratio: 5000:1 (typ.), HDMI x 2 or higher Audio Video IN, Headphone, USB: 2 or higher, BlueTooth Connectivity: BlueTooth 5.0, Wi-Fi Connectivity: Internet Link: 2.4GHz Wi-Fi 802.11 b/g/n or ac Ethernet Network (RJ45), Accessories: Stand, Cables and mountings, Warranty: 1 year	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

06. FATIMA JINNAH HOSTEL

Bill of Quantities (IT Equipments)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
2	NS-04	LEDs Screen (32") + Gym LCD 32", Panel Type: HD, Resolution: 1366*768, Viewing Angle:178°/178° Refresh Rate: 60Hz, Contrast Ratio: 3000:1, Colors: 16.7 M(8bit) HDMI: 2 or higher Component IN: Yes, A/V IN: Yes, A/V Out: Yes, SPDIF Out: Yes USB: 1 or higher	No.	4			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

06. FATIMA JINNAH HOSTEL

Bill of Quantities (Electronics)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
					1	NS-35	

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

06. FATIMA JINNAH HOSTEL

Bill of Quantities (Electronics)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
					2	NS-37	

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

06. FATIMA JINNAH HOSTEL

Bill of Quantities (Electronics)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
					3	NS-44	
4	NS-45	Providing Water Dispensers make (Homeage, Pell, Haier, Orient and approved equivalent) with: 3 Tab Operation I.e. Hot, Cold and Normal, Refrigerator Cabinet 20 liters, Energy Saving, 1L or above cold water Capacity, 3.5L or above hot water Capacity, Cooling power input 1-year complete part warranty, 1 Year after sale service	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

06. FATIMA JINNAH HOSTEL

Bill of Quantities (Electronics)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
					5	NS-47	
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

06. FATIMA JINNAH HOSTEL

Bill of Quantities (Allied Items)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	NS-40	Providing Cooking Range Welcome 3 Burner Gas Cooking Range WC-555 or equivalent: a) Stainless Steel Burner Top b) 3 Standard Burners c) Two Way Thermostat d) Single Door e) Metal Top f) Tempered Oven Glass g) Baking Roasting and Grilling Oven h) Width 27,Depth 20, Height 32	No.	1			
2	NS-51	Providing Crokery, 12 Person set 54 pieces, Pyrex	No.	4			
3	NS-52	Providing Cutleries 12 Person set 52 pieces, Material Stainless steel	No.	4			
4	NS-54	Providing Blankets Double Bed Blanket Ply: 2 Ply Size: 220x240 Cm	No.	12			
5	NS-55	Providing Quilt with cover 1. Single person quilt polyester 2. Cover	No.	12			
6	NS-56	Providing Chadar, Single person cotton, Good Quality.	No.	12			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

06. FATIMA JINNAH HOSTEL

Bill of Quantities (Allied Items)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
7	NS-57	Providing One set: Two Bedsheets + Two Pellow + Two Pellow Covers: Double Bed sheet with 2 covers a) T-150 b) Non- Iron c) Wrinkle Resistance d) High Strength e) Durable Pillows a) Cover material: same as bedsheet b) Size : 18 x 25 Inches c) Filling : 100% Polyster Ball Fiber d) Allergic Free Long Lasting Plush & Comfy Feel e) Made of soft to touch fabric	No.	12			
8	NS-75	Providing and fixing Fire Extinguishers 1. DCP type 2. CO2	No.	1			
9	NS-76	Providing Fire Blanket	No.	1			
10	NS-77	Providing First Aid Kits	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

06. FATIMA JINNAH HOSTEL

Bill of Quantities (Allied Items)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
11	NS-78	Providing Wheel Chairs, Chromed Steel Fram, Fixed Armrest, Fixed Footrest, Aluminum Foot Plate, 8" PVC Solid Front Castor, 46CM seat width, 24" Spoking Solid Wheel / Solid Mag Rear Wheel Stainless Steel Plate, PVC seat and Back	No.	1			
12	NS-87	Providing and fixing Curtain Blinds (Zebra) Modern style blinds. Horizontal style. Double fabric. Overlapping/transition options. block 95% light. easy to operate. Beautiful design. Cassette/ shutter with matching fabric on front.100% privacy	SFT	288			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)			
UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA			
07. AYESHA EXECUTIVE HOSTEL (NEW BUILDING)			
Sub-Summary			
Sr. No.	Description	Total Amount (Rs)	Remarks
7	Ayesha Executive Hostel (New Building)		
A	Civil Works		
B	Electrical Works		
C	IT Equipments		
D	Electronics		
E	Gym		
F	Allied Items		
G	Furniture		
	Total =		

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

07. AYESHA EXECUTIVE HOSTEL (NEW BUILDING)

Bill of Quantities (Electrical Works)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	NS-82	Providing and fixing Solar on-Grid 30Kw Tier A Monocrystalline, Half Cut PV Modules 30 kW (Jinko/Canadian/Longi/Trina or equivalent) Maintenance Free Grid Tied Three Phase Inverters 30 kW (GoodWe or equivalent) Wireless Remote Monitoring via 4G Dongle Device for inverter & string performances 1 Distribution Box: Chint/ABB/Eqv. MCCB AC Breaker, Surge Protection Devices 1 Structure: Galvanized Iron Fixed Tilt Roof Mounted Structures, Stainless Steel Nut bolts, Civil Works - 30 kW DC Wire: 4mm ² XLPE/PVC/Tin Coated Copper Single Core 600/1000V DC (As per Actual) AC Wire: XLPE/PVC Aluminum AC Wire for Inverter & Bus Bar Connections (As per Actual)	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

07. AYESHA EXECUTIVE HOSTEL (NEW BUILDING)

Bill of Quantities (Electrical Works)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		Electrical Installation: Cable Conduits, Cable Ties etc. PVC Bends, Ducts, Flexible Pipes, MC4 connectors etc (Job)					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

07. AYESHA EXECUTIVE HOSTEL (NEW BUILDING)

Bill of Quantities (Electrical Works)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
2	NS-84	Providing and fixing Solar Hybrid 10Kw Tier A Monocrystalline, Half Cut PV Modules 10 kW (Jinko/Canadian/Longi/Trina Solar or equivalent) T10-HV Hybrid Maintenance Free Three Phase Inverters 1 (Alpha ESS Smile or equivalent) Batteries: Smile BAT 8.2 kWh Li-Ion Storage Modules with 90% recommended DOD 1 Structure: GI fixed tilt roof mounted structure, Stainless Steel Nut bolts, Civil works 10 kW DC Wire: 4mm ² XLPE/PVC/Tin Coated Copper Single Core 600/1000V DC (As per Actual) AC Wire: XLPE/PVC AC Wire for Inverter & Bus Bar Connections (As per Actual) Electrical Installation: Cable Conduits, Cable Ties etc, PVC Bends, Ducts, Flexible Pipes, MC4 connectors etc Job Earthing Bores, Copper Wire, Grounding Wire & Lightning Arrestors 1 Net Meter documentation, installation & all dealings with respective DISCO 1	No.	1			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)							
UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA							
07. AYESHA EXECUTIVE HOSTEL (NEW BUILDING)							
Bill of Quantities (IT Equipments)							
Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	NS-03	LED Screen (55") Technology Type: UHD Andriod TV, Display Resolution: 4K, Panel Resolution: 3840 x 2160, Screen Size: 55", Speaker: 2 Operating System: Android or Tizen CPU: Quantum or Equivalent HDR10, Contrast Ratio: 5000:1 (typ.), HDMI x 2 or higher Audio Video IN, Headphone, USB: 2 or higher, BlueTooth Connectivity: BlueTooth 5.0, Wi-Fi Connectivity: Internet Link: 2.4GHz Wi-Fi 802.11 b/g/n or ac Ethernet Network (RJ45), Accessories: Stand, Cables and mountings, Warranty: 1 year	No.	3			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)							
UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA							
07. AYESHA EXECUTIVE HOSTEL (NEW BUILDING)							
Bill of Quantities (IT Equipments)							
Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
2	NS-04	LEDs Screen (32") + Gym LCD 32", Panel Type: HD, Resolution:1366*768, Viewing Angle:178°/178° Refresh Rate: 60Hz, Contrast Ratio: 3000:1, Colors: 16.7 M(8bit) HDMI: 2 or higher Component IN: Yes, A/V IN: Yes, A/V Out: Yes, SPDIF Out: Yes USB: 1 or higher	No.	31			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)							
UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA							
07. AYESHA EXECUTIVE HOSTEL (NEW BUILDING)							
Bill of Quantities (IT Equipments)							
Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
3	NS-07	<p>Laptops Type: Processor: 12th Gen Intel Core i7, upto 4.7Ghz (Max Turbo Frequency) or higher Memory: 16GB DDR4 Hard Drive 512 GB SSD Display: 14- 15.6 inch FHD (1920 x 1080) Display Battery: 4 Cell battery with 3-4 hours battery backup or higher Connectivity Standards Gigabit Ethernet, Wifi 802.11, Bluetooth or higher Camera & Mic: 720P HD Camera & Mic Ports: 1x USB 3.1 or higher, 1x HDMI, 1x RJ45 1x USB 3.0 or higher, 1 x Headset/mic combo jack or Higher Accessories: 1. Standard charger 2. Carrying Case of Same Brand with Part # 3. Wireless mouse branded with Part # 4. Mouse Pad Warranty: 1 year local/ onsite</p> <p>Software: All laptop and desktop computers shall come with the following original/ licensed software pre-installed: 1. Operating System: Windows 11 Pro 64 bit for Laptop and Desktop 2. Office Suite: Microsoft Office Home & Business 2019 for Laptop and Desktop</p>	No.	2			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

07. AYESHA EXECUTIVE HOSTEL (NEW BUILDING)

Bill of Quantities (IT Equipments)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
4	NS-12	Printer (Laser Black & White) Print Technology: Laser Print Speed: Up to 40ppm (A4) Processor: 600 MHz or higher Memory: 256 MB Printing: Duplex Automatic Black Print Resolution: 1200 x 1200 dpi Monthly Duty Cycle: Up to 40,000 pages Supported Paper Size: A4, Letter, Legal, Connectivity: standard 1 Hi-Speed USB, Gigabit Ethernet 10/100/1000BASE-T network; Wireless (Wi-Fi) Compatibility: Supported Operating System, MacOS, Windows-7,8, 10, 11. Accessories: Cables: 1 x USB, 1 x Power Cord Warranty: 1 Year	No.	1			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

07. AYESHA EXECUTIVE HOSTEL (NEW BUILDING)

Bill of Quantities (Electronics)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	NS-34	Providing and fixing Inverter ACs make (Gree, Dawlance, Haier, Pell or equivalen DC Inverter Technology mounted (front flow) Capacity >12000 BTU Power supply 220+10%/1 PH/50Hz Power Input (cooling/Heating) <1900 watt Running Current <9AMP Energy Saving 60% or above Low voltage function 150 or below Air Circulation (Indoor / Outdoor) >800/2500 CMH Noise level (Indoor / Outdoor) < (45/55) dB Panel display LCD Remote controlled LCD Temperature control thermostat or equivalent Auto air swing Speed setting cooling/Fan/Auto On/off timer Auto restart Refrigerant R410 / R410 Cooling coil (Inner Grooved copper anti-corrosive fine (or better), 1 year warranty and after sale service 10 year compressor warranty.	No.	19			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

07. AYESHA EXECUTIVE HOSTEL (NEW BUILDING)

Bill of Quantities (Electronics)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
2	NS-35	Providing and fixing Inverter ACs make (Gree, Dawlance, Haier or approved equivalent) (Inverter ACs 1.5 tons) DC Inverter Technology mounted (front flow) Capacity >18000 BTU Power supply 220+10%/1 PH/50Hz Power Input (cooling/Heating) <1900 watt Running Current <9AMP Energy Saving 60% or above Low voltage function 150 or below Air Circulation (Indoor / Outdoor) >800/2500 CMH Noise level (Indoor / Outdoor) < (45/55) dB Panel display LCD Remote controlled LCD Temperature control thermostat or equivalent Auto air swing Speed setting cooling/Fan/Auto On/off timer Auto restart Refrigerant R410 / R410 Cooling coil (Inner Grooved copper anti-corrosive fine (or better), 1 year warranty and after sale service 10 year compressor warranty.	No.	18			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

07. AYESHA EXECUTIVE HOSTEL (NEW BUILDING)

Bill of Quantities (Electronics)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
3	NS-37	Providing Refrigerator 20 Cubic Feet Invertor make (Homage, Pcl, Haier, Dawlance and approved equivalent) with: 20 Cu-Ft Capacity, smart invertor, Operating voltage/ Frequency 220/50, electronic control, Power consumption 160watt maximum, Adjustable thermostat (Temperature Control), interior Light LED, Low voltage operation upto 150v, Refrigerant R-134a or R600a, Evaporator Roll Bond, Auto Defrost function, Copper Condenser, Tow Door, Shelves/Trays/Scrapper/Door Pocket, 1 year warranty and after sale service.	No.	2			
4	NS-38	Providing Double Door Freezer, Inverter 15 Cu.ft/ 410 ltr, Convertible 4 in 1, LED top light, Static cooling technology, 1 Year Warrenty,	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

07. AYESHA EXECUTIVE HOSTEL (NEW BUILDING)

Bill of Quantities (Electronics)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
5	NS-44	Providing Microwave Oven 30 Liter make (Dawlance, Ecostar, Haier or approved equivalent) with: 30 liter capacity, Voltage 220 ~ 240, Latest Model, Rated input power 1400W maximum, Rated output power 900W approximately, LED display, Electronic (Touch Panel) control type & 1 year warranty and after sale services.	No.	3			
6	NS-45	Providing Water Dispensers make (Homeage, Pell, Haier, Orient and approved equivalent) with: 3 Tab Operation I.e. Hot, Cold and Normal, Refrigerator Cabinet 20 liters, Energy Saving, 1L or above cold water Capacity, 3.5L or above hot water Capacity, Cooling power input 1-year complete part warranty, 1 Year after sale service	No.	5			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

07. AYESHA EXECUTIVE HOSTEL (NEW BUILDING)

Bill of Quantities (Electronics)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
7	NS-46	Providing and fixing Ceiling Fan make (Super Asia, GFC, SK, Indus, Royal and approved equivalent) with: size 56" copper motor, Double "Z" Ball Bearing, Aerodynamically designed blades & Silicon steel lamination.	No.	50			
8	NS-47	Providing Pedestal Fan (56") Copper Wire, Ball Bearing Motor, Full Metal, Energy Efficient, High RPM.	No.	4			
9	24/102	Providing and fixing Copper winded Exhaust fan with louver and shutter made of Pak/Younas/G.F.C. i/c the cost of necessary cable and hardware for connection from ceiling rose complete as approved and directed by Engineer Incharge. (a) Plastic body (ii) 12 " dia	Each	24			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

07. AYESHA EXECUTIVE HOSTEL (NEW BUILDING)

Bill of Quantities (Electronics)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
10	NS-49	Providing Washing Machine make (Homage, PEL, Haier, Kenwood, Super Asia or approved equivalent) with: Copper Motor, Washing Capacity 20Kg, Energy saver, Rust proof painted metal body, Steel drum with double storm pulsator.	No.	2			
11	NS-50	Providing Dry Iron make (Panasonic, WestPoint, National and approved equivalent) with: Power 1000W, Non-Stick Soleplate, Voltage 220 - 240, Adjustable Swivel Cord & Temperature setting guide.	No.	5			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

07. AYESHA EXECUTIVE HOSTEL (NEW BUILDING)

Bill of Quantities (GYM)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	NS-58	Providing Treadmil Motor Power: 4HP or above AC Motor Continuous Commercial Grade Electronic Display: 10.1 inch TFT Colour Touch Screen Display, Programs, Speed, Distance, Time, Calories, Pulse Hand Rails: Convenient Speed +/-, Start/Stop buttons and hand pulse grips to monitor heart rate Speed Range: 1 – 20 KM/H Incline: 18 Levels Power Incline Safety: Safety Key for Emergency Stop Space Saving: Easily folds for space-saving and moving wheels for transportation Deck Cushion: SPAX Shock absorbent cushions for reduced impact on your joints Running Surface: W20.2 x L60 inches User Weight Limit: Maximum 180KG	No.	1			
2	NS-59	Providing Elliptical: ELLIPTICAL GYM AND FITNESS MACHINE a) Frame: Stride length = 20, Fly wheel = 8.5kgs b) Computer Display: 6.5 LCD c) Resistance type: ECB, 32 LEVELS d) Incline level: Power, 20 levels e) Cooling Fan & Hand pulse rate measurement f) Max. User weight: 150 Kg	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

07. AYESHA EXECUTIVE HOSTEL (NEW BUILDING)

Bill of Quantities (GYM)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
3	NS-60	PROVIDING RECUMBENT BIKE FITNESS MACHINE: a) Power Source: Adaptor DC 9V/1A b) Fly wheel weight: 7 Kg, Stride length: 340 mm c) Resistance Type: ECB Magnetic d) Q factor: 210 mm e) Hand Pulse sensors, Cup holder, Transport wheels f) Max. User weight: 120 Kg g) Read Out: Time, Distance, RPM, Speed, Calories, Pulse, Body fat, HR control, Pulse recovery	No.	1			
4	NS-61	Providing Gym Floor Mats Rubber Hard material.	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

07. AYESHA EXECUTIVE HOSTEL (NEW BUILDING)

Bill of Quantities (GYM)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
5	NS-62	Providing Plates Rubber 230kg, - 10 Plates 2.5Kg (Total= 25kg) - 10 Plates 5kg (Total= 50kg) - 5 Plates 10kg (Total = 50kg) - 3 Plates 15kg (Total = 45kg) - 3 Plates 20kg (Total = 60kg) Dumble Rubber 125Kg: - 4 sets 1Kg (Total= 4kg) - 4 sets 2kg (Total= 8kg) - 4 sets 3kg (Total = 12kg) - 4 sets 4kg (Total = 16kg) - 4 sets 5kg (Total = 20kg) - 2 sets 7.5kg (Total = 15kg) - 2 sets 10kg (Total = 20kg) - 2 sets 15kg (Total =30kg) Dumble Steel Rod weight and lock 100Kg: - 4 sets each with total 25Kg Plates (Total= 100kg) Rods 247kg, Locks 25kg.	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

07. AYESHA EXECUTIVE HOSTEL (NEW BUILDING)

Bill of Quantities (GYM)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
6	NS-63	Providing Bench 3 in 1 Abdominal Bench,	No.	1			
7	NS-64	Providing Stool, Back seat stool.	No.	4			
8	NS-65	Providing Multi Function four station, 1) Bi &Tri, 2) leg pull 3) Rowing 4) Flying	No.	1			
9	NS-66	Providing Arobic Equipments Jumping ropes 12 Youga mate 6mm 12 Weight machine digital 2	No.	1			
10	NS-67	Providing Leg Extention / Leg Curl a) Triceps Pushdown b) Lat Pull down c) Leg Extensions d) Standing Arm Curl e) Standing Triceps Extension f) Butterfly g) Weight stack: 100 LBS	No.	1			
11	NS-69	Providing Table tennis table Table tennis made in china table frame with tyres 15mm thickness. Table Tennis Nett & post set. Table Tennis rackets Club standard, made in china. (3 pairs per table) Table Tennis balls Made in china. (2 per dozen per table)	No.	2			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

07. AYESHA EXECUTIVE HOSTEL (NEW BUILDING)

Bill of Quantities (GYM)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
12	NS-70	Providing Snooker table size 4.5ft* 9ft. Marble top approximately 1inch thickness. Solid Wood frame. Cloth, balls & rubber set Taiwan. Playing cues 4 no. included.	No.	1			
13	NS-78	Providing Wheel Chairs, Chromed Steel Fram, Fixed Armrest, Fixed Footrest, Aluminum Foot Plate, 8" PVC Solid Front Castor, 46CM seat width, 24" Spoking Solid Wheel / Solid Mag Rear Wheel Stainless Steel Plate, PVC seat and Back	No.	2			
14	NS-79	Providing Strechers Stretcher Type: Simple stainless steel Straight Stretcher Trolley: Chromed Steel side guard & cylinder holder.	No.	1			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

07. AYESHA EXECUTIVE HOSTEL (NEW BUILDING)

Bill of Quantities (Allied Items)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	NS-40	Providing Cooking Range Welcome 3 Burner Gas Cooking Range WC-555 or equivalent: a) Stainless Steel Burner Top b) 3 Standard Burners c) Two Way Thermostat d) Single Door e) Metal Top f) Tempered Oven Glass g) Baking Roasting and Grilling Oven h) Width 27,Depth 20, Height 32	No.	2			
2	NS-41	Providing Stove for Daig Local material for 20 Kg daig.	No.	2			
3	NS-42	Providing Daig Silver Daig with cover knob, Capacity 10kg.	No.	3			
4	NS-43	Providing Gas cylinder LPG Gas Cylinder, Capacity 12Kg, Standered Quility material.	No.	2			
5	NS-51	Providing Crokery, 12 Person set 54 pieces, Pyrex	No.	8			
6	NS-52	Providing Cuttleries 12 Person set 52 pieces, Material Stainless steel	No.	8			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

07. AYESHA EXECUTIVE HOSTEL (NEW BUILDING)

Bill of Quantities (Allied Items)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
7	NS-53	Providing One set: Two Bedsheets + Two Pillows + Two Pillow Covers: Bed sheet with 2 covers a) T-150 b) Non- Iron c) Wrinkle Resistance d) High Strength e) Durable Pillows a) Cover material: same as bedsheet b) Size : 18 x 25 Inches c) Filling : 100% Polyester Ball Fiber d) Allergic Free Long Lasting Plush & Comfy Feel e) Made of soft to touch fabric	No.	70			
8	NS-54	Providing Blankets Double Bed Blanket Ply: 2 Ply Size: 220x240 Cm	No.	68			
9	NS-55	Providing Quilt with cover 1. Single person quilt polyester 2. Cover	No.	68			
10	NS-56	Providing Chadar, Single person cotton, Good Quality.	No.	68			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

07. AYESHA EXECUTIVE HOSTEL (NEW BUILDING)

Bill of Quantities (Allied Items)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
					11	NS-75	
12	NS-76	Providing Fire Blanket	No.	5			
13	NS-77	Providing First Aid Kits	No.	2			
14	NS-87	Providing and fixing Curtain Blinds (Zebra) Modern style blinds. Horizontal style. Double fabric. Overlapping/transition options. block 95% light. easy to operate. Beautiful design. Cassette/ shutter with matching fabric on front. 100% privacy	SFT	1,176			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

07. AYESHA EXECUTIVE HOSTEL (NEW BUILDING)

Bill of Quantities (Furniture)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	NS-F06	MEETING ROOM TABLE FOR 12 PERSONS Size: 12' x 6' x 2.5' Top / structure made of MDF pressed with lamination on both sides. Edges covered with matching PVC.	No	4			
2	NS-F13	CENTRE TABLE MOD. WSC/RI/2013 C.T Size: - 1200x600x450 mm (H). Structure made of high density chipboard, pressed with shisham veneer on both sides. With solid seasoned sh. wood beading. With Glass top. Finished with N.C. lacquer.	No	5			
3	NS-F16	STUDY TABLE MOD.0.8080 MF FORMICA Size: 1200 x 600 x 760 mm (H) Top made of high density chipboard pressed with one side formica and other side veneer. Structure made of 25/25 mm mild steel square pipe. Finished with N.C. silver paint.	No	49			
4	NS-F17	REVOLVING CHAIR MOD. WSC/B-9 92 Seat cushioned 1st quality foam covered with leatherite & back with black mesh. Complete with high quality revolving pedestal. With arms. Low back chair.	No	100			
5	NS-F34	ROSTRUM MOD. SPECIAL 7 Size: 620 x 550 x 1170 mm (H) Structure made of high density chipboard pressed with sh. veneer on both sides. With one shelf. Finished with N.C. lacquer	No	4			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

07. AYESHA EXECUTIVE HOSTEL (NEW BUILDING)

Bill of Quantities (Furniture)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
6	NS-F35	5-SEATER SOFA MOD. WSC/RI/2013 Inner structure made of solid seasoned wood. Fully cushioned with foam covered with leatherite. 1 Set (2 single seater + one 3 seater)	No	5			
7	NS-F36	SINGLE BED WITH SIDE TABLE MOD. B-2 /B-3 A (Without Mattress) Size: 1980 x 990 mm (Inside) Foot/head board made of high density chipboard, pressed with shisham veneer on both sides, legs made of solid seasoned shisham wood. Side rails made of block board. Finished with N.C. lacquer. Foam mattress resting on 19 mm thick chipboard. Without foam mattress. b. BED SIDE TABLE MOD. B-3 A Size: 580 x 435 x 620 mm (H) Structure made of high density chipboard, pressed with shisham veneer on both sides, with one drawer, wooden footing. Finished with N.C. lacquer.	No	68			
8	NS-F38	SINGLE BED MATTRESS (MOLTY ORTHO 4")	No	68			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)			
UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA			
08. MOSQUE			
Sub-Summary			
Sr. No.	Description	Total Amount (Rs)	Remarks
8	Mosque		
A	Civil Works		
B	Electrical Works		
C	Electronics		
D	Allied Items		
E	Furniture		
	Total =		

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

08. MOSQUE

Bill of Quantities (Electrical Works)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	NS-83	Providing and fixing Solar Hybrid 5Kw Tier A Monocrystalline, Half Cut PV Modules 5.4 kW (Jinko/Canadian/Longi/Trina Solar or equivalent) T10-HV Hybrid Maintenance Free Three Phase Inverters 1 (Alpha ESS Smile or equivalent) Batteries: Smile BAT 8.2 kWh Li-Ion Storage Modules with 90% recommended DOD 1 Structure: GI fixed tilt roof mounted structure, Stainless Steel Nut bolts, Civil works 5.4 kW DC Wire: 4mm ² XLPE/PVC/Tin Coated Copper Single Core 600/1000V DC (As per Actual) AC Wire: XLPE/PVC AC Wire for Inverter & Bus Bar Connections (As per Actual) Electrical Installation: Cable Conduits, Cable Ties etc, PVC Bends, Ducts, Flexible Pipes, MC4 connectors etc Job Earthing Bores, Copper Wire, Grounding Wire & Lightning Arrestors 1 Net Meter documentation, installation & all dealings with respective DISCO 1	No.	1			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

08. MOSQUE

Bill of Quantities (Electronics)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	NS-35	Providing and fixing Inverter ACs make (Gree, Dawlance, Haier or approved equivalent) (Inverter ACs 1.5 tons) DC Inverter Technology mounted (front flow) Capacity >18000 BTU Power supply 220+10%/1 PH/50Hz Power Input (cooling/Heating) <1900 watt Running Current <9AMP Energy Saving 60% or above Low voltage function 150 or below Air Circulation (Indoor / Outdoor) >800/2500 CMH Noise level (Indoor / Outdoor) < (45/55) dB Panel display LCD Remote controlled LCD Temperature control thermostat or equivalent Auto air swing Speed setting cooling/Fan/Auto On/off timer Auto restart Refrigerant R410 / R410 Cooling coil (Inner Grooved copper anti-corrosive fine (or better). 1 year warranty and after sale service 10 year compressor warranty.	No.	4			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

08. MOSQUE

Bill of Quantities (Electronics)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
					2	NS-47	
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

08. MOSQUE

Bill of Quantities (Allied Items)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	NS-77	Providing First Aid Kits	No.	1			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

09. BOUNDARY WALL

Bill of Quantities (Civil Works)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
<i>Schedule Item (Civil Works)</i>							
1	4/13	Dismantling brick work in lime or cement mortar.	100 Cft	308.81			
		Excavation					
2	3/21/b	Excavation in foundation of building, bridges and other structures, including dagbelling, dressing, refilling around structure with excavated earth, watering and ramming lead upto one chain (30 m) and lift upto 5 ft. (1.5 m)					
		a) By Manual ii) in ordinary soil.	1000Cft	38.25			
		Plain Cement Concrete					
3	6/5	Cement concrete plain including placing, compacting, finishing and curing complete (including screening and washing of stone aggregate):					
		(i) Ratio 1: 4: 8	100Cft	50.49			
		Brick work in Foundation					
4	7/4/i	Pacca brick work in foundation and plinth in:- Cement, sand mortar:- Ratio 1:5	100Cft	265.15			
		Horizontal D.P.C					
5	6/36	Providing and laying damp proof course of cement concrete 1 : 2 : 4 (using cement, sand and shingle), including bitumen coating :-					
		(a) with one coat bitumen and one coat polythene sheet 500gauge					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

09. BOUNDARY WALL

Bill of Quantities (Civil Works)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		i) 1½" thick (40 mm)	100Sft	47.90			
		Brick work in Super Structure					
6	7/5	Pacca brick work in ground floor:-					
		i) Cement, sand mortar:- Ratio 1:5	100Cft	335.31			
		Concrete Work					
7	6/6	Providing and laying reinforced cement concrete (including prestressed concrete), using coarse sand and screened graded and washed aggregate, in required shape and design, including forms, moulds, shuttering, lifting, compacting, curing, rendering and finishing exposed surface, complete (but excluding the cost of steel reinforcement, its fabrication and placing in position, etc.):-					
		In Foundation					
		(a)(iii) Reinforced cement concrete in slab of rafts / strip foundation, base slab of column and retaining walls; etc and footing beams, other structural members other than those mentioned in 6(a) (i)&(ii) above not requiring form work (i.e. horizontal shuttering) complete in all respects:-					
		(3) Type C (nominal mix 1: 2: 4)	Cft	27.00			
		Above foundation					
		(a) (i) Reinforced cement concrete in roof slab, beams, columns lintels, girders and other structural members laid in situ or precast laid in position, or prestressed members cast in situ, complete in all respects:-					
		Type C (nominal mix 1: 2: 4)	Cft	166.72			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

09. BOUNDARY WALL

Bill of Quantities (Civil Works)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		Steel Work.					
8	6/12	Fabrication of mild steel reinforcement for cement concrete, including cutting, bending, laying in position, making joints and fastenings, including cost of binding wire and labour charges for binding of steel reinforcement (also includes removal of rust from bars):-					
		c) Deformed bars (Grade-60)	100Kg	5.81			
		Plaster					
9	11/8	Cement plaster 1:3 upto 20' (6.00 m) height:-					
		c) ¾" (20 mm) thick	100Sft	496.18			
		Pointing					
10	11/18/ii	Cement pointing struck joints, on walls, upto 20' (6.00 m) height:-					
		b) ratio 1:3	100Sft	386.84			
11	11/31	Extra cost of labour and material for red oxide pigment in cement pointing to match with the colour of bricks.	100Sft	386.84			
		Main Gate					
12	25/30	Making and fixing steel grated doors, complete with locking arrangement, angle iron frame 2"x2"x3/8" (50x50x10 mm) and ¾" (20 mm) square bars 4" (100 mm) centre to centre.	Sft	192.00			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

09. BOUNDARY WALL

Bill of Quantities (Civil Works)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		Paint					
13	13/5	d) Preparing surface and painting guard bars, gates of iron bars, gratings, railing (including standards, braces, etc.) and in similar open work:-					
		i) priming coat.	100Sft	3.84			
		ii)Two coat	100Sft	3.84			
14	26/46-ii	Providing and fixing anti climb high security galvanized razor cut wire having double sharp four U-shaped pointed 0.5 mm thick (22mmx15 mm barbs) spaced @ 33 mm c/c cladde over 2.5 mm dia high tensile Core wire making coil fencing of specified diameter @ 4" c/c fixed on 2'-3" high M/S angle iron post 1½"x1½"x3/16"embeded in base of PCC (1:2:4) (4"x4"x9") @ 4' apart i/c the cost of 2 No. bars 3/8" dia welded horizontally with angle iron posts , binding wire, painting of posts, etc. complete in all respects as pproved and directed by the Engineer incharge.					
		(ii) 18 " diameter	Per Rft	6.100			
		Deduction of used bricks from original quantity.	%oNos.	416.90			
		Schedule Item (Total)					
		Say					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

10. ROAD WORKS

Bill of Quantities (Civil Works)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
<i>Schedule Item (Civil Works)</i>							
1	3/47	Jungle clearance and removing within 100 ft. (30 m).					
		a) light	100Sft	192.00			
2	4/11	Dismantling dry brick masonry.	100Cft	1.13			
		Excavation					
3	3/7	Earthwork excavation in open cutting upto 5'-0" (1.5 m) depth for storm water channels, drains, sullage drains in open areas, roads, streets, lanes, including under pinning of walls and shoring to protect existing works, shuttering and timbering the trenches, dressed to designed level and dimensions, trimming, removal of surface water from trenches, back filling and surplus excavated material disposed of and dressed within 50 ft. (15 m) lead:- i) ordinary	1000Cft	14.10			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

10. ROAD WORKS

Bill of Quantities (Civil Works)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		Borrow Earth					
4	3/5/i + 3/17	Earthwork in ordinary soil for embankment including ploughing and mixing with blade grade or disc harrow or other suitable equipment and compaction by mechanical means at optimum moisture content and dressing to designed section, complete in all respects:- 95% to 100% maximum modified dry density as determined according to AASHTO T-180 method-D including Transportation of earth.	1000Cft	14.10			
		Road Edging					
5	18/5	Providing and laying road edging of 3" (75 mm) wide and 9" (225 mm) deep brick on end, complete in all respects.	Rft	6,900.00			
		Sub Base Course					
6	18/3/ai (i) + 1/1	Providing and laying sub-base course of stone product of approved quality and grade including, placing, mixing, spreading and compaction of sub base material to required depth, camber and grade to achieve 100% maximum dry density determined according to AASHTO T-180 method-D, including carriage of all material to site of work complete in all respect as per specifications and as directed by the engineer incharge. (Crushed stone aggregate from Sargodha quarry to site, actual compacted depth shall be considered for payment)	100Cft	141.00			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

10. ROAD WORKS

Bill of Quantities (Civil Works)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		Tuff Paver					
7	10/41	Providing and laying Tuff pavers, having 7000 PSI, crushing strength of approved manufacturer, over 2" to 3" sand cushion i/c grouting with sand in joints i/c finishing to require slope. complete in all respect. (50% Grey / 50% Coloured)					
		c) 80-mm thick	Sft	36,000			
8	7.001	Deduction of used bricks from original quantity	1000Nos	0.57			
		Schedule Item (Total)					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

II. JOGGING TRACK

Bill of Quantities (Civil Works)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
<i>Schedule Item (Civil Works)</i>							
1	3/18	Dressing and levelling of earhtwork to designed section, etc. complete:- b) Ordinary or hard soil.	1000Cft	9.00			
2	18/5	Providing and laying road edging of 3" (75 mm) wide and 9" (225 mm) deep brick on end, complete in all respects.	Rft	4,500			
Murram Soil for Jogging Track							
3	NS	Providing and laying stone dust of approved quality and grade including, placing, leveling, and spreading of stone dust material to required depth and grade complete in all respect as per specifications and as directed by the engineer incharge. (Stone dust from Dina quarry to site, actual compacted depth shall be considered for payment)	100Cft	90.00			
Schedule Item (Total)							
Say							

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

12. VEHICLES

BILL OF QUANTITIES

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
					1	NS-89	
2	NS-90	Providing Tractor and Hydraulic tipping trolley	No.	1			
3	NS-91	Providing Vehicles for academy - 1 coaster 4th generation 29 seated Higher-end Coaster 4000 CC (Toyota or Equivalent) Coaster: Speed Manual floor shift Transmission, 4.2 L Engine, 29 seater, Air conditioner	No.	2			
4	NS-92	Providing Vehicle for academy - Hiace Van 2.5 Ltr-2.75 Ltr) Hiace Deluxe standard High Roof Tourer (Toyota or Equivalent) Hiace Deluxe: 14 Seater, 4 Cylinder, Inline Diesel Engine, 16 Valve DOHC, Automatic Transmission.	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

12. VEHICLES

BILL OF QUANTITIES

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
5	NS-93	Providing Vehicle for academy - sedan (1300 CC) Sedan: (Toyota or Equivalent) 1329 CC, 4 Cylinder inline, 16 Valve DOHC, Chain Drive with Dual VVT-i 1NR-FE Engine' 7 speed CVT, Front disc breaks rear drum with ABS & EBD, Power Steering, Power Window, CD player with Bluetooth, Power side view mirror.	No.	1			
6	NS-95	Providing Vehicle for academy - Suzuki Ravi carry van (800 CC) Ravi VX 800CC Euro II, or Equivalent Security System immobilizer, Commercial.	No.	1			
7	NS-96	Providing Vehicle for academy - Bike (100 CC) Honda Engine: 4-Stroke OHC Air-Cooled Transmission: 4-Speed Constant Mesh Starting: Kick Starter Final Drive: Roller Chain Fuel Tank Capacity: 9.7 Liters (Reserve: 1.5 Liters Suspension at Front: Telescopic Fork 94 mm Travel Suspension at Back: Swing Arm 84 mm Travel	No.	6			
		Sub-Total					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)							
UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA							
OVER HEAD WATER TANK 5,000 GALLON							
BILL OF QUANTITIES (CIVIL WORK)							
Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		Civil Works					
		Excavation					
1	3/21/a/ii	Excavation in foundation of building, bridges and other structures, including dagbelling, dressing, refilling around structure with excavated earth, watering and ramming lead upto one chain (30 m) and lift upto 5 ft. (1.5 m)					
		2) a) By Excavator					
		in ordinary soil.	1000Cft	3.31			
		b) Lift from 5ft (1.5m) to 15 ft (4.5 m):-					
		ii) Ordinary soil	1000Cft	2.07			
		Compaction					
2	3/24	Compaction of earthwork with power road roller, including ploughing, mixing, moistening earth to optimum moisture content in layers, etc. complete:					
		i) 95% to 100% maximum modified AASHTO dry density.	1000Cft	0.41			
		Backfilling					
3	3/13/a	Rehandling of earthwork:					
		a) Lead upto a single throw of Kassi, phaorah or shovel	1000Cft	4.30			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)							
UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA							
OVER HEAD WATER TANK 5,000 GALLON							
BILL OF QUANTITIES (CIVIL WORK)							
Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		Cement Concrete					
4	6/5/i	Cement concrete plain including placing, compacting, finishing and curing complete					
		(i) Ratio 1: 4: 8	100Cft	1.03			
		Concrete Work					
5	6/6	Providing and laying reinforced cement concrete (including prestressed concrete), using Ordinary Portland Cement / Sulphate resisting cement / Slag cement as may be required; coarse sand and screened graded and washed aggregate, in required shape and design, including forms, moulds, shuttering, lifting, compacting, curing, rendering and finishing exposed surface, complete (but excluding the cost of steel reinforcement, its fabrication and placing in position, etc.);-					
		(a)(iii) Reinforced cement concrete in slab of rafts / strip foundation, base slab of column and retaining walls; etc and footing beams, other structural members other than those mentioned in 6(a) (i)&(ii) above not requiring form work (i.e. horizontal shuttering) complete in all respects:-					
		(2) Type B (nominal mix 1: 1½: 3)	P.Cft	589.84			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)							
UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA							
OVER HEAD WATER TANK 5,000 GALLON							
BILL OF QUANTITIES (CIVIL WORK)							
Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		(a) Reinforced cement concrete in roof slab, beams, columns lintels, girders and other structural members laid in situ or precast laid in position, or prestressed members cast in situ, complete in all respects:-					
		(2) Type B (nominal mix 1: 1½: 3)	P.Cft	2,134.30			
6	6/16	Extra labour for laying concrete plain or reinforced:					
		(a) above 30' (6 m) upto 40'(12 m) height	100Cft	3.70			
		b) Above 40' upto 50' height	100Cft	1.96			
		c) Above 50' upto 60' height	100Cft	13.43			
		Steel Work.					
7	6/12-c	Fabrication of mild steel reinforcement for cement concrete, including cutting, bending, laying in position, making joints and fastenings, including cost of binding wire and labour charges for binding of steel reinforcement (also includes removal of rust from bars):-					
		Deformed bars (Grade-60)	100kg	74.56			
		PVC Water Stopper					
8	6/31A	Providing and embedding 10" (250mm) wide PVC water stopper in expansion joints of RCC structures (Retaining walls, water tanks, Slabs) complete in all respect.					
		i) 10" wide 6 mm thick	Rft	50.00			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)							
UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA							
OVER HEAD WATER TANK 5,000 GALLON							
BILL OF QUANTITIES (CIVIL WORK)							
Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		Angle Iron Step					
9	21/13	Providing and fixing 1¼"x1¼"x3/16" (31x31x5 mm) angle iron step, in manhole chambers, including carriage and setting the same in work to correct lines and levels.	Each	8.00			
		Railing					
10	25/39	Providing and fixing stair railing of 2½" (63 mm) i/d G.I. pipe, welded with 5/8"x5/8" (16x16 mm) square M.S. bars 2'-9" (838 mm) high, fixed in each step, complete in all respects, including painting, polishing three coats.	Rft	100.00			
11	25/35	Providing and fixing terrace railing of 2" (50 mm) i/d conduit pipe 16 SWG, welded with 5/8"x5/8" (16x16 mm) square bar 2.75 ft. (838 mm) high fixed at 5" (125 mm) centre to centre, in reinforced cement concrete slab with suitable arrangement, complete in all respects, as per design and drawing.	Rft	80.00			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)							
UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA							
OVER HEAD WATER TANK 5,000 GALLON							
BILL OF QUANTITIES (CIVIL WORK)							
Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		M.S Pipe					
12	23/49	Providing, laying, testing and commissioning of Grade-B,MS Seamless Schedule pipe of nominal diameter, conforming to ASTM-A106, Lontrin/ Hufaz / Pecific baolai or equivalent, duly welded i/c the cost of specials complete as approved and directed by the Engineer Incharge					
		(xi) 4"	Rft	180.00			
		Gate Valves					
13	23/52	Providing and fixing heavy duty Gate valve of specified diameter and material for pressure rating PN-16 mde of Crane (USA), Hatersly (UK) or Scon (Pakistan) i/c the cost of all accessories flanges, nut/ bolt and gaskit where required complete in all respect as approved and directed by the Engineer Incharge.					
		(b) Flange Ended Ductile Iron Valve					
		(ix) 4" dia	Each	3.00			
14	10/21	13/8"(35 mm) thick mosaic flooring, consisting of 3/8"(10 mm) mosaic topping of one part of cement and marble powder in the ratio of 3:1 and two parts of marble chips, laid over 1"(25 mm) thick flooring of 1:2:4 cement concrete including rubbing and polishing complete :-					
		(a) using grey cement	100Sft	1.56			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)							
UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA							
OVER HEAD WATER TANK 5,000 GALLON							
BILL OF QUANTITIES (CIVIL WORK)							
Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
15	10/37	Mosaic dado or skirting with one part of cement and marble powder in the ratio of 3:1 and two parts of marble chips, laid over ½"(13 mm) thick cement plaster 1:3, including rubbing and polishing, complete with finishing:					
		(a) using grey cement:					
		i) 3/8"(10 mm) thick	100Sft	3.50			
		Plinth Protection					
16	3/21	Excavation in foundation of building, bridges and other structures, including dagbelling, dressing, refilling in layers around structure with excavated earth, watering and ramming lead upto one chain (30 m)lift upto 5 ft (1.5m).					
		1) By Manual					
		ii) in ordinary soil.	1000Cft	0.25			
17	6/2	Dry rammed brick or stone ballast, 1½" to 2"(40 mm to 50 mm) gauge.	100Cft	1.80			
18	6/5	Cement concrete plain including placing, compacting, finishing and curing complete (including screening and washing of stone aggregate):					
		(i) Ratio 1: 4: 8	100Cft	2.34			
19	7/4	Pacca brick work in foundation and plinth in:-					
		i) Cement, sand mortar:-					
		Ratio 1:5	100Cft	2.27			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)							
UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA							
OVER HEAD WATER TANK 5,000 GALLON							
BILL OF QUANTITIES (CIVIL WORK)							
Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
20	10/15	Providing and laying topping of cement concrete 1:2:4, including surface finishing and dividing in panels:- (a) 1"(25 mm) thick	100Sft	5.44			
		Chamber					
21	NS	Construction of chambers 3' x 3' x 4' deep including RCC cover and frame, 9" thick brick masonry walls set in 1:3 cement mortar, 6" thick cement concrete 1:4:8 & 1:2:4, RCC slab (1:2:4), cement plaster 1:3 to all inside wall surfaces and top curing, excavation, backfilling and disposal of surplus earth etc. complete in all respect as shown in drawing.	Nos.	3.00			
22	25/31	Making and fixing steel grated cover with 1/16" thick (1.5mm) sheeting, including angle iron frame 2"x2"x3/8" (50x50x10 mm) and 3/4" (20 mm) square bars 4" (100 mm) centre to centre, with locking arrangement.	Sft	9.00			
		Vent Pipe					
23	23/21	Providing, laying, cutting, jointing, testing and disinfecting cast iron pipe line (BS-2035) in trenches, with flanged and flanged joints, complete in all respects:- b) 4" (100 mm) i/d	Rft	6.00			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)							
UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA							
OVER HEAD WATER TANK 5,000 GALLON							
BILL OF QUANTITIES (CIVIL WORK)							
Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		Crush Stone Carriage					
24	1/1	Carriage of 100 Cft. (2.83 cu.m) of all materials like stone aggregate, spawl, kankar lime (unslaked), surkhi, etc. or 150 Cft. (4.25 cu.m) of timber, by truck or by any other means owned by the contractor. (crushed stone aggregate and bajri used in concrete items) (Lead 200 Km)	Cft	2,510.10			
		Total Rs. "A"					
		NON SCHEDULE ITEMS					
25	N.S	Providing and installing of Level Indicator complete with Steel pully, Steel Wire, Gauge Unit including all accessories such as G.I. Pipe, level indicator needle & anchoring arrangement with Float, jointing material as per drawing and/or directed by the Engineer complete in all respect	No.	1.00			
26	N.S	Clean, test and disinfect overhead water tank.	No.	1.00			
		Total Rs. "B"					
		Total Rs. "A+B"					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

BILL OF QUANTITIES (TUBE WELL)

Installation of Tubewell (0.25 Cusec, Head 200ft)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	3/2	Earthwork excavation in ashes, sand and soft soil or silt clearance, undressed lead upto 50 ft (15 metre) (Water Storage Pit 10 x 10 x 5 ft)	1000Cft	0.50			
2	23/5	Direct Rotary/Reverse Rotary drilling of bore for tubewells, in all types of soil except shingle, gravel and rock:- (2Nos. - 1 trial + 1 Original)					
		a) from ground level to 250 ft. (75 m) below ground level:-					
		ii) 20" to 26" (500 to 650 mm) i/d	P.Rft	290.00			
3	23/7	Providing strong substantially built box of deodar wood 4'x2½'x9" (1200x750x225 mm), with compartments, lock and locking arrangement, for preserving samples of strata from bore hole.	Job	1.00			
4	23/8	Furnishing sample of water from borehole each set of 2 bottles.	Per Set of Two bottles	8.00			
5	6/5-f	Cement concrete plain including placing, compacting, finishing and curing complete (including screening and washing of stone aggregate):					
		(f) Ratio 1: 2: 4	100Cft	0.18			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

BILL OF QUANTITIES (TUBE WELL)

Installation of Tubewell (0.25 Cusec, Head 200ft)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		Housing Pipe					
6	23/15	Providing and installing M.S. blind pipe socketed/welded joint, M.S. reducer (where necessary), in tubewell bore hole, including jointing/welding with strainer, etc. complete:- i) 10" i/d, 1/4" (250 mm i/d 6 mm) thick	Per Rft	100.00			
		Blind Pipe					
7	23/15	Providing and installing M.S. blind pipe socketed/welded joint, M.S. reducer (where necessary), in tubewell bore hole, including jointing/welding with strainer, etc. complete:- g) 8" i/d, 3/16" (200 mm i/d 5 mm) thick	Per Rft	10.00			
		Strainer					
8	23/13	Providing and installing Fiberglass reinforced Polypropylene (FRP) strainer of specific wall thickness having slot size of 0.9mm to 1.00mm in Tubewell bore hole i/c the cost of male/ female coupling with Nylone Strip, studs complete in all respect as approved and directed by the Engineer Incharge. v) 8" inch dia (5 mm thickness)	Per Rft	30.00			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

BILL OF QUANTITIES (TUBE WELL)

Installation of Tubewell (0.25 Cusec, Head 200ft)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		Bail Plug					
9	23/13/A	Providing and installing Fiber glass Reinforced Polypropelene (FRP) bail plug of specified wall thickness having slot size of 0.9 mm to 1.10 mm in Tubewell bore hole i/c the cost of male / female coupling with Nylone Strip, studs complete in all respect as approved and directed by the Engineer Incharge					
		v) 8" dia (5mm thickness)	Per Rft	5.00			
		Pea Gravel					
10	23/19	Shrouding with graded pea gravel 3/8" to 1/8" around tubewell in borehole	Per Cft	184.00			
11	23/18 i	Development and Testing (D&T) at 150 % of the rated capacity of tubewell for a minimum period of 72 hours. D&T will include pumping, disposal and backwashing as approved by the Engineer.	Per hour	72.00			
12	23/16 a	Providing and installing PVC gravel makeup pipe 3" dia class 'B' in tube well bore hole for gravel feeding including sockets, solvents and jointing etc complete in all respect.	Per Rft	40.00			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

BILL OF QUANTITIES (TUBE WELL)

Installation of Tubewell (0.25 Cusec, Head 200ft)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		M.S Plate					
13	25/10	Fabrication of heavy steel work, with angle, tees, flat iron round iron and sheet iron for making trusses, girders, tanks, etc., including cutting, drilling, revitting, handling, assembling and fixing, but excluding erection in position.	100Kg	0.58			
14	25/11	Erection and fitting in position iron trusses, staging of water tanks, etc.	100Kg	0.58			
		M.S Pipe					
15	23/49	Providing, laying, testing and commissioning of Grade-B,MS Seamless Schedule pipe of nominal diameter, conforming to ASTM-A106, Lontrin/ Hufaz / Pecific baolai or equivalent, duly welded i/c the cost of specials complete as approved and directed by the Engineer Incharge					
		(ix) 4"	Rft	50.00			
						Total. A	
		NON SCHEDULE ITEMS					
16	NS	Geophysical logging of bore (self potential resistivity Both short normal and Gama) complete in all respect.	P/Job	1.00			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

BILL OF QUANTITIES (TUBE WELL)

Installation of Tubewell (0.25 Cusec, Head 200ft)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		PUMP & MOTOR					
17	NS	Supply, install, testing and commissioning of submersible pump set 0.25 cfs capacity, 120 ft. pumping setting depth, Bowl Assembly Head 200 feet, 6 stages, 20 HP/2pole submersible motor, 2900 RPM, Submersible cable size 3" (4Halves) , Motor Control Unit consisting of MCCB, Over/Under voltage relay, Phase reversal relay, volt meter, Ampere meter, indicating lights for all above relays, on/Off Push Buttons, All contained in a locable Cabinet complete in all respect. (Quotation) (including NR Valve, Sluice Valve and Air valve Pressure Gauge)	Each	1.00			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

BILL OF QUANTITIES (TUBE WELL)

Installation of Tubewell (0.25 Cusec, Head 200ft)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
18	NS	Providing, fixing, commissioning & testing of Hypo Chlorinator (make Europe/USA or equivalent) consisting of multifunction dosing pump with a microcontroller (RX controller) make Europe/USA or equivalent complying to EU directives 2006/95/EC and 2004/108/EC, having capacity of 8-10 Liter/hour and maximum pressure of 10 bar, having standard power supply of 230V A.C ± 10%, 50 Hz single phase, Insulation protection rating of IP65, complete with all accessories like injection valve, suction hose, discharge hose, valves, RX probe, level switch, dosing tank to be installed with 4 cusecs capacity tubewells complete in all respect.	Job	1.00			
						Total B	
		Total Amount Rs.				Total A+B	

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)							
UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA							
TUBE WELL CHAMBER (SIZE 10'x10')							
BILL OF QUANTITIES (CIVIL WORK)							
Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		Civil Works					
		Excavation					
1	3/21/1/ii	Excavation in foundation of building, bridges and other structures, including dagbelling, dressing, refilling around structure with excavated earth, watering and ramming lead upto one chain (30 m) and lift upto 5 ft. (1.5 m)					
		in ordinary soil.	1000Cft	0.39			
		Cement Concrete					
2	6/3/d	Cement concrete brick or stone ballast 1½ " to 2" (40 mm to 50 mm) gauge, in foundation and plinth:-					
		Ratio 1: 6: 12	100Cft	0.73			
		Brick work in Foundation					
3	7/4/i	Pacca brick work in foundation and plinth in:-					
		Cement, sand mortar:- Ratio 1:5	100Cft	3.61			
		Horizontal D.P.C					
4	6/36	Providing and laying damp proof course of cement concrete 1:2:4 (using cement, sand and shingle), including bitumen coating :-					
		(a) with one coat bitumen and one coat polythene sheet 500gauge					
		i) 1-1/2" thick (40 mm)	100Sft	0.32			
		Brick work in Super Structure					
5	7/5	Pacca brick work in ground floor:-					
		i) Cement, sand mortar:- Ratio 1:5	100Cft	3.64			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)							
UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA							
TUBE WELL CHAMBER (SIZE 10'x10')							
BILL OF QUANTITIES (CIVIL WORK)							
Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		Concrete Work					
6	6/6	Providing and laying reinforced cement concrete (including prestressed concrete), using coarse sand and screened graded and washed aggregate, in required shape and design, including forms, moulds, shuttering, lifting, compacting, curing, rendering and finishing exposed surface, complete (but excluding the cost of steel reinforcement, its fabrication and placing in position, etc.):-					
		(a) (i) Reinforced cement concrete in roof slab, beams, columns lintels, girders and other structural members laid in situ or precast laid in position, or prestressed members cast in situ, complete in all respects:-					
		Type C (nominal mix 1: 2: 4)	P.Cft	67.89			
		Steel Work.					
7	6/12-c	Fabrication of mild steel reinforcement for cement concrete, including cutting, bending, laying in position, making joints and fastenings, including cost of binding wire and labour charges for binding of steel reinforcement (also includes removal of rust from bars):-					
		Deformed bars (Grade-60)	100kg	1.78			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)							
UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA							
TUBE WELL CHAMBER (SIZE 10'x10')							
BILL OF QUANTITIES (CIVIL WORK)							
Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		Flooring					
8	3/15	Filling, watering and ramming earth under floors:-					
		i) with surplus earth from foundation, etc.	1000Cft	0.39			
9	7/30	Supplying and filling sand under floor; or plugging in wells.	100Cft	0.28			
		Brick ballast					
10	6/2	Dry rammed brick or stone ballast, 1½" to 2" (40 mm to 50 mm) gauge.	100Cft	0.84			
		Cement Concrete					
11	6/5/f	Cement concrete plain including placing, compacting, finishing and curing complete (including screening and washing of stone aggregate):					
		(f) Ratio 1: 2: 4	100Cft	0.28			
		Topping					
		PCC Floor					
12	10/15	Providing and laying topping of cement concrete 1:2:4, including surface finishing and dividing in panels:- (e) 2"(50 mm) thick	100Sft	1.00			
		Slab Plaster					
13	11/10/b	Cement plaster 3/8" (10 mm) thick under soffit of RCC, roof slabs only, upto 20' height.					
		b) 1:3	100Sft	1.00			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)							
UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA							
TUBE WELL CHAMBER (SIZE 10'x10')							
BILL OF QUANTITIES (CIVIL WORK)							
Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		Cement Plaster					
14	11/9-b	Cement plaster 1:4 upto 20' (6.00 m) height:- 1/2" (13 mm) thick	100Sft	3.60			
15	11/18-b	Cement pointing struck joints, on walls, upto 20' (6.00 m) height:- b) ratio 1:3	100Sft	6.85			
16	11/31	Extra cost of labour and material for red oxide pigment in cement pointing to match with the colour of bricks.	100Sft	6.85			
17	11/22	Priming coat of chalk under distemper.	100Sft	4.60			
		Distemping					
18	11/23	Distemping:- iii) three coats	100Sft	4.60			
		Steel Door					
19	25-31	Making and fixing steel grated door with 1/16" thick (1.5mm) sheeting, including angle iron frame 2"x2"x3/8" (50x50x10 mm) and 3/4" (20 mm) square bars 4" (100 mm) centre to centre, with locking arrangement	Sft	24.50			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)							
UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA							
TUBE WELL CHAMBER (SIZE 10'x10')							
BILL OF QUANTITIES (CIVIL WORK)							
Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		Steel Window					
20	25/41	Providing and fixing steel windows with openable glazed panels, using beam section for frame 1½"x1"x5/8"x1/8" (40x25x16x3 mm), Z-section for leaves ¾"x1"x¾"x1/8" (20x25x20x3 mm), T-section sashes 1"x1"x1/8" (25x25x3 mm), glass panes, wooden screed for glazing embedded over a thin layer of putty duly screwed with leaves, brass fittings, holdfast, duly painted, complete in all respects, including all cost of material and labour, etc. as per approved design and as directed by the Engineer-in-charge:- b) fixed with wire gauze, 22 SWG v) glass pane 5 mm thick	Sft	16.00			
		Roof Insulation					
21	9/5	Single layer of tiles 9"x4½"x1½" (225x113x40 mm) laid over 4" (100 mm) earth and 1" (25 mm) mud plaster without Bhoosa, grouted with cement sand 1:3 on top of RCC roof slab, provided with 34 lbs. per %Sft. or 1.72 Kg/Sq.m bitumen coating sand blinded i/c polythene sheet 500 gauge.	100Sft	1.32			
22	9/14	Khassi parnalas in cement, sand mortar 1:2, 12" (300 mm) outside width finished smooth with a floating coat of neat cement.	Rft	12.50			
		Khurras					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)							
UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA							
TUBE WELL CHAMBER (SIZE 10'x10')							
BILL OF QUANTITIES (CIVIL WORK)							
Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
23	9/15	Khuras on roof 2'x2'x6" (600 x 600 x 150 mm)	Each	1.00			
24	9/16	Bottom Khuras of brick masonry in cement mortar 1:6, 4'x2'x4½" (1200x600x113 mm) over 3" (75 mm) cement concrete 1:4:8.	Each	1.00			
25	23/62	Providing and fixing Chain Pulley Block of 5 ton capacity with 5 meter length of chain, as per required specifications complete in all respect and as approved by the Engineer Incharge.	Each	1.00			
		Heavy Steel For Girder					
26	25/10	Fabrication of heavy steel work, with angle, tees, flat iron round iron and sheet iron for making trusses, girders, tanks, etc., including cutting, drilling, rebitting, handling, assembling and fixing, but excluding erection in position.	100Kg	1.09			
27	25/11	Erection and fitting in position iron trusses, staging of water tanks, etc.	100Kg	1.09			
28	1/1	Carriage of 100 Cft. (2.83 cu.m) of all materials like stone aggregate, spawl, kankar lime (unslaked), surkhi, etc. or 150 Cft. (4.25 cu.m) of timber, by truck or by any other means owned by the contractor. (crushed stone aggregate and bajri used in concrete items) (Lead 200 Km)	Cft	84.38			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)							
UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA							
TUBE WELL CHAMBER (SIZE 10'x10')							
BILL OF QUANTITIES (CIVIL WORK)							
Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		M.S Cover					
29	25/31	Making and fixing steel grated cover with 1/16" thick (1.5mm) sheeting, including angle iron frame 2"x2"x3/8" (50x50x10 mm) and 3/4" (20 mm) square bars 4" (100 mm) centre to centre, with locking arrangement.	Sft	9.00			
		Total Rs.					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)		
UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA		
15. Other Facilities		
Sub-Summary		
Sr. No.	Description	Amount (Rs.)
1	Water & Material Quality Testing Lab.	
2	Desilting of Sewerage pipe lines	
3	Dewatering Unit	
4	Connection of Gas Pipelines to newly constructed buildings	
5	Renovation /Rehabilitation of existing buildings.	
6	Car Parking Shed	
	Sub-Total	

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

BILL OF QUANTITIES

Water & Material Quality Testing Lab.

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		Water Quality Testing Equipments					
		Alkalinity Test With DR-3900					
1	WQRA-01	Spectrophotometer (Model: DR3900) Make: HACH, Germany Packing: 1.0No/.	No.	1			
2	WQRA-02	Alkalinity (Total) TNTplus Vial Test (25-400 mg/L) Make: HACH, Germany Packing: 25.0 Tests/ Pack	No.	8			
		Arsenic (Strip Method)					
3	WQRA-03	Arsenic Test Kit (0.005 - 0.010) Make: Merck, Germany Packing: 100.0 Tests/ Pack	No.	2			
		Bicarbonate/Alkalinity (Digital Titrator Method)					
4	WQRA-04	Bicarbonate/Alkalinity, (Model AL-OT) Make: HACH, Germany Packing: 100.0 Tests/ Pack	No.	2			
		Calcium Hardness (Titration Base)					
5	WQRA-05	Hardness (Total & Calcium) Test Kit Make: HACH, Germany Packing: 100.0 Tests/ Pack	No.	2			
		Carbonate/carbon dioxide					
6	WQRA-06	Carbonate/carbon dioxide cuylte test 55-550 mg/L CO ₂ Make: HACH, Germany Packing: 25.0 Tests/ Pack	No.	8			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

BILL OF QUANTITIES

Water & Material Quality Testing Lab.

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		Chloride Test With DR-3900					
7	WQRA-07	Chloride Test Kit Make: HACH, Germany Packing: 25.0 Tests/ Pack	No.	8			
		Conductivity /TDS					
8	WQRA-08	Multi-Parameter Meter ISE Without Electrode Make: HACH, Germany Packing: 1.0 No/.	No.	1			
9	WQRA-09	Conductivity Cell (1m cable) Make: HACH, Germany Packing: 1.0 No/.	No.	1			
10	WQRA-10	Conductivity Standard Solution (1413 BT) Make: HACH, Germany Packing: 250ML	No.	2			
		Hardness Test (Drop Count Titration)					
11	WQRA-11	Total Hardness Test Kit (1 - 342 mg/l) Make: HACH, Germany Packing: 100.0 Tests/ Pack	No.	2			
		Magnesium Test With DR-3900					
12	WQRA-12	Magnesium TNTplus Vial Test (0.5-50 mg/L) Make: HACH, Germany Packing: 25.0 Tests/ Pack	No.	8			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

BILL OF QUANTITIES

Water & Material Quality Testing Lab.

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		Nitrate Test With DR-3900					
13	WQRA-13	Nitrate Reagent Powder Pillows 10 ml Make: HACH, Germany Packing: 100.0 Tests/ Pack	No.	2			
		PH					
14	WQRA-14	Ph Meter BenchTop with Probe (PHC10101) Make: HACH, Germany Packing: 1.0 No/.	No.	1			
15	WQRA-15	Buffer Solution PH-04 (2283449.99) Make: HACH, Germany Packing: 500ml/ Bottle	No.	4			
16	WQRA-16	Buffer Solution PH-07 (2283553) Make: HACH, Germany Packing: 1000ml/ Bottle	No.	4			
17	WQRA-17	Buffer Solution PH-10 (2283653) Make: HACH, Germany Packing: 1000ml/ Bottle	No.	4			
		Potassium Test With DR-3900					
18	WQRA-18	Potassium cuvette test, 5-50 mg/L. Make: HACH, Germany Packing: 25.0 Tests/ Pack	No.	8			
		Sodium Test With Ion Meter					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

BILL OF QUANTITIES

Water & Material Quality Testing Lab.

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
19	WQRA-20	Sodium Ion Selective Electrode (ISE) 3 m Cable Make: HACH, Germany Packing: 1.0 No/.	No.	1			
20	WQRA-21	Sodium Ionic Strength Adjuster Powder Pillows Make: HACH, Germany Packing: 100.0 Tests/ Pack	No.	2			
21	WQRA-22	Sodium Standard Solution, 100mg/L. Make: HACH, Germany Packing: 1000ml/ Bottle	No.	4			
22	WQRA-23	Sodium Standard Solution, 1000 mg/L. Make: HACH, Germany Packing: 500ml/ Bottle	No.	4			
		Sulfate Test With DR-3900					
23	WQRA-24	Sulfate 4 Reagent (2-70mg/l) Make: HACH, Germany Packing: 100.0 Tests/ Pack	No.	2			
		Phosphate Test With DR-3900					
24	WQRA-25	Phosphate Reagent Powder Pillows 10ml Make: HACH, Germany Packing: 100.0 Tests/ Pack	No.	2			
		Turbidity					
25	WQRA-26	Turbidity Meter Portable. Make: HACH, Germany Packing: 1.0 No/.	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

BILL OF QUANTITIES

Water & Material Quality Testing Lab.

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		Fluoride Test With DR-3900					
26	WQRA-27	SPADNS Fluoride Reagent Solution Make: HACH, Germany Packing: 500ml/ BTL	No.	2			
		Iron Test With DR-3900					
27	WQRA-28	Iron Test Kit LR Make: HACH, Germany Packing: 100.0 Tests/ Pack	No.	2			
		Microbiology Test (Total Count/ Ecoli/ Coliform					
28	WQRA-29	Paddle Tester, Total Coliforms Make: HACH, Germany Packing: 10.0 Pcs/ Pack	No.	20			
29	WQRA-30	Paddle Tester, Total Aerobic Bacteria Make: HACH, Germany Packing: 1.0 No/.	No.	1			
30	WQRA-31	Incubator 53 Liter Make: ZenithLab,USA Packing: 1.0 No/.	No.	1			
		General Laboratory Equipments					
31	WQRA-32	Thermoreactor (Digester) DRB200 Make: HACH, Germany Packing: 1.0 No/.	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

BILL OF QUANTITIES

Water & Material Quality Testing Lab.

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
32	WQRA-33	Water Distillation Unit Glass Make: ZenithLab,USA Packing: 1.0 No/.	SZ-96 No.	1			
33	WQRA-34	Laboratory Oven 53 Liter Make: ZenithLab,USA Packing: 1.0 No/.	OV-9053A No.	1			
34	WQRA-35	Hotplate with magnetic stirrer Make: ZenithLab,USA Packing: 1.0 No/.	MHS-A No.	1			
35	WQRA-36	Weighing Balance 0.0001 to 220gm A224AB ACE, GmbH Packing: 1.0 No/.	No.	1			
36	WQRA-37	Water Bath DK-420 Make: ZenithLab,USA Packing: 1.0 No/.	No.	1			
		GLASSWARE					
	A	Beaker Glass					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

BILL OF QUANTITIES

Water & Material Quality Testing Lab.

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
37	WQRA-38	Beaker Glass 100ml Beaker Glass 250ml Beaker Glass 500ml Beaker Glass 1000ml Make: Citotest, China Packing: 1.0 No. Each	No.	5			
	B	Conical Flask					
38	WQRA-39	Flask Conical Glass 100 Flask Conical Glass 250 Make: Citotest, China Packing: 1.0 No. Each	No.	5			
	C	Volumetric Flask					
39	WQRA-40	Flask Volumetric Glass 50 Flask Volumetric Glass 100 Flask Volumetric Glass 250 Flask Volumetric Glass 500 Flask Volumetric Glass 1000 Make: Citotest, China Packing: 1.0 No. Each	No.	5			
	D	Measuring Cylinder					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

BILL OF QUANTITIES

Water & Material Quality Testing Lab.

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
40	WQRA-41	Measuring Cylinder Glass 25 Measuring Cylinder Glass 50 Measuring Cylinder Glass 100 Measuring Cylinder Glass 250 Measuring Cylinder Glass 500 Measuring Cylinder Glass 1000 Make: Citotest, China Packing: 1.0 No. Each	No.	5			
	E	Pipet					
41	WQRA-42	Pipet Graduated 1ml Pipet Graduated 2ml Pipet Graduated 5ml Pipet Graduated 10ml Pipet Graduated 25ml Pipet Graduated 50ml Make: Citotest, China Packing: 1.0 No. Each	No.	5			
	F	Burette Glass					
42	WQRA-43	Burette Glass 50ml Make: Citotest, China Packing: 1.0 No. Each	No.	5			
	G	Aluminum Dish					
43	WQRA-44	Aluminum Dish Make: China Packing: 50 Pcs/Pkt	No.	2			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

BILL OF QUANTITIES

Water & Material Quality Testing Lab.

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
	H	China Dish					
44	WQRA-45	China Dish 250ml Make: China Packing: 1 No	No.	50			
	I	Bottles					
45	WQRA-46	Wash Bottle 1000ml Sample Bottle Plastic 500ml Sample Bottle Plastic 1000ml Make: Citotest, China Packing: 1.0 No. Each	No.	5			
Sub-Total =							
		Material Testing Equipments					
1	MTRA-05	ELECTRONIC TOP LOADING BALANCE CAPACITY 30KG x 2G BATTERY OPERATED	No.	1			
2	MTRA-08	ELECTRONIC PLAT-FORM BALANCE CAPACITY: 100KG x 1 OGM	No.	1			
3	MTRA-39	MOTORIZED SEIVE SHAKER SUITABLE FOR 8" DIA & 12" DIA SEIVE 220V - 50HZ - 1PH	No.	1			
4	MTRA-40	GALVANIZED SAMPLING TRAY (12"X12"X2")	No.	4			
5	MTRA-41	GALVANIZED SAMPLING TRAY (18"X12"X3")	No.	4			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

BILL OF QUANTITIES

Water & Material Quality Testing Lab.

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
6	MTRA-42	GALVANIZED SAMPLING TRAY (24"X18"X3")	No.	4			
7	MTRA-43	GALVANIZED SAMPLING TRAY (24"X24"X3")	No.	4			
		SEIVE ANALYSIS C12" DIA)					
8	MTRA-61	12" dia ASTM sieve op. 3" (75 mm)	No.	1			
9	MTRA-62	12" dia ASTM sieve op. 2 1/2" (63 mm)	No.	1			
10	MTRA-63	12" dia ASTM sieve op. 2" (50 mm)	No.	1			
11	MTRA-64	12" dia ASTM sieve op. 1 1/2" (37.5 mm)	No.	1			
12	MTRA-65	12" dia ASTM sieve op. 1" (25 mm)	No.	1			
13	MTRA-66	12" dia ASTM sieve op. 3/4" (19 mm)	No.	1			
14	MTRA-67	12" dia ASTM sieve op. 1/2" (12.5 mm)	No.	1			
15	MTRA-68	12" dia ASTM sieve op. 3/8" (9.5 mm)	No.	1			
16	MTRA-69	12" dia ASTM sieve op. 1/4" (6.3 mm)	No.	1			
17	MTRA-70	12" dia ASTM sieve No 4 (4.75 mm)	No.	1			
18	MTRA-71	Lid and receiver dia 12" ASTM MIS. Controls S.r.l. Italy	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

BILL OF QUANTITIES

Water & Material Quality Testing Lab.

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
19	MTRA-108	C6R compression testing machine with motorized ram ,two-column structure and adjustable crossbeam. Loading capacity: 50 kN Clearance between columns: 270 mm Test speed: 1.27 mm/minns: 270 mm Ram travel: 120 mmn/min Power rating: 300 W Complete with load ring 50 kN capacity with 0.001 mm resolution dial gauge (strictly conforming to the Standards),C6R piston and penetration depth gauge 30 x 0.01 mm. 230V/50 Hz/1Ph	No.	1			
		FIELD DENSITY TEST (FDT)					
20	MTRA-109	6" DIA SAND CONE CI W BASE PLATE & SAND JUG	No.	1			
21	MTRA-110	SAMPLING SPOON S.S.	No.	1			
22	MTRA-111	PLASTIC BAG. 16" x 22"	KG	1			
23	MTRA-112	CHIESEL 12" x 1"	No.	1			
24	MTRA-113	STEEL HAMMER 1KG	No.	1			
25	MTRA-114	SPEEDY MOISTURE TESTER CAPACITY: 6GM MOISTURE RANGE : 0 - 20% C/W WOODEN CARRYING CASE	No.	1			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

BILL OF QUANTITIES

Water & Material Quality Testing Lab.

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
26	MTRA-115	ELECTRON IC TOP LOADING BALANCE CAPACITY 15KG X 1GM BATTERY OPERATED	No.	1			
27	MTRA-116	8" DIA S.S.SIEVE 1.18MM (No. 16)	No.	1			
28	MTRA-117	8" DIA S.S. SIEVE 600 MIC (NO. 30)	No.	1			
		NON- DESTRUCTIRE TESTING EQUIPMENT					
29	MTRA-164	Concrete test hammer type N.Aluminium body. Supplied with hard plastic carrying case. Conforming to EN 12504-2 and ASTM CBOS MIS. Controls S.r.I.Italy	No.	1			
		Sub-Total =					
		Total =					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)							
UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA							
BILL OF QUANTITIES							
DESILTING OF SEWERAGE SYSTEM							
Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		Desilting of Manholes					
1	21/20	Desilting of Manholes including rehandling of sludge with in three chain sand removal from site to Dumping Site. Complete in all respect.	100Cft	45.24			
		Total Rs					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

BILL OF QUANTITIES

DEWATERING UNIT

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		Dewatering Unit					
1	NS-100	Providing, fixing, testing and commissioning of Mobile Trolley comprises of 3 Nos. of 16" dia Servis Tyres with MS Rims and Cast Iron Hubs, Non-Clogging Horizontal Centrifugal Pump of 0.5 cusec capacity coupled with Engine in-line arrangement, Steering Handle, Hook, with Jaw and Padding Type (Cast Iron) Coupling with Rubber Neoprene Pads complete in all respects.	Set	1.00			
		Total Rs					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)							
UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA							
BILL OF QUANTITIES							
GAS SUPPLY							
Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		Excavation					
1	3/44	Excavation of trenches in all kinds of soil, except cutting rock, for watersupply pipelines upto 5 ft. (1.5 m) depth from ground level, including trimming, dressing sides, leveling the beds of trenches to correct grade and cutting pits for joints, etc. complete in all respects.	1000Cft	9.80			
		Rehandling of earthwork:					
2	3/15	a) Lead upto a single throw of Kassi, phaorah or shovel	1000Cft	6.86			
		HDPE Pipe					
3	19/50	Providing, laying, testing and commissioning underground Yellow Polyethelene (MDPE) gas pipe tubing of required IPS (Iron Pipe Size) in the trenches , made of Dadex/ Popular / Beta or equivelant, for Gas supply i/c the cost of solvent and specials complete as approved and directed by the Engineer Incharge.					
		SDR-11					
		(v) 1.5"	Rft	1,400.00			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)							
UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA							
BILL OF QUANTITIES							
GAS SUPPLY							
Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		Valve					
4	23/46	Providing and fixing CP heavy duty brass Ball valve with CP handle of specified dia meter made of Faisal/ Sonex/ Master best quality or equivalent complete in all respect as approved and directed by the Engineer Incharge.					
		v) 1-1/2" dia	Each	4.00			
5	7/30	Supplying and filling sand under floor; or plugging in wells.	100Cft	28.00			
		Total Rs					

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

BILL OF QUANTITIES

Renovation /Rehabilitation of Existing Buildings

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
1	4/48	Removing cement or lime plaster.	100Sft.	74.00			
		Cement Plaster:					
2	11/9	Cement plaster 1:4 upto 20' (6.00 m) height: c) ¾" (20 mm) thick	100Sft.	74.00			
		Distemper:					
3	11/22	Priming coat of chalk under distemper.	100Sft.	74.00			
4	11/23	Distempereing:- a) new surface:- iii) three coats	100Sft.	74.00			
5	4/22/a	Dismantling 1st class tile roofing.	100Sft.	163.06			
6	9/46	Providing and applying torch-on plain water proofing bitumenous membrane of specified thickness (made of Roof-Grip/ Euro Bit) duly lapped/connected by heating with Torch over ps-6 primer i/c preparation/smoothen the surface complete in all respect as approved and directed by the Engineer Incharge					
		i)3 mm thick	Sft.	16,306.20			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

BILL OF QUANTITIES

Renovation /Rehabilitation of Existing Buildings

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
7	9/5	Single layer of tiles 9"x4½"x1½" (225x113x40 mm) laid over 4"(100 mm) earth and 1" (25 mm) mud plaster without Bhoosa, grouted with cement sand 1:3 on top of RCC roof slab, provided with 34 lbs. per %Sft. or 1.72 Kg/Sq.m bitumen coating sand blinded.	100Sft.	163.06			
8	9/44	P/L false ceiling comprising of 5/8" thick plaster of paris sheet of required size in approved design with one line of 6" wide niche all around , hanging with Copper wire (16 SWG) duly enriched with POP and flaxen i/c thecost of making space for rope light /screws/jute/making holes for lights and rawal plugs complete in all respects as approved and directed by the Incharge.(Measurement will be made as per carpet Area).	Per Sft	5,397.60			
Total Rs							

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

PARKING SHED

BILL OF QUANTITIES (CIVIL WORK)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		Schedule Item					
1	3/21/1/i	Excavation in foundation of building, bridges and other structures, including dagbelling, dressing, refilling in layers around structure with excavated earth, watering and ramming lead upto one chain (30 m)lift upto 5 ft (1.5m).					
		i) By Manual					
		ii) in ordinary soil.	1000 Cft.	1.01			
		P.C.C					
2	6/5	Cement concrete plain including placing, compacting, finishing and curing complete (including screening and washing of stone aggregate):					
		(i) Ratio 1: 4: 8	100Cft	0.53			
		(f) Ratio 1: 2: 4	100Cft	4.86			
		Sub Base Course					
3	18/3/a/ (i) + 1/1	Providing and laying sub-base course of stone product of approved quality and grade including, placing, mixing, spreading and compaction of sub base material to required depth, camber and grade to achieve 100% maximum dry density determined according to AASHTO T-180 method-D, including carriage of all material to site of work complete in all respect as per specifications and as directed by the engineer incharge. (Pit run or bed run gravel from sargodha quarry to site, actual compacted depth shall be considered for payment)	100Cft	10.40			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

PARKING SHED

BILL OF QUANTITIES (CIVIL WORK)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		Water Bound Macadam					
4	18/4/a + 1/1	Providing and laying base course of crushed stone (Water Bound Macadam) of approved quality and grade including, placing, mixing, spreading and compaction of base course material to required depth, camber and grade to achieve 100% maximum modified AASHTO dry density, including carriage of all material to site of work complete in all respect as per specifications and as directed by the engineer incharge. (Crushed stone aggregate from sargodha quarry to site, actual compacted depth shall be considered for payment)	100Cft	10.40			
		Tuff Paver					
5	10/41	Providing and laying Tuff pavers, having 7000 PSI, crushing strength of approved manufacturer, over 2" to 3" sand cushion i/c grouting with sand in joints i/c finishing to require slope. complete in all respect. (50% Grey / 50% Coloured)					
		c) 80-mm thick	Per Sft	3,150.00			

PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP)

UP GRADATION OF PUNJAB LOCAL GOVERNMENT ACADEMY (PLGA) CAMPUS AT LALAMUSA

PARKING SHED

BILL OF QUANTITIES (CIVIL WORK)

Sr. No.	Reference No.	Description	Unit	Quantity	Unit Rate (Rs.)		Amount (Rs.)
					In Figure	In Words	
		Parking Shed					
6	26/44	Supply and Erection of Car Parking Shed consisting of 3mm thick fiber glass heetroof (3-layers) fixed / riveted on moulded curved frame of M.S box pipe 1-1/2" x 1-1/2" 16-SWG supported on trusses of MS angle iron 1-1/2" x 1-1/2" x 3/16" all around duly supported on M.S sheet 6" x 6" x 1/4" welded on GI pipe post (Medium Quality)of specified diameter embeded in P:C:C (1:2:4)i/c the cost of excavation, cutting straightening assembling, bending as per design, welding / grinding of joint sand painting three coats complete in all respect as approved and directed by the Engineer Incharge. (i) 4" dia GI Pipe Supports	Sft	3,150.00			
		No of One unit cost					

List of Materials for Secured Advance (Reference Sub-Clause 49.7 SCC)

S/No	Type of Material	Limit for Payment*
1	Steel Reinforcement (Grade 60)	PKR 2 million
2	Tuff Paver	PKR 4 million
3	Bricks	PKR 10 million

* prescribes upper limit for net amount of payment, at any time, which shall not exceed in any certification by the Project Manager against Contractor's Statement in accordance with SCC 49.7; the Project Manager shall, however, make sure that the quantities stored and accepted for payments do not exceed their consumption requirements for execution and completion of Works particularly when the Works are in advanced stage / nearing completion.

Section 5 - Eligible Countries

1. Afghanistan
2. Armenia
3. Australia
4. Austria
5. Azerbaijan
6. Bangladesh
7. Belgium
8. Bhutan
9. Brunei Darussalam
10. Cambodia
11. Canada
12. China, People's Republic of
13. Cook Islands
14. Denmark
15. Fiji Islands, Republic of
16. Finland
17. France
18. Georgia
19. Germany
20. Hong Kong, China
21. India
22. Indonesia
23. Ireland
24. Italy
25. Japan
26. Kazakhstan
27. Kiribati
28. Korea, Republic of
29. Kyrgyz, Republic of
30. Lao People's Democratic Republic
31. Luxembourg
32. Malaysia
33. Maldives
34. Marshall Islands
35. Micronesia, Federal States of
36. Mongolia
37. Myanmar
38. Nauru, Republic of
39. Nepal
40. Netherlands
41. New Zealand
42. Niue
43. Norway
44. Pakistan
45. Palau, Republic of
46. Papua New Guinea
47. Philippines
48. Portugal
49. Samoa
50. Singapore
51. Solomon Islands
52. Spain
53. Sri Lanka
54. Sweden
55. Switzerland
56. Tajikistan
57. Taipei, China
58. Thailand
59. Timor-Leste, Democratic Republic of
60. Tonga
61. Turkey
62. Turkmenistan
63. Tuvalu
64. United Kingdom
65. United States of America
66. Uzbekistan
67. Vanuatu
68. Viet Nam

Note: The list of current member countries is also available at <http://www.adb.org/about/members>

Section 6 – Employer's Requirements

This Section contains the Specifications, Drawings, Supplementary Information that describe the Works to be procured, Personnel Requirements, and Equipment Requirements.

Table of Contents

Specifications	6-2
Drawings	6-3
Supplementary Information Regarding Works to Be Procured	6-4
Initial Environmental Examination (IEE) / Environmental Management Plan	6-5
Personnel Requirements	6-4
Equipment Requirements	6-6

Specifications Attached as Annexure-A

NOTE:

The Contractor shall submit a Site-Specific Environmental Management Plan (SSEMP) and Site-Specific Health and Safety Management Plan (SSHSMP) in compliance with PCC 81 and GCC 24.2 respectively in Section-8.

Drawings Attached as Annexure-B

Supplementary Information Regarding Works to Be Procured

The bidder shall be required to comply with relevant government regulations and guidelines on COVID-19 prevention and control issued by the Government of Pakistan (<http://covid.gov.pk/guideline>), or in the absence thereof, to international good practice guidelines, such as World Health Organization 2020, Considerations for public health and social measures in the workplace in the context of COVID-19, Geneva available here: <https://www.who.int/publications-detail/considerations-for-public-health-and-social-measures-in-the-workplace-in-the-context-of-covid-19>.

The EMP / IEE for the project is attached.

Initial Environmental Examination (IEE) / Environmental Management Plan (EMP)

Attached as Annexure-C

Personnel Requirements

S/No	Position	Minimum Qualification	No of Position	Total Work Experience [years]	Experience In Similar Work [years]
1	Project Manager	BE (Civil Engineering) or equivalent Professional qualification.	01	15	10
2	Architect	BE (Architecture) or equivalent Professional qualification	01	10	05
3	Structure Engineer	BE (Civil Engineering) or equivalent Professional qualification	01	10	05
4	Electrical Engineer	BE (Electrical Engineering) or equivalent Professional qualification	01	10	05
5	Site Engineer	BE (Civil Engineering) or equivalent Professional qualification	01	07	05
6	Construction Supervisor	Diploma with surveying qualification or equivalent qualification	01	07	05
7	Material Engineer	MSc Geology/BE (Civil Engineering) or equivalent Professional qualification	01	07	05
8	Qualified/Experienced Surveyor	Diploma with surveying qualification or equivalent Professional Qualification	01	07	07
9	Quantity Surveyor	BE (Civil Engineering) or equivalent Professional qualification	01	10	10
10	HSE Specialist	Certified Diploma in Health, Safety and Environment	01	08	05
11	Electrical Technician	Diploma with electrical qualification or equivalent qualification	01	07	05
12	IT Technician	Diploma with IT qualification or equivalent qualification	01	07	05

Equipment Requirements

No.	Equipment Type and Characteristics	Minimum Number Required
1	Surveying Equipment (Total Station) (01 Set)	01
2	Roller (05 ton-1 No.)	01
3	Concrete Mixer (1 bag cement capacity-2 No.)	02
4	Dumpers Truck (1 No.)	01
5	Water Bowser (1 No.)	01
6	Generator (50KVA, 01 No)	02
7	Scaffolding pipes and Steel Shuttering (5000 sqft)	02
8	Sand Compactor	02
9	Concrete Vibrator	02
10	Tuff Paver Compactor	01
11	Crane (5 Ton)	01
12	Mechanical Excavator	01
13	Reverse Rotary (for Tube well or alternate)	01

Section 6: Annexure-A

Technical Specifications



Punjab Intermediate Cities Improvement Investment Project

ADB



Up-Gradaation of Punjab Local Government Academy (PLGA), Campus at Lalamusa

TECHNICAL SPECIFICATIONS

May, 2023

**SPECIFICATION FOR
ROADS, WATER SUPPLY, SEWERAGE AND DRAINAGE WORKS**

TABLE OF CONTENTS

SECTION NO.	DESCRIPTION	PAGE #
SECTION - 1 EXCAVATION, TRENCHING AND BACKFILLING		1-1 to 1-8
1.1	SCOPE	1-1
1.2	SETTING OUT	1-1
1.3	CLEARING AND GRUBBING	1-1
1.4	EXCAVATION	1-1
1.4.1	General	1-1
1.4.2	Earth Excavation in Trenches	1-2
1.4.3	Earth Excavation for Structures	1-2
1.4.4	Replaced Soil under Foundations	1-3
1.4.4.1	Material	1-3
1.4.4.2	Equipment and Procedure	1-3
1.4.4.3	Compaction Standard	1-3
1.4.4.4	Quality Control	1-3
1.5	PRECAUTIONARY AND REMEDIAL MEASURES	1-4
1.5.1	Protection of Existing Facilities and Structures	1-4
1.5.2	Planking and Strutting	1-4
1.5.3	Dewatering	1-4
1.5.4	Maintenance of Excavation	1-5
1.5.5	Surplus Materials	1-5
1.5.6	Cutting Pavement	1-5
1.6	TRANSPORTATION OF MATERIAL	1-6
1.7	COMPACTED FILL AND BACKFILL	1-6
1.7.1	General	1-6
1.7.2	Backfilling for Structures	1-6
1.7.3	Backfilling of Trenches	1-6
1.7.4	Lower Portion of Trench	1-7
1.7.5	Remainder of Trench	1-7
1.8	BORROW	1-7
1.9	GRADING	1-7
1.10	TESTING OF SOIL IN PLACE	1-7
1.11	MEASUREMENT AND PAYMENT	1-7
1.11.1	Excavation and Backfilling	1-7
1.11.1.1	Method of Measurement	1-7
1.11.1.2	Basis of Payment	1-8

SECTION NO.	DESCRIPTION	PAGE #
SECTION - 2 CONCRETE		2-1 to 2-19
2.1	SCOPE	2-1
2.2	SPECIFICATIONS	2-1
2.3	COMPOSITION AND QUALITY	2-1
2.4	CEMENT	2-1
2.4.1	General	2-1
2.4.2	Portland Cement	2-2
2.4.3	Tests	2-2
2.4.4	Storage	2-2
2.4.5	Delivery and Usage Record	2-3
2.5	AGGREGATES	2-3
2.5.1	Fine Aggregate for Concrete	2-3
2.5.2	Coarse Aggregate for Concrete	2-4
2.5.3	Storage of Aggregate	2-4
2.5.4	Proportions of Coarse and Fine Aggregates	2-4
2.5.5	Water	2-5
2.6	CONCRETE MIX REQUIREMENTS	2-5
2.6.1	Strength	2-5
2.7	WATER CEMENT RATIO	2-6
2.7.1	Consistency	2-6
2.8	MEASUREMENT OF MATERIALS	2-7
2.9	MIXING METHODS	2-7
2.10	TEST OF CONCRETE	2-7
2.10.1	Strength Test During the Work	2-7
2.11	CONVEYING OF CONCRETE	2-8
2.12	PLACING	2-8
2.12.1	General	2-8
2.13	COMPACTING CONCRETE	2-9
2.13.1	Time Interval between Mixing and Placing	2-10
2.14	CONCRETE FINISHES	2-10
2.15	CONCRETE AND WEATHER	2-11
2.16	CURING OF CONCRETE	2-11
2.17	CONCRETE IN EXCAVATION AND FILLING	2-12
2.18	SHUTTERING	2-13
2.19	WATER STOPPERS	2-14
2.19.1	Scope	2-14
2.19.1 (a)	Polyvinyl chloride Water stoppers	2-14
2.19.1 (b)	Metal Water stoppers	2-15

(ii)

SECTION NO.	DESCRIPTION	PAGE #
2.20	TERRAZZO WORK	2-16
2.20.1	Scope	2-16
2.20.2	Material	2-16
2.20.3	Subgrade	2-16
2.20.4	Topping	2-16
2.20.5	Final Finish	2-16
2.21	STEEL REINFORCEMENT	2-17
2.21.1	Scope	2-17
2.21.2	Cutting and Bending	2-17
2.21.3	Quality	2-17
2.21.4	Spacing of Bars	2-17
2.21.5	Relation of Bars to Concrete Surface	2-18
2.21.6	Splicing	2-18
2.21.7	Supports	2-18
2.22	MEASUREMENT AND PAYMENT	2-19
2.22.1	Method of Measurement	2-19
2.22.1.2	Basis of Payment	2-19
SECTION - 3 BRICK AND CEMENT CONCRETE BLOCK WORK		3-1 to 3-3
3.1	SCOPE	3-1
3.2	MATERIALS	3-1
3.2.1	Portland Cement	3-1
3.2.2	Mortar Sand	3-1
3.2.3	Water	3-1
3.2.4	Aggregate	3-1
3.2.5	Additives	3-2
3.3	MORTAR GROUT	3-2
3.4	MORTAR BATCHING	3-2
3.5	SCAFFOLDING	3-2
3.6	JOINTING	3-3
3.7	BRICKS	3-3
3.7.1	Soaking	3-3
3.7.2	Laying of Bricks	3-3
3.7.3	Curing	3-4
3.8	BLOCKS	3-4
3.8.1	Concrete Block Making	3-4
3.8.2	Properties of Blocks	3-4
3.8.3	Soluble Salt Content	3-5
3.8.4	Erection	3-5

SECTION NO.	DESCRIPTION	PAGE #
3.8.5	Curign and Repairs	3-6
3.9	MEASUREMENT AND PAYMENT	3-7
3.9.1	Material (Brick and Cement Concrete Block Work)	3-7
3.9.1.1	Method of Measurement	3-7
3.9.1.2	Basis of Payment	3-7
SECTION - 4 SURFACE RENDERING		4-1 to 4-8
4.1	SCOPE	4-1
4.2	CEMENT PLASTER	4-1
4.2.1	General	4-1
4.2.2	Materials	4-1
4.2.2.1	Cement	4-1
4.2.2.2	Sand	4-1
4.2.2.3	Water	4-1
4.2.3	Mortar Composition	4-1
4.2.4	Material Batching	4-2
4.2.5	Application of Plaster	4-2
4.3	POINTING	4-2
4.3.1	Surface Preparation	4-2
4.3.2	Materials	4-2
4.3.2.1	Cement	4-2
4.3.2.2	Sand	4-2
4.3.2.3	Water	4-3
4.3.3	Mortar Composition	4-3
4.3.4	Material Batching	4-3
4.3.5	Precautions	4-3
4.3.6	Type of Pointing	4-3
4.3.6.1	Deep or Struck Cement Pointing	4-3
4.3.6.2	Flush Cement Pointing	4-3
4.3.7	Pointing Tools	4-4
4.3.8	Edges of Bricks	4-4
4.3.9	Washing after Pointing	4-4
4.3.10	Protection during curing	4-4
4.4	PAINTING	4-4
4.4.1	White or Colour Washing	4-5
4.4.2	Weather Resistant Paint	4-5
4.4.2.1	Selection of Paints	4-5
4.4.2.2	Primers	4-5
4.4.2.3	Fillers	4-5
4.4.2.4	Sealers	4-5

SECTION NO.	DESCRIPTION	PAGE #
4.4.2.5	Thinners	4-6
4.4.2.6	Brushes	4-6
4.4.3	Preparation of Surface	4-6
4.4.4	Application	4-6
4.5	MEASUREMENT AND PAYMENT	4-6
4.5.1	Cement Plaster	4-6
4.5.1.1	Method of Measurement	4-7
4.5.1.2	Basis of Payment	4-7
4.5.2	Pointing	4-7
4.5.2.1	Method of Measurement	4-7
4.5.2.2	Basis of Payment	4-7
4.5.3	Painting	4-8
4.5.3.1	Method of Measurement	4-8
4.5.3.2	Basis of Payment	4-8
SECTION - 5 DAMP PROOFING		5-1 to 5-3
5.1	SCOPE	5-1
5.2	GENERAL	5-1
5.3	DAMP-PROOFING MATERIALS	5-1
5.4	ASPHALT PRIMER	5-1
5.5	ASPHALT	5-1
5.6	BITUMENISED KRAFT PAPER	5-1
5.7	PREPARATION OF SURFACES	5-2
5.8	PLACEMENT PROCEDURES	5-2
5.9	DAMP PROOFING UNDER BRICK MASONRY WALLS	5-2
5.10	QUALITY CONTROL	5-2
5.11	MEASUREMENT AND PAYMENT	5-2
5.11.1	Damp Proofing	5-2
5.11.1.1	Method of Measurement	5-2
5.11.1.2	Basis of Payment	5-3
SECTION - 6 ROOF INSULATION		6-1 to 6-2
6.1	SCOPE	6-1
6.2	MATERIALS	6-1
6.3	APPLICATION	6-1
6.3.1	Bitumen Painting	6-1
6.3.2	Laying Mud	6-1
6.3.3	Laying of Tiles	6-1
6.3.4	Pointing	6-1

SECTION NO.	DESCRIPTION	PAGE #
6.3.5	Curing	6-2
6.4	MEASUREMENT AND PAYMENT	6-2
6.4.1	Roof Insulation	6-2
6.4.1.1	Method of Measurement	6-2
6.4.1.2	Basis of Payment	6-2
SECTION - 7 FLOORING		7-1 to 7-3
7.1	SCOPE	7-1
7.2	MATERIALS	7-1
7.3	BASE FOR FLOORING	7-1
7.4	CEMENT CONCRETE FLOORING	7-1
7.5	BRICK FLOORING	7-2
7.5.1	Method of Construction	7-2
7.6	CURING	7-2
7.7	MEASUREMENT AND PAYMENT	7-2
7.7.1	Flooring Material	7-2
7.7.1.1	Method of Measurement	7-2
7.7.1.2	Basis of Payment	7-2
SECTION - 8 METAL WORKS AND DOORS		8-1 to 8-5
8.1	SCOPE	8-1
8.2	CONTRACTOR TO FIX	8-1
8.3	BUILDING IN	8-1
8.4	FIXING INTO PREPARED OPENINGS	8-1
8.5	FABRICATION OF DOORS, WINDOWS & VENTILATORS	8-1
8.6	PUTTY	8-2
8.7	PROTECTION OF FITTINGS	8-2
8.8	FABRICATION OF ROLLING SHUTTERS	8-2
8.8.1	Shutters	8-3
8.8.2	Guide	8-3
8.8.3	Main Rollers	8-3
8.8.4	Supporting Shaft	8-3
8.8.5	Coil Spring	8-3
8.8.6	Cover	8-3
8.9	GLAZING	8-3
8.10	PAINTING PREPARATION OF THE METAL WORK	8-4
8.11	PAINT APPLICATION	8-4
8.11.1	Internal Surfaces of Steel Work	8-4
8.11.2	External Surfaces of Steel Work	8-4

SECTION NO.	DESCRIPTION	PAGE #
8.12	PAINT	8-4
8.13	WIRE GAUGE	8-4
8.14	MEASUREMENT AND PAYMENT	8-5
8.14.1	Doors, Windows and Ventilators	8-5
8.14.1.1	Method of Measurement	8-5
8.14.1.2	Basis of Payment	8-5
SECTION - 9 HAND RAILS		9-1 to 9-2
9.1	SCOPE	9-1
9.2	MATERIALS	9-1
9.2.1	Cement	9-1
9.2.2	Coarse Aggregate and Sand	9-1
9.2.3	Reinforcing Steel	9-1
9.2.4	Zinc Coated Steel Pipe (G.I.Pipes)	9-1
9.2.5	Fitting and Specials for Zinc Coated Steel Pipes (G.I. Pipes)	9-1
9.2.6	M.S Pipe and Square Bars	9-1
9.3	MEASUREMENT AND PAYMENT	9-2
9.3.1	Material for Hand Rails	9-2
9.3.1.1	Method of Measurement	9-2
9.3.1.2	Basis of Payment	9-2
SECTION - 10 WATER SUPPLY PIPES, PIPE LAYING AND APPURTENANCES		10-1 to 10-15
10.1	SCOPE	10-1
10.2	MATERIALS	10-1
10.2.1	Cast Iron Pipes and Fittings	10-1
10.2.2	Asbestos Cement pipes, Fittings and Specials	10-1
10.2.3	Galvanized Iron Pipes and Fittings	10-1
10.2.4	Unplasticised Polyvinyl Chloride Pipe	10-2
10.2.4.1	Joints for Unplasticised Chloride Pipe	10-2
10.2.5	Mild Steel Pipes	10-2
10.2.6	Polyethylene Pipes	10-2
10.2.7	Sluice/Gate Valve	10-2
10.2.8	Check Valve	10-2
10.2.9	Fire Hydrants	10-3
10.2.10	Ferrule Assembly	10-3
10.2.11	Surface Boxes	10-3

SECTION NO.	DESCRIPTION	PAGE #
10.3	APPROVAL OF MATERIALS AND EQUIPMENT	10-3
10.4	INSTALLATION	10-3
10.4.1	Handling	10-3
10.4.2	Cutting of Pipe	10-4
10.4.3	Location	10-4
10.4.4	Deflection	10-4
10.4.5	Placing and Laying	10-4
10.4.6	Jointing	10-5
10.4.7	Setting of Fire Hydrants, Valves and Surface Boxes	10-5
10.4.8	Thrust Blocks	10-5
10.5	FLUSHING	10-6
10.6	LEAKAGE TEST	10-6
10.7	RETESTING AFTER BACKFILL	10-7
10.8	PIPELINE DISINFECTION	10-7
10.8.1	General	10-7
10.8.2	Chlorination	10-7
10.8.3	Retention Period	10-7
10.8.4	Chlorination of Valves	10-7
10.9	FINAL FLUSHING	10-7
10.10	WATER SAMPLING AND TESTING	10-8
10.11	CLEAN-UP	10-8
10.12	INDICATION PLATES	10-8
10.13	WASHOUTS	10-8
10.14	AIR VALVES	10-8
10.14.1	Double Orifice Air Valves	10-8
10.14.2	Single Orifice Air Valves	10-9
10.15	MEASUREMENT AND PAYMENT	10-9
10.15.1	Pipe work	10-9
10.15.1.1	Method of Measurement	10-9
10.15.1.2	Basis of Payment	10-10
10.15.2	Service Connection	10-10
10.15.2.1	G.I. Pipe	10-10
10.15.2.1(a)	Method of Measurement	10-10
10.15.2.1(b)	Basis of Payment	10-11
10.15.2.2	Ferrule Assembly	10-11
10.15.2.2(a)	Method of Measurement	10-11
10.15.2.2(b)	Basis of Payment	10-11
10.15.2.3	Pipe Fittings and Specials	10-12
10.15.2.3(a)	Method of Measurement	10-12
10.15.2.3(b)	Basis of Payment	10-12

SECTION NO.	DESCRIPTION	PAGE #
10.15.2.4	Sluice (Gate)/Check Valves	10-12
10.15.2.4(a)	Method of Measurement	10-12
10.15.2.4(b)	Basis of Payment	10-13
10.15.2.5	Fire Hydrants	10-13
10.15.2.5(a)	Method of Measurement	10-13
10.15.2.5(b)	Basis of Payment	10-13
10.15.2.6	Indication Plates	10-14
10.15.2.6(a)	Method of Measurement	10-14
10.15.2.6(b)	Basis of Payment	10-14
10.15.2.7	Washouts	10-14
10.15.2.7(a)	Method of Measurement	10-14
10.15.2.7(b)	Basis of Payment	10-14
10.15.2.8	Air Valves	10-15
10.15.2.8(a)	Method of Measurement	10-15
10.15.2.8(b)	Basis of Payment	10-15
10.15.2.9	Sand Cushion	10-15
10.15.2.9(a)	Method of Measurement	10-15
10.15.2.9(b)	Basis of Payment	10-15

SECTION - 11 SEWER PIPE LAYING AND APPURTENANCES

11-1 to 11-10

11.0	SANITARY SEWERAGE	11-1
11.1	SCOPE	11-1
11.2	MATERIALS	11-1
11.2.1	Cement	11-1
11.2.2	Aggregates	11-1
11.2.3	Water	11-1
11.2.4	Steel Reinforcement	11-1
11.2.5	Brick Ballast	11-1
11.3	CLASSES OF PIPE	11-2
11.4	BASIS OF ACCEPTANCE	11-2
11.5	PIPE DIMENSIONS	11-2
11.6	CERTIFIED DRAWINGS AND DATA SHEETS	11-3
11.7	JOINTS FOR CONCRETE PIPE SEWERS	11-3
11.8	HOUSE CONNECTIONS	11-4
11.9	GULLY GRATING	11-4
11.10	INSTALLATION	11-5
11.10.1	Handling of Pipes	11-5
11.10.2	Excavation and Backfill	11-5
11.10.3	Placing of Bedding	11-5
11.10.3.1	Brick Ballast Bedding	11-5

SECTION NO.	DESCRIPTION	PAGE #
11.10.3.2	Crushed Stone Bedding	11-5
11.10.4	Laying of Sewers	11-6
11.11	TESTING OF SEWER LINES	11-6
11.11.1	General	11-6
11.11.2	Infiltration Tests	11-6
11.11.3	Ex-filtration Tests	11-7
11.11.4	Allowable Infiltration or Ex-filtration	11-7
11.11.5	Cleaning of Sewer Lines	11-7
11.12	MEASUREMENT AND PAYMENTS	11-7
11.12.1	Bedding	11-8
11.12.1.1	Method of Measurement	11-8
11.12.1.2	Basis of Payment	11-8
11.12.2	Sewers	11-8
11.12.2.1	Method of Measurement	11-8
11.12.2.2	Basis of Payment	11-8
11.12.3	House Connections	11-9
11.12.3.1	Method of Measurement	11-9
11.12.3.2	Basis of Payments	11-9
11.12.4	Gully Grating	11-9
11.12.4.1	Method of Measurement	11-9
11.12.4.2	Basis of Payments	11-9
SECTION - 12 CONSTRUCTION OF MANHOLES		12-1 to 12-2
12.1	SCOPE	12-1
12.2	MATERIALS	12-1
12.3	CONSTRUCTION REQUIREMENTS	12-1
12.3.1	Drop Manhole	12-2
12.4	MEASUREMENT AND PAYMENT	12-2
12.4.1	Material	12-2
12.4.1.1	Method of Measurement	12-2
12.4.1.2	Basis of Payment	12-2
SECTION - 13 SEWAGE PUMPING STATION		13-1 to 13-29
13.1	SCOPE	13-1
13.2	CIVIL WORKS	13-1
13.3	PUMPING EQUIPMENT	13-1
13.3.1	General	13-1
13.3.2	Pump Manufacturer's Qualifications	13-2

(x)

SECTION NO.	DESCRIPTION	PAGE #
13.3.3	Submittals	13-2
13.3.4	General Arrangement	13-3
13.3.5	Pump Set Construction	13-3
13.3.6	Pump Set Duties	13-3
13.3.7	Pump Characteristics	13-3
13.3.8	Motors	13-4
13.3.9	Motor Starter	13-4
13.4	LT PANELS	13-5
13.4.1	LT Panels Construction	13-5
13.4.2	LT Panels Equipment	13-7
13.4.2.1	Incoming Supply	13-7
13.4.2.2	Outgoing Circuits	13-7
13.5	LT WIRE AND CABLES	13-8
13.5.1	General	13-8
13.5.2	General Material Requirements	13-8
13.6	CONDUIT AND CONDUIT ACCESSORIES	13-9
13.6.1	PVC Conduits and Accessories	13-9
13.6.1.1	General	13-9
13.6.1.2	Material Description	13-9
13.6.2	Conduit Installation	13-9
13.6.2.1	General	13-9
13.6.2.2	Pull Boxes and Adaptable Boxes	13-10
13.7	INSTALLATION OF WIRES AND CABLES	13-11
13.7.1	General	13-11
13.7.2	Wiring Methodology	13-11
13.7.3	Small Accessories	13-11
13.8	CEILING FANS	13-11
13.9	LIGHTING FITTINGS	13-12
13.9.1	General	13-12
13.9.2	Fluorescent Fitting Accessories	13-12
13.9.3	Fluorescent Fitting	13-13
13.9.4	Lighting Fixtures Installation	13-13
13.9.4.1	Fluorescent Light Fixtures	13-13
13.10	WIRING AND ACCESSORIES	13-13
13.10.1	Switches	13-13
13.10.1.1	General	13-13
13.10.1.2	Indoor Type Switches	13-14
13.10.2	Switch and Socket Units	13-14
13.10.3	Outlet Box	13-14
13.10.4	Ceiling Rose	13-14

SECTION NO.	DESCRIPTION	PAGE #
13.10.5	Installation of Wiring Accessories and Fans	13-15
13.10.5.1	Switches and Sockets	13-15
13.10.5.2	Ceiling Fan	13-15
13.11	EARTHING SYSTEM	13-15
13.11.1	Earth Continuity Conductor	13-15
13.11.2	Earth Electrodes	13-15
13.11.3	Earth Connecting Point	13-15
13.11.4	Earthing by Earth Rods	13-16
13.11.5	Earth and Dimensions	13-16
13.11.6	Earthing Installation	13-16
13.11.7	Earth Plates	13-16
13.11.8	Earth Leads	13-16
13.12	ACCESSORIES	13-17
13.12.1	Pressure Gauges	13-17
13.12.2	Delivery Pipe Work	13-17
13.12.3	Spare Parts	13-17
13.12.4	Spanners and Special Tools	13-18
13.12.5	Guide Bars and Hoisting Machinery	13-18
13.13	ENGINEER'S DESIGN AND LAYOUT OF THE PUMP STATION	13-18
13.14	RECORD DRAWINGS	13-18
13.15	OPERATING INSTRUCTIONS	13-19
13.16	PACKING AND TRANSPORTATION	13-19
13.17	OPERATION AND MAINTENANCE MANUALS	13-19
13.18	GUARANTEE	13-19
13.19	TESTING AND COMMISSIONING	13-19
13.19.1	Works Testing	13-19
13.19.1.1	Operating Tests	13-19
13.19.1.2	Tests During Manufacture	13-20
13.19.1.3	Hydraulic Pressure Tests	13-20
13.19.2	Site Testing and Inspection	13-20
13.19.3	Commissioning and Acceptance	13-21
13.20	MAINTENANCE PERIOD	13-21
13.21	PAINT AND FINISHING	13-22
13.22	MEASUREMENT AND PAYMENT	13-22
13.22.1	Measurements	13-22
13.22.2	Basis of Payment	13-22

SECTION NO.	DESCRIPTION	PAGE #
SECTION - 14 CONSTRUCTION OF TUBEWELLS		14-1 to 14-15
14.1	SCOPE	14-1
14.2	DRILLING	14-1
14.2.1	General	14-1
14.2.2	Drilling Procedure	14-1
14.2.3	Data and Records	14-2
14.2.4	Sampling	14-2
14.3	INSTALLATION OF WELL CASING	14-3
14.3.1	General	14-3
14.3.2	Material	14-3
14.3.2.1	Pump Housing Pipe	14-3
14.3.2.2	Well Blind Pipe	14-3
14.3.2.3	Reducer	14-3
14.3.2.4	Sand Trap	14-3
14.3.2.5	Well Screen	14-4
14.3.3	Fabrication	14-4
14.3.4	Installation	14-4
14.3.5	Gravel Makeup Pipe	14-6
14.4	GRAVEL SHROUDING	14-6
14.4.1	General	14-6
14.4.2	Gravel Source	14-6
14.4.3	Specifications	14-6
14.4.4	Placing of Gravel	14-7
14.5	GROUTING OF PUMP HOUSING CASING	14-7
14.5.1	General	14-7
14.5.2	Material	14-8
14.5.3	Placement of Grouting	14-8
14.6	DEVELOPMENT AND TESTING	14-9
14.6.1	General	14-9
14.6.2	Development	14-9
14.6.3	Testing	14-10
14.6.4	Summary	14-10
14.6.5	Development	14-10
14.6.6	Testing	14-11
14.6.7	Equipment	14-11
14.6.8	Measurement and Data	14-11
14.6.9	Disinfection and Sterilization	14-11
14.6.10	Sealing of the Well	14-12

SECTION NO.	DESCRIPTION	PAGE #
14.7	MEASUREMENT AND PAYMENT	14-12
14.7.1	Drilling	14-12
14.7.1.1	Method of Measurement	14-12
14.7.1.2	Basis of Payment	14-12
14.7.2	Installation of Tubewell Casing	14-13
14.7.2.1	Method of Measurement	14-13
14.7.2.2	Basis of Payment	14-13
14.7.3	Gravel Shrouding	14-14
14.7.3.1	Method of Measurement	14-14
14.7.3.2	Basis of Payment	14-14
14.7.4	Grouting of Pump Housing Case	14-15
14.7.4.1	Method of Measurement	14-15
14.7.4.2	Basis of Payment	14-15
14.7.5	Development & Testing	14-15
14.7.5.1	Method of Measurement	14-15
14.7.5.2	Basis of Payment	14-15

SECTION - 15 TUBEWELL PUMPING FACILITIES

15-1 to 15-19

15.1	SCOPE	15-1
15.2	MATERIALS AND CONSTRUCTION REQUIREMENTS	15-1
15.3	CIVIL WORKS	15-1
15.4	MECHANICAL WORKS	15-1
15.4.1	General	15-1
15.4.2	Approval of Materials and Equipment	15-2
15.4.3	Material and Equipment	15-2
15.4.3.1	Water Pumps	15-2
15.4.3.1.1	Design	15-2
15.4.3.1.2	Manufacture	15-3
15.4.3.1.3	Quality Control Tests	15-5
15.4.3.2	Motors	15-6
15.4.3.2.1	Motor - Control	15-7
15.4.3.3	Piping	15-7
15.4.3.4	Installation	15-8
15.4.3.4.1	Pumps and Motors	15-8
15.5	ELECTRICAL WORKS	15-8
15.5.1	General	15-8
15.5.2	Regulation	15-8
15.5.3	Coordination	15-9
15.5.4	Standard Products	15-9
15.5.5	Material and Equipment Schedules	15-9

SECTION NO.	DESCRIPTION	PAGE #
15.5.6	Workmanship	15-9
15.5.7	Grounding	15-9
15.5.8	Conduit	15-10
15.5.8.1	Galvanized Iron (G.I.) Conduits	15-10
15.5.8.2	P.V.C. Pipe	15-11
15.5.8.3	Additional Requirements for Exterior Conduit	15-11
15.5.9	Conductors	15-11
15.5.9.1	General	15-11
15.5.9.2	Conductor Sizes	15-11
15.5.9.3	Conductor Insulation	15-11
15.5.10	Boxes and Supports	15-12
15.5.11	Lamp Fixture and Accessories	15-12
15.5.12	Electrical Supply Points (Outlet Connections)	15-12
15.5.13	Flexible Connections	15-13
15.5.14	Fuse Circuits and Fuse Boxes	15-13
15.5.15	Power Switchgear Assemblies	15-13
15.5.16	Exterior Switches	15-13
15.5.17	Testing	15-13
15.5.17.1	Insulation Resistance	15-13
15.5.17.2	Operating Test	15-14
15.5.17.3	Earth Plate Resistance	15-14
15.5.18	Repair	15-14
15.6	POWER TRANSFORMER	15-14
15.6.1	General	15-14
15.6.1.1	Construction	15-14
15.6.1.2	Drawing and Data	15-16
15.6.1.3	Transformer Technical Data	15-16
15.7	LIFTING GEAR (CHAIN PULLEY)	15-17
15.8	CHLORINATION EQUIPMENT	15-17
15.8.1	Chlorinator	15-17
15.8.2	Chlorinator Accessories	15-17
15.8.3	Booster Pump	15-17
15.8.4	Empty Gas Cylinders	15-17
15.9	GUARANTEE	15-18
15.10	OPERATION AND MAINTENANCE MANUAL	15-18
15.11	SPARES AND TOOLS	15-18
15.12	MEASUREMENT AND PAYMENT	15-18
15.12.1	Method of Measurement	15-18
15.12.1.1	Civil Works	15-18

SECTION NO.	DESCRIPTION	PAGE #
15.12.1.2	Electrical and Mechanical Works	15-19
15.12.2	Method of Measurement	15-19
15.12.2.1	Basis of Payment	15-19
SECTION - 16 MISCELLANEOUS		16-1 to 16-7
16.1	SCOPE	16-1
16.2	MATERIALS AND CONSTRUCTION	16-1
16.2.1	Steel Work	16-1
16.2.2	Steel Ladder/Stairs	16-1
16.2.3	Brick Pavement	16-1
16.2.4	Level Indicator	16-1
16.2.5	Lightening Arrester	16-2
16.2.6	Disinfection of Overhead Water Tanks	16-2
16.2.7	Rungs	16-2
16.2.8	Manhole Cover	16-2
16.2.9	Vents	16-2
16.2.10	Service Ducts	16-2
16.2.11	(a) Bar Screen (b) Galvanized Mild Steel Grating	16-2
16.2.12	Toilet Fixtures and Plumbing Works	16-3
16.2.13	Exhaust Fans	16-3
16.2.14	Operator's Quarter	16-3
16.2.15	Septic Tank	16-3
16.2.16	Penstock Gate	16-4
16.3	MEASUREMENT AND PAYMENTS	16-4
16.3.1	Miscellaneous Items	16-4
16.3.1.1	Method of Measurement	16-4
16.3.1.2	Basis of Payment	16-5
SECTION - 17 CLEARING AND GRUBBING		17-1 to 17-2
17.1	SCOPE	17-1
17.2	CONSTRUCTION REQUIREMENTS	17-1
17.2.1	Grubbing	17-1
17.2.2	Clearing	17-1
17.2.3	Protection and Restoration	17-2
17.3	MEASUREMENT AND PAYMENT	17-2
17.3.1	Method of Measurement	17-2
17.3.2	Basis of Payment	17-2

SECTION NO.	DESCRIPTION	PAGE #
SECTION - 18 COMPACTION OF NATURAL GROUND		18-1 to 18-1
18.1	SCOPE	18-1
18.2	CONSTRUCTION REQUIREMENTS	18-1
18.3	COMPACTION REQUIREMENTS	18-1
18.4	MEASUREMENT AND PAYMENT	18-1
18.4.1	Method of Measurement	18-1
18.4.2	Basis of Payment	18-1
SECTION - 19 CLASSIFICATION OF EXCAVATION		19-1 to 19-2
19.1	ROADWAY EXCAVATION	19-1
19.2	EMBANKMENT EXCAVATION	19-1
19.3	MATERIAL CLASSIFICATION	19-1
19.3.1	Common Material	19-1
19.3.2	Loose Earth or Loose Rock	19-2
19.3.3	Rock Material	19-2
SECTION - 20 EXCAVATION OF UNSUITABLE OR SURPLUS MATERIAL		20-1 to 20-2
20.1	SCOPE	20-1
20.2	CONSTRUCTION REQUIREMENTS	20-1
20.3	MEASUREMENT AND PAYMENT	20-1
20.3.1	General	20-1
20.3.2	Method of Measurement	20-2
20.3.3	Basis of Payment	20-2
SECTION - 21 STRUCTURAL EXCAVATION AND BACKFILL		21-1 to 21-5
21.1	SCOPE	21-1
21.2	MATERIAL REQUIREMENTS	21-1
21.2.1	Backfill	21-1
21.3	CONSTRUCTION REQUIREMENTS	21-1
21.3.1	General	21-1
21.3.2	Drain Excavation	21-2
21.3.3	Preservation of Channel/Drain	21-2
21.3.4	Depth of Footings	21-2
21.3.5	Preparation of Foundations for Footings	21-2
21.3.6	Inspection	21-2

SECTION NO.	DESCRIPTION	PAGE #
21.4	BACKFILL MATERIALS	21-3
21.4.1	Granular Backfill	21-3
21.4.2	Common Backfill	21-3
21.4.3	Special Backfill	21-3
21.5	MEASUREMENT AND PAYMENT	21-4
21.5.1	Method of Measurement	21-4
21.5.2	Basis of Payment	21-5
SECTION - 22 REMOVAL OF EXISTING STRUCTURES		22-1 to 22-2
22.1	DESCRIPTION	22-1
22.2	REMOVAL	22-1
22.3	DISPOSAL	22-1
22.4	MEASUREMENT & PAYMENT	22-2
22.4.1	Method of Measurement	22-2
22.4.2	Basis of Payment	22-2
SECTION-23 FORMATION OF EMBANKMENT		23-1 to 23-5
23.1	SCOPE	23-1
23.2	MATERIAL REQUIREMENTS	23-1
23.3	CONSTRUCTION REQUIREMENTS	23-1
23.3.1	Formation of Embankment with Common Material	23-1
23.3.2	Excavation in Embankments	23-2
23.3.3	General Requirements	23-3
23.3.4	Shoulders Ditches and Slopes	23-4
23.4	MEASUREMENT AND PAYMENT	23-4
23.4.1	Method of Measurement	23-4
23.4.2	Basis of Payment	23-4
SECTION - 24 SUBGRADE PREPARATION		24-1 to 24-3
24.1	SCOPE	24-1
24.2	CONSTRUCTION REQUIREMENTS	24-1
24.2.1	Prior Works	24-1
24.2.2	Material	24-1
24.2.3	Compaction Requirements	24-1
24.2.4	Subgrade Level in Earth Cut	24-1
24.2.5	Subgrade Level in Rock Cut	24-2
24.2.6	Subgrade Level on Embankment	24-2

SECTION NO.	DESCRIPTION	PAGE #
24.2.7	Templates and Straight Edges	24-2
24.2.8	Allowable Acceptance Limits for Level Variation in Cut and Fill	24-2
24.2.9	Proof Rolling	24-3
24.2.10	Traffic on Subgrade	24-3
24.2.11	Tolerances	24-3
24.3	MEASUREMENT AND PAYMENT	24-3
24.3.1	Method of Measurement	24-3
SECTION - 25 GRANULAR SUBBASE		25-1 to 25-5
25.1	SCOPE	25-1
25.2	MATERIAL REQUIREMENTS	25-1
25.3	CONSTRUCTION REQUIREMENTS	25-2
25.3.1	Spreading	25-2
25.3.2	Compaction	25-2
25.3.3	Compaction Requirements	25-3
25.3.4	Trial Sections	25-3
25.3.5	Tolerance	25-4
25.3.6	Acceptance Sampling and Testing	25-4
25.4	MEASUREMENT AND PAYMENT	25-4
25.4.1	Method of Measurement	25-4
25.4.2	Basis of Payment	25-5
SECTION - 26 A AGGREGATE BASE COURSE		
26.1	DESCRIPTION	26a-1
26.2	MATERIAL REQUIREMENTS	26a-1
26.2.1	Filler for Blending	26a-2
26.3	CONSTRUCTION REQUIREMENTS	26a-2
26.3.1	Preparation of surface for Aggregate base course	26a-2
26.3.2	Compaction	26a-2
26.3.3	Compaction Requirements	26a-3
26.3.4	Moisture Content Determination	26a-3
26.3.5	Trial Sections	26a-3
26.3.6	Tolerance	26a-3
26.3.7	Acceptance, Sampling and Testing	26a-3
26.4	MEASUREMENT AND PAYMENT	26a-4
26.4.1	Measurement	26a-4
26.4.2	Payment	26a-4

SECTION NO.	DESCRIPTION	PAGE #
SECTION - 26 B WATERBOUND MACADAM BASE		26b-1 to 26b-6
26.1	SCOPE	26b-1
26.2	MATERIAL REQUIREMENTS	26b-1
26.3	CONSTRUCTION REQUIREMENTS	26b-2
26.3.1	Preparation of Previously Constructed Sub-grade or Sub-base	26b-2
26.3.2	Weather Limitations	26b-2
26.3.3	Thickness of Layers	26b-3
26.3.4	Spreading Coarse Aggregate	26b-3
26.3.5	Compaction	26b-3
26.3.6	Applying Screenings	26b-3
26.3.7	Sprinkling	26b-4
26.3.8	Density Requirements	26b-4
26.3.9	Tolerances	26b-5
26.3.10	Reconstructing Damaged Base Course	26b-5
26.3.11	Maintenance and Protection of Base Course	26b-5
26.4	MEASUREMENT AND PAYMENT	26b-5
26.4.1	Method of Measurement	26b-5
26.4.2	Basis of Payment	26b-5
SECTION - 27 ASPHALTIC MATERIALS		27-1 to 27-6
27.1	ASPHALT CEMENT	27-1
27.2	ENVIRONMENTAL FACTORS	27-1
27.3	CUT-BACK ASPHALT	27-2
27.4	EMULSIFIED ASPHALT	27-2
SECTION - 28 BITUMINOUS SURFACE TREATMENT		28-1 to 28-5
28.1	SCOPE	28-1
28.2	MATERIAL REQUIREMENTS	28-1
28.2.1	Aggregate	28-1
28.2.2	Asphaltic Material	28-2
28.3	CONSTRUCTION REQUIREMENTS	28-2
28.3.1	Equipment	28-2
28.3.2	Application of Asphaltic Materials	28-3
28.3.3	Spreading of Aggregate	28-3

SECTION NO.	DESCRIPTION	PAGE #
28.4	MEASUREMENT AND PAYMENT	28-4
28.4.1	Material Requirements	28-4
28.4.1.1	Method of Measurement	28-4
28.4.1.2	Basis of Payment	28-5
SECTION - 28A BITUMINOUS PRIME COAT		28A-1 to 28A-4
28A.1	DESCRIPTION	28A-1
28A.2	MATERIAL REQUIREMENTS	28A-1
28A.3	CONSTRUCTION REQUIREMENTS	28A-1
28A.3.1	Equipment	28A-2
28A.3.2	Application of Asphaltic Material	28A-2
28A.4	MEASUREMENT AND PAYMENT	28A-3
SECTION - 28B ASPHALT CONCRETE WEARING COURSE - PLANT MIX.		28B-1 to 28B-12
28B.1	DESCRIPTION	28B-1
28B.2	MATERIAL REQUIREMENTS	28B-1
28B.2.1	Mineral Aggregate	28B-1
28B.2.2	Asphaltic Material	28B-2
28B.2.3	Asphalt Concrete Wearing Course Mixture	28B-3
28B.2.4	Job-Mix Formula	28B-4
28B.2.5	Asphalt Additives	28B-5
28B.3	CONSTRUCTION REQUIREMENTS	28B-5
28B.3.1	Bituminous Mixing Plant	28B-5
28B.3.2	Preparation of Aggregates	28B-5
28B.3.3	Hauling Equipment	28B-6
28B.3.4	Bituminous Pavers	28B-6
28B.3.5	Rollers	28B-7
28B.3.6	Preparation of Base or Existing Pavement Surface	28B-7
28B.3.7	Spreading and Finishing	28B-8
28B.3.8	Compaction	28B-9
28B.3.9	Frequency of Testing for Cores	28B-10
28B.3.10	Pavement Thickness and Tolerances	28B-10
28B.3.11	Acceptance Sampling and Testing	28B-11
28B.3.12	Weather Limitations	28B-11

SECTION NO.	DESCRIPTION	PAGE #
28B.4	MEASUREMENT AND PAYMENT	28B-11
28B.4.1	Measurement	28B-11
28B.4.2	Payment	28B-12
SECTION - 29 BRICK EDGING		29-1 to 29-1
29.1	SCOPE	29-1
29.2	MATERIAL REQUIREMENTS	29-1
29.2.1	Bricks	29-1
29.2.2	Joint Filler	29-1
29.3	CONSTRUCTION REQUIREMENTS	29-1
29.3.1	Stacking of Bricks	29-1
29.3.2	Placing of Bricks	29-1
29.4	MEASUREMENTS AND PAYMENTS	29-1
29.4.1	Method of Measurement	29-1
29.4.2	Basis of Payment	29-1
SECTION - 30 SIDE WALK & KERB STONES		30-1 to 30-12
30.1	BRICK PAVING	30-1
30.1.1	Scope	30-1
30.1.2	Material Requirements	30-1
30.1.2.1	Bricks	30-1
30.1.2.2	Joint Filler	30-1
30.1.3	Construction Requirements	30-1
30.1.3.1	Sub-Grade	30-1
30.1.3.2	Stacking of Bricks	30-2
30.1.3.3	Placing of Bricks	30-2
30.2	BRICK PAVED SIDEWALK	30-2
30.2.1	Scope	30-2
30.2.2	Material Requirement	30-2
30.2.2.1	Bricks	30-2
30.2.2.2	Joint Mortar	30-2
30.2.2.3	Bed Course Material	30-2
30.2.3	Construction Requirements	30-2
30.2.3.1	Excavation	30-2
30.2.3.2	Placing of Bed Course Material	30-3
30.2.3.3	Placing of Bricks	30-3
30.3	CEMENT CONCRETE SIDEWALK	30-3
30.3.1	Scope	30-3
30.3.2	Material Requirements	30-3

SECTION NO.	DESCRIPTION	PAGE #
30.3.3	Bed Course Material	30-3
30.3.4	Construction Requirements	30-3
30.3.4.1	Excavation	30-3
30.3.4.2	Placing of Bed Course Material	30-4
30.3.4.3	Placing the Cement Concrete Material	30-4
30.4	CONCRETE KERB	30-4
30.4.1	Scope	30-4
30.4.2	Material Requirements	30-4
30.4.2.1	Precast Concrete Kerbs	30-4
30.4.3	Construction Requirements	30-4
30.4.3.1	Excavation and Bedding	30-4
30.4.3.2	Placing	30-5
30.4.3.3	Joint	30-5
30.4.3.4	Back-filling	30-5
30.5	BRICK MASONRY KERB	30-5
30.5.1	Scope	30-5
30.5.2	Construction Requirement	30-5
30.5.2.1	Excavation and Bedding	30-5
30.6	INTERLOCKING CONCRETE PAVERS	30-5
30.6.1	Sidewalk	30-5
30.6.2	Material Requirement	30-6
30.6.2.1	Interlocking Concrete Pavers	30-6
30.6.2.2	Joint Mortar	30-6
30.6.2.3	Bed Course Material	30-6
30.6.3	Construction Requirements	30-6
30.6.3.1	Excavation	30-6
30.6.3.2	Placing of Bed Course Material	30-6
30.6.3.3	Placing of Interlocking Concrete Pavers	30-6
30.7	TUFF-TILES CONCRETE BLOCK PAVING	30-7
30.7.1	Sidewalk	30-7
30.7.2	Material Requirement	30-7
30.7.2.1	Tuff – Tiles Concrete Block Paving	30-7
30.7.2.2	Joint Mortar	30-7
30.7.2.3	Bed Course Material	30-7
30.7.3	Construction Requirement	30-7
30.7.3.1	Excavation	30-7
30.7.3.2	Placing of Bed Course Material	30-7
30.7.3.3	Placing of Tuff Tiles	30-7
30.8	MEASUREMENT AND PAYMENTS	30-7
30.8.1	Method of Measurement	30-8
30.8.2	Basis of Payment	30-8
30.8.3	Brick Paved Side Walk	30-8

SECTION NO.	DESCRIPTION	PAGE #
30.8.3.1	Method of Measurement	30-8
30.8.3.2	Basis of Payment	30-8
30.8.4	Cement Concrete Side Walk	30-9
30.8.4.1	Method of Measurement	30-9
30.8.4.2	Basis of Payment	30-9
30.8.5	Concrete Kerbs	30-9
30.8.5.1	Method of Measurement	30-10
30.8.5.2	Basis of Payment	30-10
30.8.6	Brick Masonry Kerbs	30-10
30.8.6.1	Method of Measurement	30-10
30.8.6.2	Basis of Payment	30-10
30.8.7	Interlocking Concrete Pavers	30-11
30.8.7.1	Method of Measurement	30-11
30.8.7.2	Basis of Payment	30-11
30.8.8	Tuff Tiles	30-12
30.8.8.1	Method of Measurement	30-12
30.8.3.2	Basis of Payment	30-12
30.9	CULVERTS	30-12
30.9.1	General	30-12
30.9	CONCRETE SLAB CULVERTS	30-13
30.9.1	Description	30-13
30.9.2	Material Requirements	30-13
30.9.2.1	Form Work	30-13
30.9.2.2	Steel Reinforcement	30-13
30.9.2.3	Concrete	30-14
30.9.2.4	Brickwork and Cement Plaster	30-14
30.9.3	Construction Requirements	30-14
30.9.3.1	Excavation	30-14
30.9.3.2	Formwork	30-14
30.9.3.3S	Steel Reinforcement	30-14
SECTION - 31 TRAFFIC ROAD SIGNS AND SAFETY DEVICES		31-1 to 31-8
31.1	DESCRIPTION	31-1
31.2	MATERIALS REQUIREMENTS	31-1
31.2.1	Sign Panels	31-1
31.2.2	Reflective Sheeting	31-1
31.2.3	Metal Posts	31-2
31.2.4	Plates	31-3
31.2.5	Nuts and Bolts	31-3
31.2.6	Rubber Washer	31-3
31.2.7	Caps Over the Pipes	31-3

SECTION NO.	DESCRIPTION	PAGE #
31.2.8	General	31-4
31.2.9	Concrete Foundation Blocks	31-4
31.2.10	Road Posts and Hazard Markers	31-4
31.3	CONSTRUCTION REQUIREMENTS	31-4
31.3.1	Excavation and Backfilling	31-4
31.3.2	Erection of Posts	31-5
31.3.3	Sign Panel Installation	31-5
31.3.4	Categories of Signs	31-5
31.3.5	Installation of Safety Devices	31-6
31.3.6	Sign Faces	31-6
31.3.7	Storage of Signs	31-7
31.4	MEASUREMENT AND PAYMENT	31-7
31.4.1	Measurement	31-7
31.4.2	Payment	31-8

SECTION – 32 TERMITE CONTROL TREATMENT

32.1	SCOPE	32-1
32.2	CODES AND STANDARDS	32-1
32.3	SUBMITTALS	32-1
32.4	QUALITY ASSURANCE	32-1
32.5	MATERIAL	32-1
32.6	METHOD AND EXTENT OF APPLICATION	32-2
32.7	MEASUREMENT & PAYMENT	32-2

SECTION – 33 CARPENTRY AND JOINERY

33.1	SCOPE	33-1
33.2	APPLICABLE STANDARDS	33-1
33.3	MATERIALS	33-2
33.4	SAMPLES	33-3
33.5	FABRICATIONS	33-3
33.6	PROTECTION OF MATERIALS	33-4
33.7	WOODEN DOORS	33-4
33.8	QUALITY ASSURANCE	33-7
33.9	WOODEN RAILING	33-8
33.10	KITCHEN CABINET, WOODEN BENCHES, PERGOLA AND JAFRI	33-8
33.11	SQUASH COURT HARD WOOD FLOORING	33-9
33.12	DEFECTIVE WORK	33-9
33.13	SURFACE PREPARATION	33-9
33.14	MEASUREMENT & PAYMENT	33-9

SECTION NO.	DESCRIPTION	PAGE #
SECTION – 34 FLOOR AND WALL FINISHES		
34.1	SCOPE	34-1
34.2	APPLICABLE STANDARDS	34-1
34.3	SUBMITTAL	34-2
34.4	TOLERANCES	34-2
34.5	TESTING	34-2
34.6	DELIVERY AND STORAGE	34-3
34.7	MATERIAL	34-3
34.8	EXECUTION	34-5
34.9	INSTALLATION OF TILE FLOORING	34-7
34.10	MEASUREMENT AND PAYMENT	34-12
SECTION – 35 MARBLE		
35.1	SCOPE	35-1
35.2	SUBMITTALS	35-1
35.3	DELIVERY, STORAGE AND HANDLING	35-1
35.4	TOLERANCES & TESTING	35-1
35.5	MATERIALS	35-2
35.6	FABRICATION	35-3
35.7	EXECUTION	35-3
35.8	MEASUREMENT AND PAYMENT	35-5
SECTION – 36 ELECTRICAL WORKS		
36.1	CABLE SUPPORT SYSTEM	36-2
36.2	CABLE AND WIRING	36-4
36.3	ACCESSORIES	36-5
36.4	LIGHT FITTINGS AND FIXTURES	36-6
36.5	LOW VOLTAGE SWITCHGEAR	36-7
36.6	EARTHING	36-8
36.7	TRANSFORMER	36-10
36.8	DIESEL GENERATING SETS	36-10
36.9	AREA ELECTRIC POLE AND LIGTH FIXTURE	36-10
SECTION – 37	Solar System	311-327
SECTION – 38	Performance Data for Machinery & Equipment	328-353

SECTION - 1

EXCAVATION, TRENCHING AND BACKFILLING

1.1 SCOPE

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

1.2 SETTING OUT

The Contractor shall set out the works in accordance with the dimensions, lines and levels shown on the Drawings. Where no precise positions or levels are shown on the drawings, the works shall be set out by the Contractor to the positions and levels determined by the Engineer's Representative as the work proceeds.

1.3 CLEARING AND GRUBBING

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

1.4 EXCAVATION

1.4.1 General

All excavation of whatever substance encountered shall be performed to the depths indicated or as otherwise specified. During excavation, material suitable for back-filling shall be stockpiled in an orderly manner at a sufficient distance from the banks of the excavation to avoid overloading and to prevent sides from caving. All excavated material unsuitable for backfill shall be removed and placed at a location approved by the Engineer. Grading shall be done as may be necessary to prevent surface water from flowing into the trenches or other excavations, and any water accumulated therein shall be removed by pumping or by other approved methods. Unless otherwise indicated or approved by the Engineer, excavation shall be open cut. For Contract purposes hereunder the

earth excavation work has been classified into two categories, earth excavation in trenches and earth excavation for structures.

1.4.2 Earth Excavation in Trenches

Unless otherwise directed or permitted by the Engineer not more than 100 ft of any trench in advance of the end of the pipeline already laid shall be opened at any time. Trenches shall be excavated to the dimensions and depths shown on the drawings or ordered by the Engineer or in such a position or to such dimensions and depths as shall allow for the proper construction of the relevant structure or proper excavation of the relevant operation. Pipe trenches shall be excavated to give a clear width of 6 inches on either side of the pipe. Additional excavation shall be carried out to give ample space for making joints and, where necessary, for concrete bedding or surround.

The banks of the pipe trench shall be as nearly vertical as practicable. Bell holes and depressions for joints shall be dug after the trench bottom has been prepared. The pipe, except for joints, shall rest on the prepared bottom for its full length. Bell holes and depressions shall be only of such length, depth, and width as required for properly making the particular type of joints. Stones shall be removed to avoid point bearing. Whenever wet or otherwise unstable material that is incapable of properly supporting the pipe as determined by the Engineer is encountered in the bottom of the trench, such material shall be removed to the depth required and the trench backfilled to the proper grade with coarse sand, or other suitable approved granular material. Such replacement of unsuitable material will be paid for at the contract unit price for that item of work as shall be agreed upon, before execution of this work, with the Engineer.

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

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

1.4.3 Earth Excavation for Structures

All earth excavation under this contract, which is not included under the classification of "Earth excavation in Trenches" shall be classified and paid for as earth excavation for structures.

The Contractor shall provide adequate timbering or shoring for excavations,

should the sides and ends of any excavations give way the Contractor shall, at no extra cost, remove all disturbed ground. Any excavation carried outside the limits shown on drawings and specified herein as the payment limits, shall not be treated as excavated and shall not be paid for.

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

1.4.4 Replaced Soil under Foundations

1.4.4.1 Material

Selected well graded granular material shall be used for filling beneath the structural foundations. This material should meet the requirements of A-2-4 & A-3 (AASHTO soil classification).

The suitability of the material shall be supported by adequate tests in the laboratory.

1.4.4.2 Equipment and Procedure

Suitable equipment shall be selected by the Contractor on the basis of field trials for compaction. The contractor shall indicate his planning to carry out compaction in his Method Statement for Engineer's approval before undertaking actual compaction. A test section would be required to select the most suitable equipment, layer thickness, moisture content, No. of passes etc.

1.4.4.3 Compaction Standard

The contractor shall place the material to be compacted in layers. Each layer shall be of specified thickness and shall be compacted by the optimum number of passes as explained in above section. Compaction less than 75% of relative density or 95% of Modified Proctor Density shall not be acceptable.

1.4.4.4 Quality Control

Every compacted layer shall be tested for quality of compaction by performing in-situ density tests. Sand replacement method of density measurement shall be used. The evaluation of 75% relative density or 95% Modified Proctor Density shall be based on measurement of maximum, minimum and maximum Modified Proctor Densities in the laboratory. The frequency of this testing shall be instructed by the Engineer at the site.

1.5 PRECAUTIONARY AND REMEDIAL MEASURES

1.5.1 Protection of Existing Facilities and Structures

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

1.5.2 Planking and Strutting

The Contractor shall provide at his own expense to the satisfaction of the Engineer all timbering, poling, shoring, strutting and other approved supports to the sides of all excavations, trenches and all other works in such a way as will be sufficient to secure them from falling and to prevent any movement. All responsibilities connected with this part of the work shall rest with the Contractor.

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

1.5.3 Dewatering

The Contractor shall build all drains and do ditching, pumping, well pointing, bailing, and all other work necessary to keep the excavation clear of ground water, sewage and storm water during the progress of the work and until the finished work is safe from injury. All water pumped or drained from the work shall be disposed of in a manner satisfactory to the Engineer and necessary precautions against flooding shall be taken. The procedure for dewatering of subsoil water from excavation for the purpose of construction of sewer lines and other structures shall be in accordance with the method given below:

- Dewatering of subsoil water from excavations of trenches and excavations for other structures shall be arranged by an adequate process of well-pointing, bailing and/or pumping or by any other suitable method approved by the Engineer on the basis of the method (statement to be submitted by the Contractor).
- If well-points are used then the following requirements shall be met with. Well-pointing shall consist of bore holes, provided with necessary strainers, blind pipes and pumping machinery, and these shall be of suitable size and depth and shall be located on both sides of the trench

and along the periphery of water level to a sufficient depth to keep the excavations clear of subsoil water during the process of construction.

- As a part of the work and at no extra cost, the Contractor shall provide all strainer pipes and other requisite material, and boring tools and plant, etc. for the well pointing and shall also provide pumping equipment as well as operating personnel, power, etc. Dewatering of subsoil water shall be continuous process round the clock during the progress of the work and until the finished work is safe, from injury to the complete satisfaction of the Engineer's representative and any interruption in continuous pumping and causing injury to the works done or under construction shall require the Contractor to repair or rebuild the works to the entire satisfaction of the Engineer's representative at no extra cost. No extra payment shall be made to the Contractor for the disposal of storm water and for dewatering in trenches and building structures less than 5 ft. depth.

1.5.4 Maintenance of Excavation

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

1.5.5 Surplus Materials

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

1.5.6 Cutting Pavement

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

1.6 TRANSPORTATION OF MATERIAL

All carts, trucks or other vehicles used by the Contractor for transportation of the material shall be suitably constructed or lined not to permit any leakage/spillage of soil while the vehicles are on the move. These would be so loaded and arranged as not to spill on the site and public roads. Whenever any vehicle so used is found leaking/spilling and unsuitable, it shall be immediately withdrawn from the work on notification by the Engineer.

1.7 COMPACTED FILL AND BACKFILL

1.7.1 General

After the completion of water and sewer lines, foundations, walls and other structures below the elevation of the final grade, all voids shall be backfilled with suitable materials, as specified below.

1.7.2 Backfilling for Structures

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

1.7.3 Backfilling of Trenches

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

1.7.4 Lower Portion of Trench

Backfill material below and around pipe shall be deposited in 6 inch maximum thickness layers and compacted with suitable hand tampers to 90% of maximum density until there is a cover of not less than 1 ft. over the pipe. The backfill material in this portion of trench shall consist of sandy clay or other approved materials free from stones and lumps.

1.7.5 Remainder of Trench

The remainder of the trench portion above pipe shall be backfilled with material that is free from stones larger than 6 inch in any dimension. Backfill material shall be compacted to achieve a minimum relative density of 90% of modified proctor test at optimum moisture content for cohesive soils and 95 percent of maximum density for others.

1.8 BORROW

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

1.9 GRADING

After the completion of all backfilling operations, the Contractor shall grade the work areas to the lines, grades and elevations shown on the drawings or as directed by the Engineer. Finished grading shall not be done until the installation of all utilities or appurtenance. All damage due to settlement shall be repaired by and at the expense of the Contractor.

1.10 TESTING OF SOIL IN PLACE

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

1.11 MEASUREMENT AND PAYMENT

1.11.1 Excavation and Backfilling

1.11.1.1 Method of Measurement

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

1.11.1.2 Basis of Payment

Payment for earth excavation and backfilling in trenches or structures will be made at the contract unit price per cubic ft.

The cost of dewatering, disposal of earth & earth & any shuttering or support required for excavation is included in the execution unit price.

Description	Unit
Excavation for structures and compacted backfill including dewatering & disposal of surplus material.	Cft.
Excavation for trenches and compacted backfill including dewatering & disposal of surplus material.	Cft.

SECTION - 2

CONCRETE

2.1 SCOPE

This section covers the manufacture, forming, transporting, placing, stripping of forms, finishing and curing of plain and reinforced normal concrete in the structures included herein.

2.2 SPECIFICATIONS

Concrete work shall conform to all requirements of ACI 301-72, (Revised 1975), Specifications for Structural Concrete for Buildings, except as modified by supplemental requirements below. The Contractor shall submit, for the approval of the Engineer, before commencement of any work, his Method Statement which would provide complete details of the procedures and equipment to be used for the satisfactory execution of the work. The approval of such Method Statement shall not relieve the Contractor of any of his responsibilities under the Contract.

2.3 COMPOSITION AND QUALITY

Concrete shall be composed of Portland cement, water, fine and coarse aggregates and any admixtures as and when specified. The concrete mixes will be designed by the Engineer who will determine the required quality of the concrete for the structures covered by these Specifications. The desired strength of concrete for various parts of the structures have been shown on the Drawings. Such concrete mixes shall not relieve the Contractor of the responsibilities to achieve the desired strength of concrete for various parts of structures as specified in the Technical Specifications or shown on the Drawing and to the full satisfaction of Engineer.

2.4 CEMENT

2.4.1 General

Cement shall be furnished in sacks or in bulk form as approved by the Engineer. Unless otherwise permitted, cement from not more than two plants shall be used and in general, the product from only one plant shall be used in any particular section of the work. No cement recovered through cleaning sacks shall be used.

2.4.2 Portland Cement

Portland cement shall be indigenous stuff unless otherwise approved by the Engineer. Portland cement shall conform to latest British Standard 12:1971, Specifications for Portland Cement or to ASTM Designation C150-74, Standard Specifications for Portland Cement for Type I. Portland cement conforming to ASTM Designation C150-74, Type II or IV may also be used in certain parts of work as directed by the Engineer.

2.4.3 Tests

Cement shall be sampled at storage site and tested from time to time at the discretion of the Engineer in accordance with the ASTM Designation C150-74 or its equivalent British Standards. Expenses for such tests shall be borne by the Contractor. If the tests prove that the cement has become unsatisfactory, it shall be discarded and thrown as rejection as directed and to the full satisfaction of the Engineer. Cement which has been in storage at the project site longer than four months, shall not be used until retesting proves it to be satisfactory.

2.4.4 Storage

Cement shall be stored in dry, weather tight and properly ventilated structure. All storage facilities shall be subject to approval and shall be such as to permit easy access for inspection and identification of each consignment. Sufficient cement from a single source shall be in storage at the work site to complete any lift of concrete stored. Adequate storage capacity shall be furnished to provide sufficient cement to meet the peak needs of the project. Cement in sacks shall be stored on a damp proof floor and shall not be piled to a height exceeding 6 feet.

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 permitted and directed by the Engineer so as to avoid any confusion in use of quantity of cement.

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.

Suitable, accurate scale 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.

2.4.5 **Delivery and Usage Record**

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

2.5 **AGGREGATES**

Materials used as aggregates shall be obtained from sources known e.g Margalla/Shahenabad to produce satisfactory results for the different classes of concrete. The use of aggregates from sources which have not been approved by the Engineer shall not be permitted.

2.5.1 **Fine Aggregate for Concrete**

Fine aggregate for all the classes of concrete shall be well graded natural sand, stone screenings or other inert material of similar characteristics or a combination of these. The whole of it shall be perfectly clean, free from coagulated lumps, soft and flaky particles, shale alkali, organic matter, loam mica and injurious amount of other deleterious substances. Maximum allowable content of silt and other deleterious inert substances is 5 percent by washing. Material derived from stone unsuitable for coarse aggregate shall not be used as fine aggregate. Fine aggregate derived from stone screenings shall be sharp, cubical, hard, dense and durable and shall be stacked on a platform so as to adequately protect it from dust and other admixtures.

Grading for the above specified fine aggregate shall be within the following limits, as determined by the Owner:

<u>Sieve Size</u>	<u>Percentage Passing (Dry Weight)</u>
3/8 inches	100
No. 4	95 to 100
No. 8	80 to 90
No. 16	50 to 85
No. 30	25 to 60
No. 50	10 to 30
No. 100	2 to 10

Fine aggregate for class D (1000 psi) concrete may be good quality bank run sand obtained from the River in vicinity. It shall be clean natural material graded from fine to coarse, free from lumps, clay, cinder, ashes, rubbish and other debris. It shall not contain more than 5 percent of material finer than No. 200 mesh screen, not more than 5 percent remaining on No. 4 sieve; all material shall pass through 3/8" screen.

2.5.2 Coarse Aggregate for Concrete

Coarse aggregate for the first 3 classes of concrete shall consist of quarried or crushed stone/river run gravel or inert material or a combination of these, with maximum size of 3/4 inch and shall be clean, hard durable, sound, cubical and well shaped, free from soft or friable matter, or thin elongated pieces, alkali, organic matter or injurious amounts of other deleterious substances. Deleterious inert matter shall not exceed 3 percent.

Grading for above specified coarse aggregate shall be within the following limits:

<u>Sieve Size</u>	<u>Percentage Passing (Dry Weight)</u>
1 inch	100
3/4inch	90 to 100
1/2 inch	20 to 55
3/8 inch	0 to 10
#-4	0 to 5

Coarse aggregates for Class D (1000 psi) concrete shall be broken stone or river run gravel from dense hard stone, or boulders. The stone or gravel should not be porous or slaty it must be free from earth, sand or other foreign matters. The broken aggregate or gravel shall be of the prescribed size for the class D (1000 psi). The broken aggregate or gravel shall be of max. size 1 inch or 1 1/2 inches and not contain any thing which will pass through No.4 sieve.

2.5.3 Storage of Aggregate

Each class of aggregate is to be stored separately and the Contractor is to provide means of ensuring that aggregates are stored on a suitable hard clean surface or platform to prevent contamination from the ground.

2.5.4 Proportions of Coarse and Fine Aggregates

The nominal ratio of the Volume of coarse aggregate to the volume of fine aggregate shall be decided by compression test of concrete cubes or cylinders to be furnished by the Contractor but the Owner may order these ratios to be varied slightly according to the grading of the aggregates by weight, if necessary, so as to produce required grading. Engineer can get the tests carried out at Contractor's cost.

At the beginning of the work and where there is any change in the coarse or fine aggregates or in their source of supply, the Contractor is to have a series of tests on cubes/cylinders made representative of and marked as to the aggregates and their grading and mix of concrete. Such cubes are to be tested in the laboratory under identical conditions, except for small variations in the relative proportions of the coarse and fine aggregates up and down from the best

proportions derived from the sieve analysis. The cubes etc. are to be tested at 7 days.

2.5.5 Water

Water for washing aggregates and for mixing and curing concrete shall be clean and free from injurious amounts of oil, acid, alkali, salt, organic matter, or other deleterious substances as determined by standard tests selected by the Engineer. It shall meet the following chemical requirements:

Chlorides such as sodium chloride	Max 3000ppm
Sulphates such as sodium sulphate	Max 2000ppm
Impurities	Max 2000ppm
Metled Salt	Max 25000ppm

The water for curing concrete should not have pH value lower than 5 and shall not contain impurities which cause discoloration of concrete.

2.6 CONCRETE MIX REQUIREMENTS

2.6.1 Strength

The concrete shall be one of four different classes to be paid for at their respective unit prices designated. The numerical classifications refer to the approximate proportions of cement, fine aggregate and coarse aggregate, according to the common practice. However, the actual concrete mix requirement shall consist of proportioning and mixing for the following strengths when tested in the form 6" cubes, 3 for 7 days and 3 for 28 days test shall be made for each class of concrete. The cubes are to be made, cured, stored, transported and tests are to be carried out at a testing laboratory approved by the Engineer. All such tests shall be at the cost of the Contractor.

Concrete Class	Cylinder (Min) Compressive Strength		Cube (Min) Compressive Strength	Tentative Ratio
	Tested at		Tested at	
	7 days	28 days	28 days	
A:	2000 psi	3000 psi	4000 psi	1:1-1/2:3
B:	1600 psi	2400 psi	3000 psi	1:2:4
C:	1000 psi	1600 psi	2000 psi	1:3:6
D:	No strength requirements	800 psi	1000 psi	1:4:8

2.7 WATER CEMENT RATIO

The water-cement ratio is the ratio of the weight of water in the mix to the weight of cement therein. Water content shall be sufficient to produce a workable mix of the specified strength but the total water content shall be governed by the following table:

Concrete Class	Maximum Permissible Total Water Demand (Imperial) Gallons per 112 pounds of cement
A:	6.0
B:	7.5
C:	8.0
D:	No requirements

2.7.1 Consistency

Proportions of ingredients shall vary to achieve the desired concrete consistencies when tested, conforming to the following slump requirements or as desired by the Engineer:

Use of Concrete	Minimum and Maximum Slump (inch)
Normally reinforced sections compacted by vibration, hand compacted mass concrete.	1 to 3
Heavily reinforced concrete sections compacted by vibration, hand compacted concrete in normally reinforced slabs, beams, columns and walls.	2 to 4

In all cases, the proportions of aggregates for concrete shall be such as to produce mixes which will work readily into the corners and angles of the forms and around the reinforcement without permitting the segregation of materials or licateance. Uniformity in concrete consisting from batch to batch shall be ensured.

2.8 MEASUREMENT OF MATERIALS

The coarse and fine aggregate are to be weighed or accurately measured to the Engineer's satisfaction. In no event they are to be measured by the shovel or barrow.

2.9 MIXING METHODS

The concrete shall be mixed in an approved mechanically operated batch mixer. The mixer, its hopper and working platforms shall be protected from rain and wind.

The aggregates and cement shall be mixed together before adding water until the concrete is of even colour and consistency throughout. Dirt and other undesirable substances shall be excluded. Water shall not be added indiscriminately from a hose or can. All concrete shall be thoroughly mixed by a modern reliable batch mixer to produce maximum output of concrete necessary to complete the work within the specified time without reducing the required mixing time. Concrete shall be mixed in the concrete mixers for the duration required for uniform distribution of the ingredients to produce a homogeneous mass of consistent colour but for not less than 1 1/2 minutes. The mixer shall be operated by trained operators, who have previous experience of running and operation of concrete mixers.

At the conclusion of mixing, the mixer and all handling plants shall be thoroughly cleaned out before the concrete remaining in them has had time to set.

No concrete shall be mixed by hand without the Engineer's written consent, and such consent shall be given only for small quantities under special circumstances.

2.10 TEST OF CONCRETE

2.10.1 Strength Test During the Work

Strength tests of the concrete placed during the course of the work will be made by the Engineer in an approved laboratory at the Contractor's expenses. The Contractor shall assist the Engineer in obtaining, for control purposes, such number of cylinders or cubes as the Engineer may direct, but in general, three beams taken from each 2650 cu.ft. or fraction thereof, or from each days pour, whichever is less, of each class of concrete placed, shall govern. Test specimen will be made and cured by the Engineer in accordance with the applicable requirement of ASTM Designation C31-69, Standard Method of Making and Curing Concrete Compressive and Flexural Test Specimens in the Field.

Cubes and beams will be tested by the Engineer in accordance with the applicable requirements of ASTM Designation C39-72, Standard Method of Test for Compressive Strength of Cubical Concrete Specimens and ASTM

Designation C78-64, Standard Method of Test for Flexural Strength of concrete (Using Simple Beam with Third Point Loading). The test result will be based on the average of the strength of the test specimens except that if one specimen in a set of three shows manifest evidence of improper sampling, moulding, or testing, the test result will be based on the average of the remaining two specimens. If two specimens out of a set of three show such defects, the results of the set will be discarded and average strength determined from test results of the other two sets. The standard age of test will be 28 days, but 7 day tests may be used at the discretion of the Engineer, based on the relation between the 7 days and 28 days strengths of the concrete as established by tests for the materials and proportions used. If the average of the strength test of three specimen cured under laboratory controls, for any portion of the work, falls below the minimum allowable compressive or flexural strength at 28 days required for the class of concrete used in that portion, the Engineer may change the proportions of the constituents of the concrete, as necessary to secure the required strength for the remaining portions of the work. If the average strength of the specimens cured under actual field conditions as specified herein before falls below the minimum allowable strength, the Engineer will make such changes in the conditions for temperature and moisture under which the concrete work is being placed and cured as may be necessary to secure the required strength.

2.11 CONVEYING OF CONCRETE

Concrete shall be conveyed from mixer to the place of final deposit as rapidly as practicable, by methods which will prevent segregation or loss of ingredients and in accordance with latest edition of ACI Code Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.

Any wet batch hopper through which the concrete passes shall be conical in shape. There shall be no vertical drop greater than 5 ft. except where suitable equipment is provided to prevent segregation and where specifically authorized. Belt conveyers, chutes, or other similar equipment will not be permitted either for conveying concrete except where the use of such equipment is approved in writing by the Engineer, in advance of any use. Each type or class of concrete shall be visually identified by placing a coloured tag or marker on the bucket as it leaves the mixing plant so that the concrete may be positively identified and placed in the structure forms in the desired position.

2.12 PLACING

2.12.1 General

Concrete placing shall follow the Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete, latest ACI Code requirement. No concrete shall be placed until all formwork, reinforcement, installation of parts to be embedded, bracing of forms and preparation of surface involved in the placing and the method of placement have been approved by the Engineer. Approval of the method of placement proposed will not relieve the Contractor of his

responsibility for its adequacy and he shall remain solely responsible for the satisfactory construction of all work under the Contract.

Before concrete is placed, all surfaces upon or against which concrete is to be placed shall be free from standing water, mud, debris or loose material. All surfaces of form and embedded material that have become encrusted with dried mortar or grout from concrete previously placed shall be cleaned of all such mortar or grout before the surrounding or adjacent concrete is placed. The surfaces of absorptive material against or upon which concrete is to be placed shall be moistened thoroughly so that the moisture will not be drawn from the freshly placed concrete. Concrete shall be worked into the corners and angles of the forms and around all reinforcement and embedded items without permitting the materials to its final position in the forms. The depositing of concrete shall be regulated so that the concrete may be effectively compacted with a minimum of lateral movement into horizontal layers approximately 1.5 ft. in thickness. No concrete that has partially been hardened or contaminated by foreign materials shall be deposited in the structure, nor shall retamped concrete be used unless approved by the Engineer. The surfaces of construction joints shall be kept continuously wet for at least eighteen hours during the twenty four hours period prior to placing concrete except as otherwise directed by the Engineer. All free water shall be removed and the construction joint shall be completely surface dry prior to approval. All concrete placing equipment and methods shall be subject to approval. Concrete placement will not be permitted, when in the opinion of the Engineer weather conditions prevent proper placement and consolidation.

2.13

COMPACTING CONCRETE

All concrete, except that in blinding layers and in- situ-concrete in very small sections, shall be compacted by vibration. After any necessary hand spading, working and ramming into place, each layer of concrete shall be compacted with mechanical immersion vibrators of types approved by the Engineer.

The immersion vibrators shall produce a vibration frequency of not less than 6000 impulses per minute. Under no circumstances shall the immersion vibrators be allowed to come into contact with reinforcement or shuttering. Immersion vibrators shall penetrate vertically for a few inches into any previous unset layer in order to establish a satisfactory bond, but no concrete shall be vibrated in such a manner as to cause injury to concrete (already set or otherwise) in other parts of works. Care shall be taken to keep the vibrators vertical, to insert them at regular intervals and withdraw them slowly to prevent the formation of voids, so that the entire mass of the concrete is properly compacted. Haphazard or random penetration of the vibrators without sufficient depth of insertion shall be avoided. A sufficient number of vibrators shall be used to ensure compaction of each batch of concrete before the next batch is delivered. At least one extra vibrator shall be in hand for emergency use.

Vibration shall be supplemented by hand punning with approved small-diameter

smooth steel rods with rounded ends in order to achieve complete compaction around reinforcement and other embedded fittings and a completely dense mortar finish against the shuttering.

Excessive vibration shall be avoided and vibration shall not be continued after a good surface finish, without free water, has been achieved. Vibration and punning shall be just sufficient to produce a dense, homogeneous concrete properly filling the moulds and free from air voids, segregation, bleeding, honey combing and other imperfections. Only highly skilled operators and workmen, subject to constant supervision, shall be employed in vibrating and punning concrete.

2.13.1 Time Interval between Mixing and Placing

Concrete mixed in stationary mixers and transported by non-agitating equipment shall be placed within thirty minutes after it has been mixed, unless otherwise authorized. When a truck mixer or agitator is used for transporting concrete, the concrete shall be delivered to the site of the work and discharge shall be completed within 1 1/2 hours after introduction of the cement to the aggregates. The concrete shall be placed within 20 minutes after it has been discharged. In all cases, concrete shall be placed and compacted well within the initial setting time.

2.14 CONCRETE FINISHES

Concrete finishes shall be made in accordance with the provision of ACI 301-8 or as directed by the Engineer

Workmanship in shuttering and concreting shall be such that concrete work shall normally require retouching and the surfaces being dense, watertight and where steel shuttering has been used, perfect and smooth. Should there be faults in these respects, the Contractor shall cut out and replace the whole of the lift concerned or such amount as the Engineer decides, or make good if permitted by the Engineer and to his approval. Concrete which is honey-combed or otherwise shows voids shall invariably be cut out and replaced in an approved manner as suggested by the Engineer.

Any making good shall be carried out immediately after striking the shuttering and shall be restricted to light rubbing down with wet carborundum or the approved correction of minor blemishes. In no circumstances shall surfaces be made good with cement or washes or rendering.

Exposed concrete surfacing not requiring shuttering and not subsequently to be given extra finishes shall be given perfectly dense smooth finish with a wooden float.

Where concrete slabs, ducts, bases or machine plinths will themselves form the finished floor surface the concrete shall be troweled immediately after the first laying process only just sufficiently to give a level surface. Thereafter, when the concrete has stiffened to a condition such that a hard compacted surface can be obtained without bringing up laitance, a final surface troweling shall be given with a steel float to produce a smooth finish.

2.15 CONCRETE AND WEATHER

No concrete shall be placed when the atmospheric temperature is below 15 degree centigrade without the written permission of the Engineer. When directed by the Engineer the Contractor shall provide adequate means for maintaining a temperature of not less than 20 degree centigrade for 3 days or 15 degree centigrade for five days after placing the concrete.

If Rapid-Hardening Portland Cement is used, the period may be reduced as directed by the Engineer.

The Contractor shall supply such heating apparatus as stoves salamanders or steam equipment and the necessary fuel. When dry heat is used, means of maintaining atmospheric moisture shall be provided. All aggregates and mixing water shall be heated to temperature of at least 20 degree centigrade, but not more than 75 degree centigrade, the aggregates may be heated by either steam or dry heat, if permitted by the Engineer the torch method of heating mixed aggregate shall be such as to heat the mass uniformly and avoid spots which will burn the materials. The temperature of the concrete shall be not less than 10 degree centigrade at time of placing in the forms.

In case of extremely low temperature, the Engineer may, at his discretion, raise the minimum limiting temperature of water, aggregates and mixed concrete. When the shade temperature is above 32 degree centigrade, special precautions shall be observed during concreting to the satisfaction of the Engineer. Concreting will be permitted when it is not raining. Thermometer shall be kept at the Site by the Contractor.

2.16 CURING OF CONCRETE

Unless otherwise specified or ordered by the Engineer all concrete shall be cured by water. It shall be kept wet continuously for at least fourteen days after placement. It shall be covered with water saturated material like gunny bags, canvas, clean sand, matting, etc. or any other improved method duly approved by the Engineer.

In order that tensile stresses on the cooling of concrete shall be kept to a minimum, all materials shall be as cool as practicable when mixed and placed. To this end, aggregates shall be covered, coarse aggregates shall be cooled with

water and mixing plant etc., water storage tanks and pipelines shall be covered or insulated from the effects of the sun. The temperature of concrete on placing shall in no case exceed 32 degree Centigrade.

Concrete shall be placed only against surfaces which are damp and no such work shall be started until arrangements for keeping the shuttering continuously cool and wet are in place. Shuttering and exposed faces of concrete and mortar shall be covered by at least 3 thicknesses of approved stout hessian kept continuously cool and wet by an efficient and comprehensive system of sprinklers and diffused jets of water, with appropriate temporary drainage arrangements, for at least 14 days after placing.

As an alternative to continuous curing with water after stripping of shuttering a proprietary membranes method of curing may be used provided that it is used strictly in accordance with the manufacturer's instructions, is coloured to show its presence, contains no bituminous substance, does not prejudice the appearance of permanently exposed concrete surfaces and is in all other respects to the approval of the Engineer. Wherever practicable, both faces of concrete structures shall be appropriately treated in order to prevent tensile stresses due to differential shrinkage or temperature across the section. Further more, the Contractor shall continue to provide facilities for covering and/or keeping wet such exposed surfaces of the Work as are, in the opinion of the Engineer liable at any time to be damaged by weather.

At no time shall any further work involving concrete proceed until the Contractor has satisfied the Engineer that all such work previously carried out is being protected and cured in accordance with this clause.

2.17 CONCRETE IN EXCAVATION AND FILLING

Before concrete is placed in or against any excavation or filling, the surface of such earthwork shall have been compacted and shall be free from running and standing water, oil and other deleterious matter. Loose earth and other material shall be removed. The excavation or filling shall be damp but not wet and special precautions shall be taken to prevent groundwater from damaging unset concrete or causing movement of the concrete.

Immediately after the excavation or filling has been trimmed and prepared as above, the exposed foundation shall be protected by a blinding layer or "No-fines" concrete or of cement mortar or other protection as shown on the Drawings or ordered by the Engineer. Such blinding layers and coatings shall be thoroughly cleaned and moistened before further concrete work is placed thereon.

Reinforced concrete shall not be cast against an unprotected face of earth or any other material liable to become loose or to slip; the greatest possible care shall be taken to avoid falls of material on to the concrete, by leaving the timbering in place (if permitted) or by removing the timbering in small depths and lengths at a

time and by any other approved means. If any such falls occur, all soiled concrete shall be removed and replaced at Contractor's own cost.

2.18 SHUTTERING

The Contractor shall submit, for the approval of the Engineer full proposals and design calculations for all shuttering and proposals for the period of time to elapse before each item of the shuttering is struck. Notwithstanding the approval of the Engineer to any actual shuttering or proposals for its striking, the Contractor shall retain complete responsibility for its adequacy as to the provisions of this clause and for any consequences of the striking being premature or harmful. In general the minimum time for the removal of form work shall be as under:

Form Work	Removal Time	Normal Weather above 15°C
a) Form work of vertical surfaces such as Beams side walls and columns	4 days	2 days
b) Slabs, props left under	10 days	5 days
c) Props to slab	14 days	10 days
d) Beam soffits, prop left under	14 days	7 days
c) Removal of props to Beams	21 days	21 days

Shuttering shall be designed with easily sealed access hatches for inspection purposes and for removal of water and deleterious materials, and with connections to facilitate striking without damaging the concrete. Shuttering for soffits of slabs shall be erected with an upward camber of 1/4" for each 10 feet of span. When props are to be left in position under slabs the shuttering shall be made and removed in such a way that the props are not disturbed in any way.

A tolerance of plus or minus 1/8 inch in line or level will normally be permitted after erection of the shuttering which shall nevertheless be sufficiently strong, stiff and rigidly braced against loads due to the wet concrete and vibration and against constructional loads, to remain true to the line and level accepted before concreting. It shall be sufficiently watertight to ensure that there shall occur no "fine" or escape of mortar at joints or of liquid from the concrete.

All exterior angles for concrete work not permanently buried in the ground shall

be given 3/4" x 3/4" chamfers unless otherwise indicated on the Drawings.

Timber for shuttering shall be well seasoned, free from loose knots, splits, projecting nails and the like and from any adhering foreign matter.

Steel shuttering shall be used to produce a fair face concrete with only a faint but consistent pattern of plate marks on exposed concrete surfaces. The shuttering shall be assembled from wrought tongued and grooved boarding, true and tightly fitted with joints as necessary, the whole surface and all edges being rendered smooth before and after oiling. Bearing in mind the quality of the finish required, wrought, plain-edged and butt-joint boarding may replace the tongued and grooved boarding or purpose-made steel-faced shutters of first-class quality may be used, solely at the discretion of the Engineer.

Rough shuttering shall be used for surfaces to be buried in the ground and shall be assembled from sawn boards with smooth and true edges or from approved steel shutters. In either case all joints shall be suitably filled.

The inside faces of all shuttering shall be treated with an approved material to prevent adhesion of the concrete, all such materials being kept clear of the reinforcement and other items to be embedded.

Shuttering shall be struck by static force alone without shock and vibration causing any damage to the concrete. Shuttering being reused shall be thoroughly repaired and cleaned before re-assembly.

2.19 WATER STOPPER'S

2.19.1 Scope

The work to be done under this item consists of providing and installing PVC/Metal water stops as shown on the Drawings or as directed by the Engineer.

2.19.1 (a) Polyvinylchloride Water Stopper

Polyvinylchloride water stopper shall be extruded from an elastomeric plastic compound, the basic resin of which shall be polyvinylchloride (PVC) The compound shall contain such additional resins, plasticizers, stabilizers or other materials needed to ensure that when the material is compounded and extruded to the shapes and dimensions shown, it will have physical characteristics when tested by the U.S. Corps of Engineers Tested Method specified below.

Physical Characteristics	No of Specimens Tested	Requirement	USCE Test Method
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Tensile strength using die III, not less than	5	1750 psi	568
Ultimate elongation using die III, not less than	5	350%	573
Low temperature brittleness, no sign of failure such as cracking or chipping at	5	-35°F	570
Stiffness in flexure, 1/2 inch span, not less than	3	400 psi	571

Installation

The PVC Water stops shall be laid in continuous lengths. Splices in the continuity or at the intersections of runs of PVC water stops shall be performed by heat sealing the adjacent surfaces in accordance with the manufacturer's recommendations or as directed by the Engineer. A thermostatically controlled electric source of heat shall be used to make all splices. The correct temperature at which splices should be made will differ with the material used but should be sufficient to melt but not char the plastic. After splicing, a remolding iron with ribs and corrugations to match the pattern of the water stopper shall be used to reform the ribs at the splice. The continuity of the characteristic components of the cross section of the water stopper design (ribs, tubular center axis, protrusions, and the like) shall be maintained across the splice.

2.19.1 (b) Metal Water stopper

Copper, stainless steel and steel water stopper shall be installed in joints at the locations shown on the Drawings. The thickness, shape, dimensions and splicing of metal water stopper shall be as shown on the Drawings or as approved by the Engineer.

2.20 TERRAZZO WORK

2.20.1 Scope

The work to be done under this item consists of providing terrazzo finish inside

the water tanks and at any other place shown on the Drawings. The subgrade shall comprise of (i) cement plaster (ii) cement concrete.

2.20.2 Material

Marble Chips of the specified grade, and colour shall be of approved quality obtained from quarries in Pakistan. Before any material is purchased, the Contractor shall submit to the Engineer for approved samples in duplicate. The material used in the work shall correspond with the approved samples, in quality, colour texture and finishes etc.

2.20.3 Subgrade

The subgrade under terrazzo top shall be 3000 psi cement concrete or 1:2 cement sand plaster of the thickness specified on the Drawings. The subgrade shall be constructed in accordance with the applicable stipulations and requirements, Cement Plaster of the Specifications. The subgrade surface shall be kept wet for proper adhesion of terrazzo topping, which shall be laid when the subgrade has still not hardened.

2.20.4 Topping

Terrazzo top finishing of thickness as shown on the Drawings or the Finishing Schedule shall consist of marble chips and cement mixed in ratio of 1:2 (one part grey cement and 2 parts chips of approved grading and shade with admixture of approved pigment). Terrazzo topping shall be laid true to the pattern as given on the Drawings or as directed by the Engineer. The terrazzo topping shall be well compacted and all voids and dips made good.

2.20.5 Final Finish

Smooth Finish: After 48 hours of laying the terrazzo topping requiring smooth finishes shall be grinded with No.80 Carborundum stone until the marble chips are evenly exposed.

After the first grinding neat coat of suitably coloured cement slurry be applied to repair the pores if any, formed during the course of grinding and cured for 24 hours. The second and the third grinding shall be suitably carried out with grinding stone ranging from No. 80 to 240 respectively. Electric grinders shall be used to ensure that the grinding is adequate.

The surface after all chips have been evenly exposed will be cured for one week and left undisturbed for another week. After this period the surface shall be cleaned of dirt and dust by rubbing gently with pumice stone with sufficient water. If this treatment is not successful in removal of the white scum or other materials and hardened deposits, the floor shall be lightly rubbed with grinding stone while washing soda solution is being used, it would then be treated with

oxalic acid (1:10) solution using felt or an old blanket. After oxalic acid treatment the surface shall be cleaned and washed with plenty of water and dried.

2.21 STEEL REINFORCEMENT

2.21.1 Scope

The work to be done under these items shall include furnish, cut, bend, and place all steel reinforcement as indicated on the Drawings or otherwise required. All reinforcement when surrounding concrete is placed shall be free from loose, flaky rust, and scale, and free from oil grease or other coating which might destroy or reduce its bond with the concrete. All placing shall be in accordance with Drawings furnished or approved. The use of reinforcement for the transmission of current for welding will not be permitted. All reinforcement, including dowels, remaining exposed in the work shall be suitably protected until embedded in concrete.

2.21.2 Cutting and Bending

Steel reinforcement may be mill or field cut and bent. All bending shall be in accordance with standard approved practice and by approved machine 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 bent. 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.

2.21.3 Quality

Concrete reinforcement bars shall be of following quality:

Intermediate grade Steel: It shall be deformed bars conforming to ASTM 615-81(a,b) grade 40/ grade 60 or equivalent having a minimum yield strength of 40,000 psi/ 60,000 psi. The Contractor shall provide labour, materials, arrange measuring and testing facilities to ascertain quality, weight or quantity of steel at his own expense, No steel shall be incorporated in the Works without prior approval of the Engineer.

2.21.4 Spacing of Bars

The spacing of bars shall be as shown on the Drawings or as directed by the Engineer. The variation from indicated spacing, provided that the total area of reinforcement is in accordance with the Drawings, shall not be more than 1 inch.

2.21.5 Relation of Bars to Concrete Surface

The cover of all main reinforcement shall conform to the dimensions shown on

the Drawings. The protective covering shall not be less than, and shall not exceed more than 1/4" from the values specified on the Drawings, indicate the clear distance from the edge of the main reinforcement to the concrete surface. The concrete covering of stirrups spacer bars, and similar secondary reinforcement may be reduced by the diameter of such bars.

2.21.6 Splicing

Except as otherwise shown on the Drawings or specified herein, all splices, lengths of laps, splice locations, placement and embedment of reinforcement shall conform to the applicable requirements of American Concrete Institute 318-77, Building Code Requirements for Reinforced Concrete. All splices and locations of laps in reinforcement shall be as shown on the Drawings or as directed by the Engineer. Additional bar splices shall be provided as required, subject to approval of the Engineer. Lapped ends of bars may be placed in contact and securely wired or may be separated sufficiently to permit the embedment of the entire surface of each bars by butt-welding or by approved mechanical methods such as the Cadweld splice or other type splice using positive connectors shall be adopted where indicated or directed by the Engineer. Butt welding of reinforcing bars, where indicated or directed shall conform to the requirements of American Welding Society's Recommended Practice for Welding Reinforcing Steel, Metal Inserts and Connections, D.12.1. Concrete shall be protected from heat during welding operations.

2.21.7 Supports

All reinforcement shall be secured in place by use of metal or concrete supports, spacers, or ties, 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 discoloration or deterioration of the concrete. Concrete supports shall be manufactured of the same concrete mix as used in the structure to be concreted.

2.22 MEASUREMENT AND PAYMENT

Measurement and payment for concrete, reinforcement, precast concrete, PVC water stop and Terazzo/Mosaic work will be made in accordance with the provisions of this clause specified hereinafter.

2.22.1 Method of Measurement

Concrete will be measured for the number of cubic feet acceptably placed complete in all respects as per Drawings and in strict accordance with this section of specification.

Measurement for steel reinforcement will be made of number of Tons of reinforcing steel acceptably placed on the basis of the lengths of bars installed in accordance with the approved Drawings or bar schedules or as directed, converted to weight for the size of bars listed by the use of unit weights per linear foot as follows:

<u>Bar Size</u>	<u>Unit Weight lbs. per foot</u>
1/4"	0.167
3/8"	0.376
1/2"	0.668
5/8"	1.043
3/4"	1.502
7/8"	2.044
1"	2.670
1 1/8"	3.775
1 1/4"	4.172
1 3/8"	5.049

Steel in laps and embedments indicated on the Drawings or as required by the Engineer will be paid for at the steel unit price. No measurement for payment will be made for the steel consumed in providing supports and for the additional steel in laps which are authorised for the convenience of the Contractor.

Polyvinylchloride water stop of the size and gauge as shown on the Drawings will be measured for the number of linear feet acceptably placed in the work. In computing the quantities, no allowance will be made for laps.

Measurement for terrazzo/mosaic work will be made in square feet as shown on the Drawings.

2.22.2 Basis of Payment

Payment will be made in accordance with the unit prices in the Bill of Quantities for the various items in accordance with the specifications and shall constitute full compensation for furnishing all materials, shuttering, equipment and labour and for performing all operation necessary to complete the work.

<u>Description</u>	<u>Unit</u>
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Provide and lay concrete	Cft.
Furnish and Fix Reinforcing Steel	Tons
Furnish and Install Water Stop	
(i) PVC	Lft.
(ii) Stainless Steel	Lft.
Provide and Lay Terrazzo/Mosaic Work	Sft.

SECTION - 3

BRICK AND CEMENT CONCRETE BLOCK WORK

3.1 SCOPE

This section consists of construction of brick/ cement concrete block work walls of any thickness with first class hand-mould and/or machine pressed bricks/cement concrete blocks with the specified ratio of cement mortar in foundation, plinth superstructure or for any other structure as directed by the Engineer, or shown in the Bid Schedule. The Contractor shall furnish all materials and all other requirements to produce finished brick/block work. Brick/block work and materials for brick/block work shall be in strict accordance with this section of the specifications and applicable drawings and subject to the terms and conditions of the Contract.

3.2 MATERIALS

3.2.1 Portland Cement

Portland cement shall conform to the stipulations and requirements set forth in Section "CONCRETE".

3.2.2 Mortar Sand

Sand for mortar used in construction of brickwork/block work required under these Specifications shall be furnished by the Contractor in accordance with the provisions and in conformity with the stipulations and requirements of ASTM Designation C144-70 or latest revision and shall have a fineness modulus between 1.6 to 2.5.

3.2.3 Water

The water used in the preparation of mortar shall be free from objectionable quantities of silt, organic matter, alkali salts and other impurities and it will be tested in accordance with BS-3148 and approved by the Engineer at the Contractor's cost.

3.2.4 Aggregate

Aggregates for mortar shall comply with the requirements of ASTM C144. Sand that has been in contact with seawater shall not be used unless it has been thoroughly washed to the satisfaction of the Engineer.

3.2.5 Additives

Additives where used, shall be proprietary products used in the proportions and manner recommended by the manufacturer. The additives shall in no way adversely affect the mortar strength or contain chemicals, which may be harmful to other building materials. To add gypsum to cement is strictly forbidden.

3.3 MORTAR AND GROUT

Materials for mortar, sand binding agent and water shall be mixed by volume for at least 3 minutes with the minimum amount of water to produce a correctly mixed mortar or grout of workable consistency in a mechanical batch mixer. For small jobs, hand mixing may be permitted, the ingredients being mixed with sufficient water to produce a correctly mixed workable mortar. Mortar used in masonry construction shall conform to ASTM C-270 standard.

Mortars shall be mixed in batches, which can be used within a period before the setting process commences. Once a mix begins drying off, it shall be rejected. No ingredients shall be added to it once the setting process has begun. Mortar shall not be retained for more than 30 minutes and shall be constantly worked over with hoe or shovel until used.

3.4 MORTAR BATCHING

Methods or equipment used for mixing mortar shall be such as will accurately determine and control the amount of each separate ingredient entering into the mortar and shall be subject to the approval of the Engineer. If a mixer is used it shall be of approved design and the mixing time after the ingredients are in the mixer, except for the full amount of water, shall not be less than two minutes.

Mortar shall be mixed only in sufficient quantities for immediate use and all mortar not used within 30 minutes after addition of water to the mix shall be wasted. Retampering of mortar shall not be allowed. Mixing pans and troughs shall be thoroughly cleaned and washed at the end of each day's work.

3.5 SCAFFOLDING

Contractor shall provide safe scaffolding of adequate strength for use of workmen at all levels and heights at his own expense. Scaffolding which is unsafe in the opinion of the Engineer shall not be used until it has strengthened and made safe for use of workmen. Cost of scaffolding etc., shall be included by the Contractor in the unit rate for masonry items.

Damage to masonry from scaffolding or from any other object shall be repaired by the Contractor at his own cost.

3.6. JOINTING

Jointing is the forming of joints as work proceeds. Joints shall be as follows:

- 3.6.1** Exterior exposed joints shall be tightly formed to a weather joint with the point of the trowel.
- 3.6.2** Interior exposed joints shall be tightly formed to a concave joints.
- 3.6.3** Joints which are subsequently covered with plaster or other finish materials shall be struck flush.

3.7. BRICKS

The bricks used shall be of standard size (9"x4.5"x3") first class well burnt, uniform in shape, size, texture, colour and should produce a ringing sound when struck. The bricks shall be free from flaws, cracks, chips, stone nodules of lime or kan-kar or any other blemishes. The brick shall not absorb more than one sixth of its weight when soaked in water for one hour. Compressive strength shall not be less than of 1400 psi. Bricks over burnt, under burnt vitrified and irregular shall not be used. Bricks of uniform size shall be used throughout the work and source of supply shall not be diversified.

3.7.1 Soaking

Before use all bricks shall be soaked in clean water in tanks or pits for at-least two hours.

3.7.2 Laying of Bricks

All brickwork shall be skillfully laid with level courses, uniform joints, square corners, plumb verticals and true surfaces except when otherwise shown on the Drawings or directed by the Engineer. Brickwork will be of best standard of workmanship obtainable and objectionable offsets in the brickwork shall be avoided. Smoothest practicable finished surface of the brickwork shall be ensured. Unless otherwise specified bricks shall be laid in English Bond with frogs (Manufacturer's marks) upward.

All horizontal joints shall be parallel and truly level. Vertical joints in alternate courses shall come directly over one another. Thickness of joints unless otherwise specified shall not be less than 1/4 of an inch and not more than 3/8 of an inch. The height of 4 courses and 3 joints as laid shall not exceed by more than 1 inch the height of 4 bricks as piled one upon the other.

3.7.3 Curing

All brick work involving use of cement shall be cured by water curing or other acceptable methods. The Engineer shall approve all methods and operations of the Contractor in curing different portions of work.

When curing by water brickwork shall be kept wet for at least 14 days by covering with water saturated materials or by a system of perforated pipes, mechanical sprinklers, porous hose, ponding or by any other approved method which will keep all surfaces to be cured continuously wet. Water used for curing shall meet the requirements given in Clause 3.2 of these specifications.

3.8 BLOCKS

Cement, aggregates and water for concrete blocks shall conform to the requirements as specified in the section for plain and reinforced concrete or as approved by the Engineer.

3.8.1 Concrete Block Making

3.8.1.1 The solid and hollow blocks as and where used by planning, shall be machine moulded. The block making machines shall be of the standard approved by the Engineer. They shall be operated according to the instructions laid down by the manufactures.

3.8.1.2 The blocks shall be continuously water cured by sprinkling water for a minimum of 10 days and covered between sprinkling operations with 4 mils thick polyethylene sheeting. After the 10 days water curing period the blocks shall be air dried. Under no circumstances will blocks be used in the work until they are completely dry. During curing period no surfaces of the block will be allowed to dry.

3.8.1.3 Cured concrete blocks shall be stored off the ground, stacked on level platforms, which allow air circulation under stacked units. Units shall be covered and protected against wetting.

3.8.1.4 Care shall be exercised in the handling of all concrete blocks. No damaged blocks shall be used in the work.

3.8.1.5 The blocks cast on different dates shall be stacked separately and must be labeled showing the date on which they were cast.

3.8.2 Properties of Blocks

3.8.2.1 All blocks shall be of size and shape required to complete the work shown in the Drawings or as instructed by the Engineer.

- 3.8.2.2 The cement, sand and coarse aggregate shall be volume batched and their proportion may be adjusted so as to provide the concrete of the required strength when tested and shall be mixed in a concrete mixer.
- 3.8.2.3 All blocks shall conform to ASTM C 145 standard. The compressive strength based on gross area shall be minimum 8.30 MPa for an average of 3 blocks and minimum 7.0 MPa for lowest individual blocks with 28 days after casting Cement Concrete Solid Blocks.
- 3.8.2.4 The Contractor shall provide test certificates show in the average minimum crushing strength of the blocks prior to the commencement of the construction. Further test certificates shall be provided as required by the Engineer, to ensure that all batches of block strengths are to be determined in accordance with ASTM C- 140 Standard.
- 3.8.2.5 The test shall be carried out by a laboratory approved by the Engineer. Evidence shall be produced that the block manufacturer has an efficient method of quality control. The Engineer will require to test samples of blocks periodically and the Contractor shall make necessary arrangements accordingly. The method of sampling for all test shall be in accordance with ASTM C-140.
- 3.8.2.6 All properties or specifications of blocks, not explain in these Specifications or ASTM C 145 shall comply with the requirements of PS 419, as directed by the Engineer.

3.8.3 Soluble Salt Content

For exposed block work, the contents by weight percent of soluble sulphate, calcium, magnesium, potassium and sodium radicals, shall not exceed 0.30, 0.10, 0.30, 0.03 percent respectively when ascertained in accordance with BS 3921, at the cost of the Contractor.

3.8.4 Erection

- 3.8.4.1 Block shall be laid true to line, level and laid in accurately spaced courses in stretcher bond with vertical joints of each course located at centre of units in alternate courses below. Vertical joints shall be buttered in the entire height of blocks. Each course shall be bonded. Courses of block shall be kept plumb throughout and corner reveals shall be true and in plumb.

Standard with of mortar joints for both horizontal and vertical joints shall be 7/16 inch (maximum). Mortar joints in wall shall have full mortar coverage on vertical and horizontal faces between the blocks. Mortar joints on wall including struck joints, shall be thoroughly compacted and pressed tight against the edges of the blocks with proper tools. Blocks terminating against soffits of beam or slab construction shall be wedged tight with wedges and the joints shall be packed solidly with mortar between the top of the block and the bottom of slab or beam.

Control expansion joints shall be kept free from mortar or other debris.

Unless otherwise shown on the drawings or specified by the Engineer, the spaces around door frames and other material or built in items shall be solidly filled with mortar. Spaces around the door and window hold fasts shall be filled in with Class C concrete. Work required to be built in with masonry including door frame anchors, wall plugs, dovetail anchors and accessories shall be built in as the erection progresses.

3.8.4.2 The block work shall be carried out in a uniform manner and no portion shall be carried more than one metre above the adjoining one at any times. All masonry shall be kept strictly true and square and the whole properly bonded together and levelled round each floor.

3.8.4.3 Sleeves, Chases, holes, sinking and mortices for other trades shall be correctly located and formed to the sizes as required by the relevant trades. Chiselling of completed walls or the formation of holes shall only be carried out with the approval of the Engineer.

3.8.4.4 Walls of blocks indicated as being non-load bearing shall be constructed on insitu concrete floor slab unit after the floor formwork is struck and the concrete has obtained sufficient strength to support their weight. Tothing into load-bearing walls shall not be permitted.

3.8.4.5 All bolts, anchors, ties, pipe sleeves, flushing metal attachments lintels and the like required to be built into the work shall be correctly inserted and executed as the work proceeds.

3.8.4.6 Walls or partitions abutting concrete columns or walls shall be securely anchored and tied with metal anchors or ties at not more than 18 inches vertical centres. Wall ties cast in with concrete shall be bent down after the removal of form work and shall be securely jointed into the mortar beds of walling.

3.8.5 Curing and Repairs

3.8.5.1 All block masonry shall be water cured and shall be kept wet for at least seven days, by an approved method, which will keep all surfaces to be cured continuously wet. Water used for curing shall meet the requirements of specifications for water used in the manufacture of blocks.

3.8.5.2 Tolerances

All block work shall be erected plumb and true to line and level with the maximum variation in any storey height or any length of wall being one mm in one metre. The maximum tolerance in the length, height or width of any single masonry wall shall be $\pm 1/8$ inch.

3.8.5.3 If, after the completion of any block masonry work, the block is not in alignment or level, or does not, conform to the lines and grades shown on the Drawings or shows a defective surface, it shall be removed and replaced by the Contractor at his expense unless the Engineer grants permission, in writing, to patch or replace the defective area.

3.9 MEASUREMENT AND PAYMENT

3.9.1 Material (Brick and cement concrete block work)

Measurement and payment for brick/cement concrete blockwork shall be made in accordance with the provisions given hereafter.

3.9.1.1 Method of Measurement

Measurement for brick/block work shall include number of cubic ft. of brick/block work provided within the limits as shown on the Drawings or as directed by the Engineer.

3.9.1.2 Basis of Payment

Payment for brick/block work shall be made at the contract unit price per cubic feet. Payment shall constitute full compensation for furnishing all materials, equipment and labour including all incidentals necessary to complete the work:

Description	Unit
Provide and Lay Brick Masonry with cement sand mortar in foundation and super structures.	Cft.
Provide and Lay Block Masonry with cement sand mortar in foundation and super structures.	Cft.

SECTION - 4

SURFACE RENDERING

4.1 SCOPE

The work covered by this part of the Specifications consists of supplying all materials, labour, and equipment, appliances in performing all operations required for doing the work of cement plastering, pointing, and white washing in accordance with the herein stated requirements except when specifically modified by the Engineer.

4.2 CEMENT PLASTER

4.2.1 General

The work to be carried out under this item shall consist of providing 1/2" thick plaster in grey cement as specified below. The work shall be carried out in accordance with applicable requirements of British Code of practice 211:1966 or latest revision.

4.2.2 Materials

4.2.2.1 Cement

All cement required for incorporation in this Section shall conform to the applicable requirements of Section "CONCRETE"

4.2.2.2 Sand

The sand shall be of medium to coarse grain and having a fineness modulus varying between 1.10 to 1.50 obtained from an approved quarry e.g. Lawrencepur/Local. The material shall be free from clay, vegetable matters and other impurities. Sand bearing clay shall be washed at the discretion of the Engineer.

4.2.2.3 Water

Water required for cement sand paste and curing purposes shall conform to applicable requirements of Section "CONCRETE"

4.2.3 Mortar Composition

Mortar for plastering shall consist of one part of Portland cement to 3 parts of sand by volume.

4.2.4 Material Batching

Material batching for preparation of mortar shall conform to stipulations and requirements set for in the Section "BRICK AND CEMENT CONCRETE BLOCK WORK".

4.2.5 Application of Plaster

The surface on which plaster is to be applied shall in case of brick work, be properly raked and wetted before application of plaster. Plaster shall be applied in a thickness of 1/2". If the specified thickness is more than 1/2" then plaster shall be applied in two coats viz rendering coat and the final coat. Plaster shall be carried out to the full length of the wall or to the natural points. Vertical or horizontal joints which show themselves shall not be allowed. Rendering coat shall be roughened with waving lines drawn by wire brushes to provide bond for the final coat and it shall be properly moistened before application of subsequent coat. The final coat shall be finished with floats to provide smooth and uniform surface. All arises shall be straight and either truly horizontal or perpendicular and finished with 1/8" radius. Defective finishes if any shall be cut out and replastered at the expense of the Contractor. Plaster after finishes shall be kept moist for about 10 days to the satisfaction of Engineer.

4.3 POINTING

4.3.1 Surface Preparation

The joints of brickwork which is to be pointed shall be raked out with a hook to a depth of 1/2". The raking shall be done while the mortar is still green and not later than 48 hours of time of laying. After raking, the brick work is brushed to remove all loose dust from the joints and thoroughly washed with water, all putlog holes shall be filled up before pointing as the scaffolding for masonry has been taken down. The work shall be watered for 24 hours before pointing is done.

4.3.2 Materials

4.3.2.1 Cement

All cement required for incorporation in this section shall conform to the applicable requirements of Section "CONCRETE".

4.3.2.2 Sand

The sand required for incorporation in this Section shall conform to the applicable requirements of "CEMENT PLASTER" as per Clause 4.2.

4.3.2.3 Water

Water required for cement sand paste and curing purposes shall conform to applicable requirements of Section "CONCRETE".

4.3.3 Mortar Composition

Unless otherwise specified, the mortar shall be mixed by volume. The ratio of Cement Sand shall be as specified in the BOQ.

4.3.4 Material Batching

Material batching for preparation of mortar shall conform to stipulations and requirements set forth in Section "BRICK WORK".

4.3.5 Precautions

Before starting work of pointing the following precautions shall be taken.

- i) Fine aggregate i.e. sand shall be washed before use.
- ii) It shall be ensured that all joints are properly raked.
- iii) The surface to be pointed shall be kept moist but excessive moisture shall be avoided.
- iv) The scaffolding for pointing shall always be provided double.

4.3.6 Type of Pointing

Unless otherwise specified, the following types of pointing shall be done.

4.3.6.1 Deep or Struck Cement Pointing

This type of pointing shall be done to all un-plastered faces of brickwork where the brickwork is liable to be affected by dampness and saltpeter, such as in the plinths of buildings. The mortar shall be filled in the joints flush with masonry or brickwork with a pointing trowel and then pressed with proper pointing tools. Lining with a spike on a mass of mortar shall not be allowed.

4.3.6.2 Flush Cement Pointing

This type of pointing shall be done at all brickwork with exposed face, when the finish of the face is not important or when a flush floor surface is required or when the floor or brickwork is subject to wear or to the effects of dampness and saltpeter. The mortar shall be filled and pressed into the joints with a jointing trowel, and finished off level with the edges of the bricks to give the smoothest possible appearance to the work.

4.3.7 Pointing Tools

The pointing tools for horizontal joint shall be such as to form weathered and struck joints; and for vertical joint, triangles, so as to make a (v) notch. Care shall be taken not to develop a cutting edge in the tools since the idea is to compress the green mortar into the joints and not to cut it away.

4.3.8 Edges of Bricks

The mortar shall not be spread irregularly over the edges and corners of the bricks which shall be left clearly visible. The practice of smearing mortar over defects in bricks, to hide them shall not be allowed and shall render the whole brickwork liable to be rejected.

4.3.9 Washing after Pointing

After pointing, the face of the work shall be cleared off all surplus mortar sticking to the face. No washing shall be done till the pointing has set.

4.3.10 Protection during curing.

After completion, pointing shall be kept for 10 days and shall be protected during that period from extreme fluctuations of temperature and weather

All defects detected during curing or afterwards shall be treated at the Contractor's expenses according to directions of the Engineer.

4.4 PAINTING

The following codes and standards shall be followed wherever relevant and applicable and/or directed by the Engineer.

BS 242-66	Linseed Oil.
BS 245-76	Specification for mineral solvents (white spirit and related hydrocarbon solvents) for paints and other purposes.
BS 2523-83	Lead-based priming paint
BS 2569-64/45	Sprayed metal coatings.
BS 2992-70	Painters and decorators brushes.
BS CP. 3012-72	Cleaning and preparation of metal surfaces.
BS 4800-81	Paint colours for building purposes.
BS 5082-74	Water-thinned priming paints for wood.
BS 5358-76	Specifications for low-lead solvent-thinned priming paint for woodwork.
BS 6150-82	Code of practice for painting of buildings.

4.4.1 White or Colour Washing

The whitewash shall be made from pure fat lime brought to site of work in the form of un-slaked lime. Water shall be added to this lime in a container until the mixture is of consistency cream and allowed to rest until cracks shall appear on its surface (48-72 hours). After screening through coarse cloth, gum at the rate of 4 oz. boiled with 10 oz. of rice shall be added to each cubic feet of white wash. The colour pigment if required shall be added and mixed with white wash and stirred to give the required shade. Enough quantity shall be prepared in one go so as to meet the requirement of one complete room.

4.4.2 Weather Resistant Paint

4.4.2.1 Selection of Paints

Concrete and Masonry

Cement based paints or one of the three common types of the exterior latex paints (polyvinyl acetate, styrene-butadiene and acrylic) of ICI/Burger make or equivalent shall be used whichever specified. Approved quality cement based or weather resistant emulsion paints shall be used as directed by the Engineer.

4.4.2.2 Primers

Concrete and Masonry

Boiled linseed oil or silicone water repellent primers ICI/Burger make or equivalent shall be used on concrete and masonry surfaces. Before application of paint, concrete and masonry surface should be allowed to dry for at least 3 weeks after cessation of curing.

4.4.2.3 Fillers

Concrete and Masonry

Paste of zinc oxide and varnish thinned with turpentine shall be used as filler on masonry and concrete.

4.4.2.4 Sealers

Concrete and Masonry

Water-insoluble and water-repellent substances dissolved in solvent such as petroleum naphtha or the special clear silicone compounds shall be used to seal masonry surfaces.

4.4.2.5 Thinners

Concrete and Masonry

Thinners such as turpentine, mineral spirit, water, xylene and linseed oil of approved quality shall only be used in accordance with the manufacturers' instructions and with prior approval of the engineer.

4.4.2.6 Brushes

All brushes used for painting work shall conform to B.S 2992 or equivalent American Standards.

4.4.3 Preparation of Surface

All loose material and dirt on the surface shall be removed with a brush. Holes and irregularities of surface shall be repaired with lime putty, and the surface shall be allowed to dry before applying whitewash or colour wash and weather resistant paint. All greasy spots shall be given a coat of rice, water and sand. Surfaces discolored by smoke shall be washed with a mixture of wood ashes and water or yellow earth before being white-washed or painted.

4.4.4 Application

Three coats of white or colour wash shall be applied on the prepared surface with a brush. Paint or finish to any surface shall be applied when ambient temperature is 10 degree centigrade or above and less than 43 degree centigrade unless otherwise recommended by the manufacturer. No painting shall be done above 90% relative humidity. Drop cloths shall be placed to adequately protect all finished work.

All paint and coating materials shall be in thoroughly mixed condition at the time of application. All work shall be done in a workman-like manner, leaving the finished surface free from drips, ridges, waves, laps and brush marks. All paints shall be applied under dry and dust free conditions.

All primary paint shall be applied by brushing. The first coat of paint shall be applied immediately after cleaning.

4.5 MEASUREMENT AND PAYMENT

4.5.1 Cement Plaster

Measurement and payment for cement plaster shall be made in accordance with the provisions given hereafter.

4.5.1.1 Method of Measurement

Measurement shall be made of cement plastering for the actual area in square foot in accordance with this section of Specification or as directed by the Engineer.

4.5.1.2 Basis of Payment

Payment shall be made for the number of square foot of surface area cement plastered at the contract unit price per square foot and shall constitute full compensation for furnishing all materials, equipment and labour including all incidentals necessary to complete the work in strict accordance with this Section of Specification.

Description	Unit
Provide and apply ½" thick 1:3 Cement Sand Plaster for ceiling.	Sq.ft.
Provide and apply ½" thick 1:4 Cement Sand Plaster for walls.	Sq.ft.

4.5.2 Pointing

Measurement and payment for cement pointing shall be made in accordance with the provisions given hereafter.

4.5.2.1 Method of Measurement

Measurement will be made of cement pointing for the actual area in sq.ft in accordance with this section of Specification or as directed by the Engineer.

4.5.2.2 Basis of Payment

Payment shall be made for the number of square feet of surface area cement pointed at the contract unit price per square feet and shall constitute full compensation for furnishing all materials, equipment and labour including all incidentals necessary to complete the work in strict accordance with this section of specification.

Description	Unit
Provide and apply Cement Sand mortar	
i) Flush pointing	Sq.ft
ii) Struck pointing	Sq.ft

4.5.3 Painting

Measurement and payment for white washing and weather resistant paint shall be made in accordance with the provisions given hereafter.

4.5.3.1 Method of Measurement

The measurement shall be made in sq.ft of the actual surfaces completed and approved.

4.5.3.2 Basis of Payment

Payment shall be made for number of square feet of the actual surface painted measured as provided above at the Contract unit price per square feet for the respective item and shall constitute full compensation for all materials, equipment, labour, including all incidentals necessary to complete the work.

Description	Unit
Provide and apply white wash.	Sq.ft.
Provide and apply weather resistant paint.	Sq.ft.
Provide and apply vinyl emulsion paint.	Sq.ft.
Provide and apply enamel paint.	Sq.ft.

SECTION - 5

DAMP PROOFING

5.1 SCOPE

The work covered under this section shall consist of damp proofing concrete surface or brick/block masonry surface, in accordance with these specifications and at the locations shown on the Drawings or as directed by the Engineer.

5.2 GENERAL

The concrete surface shall be damp proofed with bitumen by the absorptive method where as brick/block masonry surfaces shall be first treated with a horizontal layer of Portland cement concrete and then covered with bitumen damp proof cover with Hessian base. Vertical faces of walls likely to come in contact with earth shall be first plastered with cement plaster and then treated with bitumen by the absorptive method. Damp proofing shall not be applied when the temperature is below 39° F and falling. The work shall be done by workmen experienced in the application of damp-proofing. Damp proofing shall be applied as shown on the Drawings.

5.3 DAMP-PROOFING MATERIALS

All asphaltic materials shall be delivered in sealed containers bearing the manufacturer's original labels. Bituminized kraft paper shall be delivered in rolls as per manufacturer's original packing. Other materials shall be delivered as provided under relevant clauses of these Specifications. All materials shall conform to the Specifications designated and be approved by the Engineer. Damp proofing materials shall conform to the following requirements along with the requirements shown on the Drawings.

5.4 ASPHALT PRIMER

The asphalt primer shall consist of an asphaltic base thinned to a suitable brushing consistency, with a volatile solvent, and shall conform to the requirements set forth under ASTM 41-73 or latest revision.

5.5 ASPHALT

Asphalt for damp proofing shall meet the requirements of ASTM D 449-73, Type C or latest revision.

5.6 BITUMENISED KRAFT PAPER

3-ply brown kraft paper (0.00113 lbs/ft² each ply) sandwiched with two layers of Bitumen (0.00083 lbs/ft² each layer) as manufactured by Messrs Packages Ltd., Lahore or equivalent, as approved by the Engineer, shall be used.

5.7 PREPARATION OF SURFACES

Surfaces to receive damp proofing shall be smooth, clean and dry. Holes, joints and cracks shall be painted flush with mortar and high spots ground level with the surrounding surface. Before damp proofing, surfaces shall be swept clean of all foreign matter and shall be inspected and approved.

5.8 PLACEMENT PROCEDURES

The selection and combination of various waterproofing and damp proofing materials for different locations shall be as shown on the Drawings or as directed by the Engineer. Unless otherwise directed or approved by the Engineer, the following procedures shall be adopted.

5.9 DAMP PROOFING UNDER BRICK MASONRY WALLS

The damp proofing shall comprise of:

1 1/2" thick layer of plain cement concrete Class B shall be placed over the area to be damp proofed.

A priming coat of asphalt primer conforming to BS specification 1097 October 1973 before the application of asphalt coating.

An asphalt coat using not less than 30 lbs per 100 sq.ft. and 2 layers of Bituminized kraft paper or polythene sheet.

5.10 QUALITY CONTROL

Sampling of asphalt for Specifications compliance shall be done in accordance with ASTM D 140-70. Samples shall be taken from each consignment, as directed by the Engineer.

5.11 MEASUREMENT AND PAYMENT

5.11.1 Damp Proofing

Measurement and payment for Damp proofing work shall be made in accordance with the provisions of this clause specified hereinafter.

5.11.1.1 Method of Measurement

Measurement will be made per Sq.ft of superficial area or surface damp proofed as per this Section of Specification and accepted by the Engineer.

5.11.1.2 Basis of Payment

Payment will be made for the number of sq.ft of superficial area damp proofed at the Contract Unit Price and will include full compensation for furnishing and placing all materials and for all labour, equipment, tools and incidentals necessary to complete the work prescribed in the Bill of Quantities Items:

Description	Unit
Furnish and Apply 1 ½" Damp Proofing Under masonry walls.	Sft.
Furnish and Apply ¾" Vertical Damp Proofing Under masonry walls.	Sft.

SECTION - 6
ROOF INSULATION

6.1 SCOPE

The work consists of insulation with brick tiles of sizes 9"x4" x 1 1/2" or any other approved size laid in cement mortar (1:3) over rammed mud laid to grade as shown on drawings after applying two coats of bitumen on the R.C.C. roof slab surface at 30/25 lbs, respectively for first and second coats at specified heat and laying 20 lbs. polythene sheet complete in all respects.

6.2 MATERIALS

The brick tiles shall comply with the standards set in "Section Bricks" except for their thickness and strength. The cement, sand and water shall meet the requirements as given in Section "CONCRETE".

Bitumen shall be PB3 or PB4

The clay for making mud shall be clean, free of all organic and other injurious matters.

6.3 APPLICATION

6.3.1 Bitumen Painting

Bitumen heated to the specified temperature and applied on R.C.C. roof slab cleaned and dried surface including sanding at 1 1/2 cu.ft per hundred sq.ft. of surface.

6.3.2 Laying Mud

The clay shall be mixed with reasonable quantity of water and thoroughly kneaded to form a thick paste to which copped straw at the rate of 10 lbs. per cu.ft of mud shall be added. It shall be laid and thumped with wooden trowels to form the slope as shown on the drawings.

6.3.3 Laying of Tiles

The brick tiles shall be laid in cement mortar (1:3) in fall/slope as shown on drawings.

6.3.4 Pointing

The brick tiles shall then be flush pointed in cement mortar (1:2)

6.3.5 Curing

The tiles laid shall be cured properly for ten days.

6.4 MEASUREMENT AND PAYMENT

6.4.1 Roof Insulation

Measurement and payment for roof insulation shall be made in accordance with the provisions given hereafter.

6.4.1.1 Method of Measurement

The measurement of the roof insulation shall be made in actual area acceptably laid in square feet complete in all respects as per relevant drawing or as directed by the Engineer.

6.4.1.2 Basis of Payment

Payment for roof insulation work shall be made for the number of the sq.ft measured of roof insulation provided above at the Contract Unit Price per sq.ft. It includes the cost of bitumen, mud laying, laying of tiles & pointing and shall constitute full compensation for providing and furnishing all materials, equipment, labour and all incidentals necessary to complete the work in accordance with the specifications for B.O.Q. items.

Description	Unit
Provide and Lay Roof insulation earth and tile roofing as per drawing	Sft.

SECTION - 7

FLOORING

7.1 SCOPE

The work covered in this Section consists of furnishing all plant, labour and material etc., and of performing all operations in connection with making cement concrete floor in conformity with lines and dimensions shown on the Drawings and in strict accordance with these specifications.

7.2 MATERIALS

Cement, sand and aggregate shall conform to the requirement of relevant clauses in section "CONCRETE"

7.3 BASE FOR FLOORING

The base for flooring shall be laid down when the earth filling has been done up to the specified level in a layer of 6 inches and has been properly watered and consolidated and correctly leveled.

A layer of sand about 4" thick shall be laid and rammed after having saturated so that a 4" layer is reduced to about 3" after compaction.

Portland cement concrete of Class C (2000 psi) shall be laid in one operation in a uniform layer of specified thickness, absolutely true and parallel to the required level of the finished surface. Concrete shall be cured for at least 7 days before any topping is laid. Before laying the surface shall be washed and scrubbed with wire brushes so that the concrete in the base and the topping are well bounded.

7.4 CEMENT CONCRETE FLOORING

Before laying the topping, the surface of the base shall be divided into symmetrical panels by glass strips. The size of panels, unless otherwise specified, shall not exceed 3 ft. square and concrete shall be placed in alternative panels. The top of the glass strips shall be adjusted to the specified level of the finished floor surface.

Cement concrete floor shall consist of laying a topping of cement concrete of Class B (3000 psi) of specified thickness over the prepared and finished base as or roughed surface of floor slabs.

Placing operation shall be specifically timed. No sooner the concrete has been evenly spread in a panel, then it shall be beaten for about 5 to 10 minutes with "wooden thapies" (about 5 lbs. weight).

Immediately after consolidation, the surface shall be leveled with a wooden trowel. Excessive trowelling in the early stages shall be avoided. The surface shall be tested with a straight edge to detect undulations, which, if found, shall be eliminated. The finer stuff in the concrete which has come to the surface with the stroking shall be quickly but carefully smoothen with the steel trowel. When the concrete has hardened sufficiently, trowelling shall be done with steel trowel. No dry cement or a mixture of dry cement shall be sprinkled on the surface for hardening the surface.

7.5 BRICK FLOORING

The work covered by this item consists of furnishing and laying 4 inch sand over prepared earth to required slope and grade. 3 inch thick layer of Class D (1000 psi) concrete is laid over it and 4.5 inch thick brick on edge are laid in 1:3 cement sand mortar. These joints of these bricks are struck at the top by flush pointing.

7.5.1 Method of Construction

The method consists of placing bricks on edge for flooring in 1:3 cement sand mortar over 4 inch sand and 3 inch Class D (1000 psi) concrete and striking the joints of bricks with flush pointing and laid over thoroughly consolidated bottom by ramming and watering before laying this floor.

7.6 CURING

The concrete flooring properly laid shall be cured for 7 days.

7.7 MEASUREMENT AND PAYMENT

7.7.1 Flooring Material

Measurement and payment for concrete flooring, brick flooring and compacted sand fill will be made in accordance with the provisions given hereafter.

7.7.1.1 Method of Measurement

Measurement will be made for the number of square feet of flooring acceptably placed complete in all respects as per drawings and in strict accordance with this section of specification or as directed by the Engineer.

7.7.1.2 Basis of Payment

Payment will be made for the number of square feet of flooring measured as above at the Contract Unit Price per square feet and shall constitute full compensation for all work including earth and sand filling, glass strips, concrete, brick on edge and all other incidentals to complete the work.

Description	Unit
Provide and Lay compacted 3" sand fill and Cement Concrete Floors using 1/4" thick glass strips for panel.	Sft.
Brick on edge flooring laid in 1: 6 cement mortar, over a bed of 3/4"(20mm) thick cement mortar 1:6	Sft.
Provide and Lay dry brick or stone ballast 1-1/2" to 2" gauge under floor.	Cft.
Provide and Lay PCC class B (3000 psi) floor 1-1/2" thick in ground floor laid over dry brick.	Sft
Provide and Lay floors of 1 inch thick floor of chip tile 12" x 12" x 1" in grey cement over 1" cement mortar 1:4.	Sft

SECTION - 8

METAL WORKS AND DOORS

8.1 SCOPE

This Section of specification consists of furnishing all plant, labour, equipment and materials in performing all operations in connection with providing and fixing metal windows, doors, rolling shutters etc. All metal windows, doors, and rolling shutters including painting shall be according to the Schedule specified on drawings and manufactured by a firm to be approved by the Engineer. They shall be handled with care, shall be staked on edge on level bearers and be supported evenly against a wall or vertical bearers, under cover.

8.2 CONTRACTOR TO FIX

The Contractor shall fix the windows, doors & rolling shutters as described. He shall be responsible for storing windows etc., and carrying to their respective positions, assembling composites, bedding and jointing with mastic at the mullions and transoms, fixing lugs and screws to frames, placing in the openings and bedding with cement and pointing externally with mastic.

8.3 BUILDING IN

Where applicable metal windows, doors and rolling shutters etc., shall be built in, set to plumb and line and cement mortar shall be grouted into the channel of the frame as brickwork proceeds. Fixing lugs shall be grouted in at the jambs, head and sill. When screwing up lugs or fixing screws, care shall be taken to ensure that windows etc. are not distorted.

8.4 FIXING INTO PREPARED OPENINGS

Windows etc., to be fixed into prepared openings shall have at least 1/8 inch tolerance all round. Window frames shall be grouted with cement mortar into the channel of the frame joints between building openings and window etc. Frames shall be chalked with mastic cement of an approved make.

8.5 FABRICATION OF DOORS, WINDOWS AND VENTILATORS

Shape:

The steel section shall be thoroughly straightened in the shape by methods that will not injure it before being laid off or worked in any way.

Cutting and Forming:

All members shall be so cut and formed that they can be accurately assembled without being unduly cracked, strained or forced into position.

Jointing:

The jointing of the different parts of the members of mild steel shall be carried out by welding process in conformity with the requirements of American Welding Society for such joints. Welding points shall be made quite smooth by filling them and making smooth.

Galvanizing:

If required, all exterior doors, frames, anchors, reinforcing and related items shall be fabricated from hot dipped galvanized steel, conforming to BS 729 Part 1. Following fabrication, touch up all welds with liquid Zinc. Window frames and ventilators shall be hot dipped galvanized after fabrication conforming to BS 729 Part 1. Following fabrication, touch up all welds with liquid Zinc.

8.6 PUTTY

The putty shall be of a type specially prepared for use with metal work in tropical conditions.

8.7 PROTECTION OF FITTINGS

Fittings shall be wrapped and protected from damage until all rough trades have been completed.

8.8 FABRICATION OF ROLLING SHUTTERS**8.8.1 Shutters**

The shutter shall be fabricated using standard galvanized corrugated segments of the required length according to size of the shutter and of 20 gauge thickness. These segments shall be inter linked properly to allow rotation for smooth rolling up and down. In order to reduce noise during operation, 2 inch wide wire reinforced canvas belt shall be riveted (using aluminum rivets) to both shutter ends and aluminum rollers shall be installed at top.

8.8.2 Guide

The guides for the shutter shall be fabricated from mild steel plates and shall be embedded to wall or columns by providing necessary anchors.

8.8.3 Main Rollers

The main rollers, mounted on the supporting pipe, on which the shutter has to roll up, shall be of mild steel with deep groove ball bearings and provision for greasing.

8.8.4 Supporting Shaft

The supporting shaft shall be of standard mild steel. Pipe strong enough to support the load of the shutter with minimum deflection. This shaft shall have adequate supports at the ends fabricated from mild steel plates. Each shutter shall have separate bracket supports. However, due to space limitation for mounting, the same may be made common for adjacent shutter.

8.8.5 Coil Spring

On each end, between the bracket support and the roller coil, a spring shall be provided. The spring shall be of spring steel, one end of which shall be fixed to the pipe and the other to the roller. These springs shall be suitable to balance the weight of the shutter to allow smooth operation.

8.8.6 Cover

The cover shall be fabricated from 22 SWG gauge mild steel sheet of uniform shape and size without deformations.

8.9 GLAZING

Glazing shall be fixed in metal windows by proprietary PVC or neoprene molded soling strips as provided by the manufacturers of the windows, or as may be directed by the Engineer.

All windows shall be glazed with 5 mm thick glass.

The contractor shall be responsible for protecting and maintaining all glazing in its prime condition. On completion all glass shall be cleaned inside and out and all cracked and broken glass shall be replaced, all to the satisfaction of the Engineer.

8.10 PAINTING PREPARATION OF THE METAL WORK

Iron and steel surfaces shall be cleaned by means of solvents approved methods. Cleaned surfaces shall be primed as soon as practicable after cleaning.

8.11 PAINT APPLICATION

Unless otherwise specified or instructed the Contractor shall apply paints as follows:

8.11.1 Internal Surfaces of Steel Work

2 coats Zinc Chrome primer
2 under coats
1 glass finish coat

8.11.2 External Surfaces of Steel Work

2 Coats Zinc Chrome Primer
1 aluminium bitumastic under coat
1 aluminium bitumastic finish coat.

All painting coats upto and including the first undercoats, shall be applied under cover at "WORKS" before dispatch to the Site. (The second undercoat and the finishing coat shall be applied after erection on Site). Extreme care shall be taken to protect paint coats during transit.

8.12 PAINT

The paints for any painting sequence shall be mutually compatible and of the same approved manufacture. All paints shall be supplied in small sealed containers each not exceeding one gallon capacity.

8.13 WIRE GAUGE

Unless otherwise specified the wire gauge shall be of best quality as approved by the Engineer uniformly woven wire webbing of 12 x 12 meshes to 645 mm (one sq.inch) made from 22 gauge galvanized iron wire. All panel shall be in one piece and no joints shall be allowed in the gauge.

Wire gauge shall be fixed as shown on the drawings or as directed by the Engineer. The gauge shall remain right to the full width and without any sag.

8.14 MEASUREMENT AND PAYMENT

8.14.1 Doors, Windows and Ventilators

Measurement and payment for steel doors, windows, rolling shutters and ventilators shall be in accordance with the provisions given hereafter.

8.14.1.1 Method of Measurement

The quantity to be paid for under this item shall be net openings in sq.ft. in the walls where steel doors, rolling shutters, windows and ventilators have been acceptably fixed complete in all respects as per relevant drawings or as directed by the Engineer.

8.14.1.2 Basis of Payment

Payment shall be made for the number of sq.ft. of steel doors, rolling shutters, windows & ventilators measured as provided above at the Contract Unit Price per sq.ft. for all supply of items and means of fixing, cutting, shaping, priming, painting as necessary and all other operations required for the complete erection and commissioning to the full satisfaction of the Engineer for the item.

Description	Unit
Provide, Install and paint Complete Steel windows and ventilators and fix glazing	Sft.
Provide, Install, Paint Complete Rolling Shutter.	Sft.
Provide, Install, Paint Complete Steel Gate.	Sft.
Provide, Install, Paint Complete door.	Sft.

SECTION - 9

HAND RAILS

9.1 SCOPE

The work covered by this Section of the specification consist of furnishing all plant, labour, equipment, appliances and materials and of performing all operation in connection with construction of Hand Rails in strict accordance with these specifications and notes shown on the drawings.

9.2 MATERIALS

9.2.1 Cement

Cement shall conform to the requirement of the Section "CONCRETE".

9.2.2 Coarse Aggregate and Sand

Coarse aggregate and sand shall conform to the requirement of the Section "CONCRETE".

9.2.3 Reinforcing Steel

Reinforcing Steel shall conform to the requirement of the Section "STEEL REINFORCEMENT".

9.2.4 Zinc Coated Steel Pipe (G.I Pipes)

Zinc coated steel pipe (G.I Pipes) shall be galvanized and threaded and shall conform to BS Specification 1387-1957 "Steel tubes and Tubulars" medium tube.

9.2.5 Fitting and Specials for Zinc Coated Steel Pipes (G.I Pipes)

Fitting and specials for zinc coated steel pipe (G.I Pipes) shall be galvanized and threaded and shall conform to the applicable requirements of BS specification 1387- 1957.

9.2.6 M.S Pipe and Square Bars

M.S pipe of thickness 1/16" and square bars of 3/4" shall conform to the requirements of ASTM A36.

9.3 MEASUREMENT AND PAYMENT

9.3.1 Material for Hand Rails

Measurement and payment for Hand Rails shall be made in accordance with the provisions given hereafter.

9.3.1.1 Method of Measurement

Measurement shall be made for the number of linear feet of Hand Rail actually constructed in place and accepted in strict accordance with this Section of Specification and as shown on the Drawings or as directed by the Engineer.

9.3.1.2 Basis of Payment

Payment shall be made for the number of linear feet of Hand Rail as provided above at the contract unit price per linear feet to furnish, construct and shaping the hand rail and shall constitute full compensation for all work related to the item.

Description

Unit

Provide and Fix Hand Rails on staircase
and on roof including Painting as shown
on Drawings or as directed by the Engineer

Lft.

SECTION - 10

WATER SUPPLY PIPES, PIPE LAYING AND APPURTENANCES

10.1 SCOPE

The work covered by this Section of the specification consists of furnishing all plant, labour, equipment, appliances and materials and of performing all operations in connection with water supply lines and appurtenances in strict accordance with this section of the specifications and the applicable Drawings.

10.2 MATERIALS

Material shall conform to the respective specifications and other requirements specified hereinafter and shall be new and unused.

10.2.1 Cast Iron Pipes and Fittings

Cast iron pipes and fittings shall comply with BS 78 for spigot and socket vertically cast pipes, BS 1211 for spigot and socket spun iron pipes and BS 2035 for flanged pipes.

10.2.2 Asbestos Cement pipes, Fittings and Specials

These shall conform to International Organization for Standardization Recommendation R 160 "Asbestos Cement Pressure Pipe" or British Standard Specification 486 "Asbestos Cement Pressure Pipe" of the class capable of withstanding a 400 ft. head test pressure. Short lengths of pipe machined overall shall be used at fittings for tying in.

The fittings and specials for asbestos cement pipes shall be cast-iron conforming to British Standard Specification 78: PART 2 Fittings: "Cast Iron Spigot and Socket Fittings", Class AV, except that the fittings and specials shall have the shapes, dimensions and tolerance required to fit the asbestos-cement pipes. Fittings and specials for asbestos cement pipe shall be supplied by the manufacturer of the asbestos cement pipe.

10.2.3 Galvanized Iron Pipes and Fittings

The galvanized iron pipes shall strictly conform to BS 1387-1967 "medium quality" Specifications for "Steel Tubes and Tubulars suitable for screwing to BS 21 pipe threads". All screwed pipes and sockets shall be of wrought iron have BS 1740. A complete and uniform adherent coating of zinc white will be provided for galvanized iron pipes and fittings.

10.2.4 Unplasticised Polyvinyl Chloride Pipe and Fittings

Unplasticised polyvinyl chloride (uPVC) and fittings if approved by the Engineer shall conform to BS 3505 pipes shall be class B. Pipe and fittings shall not be stored directly exposed to sunlight handled or laid in conditions where ambient temperatures may cause distortion or damage. In extreme conditions, pipe and fittings may have to be stored under water.

10.2.4.1 Joints for Unplasticised Chloride Pipe

Joints for unplasticised polyvinyl chloride pipe shall be the Z type consisting of a socket with rubber gasket, or approved equal, and assembled in accordance with the pipe manufacture's recommendations.

10.2.5 Mild Steel Pipes

The mild steel pipes shall conform to BS 1387-1967 "medium quality" Specifications for "Steel Tubes and Tubulars". All pipes shall have thickness suitable to withstand the working pressure as specified in the Bill of Quantities.

10.2.6 Polyethylene (P.E) Pipes and Fittings

High-density polyethylene pipes (HDPE) and fittings shall conform to ISO 4427/DIN 8075 standards. Material, diameters, wall thickness shall be as indicated in 4427/DIN 8074. Tests to be performed for pipes shall be Heat revision, Short term hydrostatic pressure test and Tensile strength and for P.E. compounds shall be Elongation at break, Melt flow rate and Density test.

Warning tape shall be provided for lying over P.E. pipes. It should be single fold, 0.02 inch thick and 2 inch wide, with warning for digging continuously printed in Urdu language. The tape shall be placed one foot above the P.E. pipe.

Bricks on edge shall be placed on the P.E. pipes along its edge after it is laid in order to avoid any damage to the pipe.

10.2.7 Sluice/Gate Valve

Valves shall be wedge gate valves/check valve conforming to British Standard Specification 5163 : 1974. Ends of valves shall be suitable for the type of pipe to which the valves will be connected. The direction of flow should be marked by arrow on the body of the valve.

10.2.8 Check Valve

Check valve shall comply with the requirements of BSS 5153 : 1974 or equivalent. The valve shall be of swing type and shall be of quick acting single door type.

10.2.9 Fire Hydrants

The metal of the fire hydrant shall conform to BS 750 (Type-2) and shall be of screw down streamline pattern. The body shall be best quality, closed grain, grey cast iron with spindle of manganese bronze having tensile strength of not less than 11.0 tons per square in machined from solid rolled bars. The seating valves and other parts shall be of best quality gun metal with Brinell Hardness No. 80. The direction of closing shall be by clockwise rotation and outlet shall have fire hose threads for accommodation of 2 1/2" dia hose connection. Inlet flanges of hydrant shall be suitable for jointing with flanges of hydrant bends and tees. All fire hydrants shall be coated with one coat of primer and two coats of signal red enamel paint approved manufacturer to give a uniform protective coating on cast iron.

10.2.10 Ferrule Assembly

Ferrule assembly shall consist of brass ferrule assembly including corporation cock for disconnection of approved quality including PP saddle, PP strap, and all other items related to make complete house connection.

10.2.11 Surface Boxes

The surface boxes shall be manufactured as per Drawings. Cover and frame shall be of cast iron.

10.3 APPROVAL OF MATERIALS AND EQUIPMENT

As soon as practicable but within 30 days after receipt of notice to proceed and before any materials or equipment are purchased, the Contractor shall submit for approval of the Engineer a complete schedule, in triplicate, of materials and equipment to be incorporated in the work, together with the names and addresses of the manufacturers and their catalogue cuts, diagrams, drawings, and such other descriptive data as may be required by the Engineer. No consideration will be given to partial lists submitted from time to time. Approval of materials and equipment with deviations from the specifications shall not be construed as approval of the deviations unless they are specifically brought to the notice of the Engineer. Laboratory results and certifications, specified or otherwise required, shall be submitted prior to delivery of the material and equipment to site.

10.4 INSTALLATION

10.4.1 Handling

Pipe and accessories shall be handled in such a manner as to ensure their delivery to the trench in sound, un-damaged condition. If any pipe or fitting is damaged, the repair or replacement shall be made by the Contractor at his expenses in a

satisfactory manner. No other pipe or material of any kind shall be placed inside of a pipe or fittings. Pipe shall be carried into position and not dragged. The interior of pipe and accessories shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations by plugging or other approved method. Before installation, the pipe shall be inspected for defects. Material found to be defective before or after laying shall be replaced with sound material without additional expense to the Employer. Rubber gaskets that are not to be installed immediately shall be stored in a cool dark place and protected against the direct rays of the sun.

10.4.2 Cutting of Pipe

This shall be done in a neat and workman-like manner without damage to the pipe. Unless otherwise authorized by the Engineer or recommended by the manufacturer, cutting shall be done with a mechanical cutter of approved type. Wheel cutters shall be used wherever practicable.

10.4.3 Location

Where the location of the water pipe is not clearly defined by dimensions on the Drawings, the water pipe shall be located as directed by the Engineer.

10.4.4 Deflection

Maximum allowable deflections from a straight line or grade, as required by vertical curves, horizontal curves, or offsets will be as recommended by the manufacturer and as approved by the Engineer. If the alignment requires deflections in excess of the specified limitations, special bends or a sufficient number of shorter lengths of pipe shall be furnished to provide angular deflections within the limit set forth, as approved.

10.4.5 Placing and Laying

Pipe and accessories shall be carefully lowered into the trench by means of derrick ropes, belt slings, or other suitable equipment. Under no circumstances shall any of the water line materials be dropped or dumped into the trench. Care shall be taken to avoid abrasion of the pipe coating. Poles used as levers shall be of wood and shall have broad flat faces to prevent damage to the pipe. Except where necessary in making connections with other lines or authorized by the Engineer, pipe shall be laid with the bells facing in the direction of laying. The full length of each section of pipe shall rest solidly upon the pipe bed, with recesses excavated to accommodate bell coupling and joints. Pipe that has the grade or the joint disturbed after laying shall be taken out and relaid. Pipe shall not be laid in water shall be kept out of the trench until the materials in the joints have hardened or until chalking or jaunting is completed. When work is not in progress, open ends of pipe, fittings, and valves shall be securely closed so that no trench water, earth, or other substances will enter the pipes or fittings. Where

any part of a coating or lining is damaged, the repair shall be made by the Contractor at his own expense in a satisfactory manner. D.I pipes shall be installed in accordance with recommendations of the pipe manufacturer. Pipe ends left for future connections shall be provided with valve, plugged or capped, and anchored, as shown or as directed, where connections shall be made by using specials and fittings to suit the actual conditions.

10.4.6 Jointing

- a. The joints shall be in accordance with the recommendations of the manufacturer or as approved by the Engineer.
- b. Connections between different types of pipes and accessories shall be made with transition fittings where recommended by the pipe manufacturer.
- c. Service connections shall be made as indicated and in accordance with the recommendations of the pipe manufacturer.

10.4.7 Setting of Fire Hydrants, Valves and Surface Boxes

Fire hydrants shall be located and installed, as shown. Hydrants shall be set plumb and in accordance with the manufacturer's instructions.

Valves and surface boxes shall be installed as shown or directed, and shall be set plumb. Surface box shall be centered on the stems. Concrete, concrete pipe, brick, brick ballast used in chambers shall conform to the relevant clause of the Specifications. Where feasible, valves shall be located outside the area of roads and streets. Earth fill shall be carefully tamped around each valve box to the satisfaction of Engineer on all sides of the box, or to the undisturbed trench face if less than 4 ft.

Hydrants and valves shall have the interiors cleaned of all foreign matter before installation. Surface boxes shall be lighted and the hydrant or valve shall be inspected in open and closed positions to ensure that all parts are in working condition.

10.4.8 Thrust Blocks

Plugs, caps, tees, bends and fire hydrants shall be provided with concrete thrust blocks. Backing shall be placed between solid ground and the hydrant or fitting to be anchored. The area of bearing shall be as shown on the Drawing. The backing shall be so placed that fitting joints shall be accessible for repair. The concrete shall be of class B plain cement concrete.

10.5 FLUSHING

The Contractor shall provide facilities for flushing the line. Water for flushing the line shall be arranged by the Contractor. Flushing of line shall be done section by section. For each valved section of pipeline, the Contractor shall make a temporary hose connection between the water pipeline and the pipeline under test. Water shall be pumped into the section flushed. Other arrangements for storing and pumping of water shall be subject to the approval of Engineer. Due precautions shall be taken by the Contractor for the disposal of water. The pipeline shall be flushed by keeping all the branch pipes open. Flushing shall be continued until clean water starts flowing through the other end. Section by section, the entire pipeline shall be flushed at a minimum flushing velocity of 2.5 ft./sec.

10.6 LEAKAGE TEST

Flushing of the pipeline shall be followed by a leakage test. The Contractor shall provide facilities for performing the leakage test. Water and pumping facilities shall be provided by the Contractor. Before the testing of pipeline, the Contractor shall ensure that concrete backing blocks have been provided where necessary. The test shall be performed only after all concrete work in contact with pipe to be tested has set for a minimum of 72 hours. All joints shall be left exposed. Leakage test shall be performed by keeping the end of the pipeline closed by proper plugs blocked to resist 150 per cent of the actual working pressure. While filling the line all valves and openings shall be kept open and water shall be filled in slowly. When the pipeline is completely filled with water and all air expelled, water shall be pumped into the pipeline to a minimum pressure of 150 percent of actual working pressure and the test pressure shall be maintained for at least 30 minutes for each section of 330 feet. Each and every joint shall be inspected for leaks and for all visible leakage, a displacement leakage test shall be performed by the Contractor, for the newly laid pipeline. The pipeline shall be filled with water and all the air from the pipeline shall be expelled. No piping installation will be accepted until the leakage is equal or less than the number of imperial gallons per hour as determined by the formula:

$$L = 0.00054 \cdot ND \cdot P$$

L = Leakage in Imperial Gallons

N = Number of joints

D = Nominal diameter of pipe in inches

P = Average test pressure (psi) during test

In the event of the pipeline failing the leakage test, the Contractor shall locate and repair the defective pipe, fitting or joint at his expenses. For dewatering the line for repairs the Contractor shall follow the instructions given by the Engineer for disposal of water. After repairs of the line, the Contractor shall retest the line. The line will not be accepted until it passes the leakage test.

10.7 RETESTING AFTER BACKFILL

After the pipe trench has been backfilled, the entire length shall be subjected to a leakage test as a whole unit. The Contractor shall repair the line if it fails to pass the leakage test requirements specified hereinbefore. The test shall be repeated and repairs affected until the pipeline passes the leakage test.

10.8 PIPELINE DISINFECTION

10.8.1 General

The Contractor shall furnish all equipment, labour and material for the proper disinfection of the pipeline. Disinfection shall be accomplished by chlorination after the lines have been successfully tested for leakage but before they have been connected to the main system. Disinfection of the pipelines shall be done in the presence of the Engineer's representative with equipment approved by him.

10.8.2 Chlorination

A chlorine and water mixture shall be supplied by means of a solution feed chlorination device. The chlorine solution shall be applied at one end of the pipeline through a trap, in such a manner that as the pipeline is filled with water, the dosage applied to the water entering the pipe shall be at least 25 ppm or enough to meet the requirements given hereinafter.

10.8.3 Retention Period

Chlorine solution shall be retained in the pipeline for a period of at least 24 hours. After the chlorine treated water has been retained for the required time, the chlorine residual at the pipe extremities and at such other representative points shall be at least 10 parts per million. This procedure shall be repeated until the required residual chlorine concentration is obtained.

10.8.4 Chlorination of Valves

During the process of chlorination of the pipeline, all valves or other appurtenances shall be operated while the pipeline is filled with the heavily chlorinated water.

10.9 FINAL FLUSHING

Following complete disinfection of the pipeline, all treated water shall be thoroughly flushed from the pipeline at its extremities. Treated water and water used for flushing the pipelines shall be disposed of in a manner instructed by the Engineer. Fresh treated water shall be filled in the line and water tested for presence of coliform. The test result should indicate negative coliform presence. If the test indicates any positive coliform, the entire process of disinfection shall be repeated or improved upon until coliform free samples are obtained.

10.10 WATER SAMPLING AND TESTING

Disinfection of the pipeline and appurtenances shall be the responsibility of the Contractor. The first set of samples will be collected for analysis by the Engineer. Should the sample reveal presence of coliform, the Contractor shall again disinfect the pipeline and appurtenance and shall pay the Owner for sampling and testing for subsequent retests until coliform free samples are obtained. The charges for resampling and retesting shall be paid by the Contractor.

10.11 CLEAN-UP

Upon completion of the installation of the water supply lines, distribution system and appurtenance, all debris and surplus materials resulting from the work will be removed and disposed of in a manner satisfactory to the Engineer

10.12 INDICATION PLATES

The indication plates shall be installed in accordance with the drawings and as directed by the Engineer.

10.13 WASHOUTS

The design and locations of washouts shall be illustrated on the Drawings and to be approved by the Engineer. Exact positioning shall be determined with regard to topography and to the approval of the Engineer. At least 10 ft. of the washout pipe work, inclusive of the isolating valve, measured from the center line of the pipeline, shall be laid at the same time as the pipeline and suitably capped to prevent ingress of foreign material. The minimum gradient for the washout pipe work shall be 1 in 100.

10.14 AIR VALVES

10.14.1 Double Orifice Air Valves

These shall be designed to meet the following conditions:

- i) Expulsion of air during charging of the pipeline
- ii) Admit air during emptying of the pipeline to avoid the occurrence of negative pressure
- iii) Expulsion of air accumulated at summit points along the pipeline under normal operating conditions

Conditions (i) and (ii) shall be met by the employment of a large orifice capable of handling large volumes of air at high flow rate, and condition (iii) by a small

orifice capable of discharging small quantities of air as they accumulate.

The large orifice shall be sealed by a buoyant rigid ball and the chamber housing shall be designed to avoid premature closing of the valve by the air whilst being discharged. The small orifice shall be sealed by a buoyant ball at all pressures above atmospheric except when air accumulates in the valve chamber.

The nominal pressure shall be NP-10 for air valves on potable water lines and NP-16 for air valves on fire water lines.

10.14.2 Single Orifice Air Valves

These shall be designed to carry out the function described in 10.14.1 above. Each valve shall be provided with only a small orifice which shall operate in the same manner as that in a double acting air valve.

Valves with air intake or exhaust facilities shall have approved screening arrangements to prevent the ingress of air borne sand.

The nominal pressure shall be NP 10 for air valves on potable water lines and NP-16 for air valves on fire water lines.

Body ends shall be flanged with raised faces and drilled according to BS 10 for the nominal pressure specified or indicated in the Drawings.

The materials for the valves shall be as follows:

Cast iron body cover and bowl for small orifice, cast iron with gunmetal seat with rubber covered ball or other approved; for large orifice, cast iron with rubber seat and vulcanite covered ball or other approved.

10.15 MEASUREMENT AND PAYMENT

10.15.1 Pipe work

Measurement and payment of pipe work, fittings, specials and appurtenances will be made in accordance with the provisions of this clause specified hereinafter.

10.15.1.1 Method of Measurement

Measurement will be made for the number of linear feet of asbestos cement, galvanized iron, cast iron, unplasticised polyvinyl chloride and mild steel pipes acceptably provided & installed complete in all respects as per relevant Drawings and specification as directed by the Engineer.

10.15.1.2 Basis of Payment

Payment will be made for the number of linear feet of pipe work as measured above at the Contract Unit price of each unit and shall constitute full compensation to provide, handle, lay and joint asbestos cement, galvanized iron, unplasticised polyvinyl chloride, mild steel, cast iron pipes and including flushing, leakage testing before & after backfilling, final flushing and works related to the item.

Description	Unit
Supply, lay, joint and test asbestos cement pipes complete with rubber rings and sockets as per drawings and specifications or as Directed by the Engineer.	L.ft
Supply, lay, joint and test cast iron pipe complete in all respects as per drawings and specifications.	L.ft.
Supply, lay, joint and test mild steel pipes complete in all respects as per drawings and specifications.	L.ft.
Supply, lay, joint and test uPVC pipes, class B, fittings and accessories complete in all respects as per drawings and specifications.	L.ft.
Supply, lay, joint and test galvanized pipes, fittings and accessories complete in all respects as per drawings and specifications.	L.ft.
Supply, lay, joint and test polyethylene pipes, fittings and accessories including warning tape and bricks on edge complete in all respects as per drawings and specifications.	L.ft.

10.15.2 Service Connection

10.15.2.1 G.I Pipe / Polyethylene Pipe

10.15.2.1(a) Method of Measurement

Measurement will be made for the number of linear foot of pipe including fittings acceptably provided & installed complete in all respects as per relevant Drawings or as directed by the Engineer.

10.15.2.1(b) Basis of Payment

Payment will be made for the number of linear foot of pipe work as measured above at the Contract Unit Price of each unit and shall constitute full compensation to provide, handle, lay, joint and test pipe, fittings, including sleeves, nuts, sockets, plugs, bitumen coating and all other work related to the item.

Description	Unit
Provide & install galvanized iron pipe and all fittings including excavation and backfilling complete with sleeves, nuts, bends, sockets, elbows, plugs, bitumen coating and testing for making service connections.	L.ft.
Provide & install polyethylene pipe and all fittings including excavation and backfilling complete with bends, sockets, elbows, plugs, and testing for making service connections with ferrule clamps etc as per drawing.	L.ft.

10.15.2.2 Ferrule Assembly

10.15.2.2(a) Method of Measurement

Measurement shall be made for the number of ferrules acceptably provided & installed complete in all respects as per relevant Drawings or specifications.

10.15.2.2(b) Basis of Payments

Payment shall be made for the number of ferrules measured as above at the contract unit price for each unit and shall constitute full compensation for providing, tapping, drilling, fixing including P.P straps, P.P Saddles, and all other work related to the item to make complete house connection.

Description	Unit
Provide & install brass ferrule assembly of approved quality including tapping, drilling, M.S strap, PP saddle, etc. including corporation cock for disconnection complete in all respects as per drawings.	No.

10.15.2.3 Pipe Fittings and Specials

10.15.2.3(a) Method of Measurement

Measurement will be made for the number of pounds of fittings and specials acceptably provided & installed in Asbestos Cement pipe work complete in all respects as per relevant drawings or as directed by the Engineer.

10.15.2.3(b) Basis of Payment

Payment will be made for the number of pounds of fittings/specials as provided above at the Contract Unit Price and shall constitute full compensation for the cost of providing, handling, fixing, jointing, disinfecting, respective type of fitting/special, and all other work related to the item.

Description	Unit
Provide & install plain ended cast iron fittings	Lbs.
Provide & install flanged cast iron fittings	Lbs.

10.15.2.4 Sluice (Gate)/Check Valves

10.15.2.4(a) Method of Measurement

Measurement will be made for the number of sluice (gate) valves or check valves acceptably provided & installed complete in all respects as per relevant Drawings or as directed by Engineer.

10.15.2.4(b) Basis of Payment

Payment will be made for the number of sluice (gate) or check valves measured as above at the Contract Unit Price for each unit and shall constitute full compensation for providing, handling, fixing and jointing and all other work related to the item including construction of chamber.

Description	Unit
Provide & install sluice (gate) valve including all fittings as per drawings	No.
Provide & install sluice (gate) valve including all fittings and construction of chamber as per drawings:	No.
Provide & install check valve including all fittings as per drawings	No.
Provide & install check valve including all fittings and construction of chamber as per drawings:	No.

10.15.2.5 Fire Hydrants

10.15.2.5(a) Method of Measurement

Measurement shall be made for the number of fire hydrants acceptably provided & installed complete in all respects as per relevant Drawings or as directed by the Engineer.

10.15.2.5(b) Basis of Payment

Payment will be made for the number of fire hydrants measured as above at the Contract Unit Price for each unit and shall constitute full compensation for providing, handling, fixing and jointing and all other work related to the item including construction of chamber.

Description	Unit
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Provide and install fire hydrant including all fittings and construction of chamber as per drawings.	No.
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10.15.2.6 Indication Plates

10.15.2.6(a) Method of Measurement

Measurement will be made for the number of indication plates acceptably provided & installed complete in all respects as per relevant drawings.

10.15.2.6(b) Basis of Payment

Payment will be made for the number of indication plates measured as above at the contract unit price for each unit and shall constitute full compensation for providing handling, fixing and all other work related to the item.

Description	Unit
Provide and install indication plates as per drawing.	No.

10.15.2.7 Washouts

10.15.2.7(a) Method of Measurement

Measurement will be made for the number of washouts acceptably provided & installed complete in all respects and as approved by the Engineer.

10.15.2.7(b) Basis of Payment

Payment will be made for the number of washouts measured as above at the contract unit price for each unit and shall constitute full compensation for providing, handling, fixing and all other work related to the item including construction of chamber.

Description	Unit
Provide & install washouts with all fittings for draining out the lines including construction of chamber for washout alongwith separate chamber for disposal into nearest	

manholes as shown on the drawing or as directed by Engineer. No.

10.15.2.8 Air Valves

10.15.2.8(a) Method of Measurement

Measurement will be made for the number of air valves acceptably provided & installed complete in all respects and as approved by the Engineer.

10.15.2.8(b) Basis of Payment

Payment will be made for the number of air valves measured as above at the contract unit price for each unit and shall constitute full compensation for providing handling, fixing and jointing related to the item including construction of chamber.

Description	Unit
Provide install test and commission single acting air valve and all fittings including construction of chamber complete in all respects.	No.
Provide install test and commission double acting air valve and all fittings	No.

10.15.2.9 Sand Cushion

Sand filling shall be provided in excavated trenches at road crossing. Method of filling shall be same as for backfilling in trenches.

10.15.2.9(a) Method of Measurement

Measurement will be made for the number of cubic feet of sand acceptably provided & placed under road crossing complete in all respects and as approved by the Engineer.

10.15.2.9(b) Basis of Payment

Payment shall be made for the number of cubic foot of sand measured as provided above at the contract unit price per cu.ft and shall constitute full compensation for all work related to the item.

Description	Unit
Sand filling in trenches for pipe.	Cft.

SECTION - 11

SEWER PIPE LAYING AND APPURTENANCES

11.0 SANITARY SEWERAGE

11.1 SCOPE

The work covered by this section of the specifications consists of furnishing all reinforced concrete pipes, plant, labour, equipment, appliances and materials and of performing all operations required for installing and testing the sewer pipes in strict accordance with the specifications of this section and the applicable drawings and subject to the terms and conditions of the contract.

11.2 MATERIALS

All materials used in the manufacture of reinforced cement concrete pipes for use under this contract shall conform ASTM Designation C-76-91 or latest revision and also with the following specifications.

11.2.1 Cement

The sulphate resistant cement to be used in the manufacture of reinforced concrete pipes shall conform to the requirement of ASTM's relevant Designation C 150 (latest revision).

11.2.2 Aggregates

The coarse/fine aggregate to be used in the manufacture of concrete pipes to be furnished and installed under this contract shall be generally in accordance with the provisions of section of these specifications.

11.2.3 Water

Water to be used in the manufacture of pipes shall be approved by the Engineer.

11.2.4 Steel Reinforcement

The material shall conform to the specifications contained in Section 2 of these specifications.

11.2.5 Brick Ballast

Brick ballast shall have a maximum gauge of 1-1/2 inch and shall be graded down to 3/4 inch and shall not contain more than 10% which will pass through screen made of 1/4 in. diameter bars spaced at 3/4 in. centre to centre.

11.3 CLASSES OF PIPE

The reinforced cement concrete pipes to be furnished and installed under this contract shall be of the strength Class III Wall "B" or specified otherwise on the Drawings.

Following technical criteria shall be adhered to:

Class of Pipe : Class III Wall "B"
Concrete Strength : 4000 Psi (Cylinder Test)

The design requirements for these classes of reinforced cement concrete pipes shall be as described in ASTM Designation C-76 for the respective strength classes. Unless otherwise called for in other parts of these Technical Specifications or applicable variation order, all reinforced cement concrete pipes under this contract shall comply with the Wall B design requirements as set forth ASTM Designation C-76-91 or latest revision.

Pipe less than 12" diameter shall conform to ASTM Specification C-14-73, Class 2, wall thickness 1 inch (25mm)

11.4 BASIS OF ACCEPTANCE

Acceptance of reinforced cement concrete pipes will be on the basis of three edge bearing and material tests as per ASTM Designation C-76-91 or latest revision and inspection of manufactured pipes for defects and imperfections. The Contractor shall bear the cost of such tests and pay fees etc., and also pay for the carriage of such samples and all other expenses contingent to tests.

11.5 PIPE DIMENSIONS

The internal diameters and wall thicknesses of reinforced concrete pipes under this contract shall be as set forth in ASTM Designation C-76-91 or latest revision in Tables 1 to 5 for "Wall B" pipes as required and shown on the Drawings.

The lengths of reinforced concrete pipes under this contract shall be as required to provide the designated laying length plus any overlap needed for the pipe joint. Pipe shall be of standard length of 8 ft. unless otherwise approved in writing by the Engineer. Only one laying length shall be permitted for each size of reinforced concrete pipe under this contract and pipes not of the approved uniform laying length shall not be used in the work. Each layer of circumferential reinforcement shall be assembled into a rigid case supported by 4 Nos. longitudinal bar of quarter inch diameter.

The strength test requirements in pounds per linear foot of pipe under the three-edge-bearing method shall be either the D-Load (test load expressed in

pounds per linear foot per foot of diameter) to produce 0.01 in crack, or D-loads to produce the 0.01 in crack and the ultimate load as specified below, multiplied by the internal diameter of the pipe in ft.

D-Load to produce a 0.01 in crack = 1000 pounds
D-Load to produce the ultimate load = 1500 pounds

Lift holes in the walls of reinforced cement concrete pipes will not be permitted under this contract for the purpose of handling and laying. Other approved lifting methods shall be employed.

11.6 CERTIFIED DRAWINGS AND DATA SHEETS

The Contractor shall submit in triplicate, for approval by the Engineer certified drawings and data sheets as required to provide complete information on all concrete sewer pipes, dimensions, type and dimensions of pipe ends, joint details, proposed concrete design mix for each different strength class of reinforced pipe and any other information needed to demonstrate full compliance with these specifications.

No concrete sewer pipe shall be delivered to the work site until the Engineer has formally approved the certified drawings and data sheets and until all test requirements called for in the respective ASTM Standard Specifications C-76 or latest revision have been met.

11.7 JOINTS FOR CONCRETE PIPE SEWERS

Rubber gasket joints shall be used for either tongue and groove or bell and spigot pipes.

Rubber gasket joints shall be made using specially designed rubber gaskets, made to fit the applicable tongue and groove or bell and spigot pipes and adequately tested under operating conditions. Special care must be taken in the selection and handling of the concrete pipes for use with rubber gasket joints, to ensure that pipe ends shall be smooth and concentric with tolerance which closely conforms to the requirements of the manufacturer of the rubber gaskets. The tongue or spigot end of each pipe shall be specially designed to perform groove or offsets to fit the manufacturer's rubber gaskets design.

The rubber gasket joints shall conform to all applicable requirements of the latest revision of ASTM Designation C443, entitled "Joints for Circular Concrete Sewer and Culvert pipe, using Flexible Watertight Rubber Type Gaskets" except that the test pressure need not exceed 10 feet of head at which the complete sewers shall meet the infiltration or ex-filtration limits set forth hereinafter.

The groove end of tongue and groove of pipes shall have at least one line of wire reinforcement of 8 gauge size placed in the centre of the groove.

The rubber gasket shall be installed on the pipe in accordance with the instructions of the gasket manufacturer. In general the gaskets shall be pre-assembled to the pipe at the pipe manufacturing plant. The pipes shall be handled with special care at all times to prevent damage to the pipe ends. A lubricant shall be used for jointing the pipes as recommended by the rubber gasket manufacturer. Care shall be taken to avoid contamination of the gasket and lubricated surfaces with earth or other undesirable material during installation.

For either tongue and groove or bell and spigot pipes, mechanical means shall be used to pull the pipe home for all sizes of 12" or larger diameter in accordance with the recommendations of the rubber gasket manufacturer. Pipes of 8"/9" diameter may be coupled manually using a cross member and bar. Under no circumstances will bars alone be used nor shall any motor driven equipment be used to force the pipe home.

11.8 HOUSE CONNECTIONS

House Connections shall be made through manholes as indicated in the drawings or as directed by the Engineer.

House connection shall be provided individually for each plot by means of a 9" dia R.C.C. sewer pipe and a dead end, laid at an average depth of 2.0 feet below N.S.L. level and in such a manner that other services such as water supply, telephone and gas lines are not disturbed or interfered. The work of laying the sewer pipe shall conform to the specifications laid down in the relevant section of this contract.

The inlet of each house connection shall be plugged with brick masonry 4 1/2 inch thick in 1:6 cement sand mortar both in the manhole and the pipe in the plot.

11.9 GULLY GRATING

Gully grating shall be made through manholes as indicated in the drawings or as directed by the Engineer.

Gully grating shall be provided on the road junctions as mentioned in the drawings by means of a 9" dia RCC sewer pipe connecting the nearest manhole with the chamber of size 1'-0"x1'-0". The pipe is laid in such a manner that other services such as water supply and sewerage system are not disturbed or interfered. The work of laying RCC pipe shall conform to the specifications laid down in the relevant section of this contract. Approved grating shall be fixed at the top.

11.10 INSTALLATION

11.10.1 Handling of Pipes

Concrete sewer pipes shall be handled with special care at all times during the manufacture, while transporting to the site of work, and while installing. Each pipe shall be carefully inspected before being laid and no cracked, broken or defective pipe shall be used in the work. Chipping of the tongue and groove or bell and spigot pipe ends, which in the Engineer's opinion may cause defective joints, shall be sufficient cause for the rejection of any concrete pipe.

11.10.2 Excavation and Backfill

The excavation and backfill for sewer installations shall be as specified in applicable provisions of these technical specifications and will be paid for under separate contract items as classified and as per applicable variation orders.

11.10.3 Placing of Bedding

11.10.3.1 Brick Ballast Bedding

The brick ballast shall be clean material of 1 to 1 1/2 inch gauge broken from first class bricks or bats, or from dense over burnt bricks. No under-burnt bricks or bats nor those which have become spongy or porous in the process of burning shall be broken up for brick ballast.

The material shall be evenly spread over the full width of the formation in 4 inches loose layers and compacted with hand or mechanical hammers until the full thickness as shown on the drawings for the particular pipe size has been built up and finished not more than 1/2" below required level. The Contractor shall note that it is essential that the material at the sides of the pipes is adequately compacted. Before the subsequent placing of pipe surrounding material, pipe joints shall be protected. Protection may take the form of a twist of yarn lightly pressed into the annular joints space or other equal protection approved by the Engineer's Representative.

11.10.3.2 Crushed Stone Bedding

Crushed stone bedding shall be from an approved source. It shall be strong, durable, hard and impervious, having crystalline structure. The broken stone shall have sharp edges and clear fractured faces, shall be free from thin elongated or laminated pieces.

The crushed stone shall have a maximum gauge of 1 1/2" and shall be graded down to 3/4". When shifted through a screen made of 1/4" diameter bars spaced 3/4" center to center, it shall yield no more than 10 percent by volume of fine materials.

11.10.4 Laying of Sewers

Neither any sewer pipe nor the bedding shall be laid or placed till the alignment of the sewer and its levels and gradients have been carefully checked and tested with the trench excavation and found correct.

Each length of sewer pipe shall be checked for cracks and defects before placing in the line. Defects which in the opinion of the Engineer indicate imperfect placing, shall make, the pipe liable to rejection. Each pipe shall be placed carefully to line and grade and in close contact with adjoining pipe. These specifications require rejection of the work if the sewer invert varies as much 1/2 inch from the proper elevation. As shown on Drawings, the bottom of the trench must be shaped to fit the pipe barrel, with holes left for the bells. If excavation has been carried below the correct grade, refilling must be done with satisfactory materials as approved by the Engineer at no extra cost. The concrete pipe joints shall be of the type specified above and shall be made in accordance with the aforesaid specifications.

When laying is not in progress, the open pipe shall be closed with a tapered wooden plug to keep out foreign matter.

11.11 TESTING OF SEWER LINES

11.11.1 General

All sewer built under this contract shall be tested for infiltration or ex-filtration as specified below. The tests shall be made at times selected or approved by the Engineer. Sections of the completed sewer shall be isolated and measurements of the infiltration or ex-filtration shall be made by approved method. The contractor shall furnish all labour, material and equipment required for making the tests with no extra compensation over and above the agreed contract prices for the laying of sewer lines.

11.11.2 Infiltration Tests

The sewers which are constructed with the ground water level above the invert level of the pipe shall be tested for infiltration after the sewers have been installed and backfilling has been substantially completed. The tests and measurement shall be performed by the Contractor in the presence of and in a manner approved by the Engineer. The duration of the tests shall be only long enough to establish the true rate of infiltration. The amount of leakage over a 24 hour period will then be calculated from the result of the measured true rate of infiltration.

11.11.3 Ex-filtration Tests

The sewers which are constructed with the ground water level below the invert level of the pipe shall be tested for ex-filtration by isolating a section of sewers between manholes by means of approved temporary type of water tight bulk heads. The method of testing for ex-filtration shall be generally as follows

1. After isolation of sewer section, it shall be filled with water to a level which is 3' above the crown of the pipe at the higher end of the isolated section under test. The level will not be more than 6 ft. above the invert level of the sewer pipe at its lower end.
2. The duration of the ex-filtration test shall be one hour after the filling with water has been completed.
3. Determination of the amount of ex-filtration shall be made by measuring the total loss of volume of water in the manholes.
4. The amount of ex-filtration over a 24 hour period will then be calculated from the measured loss of volume during the test observation period.

11.11.4 Allowable Infiltration or Ex-filtration

The calculated amount of infiltration or ex-filtration over a 24 hour period shall not exceed 500 gallons per inch of pipe diameter per mile of sewer which rate shall be applied to the actual sewer size and length tested to determine the allowable infiltration or ex-filtration over the 24 hour period.

If the measured infiltration or ex-filtration exceeds the specified allowable limit, then the Contractor shall locate the points of leakage and make necessary repairs so as to reduce the leakage to less than the permissible maximum stated above.

11.11.5 Cleaning of Sewer Lines

The contractor shall clean all the sewer lines at no extra cost with the method approved by the site Engineer prior to handing it over to the Owner.

11.12 MEASUREMENT AND PAYMENTS

Measurement and payment for sanitary sewers will be made in accordance with the provisions given hereafter.

11.12.1 Bedding

11.12.1.1 Method of Measurement

The quantity to be paid for under this item will be the number of cubic foot of bedding material acceptably provided & placed under sewers complete in all

respects as per relevant drawings.

11.12.1.2 Basis of Payment

Payment shall be made for the number of cubic feet of bedding material measured as provided above at the Contract Unit Price per cubic foot and shall constitute full compensation for all work related to the item.

Description	Unit
Provide & place bedding as per drawing.	Cft.

11.12.2 Sewers

11.12.2.1 Method of Measurement

Measurement shall be made at site of the actual lengths of reinforced concrete pipes of different sizes and strength supply, installed and tested, as authorized for payment under this contract. The measurement will be made along the centre line of the pipe and between the inside walls of manholes or junction chambers. The unit of measurement will be linear foot.

11.12.2.2 Basis of Payment

The unit rate quoted in the priced B.O.Q. for supplying, laying and joining cement concrete sewerage pipes shall include full compensation for the cost of pipes, charges for their carriage to site and testing before and after laying, labour charges for laying, jointing, cleaning of sewer lines etc. and cost of all incidentals for completion of this item of work as per specifications laid down in this section.

Description	Unit
Supply, lay, joint and test R.C.C pipes of various sizes complete in all respects as specified in drawing.	Lft.

11.12.3 House Connections

11.12.3.1 Method of Measurement

Measurement shall be made for the number of units of house connections provided & installed at site as per specifications & drawings complete in all respects.

11.12.3.2 Basis of Payments

Payment will be made for the number of units of House connections as measured above at the contract unit price for each unit and will constitute full compensation for supply, lay and joint 6"/9" dia R.C.C. Pipe for house connection including all excavation, backfilling, testing and all other works related to complete the item in accordance with lines and grades as shown in the drawings or as directed by the Engineer.

Description	Unit
Provide and construct chamber for house connection including excavation, bedding, sand filling, backfilling including 9" dia RCC pipe complete in all respects.	No.
Provide and construct chamber for house connection including excavation, bedding, sand filling, backfilling including 9" dia RCC pipe complete in all respects.	No.

11.12.4 Gully Grating

11.12.4.1 Method of Measurement

Measurement shall be made for the number of units of gully grating provided & installed at site as per drawings complete in all respects.

11.12.4.2 Basis of Payments

Payment will be made for the number of units of Gully grating measured as above at the contract unit prices and will constitute full compensation for supply, lay and joint 6"/ 9" dia RCC Pipe for gully grating including all excavation, backfilling, testing and all other works related to complete the item in accordance with lines and grades as shown in the drawings or as directed by the Engineer.

Description	Unit
Construction of chamber with grating and 9" dia RCC pipe	

complete in all respects as
per drawings or as directed
by the Engineer.

No.

SECTION - 12

CONSTRUCTION OF MANHOLES

12.1 SCOPE

The work consists of constructing manholes for sewerage at positions shown on the plans or where otherwise directed by the Engineer, and in accordance with the Detailed Drawings supplied from time to time, complete in all respects. The Contractor shall furnish all plant, labour equipment and materials in performing all operations in connection with the construction of manholes.

The various items of work involved in the construction of manholes shall be carried out strictly in accordance with respective technical specifications laid down for the item of work in these tender documents.

12.2 MATERIALS

Brick masonry, Portland cement concrete, and other materials shall meet the specified requirements of the relevant sections of the specifications. Cast iron frame shall conform to the specifications as per BS 497. Manhole steps shall be of galvanized mild steel.

12.3 CONSTRUCTION REQUIREMENTS

Manholes shall be constructed with brick masonry laid in 1:3 cement sand mortar, built on Class D concrete (1000 psi). The cover slab shall be of Class B (3000 psi) reinforced cement concrete, fitted with cast iron frame which shall have reinforced cement concrete cover as shown in the plans. Reinforcement and concrete shall conform to the requirements of Section "CONCRETE". The outside and inside of the walls shall be plastered (1/2 inch thick) with 1:3 cement sand mortar and two coats of hot PB-4 bitumen shall be applied outside. At the bottom of manholes for sewers, a proper channel as per Drawings, shall be constructed in the whole length of the manhole along the centre line of the sewers, to lead the sewage from one sewer to the other. Galvanized mild steel steps shall be installed at 12 inches interval inside the manhole during the construction of the manhole walls. Cutting holes into the wall for the steps after construction will not be permitted. Top rung shall be 18 inches below the manhole cover and the lowest not more than 12 inches above the benching (floor).

Depth of manhole shall be from invert level of sewer to the top of manhole.

12.3.1 Drop Manhole

The Contractor shall construct drop manholes wherever shown in the drawings or ordered by Engineer's representative. The Contractor shall make the drop connection as shown on the drawings or ordered by the Engineer's Representative.

12.4 MEASUREMENT AND PAYMENT

12.4.1 Material

Measurement and payment for various types of Manholes shall be made in accordance with the provision of this Clause specified hereafter.

12.4.1.1 Method of Measurement

Measurement shall be made for the number of manholes of various types constructed at site as per Drawings and Specifications laid down in this section and to the approval of the Engineer.

12.4.1.2 Basis of Payment

Payment shall be made for each manhole as a complete unit at the Contract Unit Price to provide and construct manhole including excavation and backfilling, covers with frame, cast iron steps, plastering, benching and all incidentals related to the item in accordance with lines and grades as shown in the Drawings or as directed by the Engineer.

Description	Unit
Construction of circular masonry Manhole including manhole cover and frame.	No.
Extra over 12.1 for Drop Manholes including C.I pipes and fittings, concreting complete in all respects.	No.

SECTION - 13

SEWAGE PUMPING STATION

13.1 SCOPE

The work shall consist of furnishing, installing, commissioning and testing of sewage pumps and appurtenances involving all mechanical and electrical works and construction of pumping station in accordance with these specifications and in reasonably close conformity with the lines, grades, and dimensions shown on the plans and or established by the Engineer.

13.2 CIVIL WORKS

Building for the pumping station shall be constructed in accordance with the relevant specifications and Drawings and as directed by the Engineer.

The installation, testing and commissioning of sewage pumps shall be strictly in accordance with the instructions of the manufacturer of such machinery.

13.3 PUMPING EQUIPMENT

13.3.1 General

The works shall consist of providing, installing and commissioning sewage pumps and accessories for sewage pumping station. The contractor shall be responsible for furnishing all plant, labour, equipment, appliances, materials and performing all operations in strict accordance with this section of specifications and applicable drawings. Any equipment damaged by the contractor during the course of installation shall be repaired or replaced by the contractor at his own expense. The equipment to be supplied shall generally include:

- a) Non-clogging submersible and centrifugal pumps with IP Class 64 electric motor, duck foot bend, etc.
- b) Delivery and interconnecting pipe work as per drawings.
- c) LT panels
- d) Power cables from LT-panel up to pump motors.
- e) Recommended spares, spanners and special tools.
- f) Guide bars and arrangements for hoisting machinery and appurtenances.

13.3.2 Pump Manufacturer's Qualifications

The equipment herein specified is meant to be standard, in regular production and designed for the intended service.

The pumps and their appurtenances shall be of approved manufacturer.

13.3.3 Submittals

As part of his proposal the contractor shall submit with the tender the following items of descriptive information.

1. Certified and guaranteed performance curve for each pump showing.
 - a) Head versus quantity from shut off head to minimum head of the proposed impeller at the design speed herein specified.
 - b) Efficiency, B.H.P. and required NPSH
 - c) Manufacturer's recommended limits of operation.
2. Tabulated data for each type and size of drive motor including rated H.P., full load RPM, power factor and efficiency curves from full to zero load, service factor and KW input when the pump is at its design point and at the high flow point.
3. Drawings, catalogues and brochures of all equipment including pumps, motors, shafts and lubrication system which the Tenderer proposes to furnish, such information is to be furnished in sufficient detail, appropriately under-lined (checked or otherwise designated) to fully indicate conformity to the requirements of these specifications.

Within 30 calendar days after the execution of the contract, the Contractor shall submit four (4) copies of the following, for the approval of the Client.

1. Certified dimensional drawings of each item of equipment and auxiliary apparatus to be supplied including accurately dimensioned drawings of piping and valves.
2. Certified foundation and anchor bolt plans for all items and other data required for the complete installation.
3. Schematic electrical wiring diagrams and other data as required.

13.3.4. General Arrangement

The proposed arrangement of the pumps is shown on drawings. Sewage will be drawn from the wet well and will be discharged into the nearby open nullah. Arrangement shall be made in the pipe work so that any pump shall be easily removed.

13.3.5 Pump Set Construction

Sewage pumps shall be vertically mounted in the wet well and will be driven by 380 Volt motors directly coupled to form a single integral unit.

Pump casings shall be of cast iron. Impellers shall be of zinc free bronze or cast iron keyed to high tensile steel or stainless steel shafts adequately protected against corrosion and wear by renewable bronze sleeves.

13.3.6 Pump Set Duties

Pumpset duties are as given in the drawings or as submitted by the Engineer.

13.3.7 Pump Characteristics

Pumps shall operate in parallel during normal operations. Pump performance characteristics shall be such that the operating point is as close as possible to maximum efficiency for each pump, while operating in parallel shall add discharges to the fullest extent and the plant shall be suitable for cavitation free operation even while a single pump is operating.

13.3.8 Motors

The pump motors shall be totally enclosed, water cooled, weather protected and squirrel cage induction type.

Except where otherwise specified, the insulation of all motors shall be capable of withstanding the temperature rise for Class B insulation without detriment to any part of the machine. A temperature rise in excess of that for Class E will not be permitted.

When operating continuously at full rated load, temperature rise shall not exceed 40 degree centigrade above an ambient temperature of 50 degree centigrade.

All motors shall be continuously rated at least 20% in excess of the maximum power required and also be of adequate power to start and accelerate to full speed in not more than 20 seconds when started with 95% per unit motor terminal voltage, the torque shall not be less than 1.6 unit at 7% slip.

Rating plates shall be fitted to all motors and contain all the information required by BS 2613. The plates shall be manufactured from stainless steel or cast bronze. The lettering shall be stamped or deeply engraved such that corrosion will not cause premature obliteration.

13.3.9 Motor Starter

The appropriate automatic starters for all electric motors supplied under this contract shall be mounted in LT panels designed for flush or back mounting, as appropriate to the design of the panel. The starters shall be provided with an isolating switch auxiliary contacts as needed by the control and indication scheme and damp proof heating of the motors, magnetically operated air break contactors, under voltage release, and single-phasing prevention device. Each starter shall contain over-load trips, correctly set to afford protection to the motor which it controls. Protective devices against dry running of the Pumps shall also be provided in the same panel.

All starters shall be of adequate rating for the duty imposed on them and shall limit the starting current from 2-2.5 times of the full load current. All starter contactors shall have a double break per phase, with contacts arranged so that they can be easily renewed. Starters shall be provided with reset buttons, and time delay units etc. Wherever applicable.

13.4 LT PANELS

The contractor shall provide one LT-panel to be installed in the operator's quarter. The panel shall house all circuit breakers, pump starters etc. the panel shall be constructed and equipped as under:

13.4.1 LT Panel Construction

LT panels shall be supplied completely assembled and wired in accordance with the requirements of B.S.S 5472 or equivalent. These shall be of the totally enclosed, weather proof and vermin proof type, and shall be entirely suitable for work in climatic conditions as described elsewhere.

LT panels shall be constructed of steel plate not less than 14 S.W.G. and framed and braced in such a way so as to bear the weight of all equipment mounted in them without sagging, or distorting or springing under manual pressure and shall be provided with a substantial frame for floor mounting and shall be securely bolted in position.

Suitable provisions shall be made for access to the front and/or rear of the panels, and all doors shall be fitted with locks. All cable entries shall be through the base of the panels.

All meters, switches and other equipment shall be fully labelled externally and inside the panel in which they are mounted. All internal wiring shall be identified with numbered plastic tags. All wiring shall be carried down to terminal blocks of adequate rating, clearly ferruled in accordance with the diagrams, and suitable gland plates shall be provided for termination of cables.

All panels shall be equipped with internal panel heaters, as part of the internal wiring of the panel. These heaters shall be low wattage, metal sheathed type and shall be designed to maintain the temperature at a suitable value sufficient condensation when permanently in circuit; however, they shall be provided with an isolating switch to enable them to be switched off for maintenance purposes. This isolating switch will normally be inside the switch compartment to obviate misuse and inadvertent switching off.

All switches, handles, switch mounts, lock faces and push button surrounds shall be chromium plated, all panels shall be finished in high gloss sprayed paint to B.S.S. 4800 or equivalent in a shade to be specified by the Engineer. All panels shall be painted white internally.

Circuit breakers where provided shall be capable of being padlocked in the open position, these shall be provided with a handle may also serve as a position indicator.

Circuit breakers shall be equipped with thermal magnetic tripping devices. The thermal trip device shall be ambient compensating and shall have an inverse time current tripping characteristic suitable for proper protection of circuit conductors from over current heating. Magnetic trip devices shall be instantaneous and direct acting, adjustable over a range of 3 to 10 times rated current. The tripping devices furnished shall have suitably related time current characteristics so that tripping/fusing of only the nearest circuit breaker/or fuse ahead of the fault is assured.

100% spares shall be supplied whenever fuses are employed.

Copper buses shall be properly rated, rigidly supported in accordance with B.S. 159 or and equivalent good practice. They shall be adequately sized and ventilated and due allowance shall be made for loss of cross section due to drilling, fixing etc.

A Copper earth bus of adequate rating shall be provided in each LT panel near the base and a ground lug complete with connector shall be provided for connecting the earthing copper conductor.

All panels shall conform to the following specifications:

Supply voltage:	380 volts, 3 phase, 4 wire, 50 Hz
Breaking capacity:	50 Kilo Amperes
Neutral:	Solidly earthed

Phase Sequence & Colouring:	Red, Yellow and Blue
Small wiring:	3/0.036 (1.5mm) black PVC covered 660V grade wherever possible.
Relay cases:	Flush drawout if required.
Indication lamps:	Label alarm type
Designation Labels:	Engraved traffolyte white letter-in on a black background.
Current transformers:	As per B.S. 3938 or Equivalent
Voltmeter & Ammeters:	As per B.S. 89 or Equivalent
Moulded case circuit breakers:	As per B.S. 4752 Part I or Equivalent.
Miniature circuit breakers:	As per B.S. 3871 Part I or Equivalent.
Load break switches:	As per B.S. 5419 or Equivalent
H.R.R.C Fuses:	As per B.S. 88 or Equivalent

Tests

- (1) Type and routine tests as per B.S.S. 5419 or approved equivalent.

13.4.2 LT Panel Equipment

The LT-Panel shall be generally as shown on the drawings and shall have the following equipment.

13.4.2.1 Incoming Supply

- 1 - Three pole and neutral contact air circuit breaker rated at maximum of 200 Amps.
- 1 - Flush pattern ammeter suitably scaled
- 1 - Ammeter phase selector switch
- 1 - Flush pattern voltmeter suitably scaled
- 1 - Voltmeter phase selector switch
- 3 - Air insulated current transformers of suitable capacity for metering purposes.
- 1 - Set of cable terminations for power cables from below:
- 1 - Circuit label engraved "Incoming Supply"

13.4.2.2 Outgoing Circuits

Three outgoing circuit for pumps each equipped exactly as:

- 1 - Triple Pole load break switch with fuses of adequate rating.
- 1 - Set starting equipment comprising of contactors timers etc., to limit starting current to 2-2.5 times nominal current, in accordance with type of motor and starting mechanism supplied.
- 1 - Set of thermal overload trips
- 1 - Green coloured indicating lamp to indicate "Pump Running".
- 1 - Red coloured "Pump Stopped" indication lamp.
- 1 - Red coloured "Pump Trip" indication lamp.
- 1 - Start push button
- 1 - Stop push button
- 1 - Set of cable terminations for power cables.
- 1 - Set of terminal blocks for power cables.
- 3 - Circuit label engraved Pumps.

One outgoing circuit for Internal lighting Db.

13.5 L.T. WIRE AND CABLES

13.5.1 General

All cables for lighting and small power shall be PVC insulated at specified voltage grade complying with B.S. 6346 and /or 6004.

The cables purchased directly from the following manufacturers shall be used in the same preference order:

- M/s Pakistan Cables Karachi (subsidiary of BICC UK)
- M/s Newage Cables (Lahore)
- M/s Pioneer Cables (Karachi)

13.5.2 General Material Requirements

The cables shall be furnished and installed in accordance with the details shown on the drawings. The general guidelines and criteria for reference is given below:

- The polyvinyl-chloride (PVC) insulation shall comply with B.S. 6746.
- Conductor shall be stranded or solid high conductivity soft annealed electrolytic copper complying with B.S. 6360.
- The multi core cables shall be circular, PVC insulated and PVC sheathed.
- All single core cables to be run in conduits for light circuit, socket outlets and circuits operation upto 250 volts shall be 450/750 volts grade.
- The size of the wires shall be as follows:
 - a. Light or fan point wiring with .0024 sq.inch single core PVC insulated copper conductor wires.
 - b. Circuit wiring i.e. from Distribution board to switch board, will be with .004 sq.inch single core PVC insulated copper conductor wires.
 - c. Power plug wiring with .0096 sq.inch single core PVC insulated copper conductor wires direct from Distribution board.
 - d. All other cables shall be as shown on the drawing.

13.6 CONDUIT AND CONDUIT ACCESSORIES

13.6.1 PVC Conduits and Accessories

13.6.1.1 General

The conduit and its accessories for light and power wiring shall be of polyvinyl chloride (PVC) complying with Pakistan Standard PSI-1416, 1417 & BSS 3505/1968 Class O. Conduit and conduit accessories manufactured by Pakistan P.V.C. Limited under the trade name of "SHAVYL" are preferred.

13.6.1.2 Material Description

Manufactured smooth bends shall be used where conduit changes direction. Bending of conduit by heating or otherwise shall be allowed at special

situation only, for which approval of Engineer shall be necessarily required. The use of sharp bends and tees shall not be allowed. The bends shall have enlarged ends to receive conduit without any reduction in the internal diameter at joint. Round C.I. Junction Boxes shall be provided with one piece C.I. Cover plate which shall be installed on the box by means of Chromium plated screws. Pull box shall be installed in conduit runs, wherever required to limit the pulling length of cables. The Drawings are schematic and do not indicate the location of pull boxes.

13.6.2 Conduit Installation

13.6.2.1 General

The conduit shall be installed concealed in the surface of ceiling, wall and columns etc. as required. The concealed conduit shall have minimum 0.4 inch cover of concrete when concealed in slabs, walls and columns etc. In the RCC work the conduit shall be laid before pouring of concrete.

Under no circumstances shall conduit and accessories required for the electrification of the building be laid after pouring of concrete. The conduit to be concealed in RCC slab shall be laid above the bottom reinforcement steel of the slab and shall be securely tied with the reinforcing steel, in order to prevent it from being disturbed during the pouring of concrete. All conduit outlet boxes to be concealed shall be laid firmly flush with the soffit of the slab or beam.

Where the conduits have to be concealed in brick work chases shall be made with appropriate tools and shall then be fixed firmly in the recesses and covered with cement concrete mixture to have at least 0.4 inch cover before plastering. The work of cutting in the cement concrete or brick work shall be co-ordinated with the civil work. The Contractor shall obtain approval of the Engineer for chasing and cutting.

13.6.2.2 Pull Boxes and Adaptable Boxes

Pull boxes and adaptable boxes shall be provided in conduit runs wherever required to facilitate pulling operation. The drawings are diagramatic and do not indicate the position and spacing of pull boxes or adaptable boxes. However, these shall meet the following requirements.

- Pull boxes
- For straight runs the spacing shall not be more than 66 feet.
- For runs with one 90 degree bend, the spacing shall not be more than 50 feet.
- For runs with two 90 degree bends, the spacing shall not be more

than 33 feet.

- Adaptable boxes

For conduits up to 0.1" dia the boxes shall be 2" in depth.

For conduits up to 1.6" dia the boxes shall be 2.5" in depth.

For conduits up to 2" dia the boxes shall be 2.7" in depth.

The rectangular inspection boxes or pull boxes shall be 16 SWG heavy gauge sheet steel of suitable design to receive conduits. The box shall be painted inside and outside with black enamel paint over a base coat of red oxide primer paint. The minimum length of inspection box shall not be less than four times the cable manufacturer recommended bending radius of the cable. All concealed type pull boxes shall have a white plastic sheet of appropriate size fixed to the box by means of galvanized screws.

Adaptable boxes shall be 16 SWG sheet steel and painted and finished to the same quality as the lighting distribution boards.

Wherever the conduit lengths cross the expansion joint either along the columns or slab, suitable arrangement shall be provided so that when the conduit lengths in the expansion joints are stressed, the conduit shall not crack or break.

13.7 INSTALLATION OF WIRES AND CABLES

13.7.1 General

The wiring shall be started only after the conduit system is completely installed and all outlet boxes, junction boxes, submain boards etc. are fixed in position. All installation material such as lugs, solder, identification tags, pins, clips, straps, lubrication etc. shall be provided without any additional cost to the Employer. The wires shall be pulled in conduit with care, and to facilitate pulling, the cable manufacturer's recommended lubrication shall be used for decreasing friction. Use of any kind of oil or soap will not be permitted. Where several wires are to occupy the same conduit, they shall be pulled together. The wires shall not be bent to a radius less than ten times the overall diameter of the wire.

13.7.2 Wiring Methodology

The wiring shall be continuous between terminations. The looping in system shall be followed throughout. The use of connectors will be allowed only at locations where looping-in is rendered difficult. The consent of the Engineer in writing will be required for use of connectors.

The connectors shall be of porcelain/PVC body, having sunk in screw terminals and terminal taps after its installation.

13.7.3 Small Accessories

Terminal lugs, sockets, thimbles, insulation tapes, etc. required for terminating wires shall be provided by the Contractor without any additional cost. The wires inside switch board or control boards shall be securely laid in a neat arrangement.

13.8 CEILING FANS

Ceiling fans shall be capacitor type, five speed adjustments suitable for 230V, single phase, 50 Hz. The minimum air displacement shall be 6300 ft³/min for 48" sweep and 7940 ft³/min. for 56" sweep at maximum speed. The fan motor shall be capacitor type and bearings shall be groove type to give noiseless operation. The fan regulator shall have laminated high grade sheet steel and shall have five speed marks and one "OFF" mark. The regulators shall be recessed mounting type. The fan and regulator shall be of 'Asia', 'Millat delux' or 'Climax' maker or as approved by the Engineer.

The fan hook shall be made of 5/8" dia mild steel rod bent to shape of approved design. It should be in the form of loop about 3 -1/4" long and about 2" wide. The rod shall be bent to have at least 8 inches extension on both sides for tying to the reinforcement steel of the slab. All ceiling fans shall be of one make only. The hook shall be tied "so as not to be disturbed during pouring of concrete.

Installation of fan shall include fixing of down rod, clamp, fan, blades, fan regulator and extension of wiring through down rod from ceiling rose to fan terminals, testing and commissioning.

Any scratches on the body of the fan or fan rod appearing during installation shall be cleaned and painted properly with same quality paint as provided by the manufacturer.

13.9 LIGHTING FITTINGS

13.9.1 General

Light fixture schedule is provided in the drawing along with catalogue number of the manufacturer which are meant to serve as illustrations of the types of fixtures required for various applications. The Contractor shall be required to submit samples of each and every light fixture for the approval of the Engineer before supplying the fixtures. The Contractor should be prepared to carry out any number of modifications and improvements in the submitted sample free of cost until a finally acceptable sample is produced. Mass production shall be taken in hand only when a finished and modified sample has been produced

and approved in writing by the Engineer. The Contractor has the option to offer acceptable equivalent of specified light fixtures.

13.9.2 Fluorescent Fitting Accessories

The fluorescent light fittings shall have lamps of proper type and wattage as specified in the items of Bill of Quantities. The fluorescent lamps shall be 4 ft. 40 watts and 2 ft. 20 watts as required. The fluorescent colour shall be white, cool day light or daylight in that order of preference. The lamps shall be of PHILIPS make.

Fluorescent lamp lighting fittings shall be equipped with power factor correction capacitors to give p.f. equal to 0.9 or better. The various combinations of the capacitors will be:

- i) For 1x40 watt fixture 4.5 micro farad capacitor at 250 volts.
- ii) For 2x40 watt fixture 3.71 micro farad capacitor at 250 volts.

The ballast shall be per coil or polyester filled type, totally enclosed, and suitable to operate on 230V, 50 c/s single phase supply. The power loss shall not be more than 10 W. for 40 W ballast. Wiring diagram, wattage, voltage and current figures shall be printed on the body of the ballast. The ballast shall be noiseless in operation without any whistling sound. The lamp holders shall be rotary, lock-in type.

The starter shall provide ample preheating of the fluorescent lamp electrodes prior to ignition so as to have favourable effect on the life of lamp with a minimum of end blackening. The starters shall be PHILIPS or approved equivalent type. An earthing terminal shall be provided on the body as per safety regulations. Ceiling roses shall be provided for all light fittings.

The internal wiring of the light fixture shall be carried out at manufacturers factory with heat resistant wires of size not less than .0024 sq.inches

13.9.3 Fluorescent Fitting

The industrial type fittings shall have sheet steel reflector white stove enamelled inside and outside. The sheet steel for the body of the luminair shall be of 22 SWG and for the Reflector it shall be of 24 SWG. Appropriate size bushed wire entry holes, fixing holes, etc. shall be provided. The pendant type fittings shall have 2 Nos. 12.5mm (1/2") dia chromium plated tube pendants with fixing plates as required. The plastic diffusers of fluorescent light fittings shall be of high quality "Perspex" and the louvers shall be of moulded plastic of minimum 0.08" thickness.

13.9.4 Lighting Fixtures Installation

The mounting heights and position of light fixtures shall be as indicated on the drawings.

The Contractor must ensure that the light fixture 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.

13.9.4.1 Fluorescent Light Fixtures

The fluorescent light fixtures on the surface of ceiling/walls shall be installed with back of the body flush with the ceiling surface, and in a manner so as to facilitate wiring.

Nylon plugs and galvanized steel bolts or screws shall be used for fixing the light fixture to the ceiling.

The wiring between ceiling rose and fixture shall be with two core .0015" Sq.inch flexible cable, PVC insulated.

13.10 WIRING AND ACCESSORIES

13.10.1 Switches

13.10.1.1 General

The switches shall be piano type having silver tipped contacts and shall operate with snap action. Switches manufactured by Pakistan/Premier Plastic Industries or approved equivalent shall be installed.

13.10.1.2 Indoor Type Switches

Switches for controlling light and fan points shall be single pole, rated for 5 Amps, 250 volts a.c. The body of the switches shall be of bakelite with white face plate suitable for flush mounting on a sheet steel outlet box. The switches shall be piano type having silver tipped contacts and shall operate with snap action.

Unless otherwise specified wherever switches control only the light points, these shall be plate type gang switches installed on common outlet boxes.

For locations where switches and fan regulators are installed together, single switches shall be grouped and fixed on 0.2 inches thick plastic sheet screwed to a sheet steel box of appropriate dimensions. The fixing of plate on outlet boxes shall be by means of flat head screws flush with the surface of the plate.

All switches (other than those used for lighting control) shall be identified by the inclusion of appropriate engraved symbols on the operating levels.

The fixing of switch plate on outlet boxes shall be by means of flat head countersunk brass screws with the head of the screw finish flush with surface

of the plate.

13.10.2 Switch and Socket Units

Switch and socket unit shall be 3-pin rated for 15-A or 5A 250V, 50 Hz ac. These shall be moulded type with white plastic face plate and suitable for mounting recessed on wall or columns on a 16 SWG sheet steel box of appropriate size, to be fixed recessed in the wall or column. The sheet steel box shall have conduit entry holes and an earth terminal to connect 3/036" wire as earth continuity copper conductor. Each socket shall have its control switch by the side of it on a board and thus the complete unit specified in.

13.10.3 Outlet Box

The outlet boxes for installation of switches, fan regulators and socket outlets shall be 16 SWG sheet steel having appropriate dimensions. The box shall have suitable arrangement for receiving the conduit. An earth terminal shall be provided for connecting the earth wire. The outlet box shall be given two coats of anti-rust red oxide paint. All sheet steel outlet boxes shall have conduit entry holes and earth terminals for connecting 14 SWG earth continuity copper conductors.

13.10.4 Ceiling Rose

The ceiling rose shall be suitable for 5 amps. 250V single phase a.c It shall have white plastic moulded base plate, copper or brass terminals for wiring with 7/029" cable. The ceiling rose shall have a cover with cable inlet hole.

13.10.5 Installation of Wiring Accessories and Fans

The mounting heights of all wiring accessories fixtures are stated on the drawings. In case the mounting height is not mentioned, the instructions of the Engineer shall be obtained before fixing.

13.10.5.1 Switches and Sockets

Switches and switch sockets units shall be installed on .065 inches (16 SWG) thick sheet steel box for surface mounting or recessed in wall. Where switches and fans grouped together and installed on a common plastic sheet shall be fixed flush with the surface of the box. The fixing of plastic sheet on sheet steel box shall be by means of flat head galvanized screws sunk in the plastic plate so as to finish flush with surface. The edges of the plastic plate shall be chamfered.

13.10.5.2 Ceiling Fan

The installation of fan shall include fixing of blades, down-rod, clamp, canopy, fan regulator, including testing and commissioning. The down rod

shall be of required length having long threads and shall be provided with check nuts to secure it firmly with the clamp and with the body of the fan. A split pin shall be provided both at the fan body end and at the clamp for safety.

Any scratches on the body of the fan or fan rod appearing during installation shall be cleaned and painted properly with the same quality paint as provided by the manufacturer.

13.11 EARTHING SYSTEM

13.11.1 Earth Continuity Conductor

The earth continuity conductors and earthing leads shall be solid hard drawn, bare electrolytic copper wires of sizes given on the Drawings. All fixing accessories such as copper earth clips, sockets, lugs, thimbles etc. shall be provided. The sizes above 8 SWG shall be of standard copper wires.

13.11.2 Earth Electrodes

The earth point shall comprise of a 2'x2'x0.2" thick electrolytic copper plate, tinned for protection against corrosion. The edges of the copper plate shall be chamfered. The plate shall have two terminals for connection earthing leads to earth electrode. The terminals shall comprise 5/8" dia. copper bolt and nut and double washers.

13.11.3 Earth Connecting Point

The earth connecting point or substation earth bar shall comprise 1'x2'x0.32" electrolytic copper bar having four terminals of 0.4" dia. copper bolts, nuts and washers. The fixing bolts of brass shall be provided for fixing the bar on the wall. The bar shall be tinned for protection against corrosion.

13.11.4 Earthing by Earth Rods

The earth rod shall be of mild steel and shall be protected against rusting by a thick exterior layer of copper (not less than 0.013"), permanently molten or electrolytically deposited on a high strength steel core which shall provide rigidity for easy drilling without Bending.

13.11.5 Earth and Dimensions

The earth rod shall have nominal dia. of 0.63" with chamfered head of (0.24"x0.16" chamfer). The overall length of earth rod shall be (10"x0.2").

13.20.6 Earthing Installation

The earth continuity conductors shall be installed all along the length of conduit on the outer surface of conduit by means of copper earth clips. The copper earth clip shall be made of 22 gauge copper sheet bent into a loop and provided with 1/8" bolts and nuts for fastening. The earth continuity

conductor on cable tray shall be laid along the power cables throughout the length. It shall be connected to cable tray at every 8 ft. interval. At terminations the earth continuity conductor shall be bolted firmly and effectively to the body of the switch board. Where an earth connecting point and earth connection to the body of the switch board shall be taken from the connecting point. Before making earth connections to the body of the switch board or any metallic body, the body at the point of connection shall be thoroughly cleaned to the bright metal surface. The earth continuity copper wires shall be brazed or cad welded to the connecting socket. The use of solder will not be allowed.

13.11.7 Earth Plates

The earth plate or earthing set shall be buried underground upto the natural water level. The plate shall be erected upright in the excavated pit and shall be surrounded by charcoal and lime packed hard 1.0 foot around the plate. If the water level is not found upto the depth of 15 feet then artificial earth point may be made. The artificial earth point shall be similar to the normal earth point except that watering arrangement shall be made for keeping the earth damp around the plate.

13.11.8 Earth Leads

At all earth points including transformer neutral earth, two earth leads of standard hard drawn copper wires of 8 SWG shall be installed between the connecting point and the plate. The earth lead shall be laid in a 2" dia G.I. Pipe upto the earth plate. The wires shall be connected at both end by means of copper sockets, and bolts. Water chamber shall be provided as shown on the Drawings.

13.12 ACCESSORIES

13.12.1 Pressure Gauges

The Contractor shall supply with each pump two pressure gauges to show suction and delivery pressure. The pressure gauges shall comply with B.S. 1980 Part 2 or equivalent showing pressure in feet of water and shall have an accuracy of 1% over the full working range.

Gauges shall have dials not less than 6" in diameter and shall be provided with isolating valves and valves for releasing air from connection pipes.

Each gauge shall have its serial number clearly marked on its face and shall be clearly labeled as to what pressure it shows and level above or below which it reads.

13.12.2 Delivery Pipe work

All pipe work, valves & fittings at suction and delivery sides and the delivery manifold shall be of cast iron conforming to B.S. 2035 or as mentioned in BOQs and drawings. The Contractor shall indicate on his detailed drawings thrust blocks that are required to anchor pipe work to suit his particular plant.

Puddle flanges shall be fitted to pipes where the structure through which they pass is required to take thrust resulting from the pipe. Puddle flanges shall also be fitted where a water barrier is required. All puddle flanges shall be clearly shown on the Contractor's drawings and the resultant thrust clearly indicated. Puddle flanges shall only be fitted with the Engineer's prior approval.

All necessary supports, saddles, slings, fixing bolts and foundation bolts shall be supplied to support the pipe work and its associated equipment in an approved manner. Valves and other devices mounted in the pipe work shall be supported independently of the pipes to which they connect. Brackets or other forms of supports which can conveniently be so designed, shall be rigidly built up of steel welding in preference to the use of castings.

The Contractor shall be responsible for setting in position any pipes and fittings to be built into the various structures in accordance with the Drawings or as directed by the Engineer.

13.12.3 Spare Parts

The Contractor shall provide the required and recommended spare parts for at least three years service under normal anticipated running conditions. Each item shall be described in Schedules and shall be priced separately.

All spare parts shall be interchangeable with the corresponding part of the plant and each shall bear a corrosion proof label giving adequate description for its rapid identification.

13.12.4 Spanners and Special Tools

The contractor shall provide for each pumping station all necessary spanners, eye bolts and special tools or appliances necessary for easy erection, dismantling or adjustment of the plant in the station. The Contractor shall submit details describing each item and the purpose for which they are intended. The spanners, eye bolts and special tools or necessary appliances shall form part of supplies at no extra cost to the Owner.

13.12.5 Guide Bars and Hoisting Machinery

Each pump shall be provided with guide bars to pull the pump out of the chamber as shown on the drawings. The guide bars shall be such to allow easy sliding of pump when it is pulled upwards. These guide bars shall also guide the delivery outlet of the pump to the delivery pipe. Each pumps station shall be equipped with a tons capacity chain pulley, supported on girders as shown on

drawings for the hoisting purpose.

13.13 ENGINEER'S DESIGN AND LAYOUT OF THE PUMP STATION

In selecting the sewage pumps and offering his designs the Contractor shall ensure that no significant changes are required to the basic requirements, overall dimensions of the pump house as shown on the drawings other than those necessary to produce a sound engineering installation. The Contractor shall however, be responsible for the detailed design and layout of the pumps.

13.14 RECORD DRAWINGS

During the course of the work, the Contractor shall maintain a fully detailed record of all changes from the approved drawings in order to facilitate easy and accurate preparation.

The final record drawings shall show the complete works including pipe work and cables. The scales employed shall be such that all details are legible. The drawings shall clearly show the names of plant manufacturer, giving models and type numbers, and all details of plant and machinery, duty ratings, sizes, current settings, fuse ratings etc. of all items of plant including electrical distribution, cabling and wiring installations.

At the end of the contract the Contractor shall provide two copies of all drawings and schedules correctly modified as final record drawings. These shall be submitted to the Engineer for approval before the date of takeover of the works and shall be a complete record of the installations. After approval, the Contractor shall provide one reproducible and five ammonia prints of all record drawings and schedules within four weeks of the completion of the works and parts lists with ordering information. Six (6) copies shall be provided.

13.15 OPERATING INSTRUCTIONS

Complete operating and maintenance instructions shall be furnished for all equipment included in these specifications. The maintenance instructions shall include trouble shooting data, preventive maintenance schedule, and complete spare parts lists with ordering information. Six (6) copies shall be provided.

13.16 PACKING AND TRANSPORTATION

All parts and equipment shall be packaged and/or otherwise protected against damage and deterioration during transit or during prolonged periods of exposure to the climatic conditions at the job site. All finished, unfinished, painted and unpainted surfaces shall be protected.

All equipment and parts shall be protected from the entrance of water during

transportation and storage. All equipment factory tested with water shall be completely drained before transportation.

Factory assembled parts and components shall not be dismantled for transportation unless permission is received from the client.

13.17 OPERATION AND MAINTENANCE MANUALS

The Contractor shall provide fully detailed Operation and Maintenance Manuals covering all parts of the pumps and motors.

13.18 GUARANTEE

Equipment furnished under this section shall be guaranteed for a period of one year from date of acceptance thereof against defective material design and workmanship, upon receipt of guaranteed period, new replacement of part or parts shall be furnished promptly by the Contractor at no additional cost.

13.19 TESTING AND COMMISSIONING

13.19.1 Works Testing

13.19.1.1 Operating Tests

All motors shall be individually tested for performance at the Manufacturer's Works in accordance with B.S. 5000, Part 99 or equivalent standard and the motors and pumps coupled together shall be tested at the Manufacturer's works in accordance with B.S. 599:1966 (to Class E accuracy), or equivalent standard.

The contractor shall satisfy the Owner regarding the accuracy of all instruments used for these tests and shall produce current test certificates, or otherwise have them calibrated at his own expense by an approved independent authority.

13.19.1.2 Tests during Manufacture

The Contractor shall carry out during manufacture all tests specified in the relevant British or Equivalent standard and shall forward to the Engineer duly certified copies of the test results and certificate stating that the equipment and materials comply with the relevant British or equivalent Standard. In case the Owner decides to carry out any factory tests in the presence of specialized experts, the contractor shall be required to arrange tests in the presence of such experts at contractor expense.

13.19.1.3 Hydraulic Pressure Tests

The pump casing, pipe work, and all other parts of the installation subject to

pressure shall be hydraulically tested at Manufacturer's works to at least twice the maximum permissible working pressure.

The contractor shall give not less than twenty clear days notice in writing of the time, date and place of all impending tests so that the Owner or his Representative may be present to witness such tests.

The Contractor shall furnish test certificates in triplicate for all tests whether witnessed or not.

13.19.2 Site Testing and Inspection

On completion of erection the Contractor shall satisfy himself that the pumps are operating correctly. The Engineer or his representative will carry out an inspection and witness tests to ensure pumps, motors and appurtenances have been supplied and installed in accordance with the specifications and that the mechanical and electrical performance are in accordance with the guarantees.

Should any part of the installation not comply with these specifications or the workmanship prove unsatisfactory, the Contractor shall take immediate steps to remedy the deficiency to the satisfaction of the Engineer.

The Contractor shall provide all necessary equipment, tools, materials, labour and consumable items for the due performance of all tests and commissioning procedures. Adequate safety barriers and warning notices shall also be provided to ensure the safety of all personnel conducting or in the vicinity of any tests.

Not less than three weeks before carrying out any tests, the Contractor shall submit for the approval of the Engineer a detailed description of the tests to be carried out.

In addition to any specific tests required on items of plant, as detailed elsewhere in these specifications, the following tests shall be carried out:

- a) Pumps shall be tested for adequate performance including hydraulically and electrically to demonstrate that they function as designed.
- b) All pipe work, valves, etc., shall be pressure tested at 150 percent of design pressure.
- c) Load tests shall be carried out on all lifting equipment at 125% of rated load.
- d) All electrical installations shall be tested.
- e) All alarm systems, overloads and safety equipment shall be tested for simulated conditions.

- f) Greasing and lubrication systems shall be tested.
- g) All switchboard, motor control centers, control panels and distribution boards shall be tested for proper installation and functioning.
- h) The performance of the pumps shall be tested to conform to rating curves.
- i) Any other tests required by the Engineer.

13.19.3 Commissioning and Acceptance

When each part of the pump station has been satisfactorily set to work, the Contractor shall commission the whole of the Work.

The commissioning period shall continue until such time as the performance guarantees have been proved for each item of plant for seven consecutive days.

During the whole of the commissioning period, the Contractor shall supply all labour to supervise, operate, keep in operation, adjust, test, maintain, repair and do all things necessary to keep the Works running whether the Works is operated on output to waste or re-circulated into supply, and shall include for the provision of such labour on a hour-a-day continuous basis during the testing period and for such other periods as may be necessary for retesting or the proper testing the whole or separate parts of the Plant.

13.20 MAINTENANCE PERIOD

During the Maintenance Period the Contractor shall comply with the provisions of the Conditions of Contract but shall not be held responsible for the operation of the Work, the carrying out of routine maintenance or for any renovation due to fair wear and tear.

In addition to any visits necessary to comply with his responsibilities during the maintenance period, the Contractor shall include for two visits to the Works by a competent Engineer and/or other specialist representative who shall inspect all plant, provided under the Contract and service, adjust and re-calibrate as necessary all items requiring attention. The visits shall be for a period of not less than two days.

13.21 PAINT AND FINISHING

Painting and finishing of equipment and cast iron pipe work shall be as under:

- a) Before erection, drive motor, pumps and all other major equipment components shall be painted with a prime coat and two finish coats of high quality machine enamel.

- b) All scratches and damages in painting and finishing shall be repaired by applying primer and finish paint in the field after erection to the entire satisfaction of the Engineer.

13.22 MEASUREMENT AND PAYMENT

Measurement and payment for the civil, mechanical and electrical works will be made in accordance with the provisions of the clauses specified hereinafter.

13.22.1 Measurement

a) Civil Works

Measurement of various items of building work and sewage pumping main will be made in accordance with the relevant sections of specifications and as shown in Drawings or as directed by the Engineer. No measurement of quantities for the electrical items will be made.

b) Electrical & Mechanical Works

Measurement of various items of Electrical & Mechanical works will be made as under.

Measurement for non-clogging submersible pumps will be made for the number of pumps successfully installed and tested complete in all respects.

No measurement for LT-panel and power cables upto each pump motor will be made. Lump sum will be the basis for payment.

No measurement for suction & delivery pipe work, manifold upto the A.C. piping main, support brackets etc will be made. Lump sum will be the basis for payment.

No measurement for the electrification of the pump house building will be made. Lump sum will be the basis for payment.

13.22.2 Basis of Payment

a) Civil Works

Payment will be made in accordance with the Unit Price in the Bill of Quantities for the various items in accordance with the specifications and shall constitute full compensation for furnishing all materials equipment and labour and for performing all operations necessary to complete the work.

b) **Electrical and Mechanical Works**

The items will be paid for at the contract unit price which price and payment shall be full compensation for furnishing, installing and commissioning all machinery and equipment for Electrical and Mechanical works complete in all respects as shown on the Drawings including all labour, tools, equipment and incidental to complete the work.

Description

Unit

Provide, install, successfully test and commission non-clogging submersible pumps and electric motor, coupling & guide bar, duck foot bend etc. complete in all respects as per drawings and specifications.

Each

Provide and install LT-Panel and power cables upto each pump motor including earthing of pumps/motors as per drawings and specifications.

As specified in BOQ

Electrification of Pump Station complete in all respects including earthing of distribution board as per drawings and specifications.

As specified in BOQ

SECTION - 14

CONSTRUCTION OF TUBEWELLS

14.1 SCOPE

The work covered by this Section of the Specification shall consist of all plant, labour, equipment, appliances, materials etc. as necessary for the well drilling, installation of materials, well completion, development, testing and miscellaneous work required for the satisfactory completion of all work involved with the construction of tubewells for water supply system.

14.2 DRILLING

14.2.1 General

The Contractor shall drill each bore hole for water supply wells at the location established in the field by the Engineer. The Contractor shall prepare the site for the construction of the tubewell and shall provide for the disposal of water, cuttings, and refuse from his operations away from the tubewell.

14.2.2 Drilling Procedure

The bore hole shall be drilled by the revers circulation rotary method with a minimum drill bit diameter of 22/ 18 inches as per project requirement mentioned in Bill of Quantities. The contractor at his own risk and with the permission of the engineer may adopt other method of drilling at locations where sub-surface conditions are such that the reverse circulation rotary method is not feasible or suitable in which case the contractor shall not be entitled to any extra claim. Each bore hole shall be drilled to the depth specified by the Engineer. It is anticipated that the depth of tubewells will vary; however, no minimum depth for any individual tubewell or average depth for all tubewells is guaranteed. The bore holes shall be drilled sufficiently straight and plumb so that the pump and tubewell casing may be installed concentric with the hole and within the tolerance specified for plumbness of the casing. Waste materials from the drilling operation shall be disposed off in a manner approved by the Engineer.

The Contractor shall be responsible for protecting the tubewells from contamination by foreign material until the completion of the tubewell. The Contractor shall bear any expense that may result from damage to any tubewell, tools, or equipment that may be caused by caving, washing, or other disturbances within the tubewell.

Where necessary to prevent sloughing and caving of surface material, the Contractor shall furnish and install a conductor casing with a minimum diameter 2 inches greater than the bit diameter not less than 6 inches above the ground surface upto a sufficient depth to encounter firm material. The conductor casing shall be new or

used pipe of adequate strength for the purpose. After the drilling is completed, the conductor casing shall be removed by the Contractor and shall remain his property.

If unstable material is encountered during drilling, the Contractor shall stabilize the material in a manner approved by the Engineer. The use of drilling fluid additives or other suitable materials specially approved by the Engineer may be employed in stabilizing the bore hole. All temporary casing shall be removed by the contractor in 5 to 10 feet stages as ground shrouding is placed. If in the opinion of the Engineer, it is necessary to discontinue work on any bore hole because it is out of line more than the amount specified or on account of jammed tools, caving ground, or because of negligence on the part of the Contractor, the Contractor shall drill another bore hole at an alternative location designated by the Engineer. The Contractor will not be entitled to payment for any work done or materials furnished for bore holes abandoned as a result of his operation or negligence.

14.2.3 Data and Records

The Contractor shall keep an accurate drilling log of each bore hole including a description of all materials encountered and their location in the bore hole. The fact that the Engineer or his representative may be present and keeping a separate record shall not release the Contractor from this responsibility.

In the case of defective or incomplete records the Contractor shall complete the records at his own expense. All records and data shall be kept by the Contractor on forms approved by the Engineer. The Contractor shall deliver to the Engineer the original of all records.

14.2.4 Sampling

Representative ditch samples or cuttings of the material penetrated shall be taken at every 5' interval or at each change in lithology encountered which ever is less of the bore hole. Special care shall be exercised to determine the thickness and location of each change in material encountered and to obtain satisfactory samples. Immediately upon taking each sample, the sample shall be placed in a plastic or cloth bag, partitioned wooden box or other approved container, properly marked for identification, and plainly labeled with the depth of the top and bottom of the section of the bore hole represented. The containers shall be furnished by the Contractor. The method of obtaining, processing, and storing the samples will be subject to approval by the Engineer. The Contractor shall deliver all samples to the Engineer at the site of the tubewells, except that when requested to do so by the Engineer, the Contractor shall deliver specified samples to the Engineer's field headquarters.

14.3 INSTALLATION OF WELL CASING

14.3.1 General

Installation of casing shall consist of all work required in connection with the installation of casing pipe, comprising mild steel housing pipe, blind pipe, reducer, sand trap and brass screen required for each tubewell as specified herein or on the Drawings or as directed by the Engineer and shall include, but not be limited to storing, fabricating and installing all pump housing and tubewell casing including concentric reducers.

14.3.2 Materials

14.3.2.1 Pump Housing Pipe

Pump Housing Pipe shall be of mild steel of designated diameters and wall thickness indicated in the drawings or BOQ. The pipes shall be made from steel plates conforming to ASTM Specifications A-53/79.

The pipes shall have beveled ends. The pipe shall be furnished in standard lengths of 16 ft. and shall be painted outside with antirust chemical. All pipes shall be free from dents, injuries, scars and ovalities.

The housing pipe shall be installed to extend a minimum 3' above ground level in addition to the housing as specified by the final design below ground level.

14.3.2.2 Well Blind Pipe

Well blind pipes shall be of fiber glass or as mentioned in BOQs and drawings. Well blind pipes shall be of designated diameters as indicated in the drawings. The manufacturing company approved for ISO 9001-2008 for fiber glass pipes and strainers.

14.3.2.3 Reducer

For connecting M.S. housing pipe and well blind pipe at depths below ground level a transitional reducer shall be provided and made of the same material and of the same thickness as used for well casing specified above. The ends of the reducer shall be suitable for welding to the pump housing and well blind pipe.

14.3.2.4 Sand Trap/Bail Plug

Sand trap shall be of the same material and thickness as followed for well casing. Sand trap shall be provided with a base plate, welded at one end of the pipe. A steel hook bent in the form of 'U' shall be bolted to the base plate to sustain a maximum suspended length of 500 ft. of well casing. Sand trap shall be 10 feet long in sizes as indicated in the drawing.

14.3.2.5 Well Screen

Well screen shall be of fiber glass or as mentioned in drawings suitable for gravel pack tubewell and strong enough for location at a depth not exceeding 400 ft. below ground level. The strainer shall have minimum open area of 10 percent, minimum wall thickness of 0.25 inch and slot size of 0.04 inch. The slots shall be of a shape that produces an opening of a 'V' form, narrow on the outside and wide on the inside. The openings shall be free from jagged edges, irregularities or any thing that will accelerate or contribute to clogging or corrosion of the screen. The manufacturing company approved for ISO 9001-2008 for fiber glass pipes and strainers.

14.3.3 Fabrication

The depth of pump housing casing will be established by the Engineer for each tubewell depending on the future water levels and draw down anticipated. Lengths of the specified diameter of steel casing shall be provided to extend the pump housing casing from the elevation of the top of the pump housing casing to the depth established by the Engineer.

Adjoining sections of pump housing casing shall be assembled by field welding. The ends of the casing sections shall be lathe turned or otherwise prepared for jointing. All field welding shall be performed by the electric arc method, using heavily coated welding rods suitable for all-position welding. After being welded, the welds shall be cleaned of slag and shall show uniform smooth sections, feather edges without overlap, and free from porosity and clinkers. The pump housing casing shall be connected to the tubewell casing by means of a concentric tapered reducer having a minimum length of 24 inches.

The length and sizes of tubewell casing to be installed shall be specified for each tubewell by the Engineer and shall be sufficient to extend from the bottom of the housing casing to the bottom of the tubewell. The bottom of the tubewell casing shall be provided with bail plug as shown on the drawings.

The tubewell casing shall consist of slotted sections for installation opposite water yielding formations and plain pipe sections or bail plug opposite non- water yielding formations as directed by the Engineer.

14.3.4 Installation

The Contractor shall install the entire pump housing and tubewell casing assembly straight, plumb, and concentric in the drilled hole to permit the installation of the pump in such a manner that it will operate satisfactorily and without damage. The methods employed by the Contractor in the installation of the casing and in obtaining or correcting the verticality and straightness of the pump housing casing shall be subjected to the approval of the Engineer.

Centralizers, spacers or other suitable devices shall be attached to the tubewell

casing so that it will be centered in the drill hole throughout its entire length and held in such position while gravel shrouding is being placed. Centralizers shall be attached to the pipe in a manner that ensures that the pipe is accurately centered in the drill hole. The detail design of centralizers and the method of attachment to the pipe shall be subject to the approval of the Engineer. Unless otherwise directed centralizers shall be spaced at no more than 60 ft. along the overall length of screen and casing assembly.

The Contractor shall install the pump casing so that the deviation of its axis from the vertical shall not exceed 4 inches at the bottom of the pump housing casing. Measurements for determination of verticality and straightness of the pump housing casing shall be made by the Contractor in the presence of the Engineer upon completion of the gravel shrouding.

Measurements for determining the deviation of the pump housing casing from the vertical shall be made by the use of a circular plumb having a minimum outside diameter of 1 inch less than the inside diameter of the pump housing casing. The plumb shall have vertically and shall be suspended in the centre of the pump housing casing from a point 10 ft. above the top of the casing. When the plumb is lowered to the bottom of the pump housing casing, the line from which the plumb is suspended shall not deviate from the centre of the pump housing casing at the top by more than corresponding to a deviation of the plumb 4 inches at the bottom of the pump housing casing. All deviations shall refer to a vertical line passing through the centre of the pump housing casing to the top of the pump housing casing.

Straightness shall be determined by lowering a section of pipe 40 ft. long or a dummy of the same length to the bottom of the pump housing casing. The minimum diameter of the pipe or dummy shall be 1 inch less than the inside diameter of the pump housing casing. If a dummy is used, it shall consist of a rigid spindle with three cylindrical rings, each ring having a height of at least 12 inches. The rings shall be true cylinders and shall be located at each end and in the centre of the dummy. The central shaft of the dummy shall be rigid so that it will maintain the alignment of the axis of the cylindrical rings. The pump housing casing shall be sufficiently straight so the pipe or dummy can be passed freely throughout the entire length of the pump housing casing. Plumbs, pipes and dummies used in these tests shall be approved by the Engineer.

Any tubewell failing to meet the specified requirements for straightness, verticality and concentricity shall be abandoned, and the Contractor shall construct a new well at his own expense at an alternative site designated by the Engineer.

After completion of installation of the pump housing casing and approval of the installation by the Engineer, the Contractor shall paint the letter and number designation of the tubewell on that portion of the pump housing casing which projects above the ground surface. All paint, brushes, stencils and other materials required shall be furnished by the Contractor. The characters shall not be less than 6 inches shall be painted with lines 1 inch wide, and shall be positioned on the casing

in accordance with the Engineer's instructions.

14.3.5 Gravel Makeup Pipe

A 3 inch diameter (pvc or as mentioned) in drawings gravel makeup tremie pipe with capped upper end shall be attached to the upper pump house casing to extend from 3 feet above ground level to penetrate the full length of the upper grout seal. The tremie pipe shall be attached to the pump house casing by means of welded straps spaced no less than to provide four support straps spaced over the length of the pipe. Support shall be sufficient to hold the pipe in place until placement of the upper grouted seal has been completed. The configuration shall be in accordance with the drawings and the pipe shall be located so as to be at 90 degrees to the direction of the pump outlet.

14.4 GRAVEL SHROUDING

14.4.1 General

Gravel shrouding shall consist of all work required in connection with supply and placing of gravel shrouding in annular space between the walls of the drilled hole and the outside of the pump casing. The work shall include, but not limited to development of source, excavation, stock piling, grading, washing, storing, transporting and placing of gravel shrouding as specified herein or as directed by the Engineer.

14.4.2 Gravel Source

The Contractor may obtain gravel from any source or location subject to the approval of the Engineer provided that the gravel meets the requirements of the specifications. The Employer will not be responsible for the amount of work involved or the amount of materials wastage in order to obtain the required amount of gravel of proper gradation.

14.4.3 Specifications

The gravel shrouding shall be clean, washed, water worn, hard, well rounded of siliceous material and without platy particles free from gypsum shale under no circumstances shall contain >5% calcareous material. The gravel supplied shall be subject to inspection and screening in the field to ensure proper gradation suitable to the formation. The gravel shall be reasonably graded and shall conform to the following requirements:

TYPICAL GRADING

U.S. Standard Screen Number	Percentage Passing
3/8 inch	100
No.4	75-100
No.8	35-65
No.14	05-30
No.16	00-15
No.35	00-0

14.4.4 Placing of Gravel

Gravel shall be placed at constant rate using tremie pipe, hoppers or other similar devices to provide a continuous and uniform gravel flow so as to minimise segregation of particle sizes. When tremie pipe or hoppers are used, gravel shall be introduced in the annular space between the pump-housing and the edge of the hole at two points located 180° apart. The tremie pipe, when used, shall be of suitable size and lowered to the bottom of the well on two opposite sides of the bore hole and calculated quantity of gravel shall be poured in the pipe through a funnel and the pipe shall be raised by 6 ft. interval. In all cases water shall be circulated steadily during gravel placement by inserting the drilling rod into pump housing and operating the circulation pump on the drilling rig. The water level in the annular space outside the pump housing shall be maintained at or above natural ground surface level by return flow from the cutting bit.

Temporary casing, if used, shall be carefully withdrawn in 6 to 10 ft. interval during placement of gravel shrouding and the gravel shall be introduced so that each stage of the hole above bottom of the casing is completely filled before the casing is withdrawn to the next stage. The process of withdrawing the temporary casing shall be continued until the bottom of temporary casing is at least 10 ft. above the top of the top most screen. Above this point the temporary casing shall be removed.

14.5 GROUTING OF PUMP HOUSING CASING

14.5.1 General

Grouting of pump housing casing shall cover providing all equipment, labour and doing all work required to seal the annular space between the pump housing casing and the bore hole face by the introduction of grout as specified herein and on the Drawings according to procedures approved by the Engineer.

14.5.2 Material

The grouting operation shall be done with 1:2 cement sand mortar. Cement and sand shall conform to the requirements of Section "CONCRETE".

14.5.3 Placement of Grouting

The grout may be placed by either the trimmie method or by being pumped into place provided that both the method and the type of grout is approved by the Engineer prior to the start of the operation.

If the trimmie method is selected and approved the grout material shall be placed by trimmie pouring, (after water or other drilling fluid has been circulated in the annular space sufficient to clear obstructions). The trimmie method shall be used where there is a minimum annular space of 3 inches only between the upside surface of the inside casing and the inside surface of either the external casing or the borehole. The minimum size trimmie pipe utilized shall be 2 inches inside diameter. Where concrete grout is used the minimum size trimmie pipe used shall be three inches inside diameter. When making a trimmie pour, the trimmie pipe shall be lowered to the bottom of the zone being grouted and raised slowly as the grout material is introduced. The trimmie pipe shall be kept full continuously from start to finish of the grouting procedure, with the discharge end of the trimmie pipe being continuously submerged in the grout until the zone to be grouted is completely filled. The minimum curing time before construction may be resumed is 72 hours. If the method of grout placement selected and approved is to be by pumping, the grout shall be injected (after water or other drilling fluid has been circulated in the annular space sufficient to clear obstructions) in the annular space between the inner casing and either the outer casing or the borehole. The annular space must be a minimum of 1½ inches for sand and cement of neat cement grout, and not less than three times the size of the largest coarse aggregate used. The grout pipe shall extend from the surface to the bottom of the zone to be grouted. The grout pipe shall have a minimum inside diameter of one inch for sand cement of neat cement grout. It shall have a minimum diameter of 1½ inches for concrete grout.

Grout shall be placed, from bottom to top, in one continuous operation. The grout pipe may be slowly raised as the grout is placed but the discharge end of the grout pipe must be submerged in the emplaced grout at all times until grouting is completed. The grout pipe shall be maintained full, to the surface, at all times until the completion of the grouting of the entire specified zone. In the event of interruption in the grouting operation, the bottom of the pipe should be raised above the grout level and should not be re-submerged until all air and water have been displaced from the grout pipe and the pipe flushed clear water. Curing time before construction may be resumed is minimum of 72 hours.

14.6 DEVELOPMENT AND TESTING

14.6.1 General

Development and testing shall consist of all work required in connection with the development of each tubewell to produce the design capacity of sand-free water with a minimum draw-down, and the testing of each tubewell to determine the effectiveness of the development operations as specified herein. Development and testing shall include, but not be limited to surging, backwashing and pumping the tubewell at higher than rated capacity; testing the tubewell for specific capacity, sand content and degree of development and disinfection and sealing each tubewell. The Contractor shall be required to sound the well, to determine whether excess sand has accumulated in the bottom of the well at the following stages of the work:

- (i) On completion of the casing and screen installation
- (ii) Before the starting of the development and
- (iii) After completion of development and testing

If it is found at any stage mentioned above that the well contains more than 3 ft. of sand or other material in the bail plug, the Contractor shall clear the well down to a level approximately 3 ft. above the bottom plate of the bail plug.

Water obtained in development and testing shall be disposed of by the Contractor in an approved manner. No separate payment will be made for the first 20 hours of development and testing for each tubewell. Development and testing ordered by the Engineer in excess of 20 hours per tubewell will be paid for at the quoted unit price for this item.

14.6.2 Development

The development procedure and methods used for development of the tubewells shall be established by the Contractor subject to approval by the Engineer and the development operations shall be witnessed by the Engineer, from their initiation to their completion. The Contractor shall maintain a complete record of the development operation and shall make regular periodic measurements of discharge rates, sand content and water level measurements. The procedures used shall include back washing and pumping at 1.5 times the rated capacity and may include surging or similar procedures determined by the Contractor. The Contractor shall notify the Engineer following the completion of the 6 hours pumping period, that the tubewell is ready for testing. In wells where bentonite or other formation stabilizing agents are used, the Contractor shall undertake a programme of cleaning the well with poly phosphates or other dispersing agents in a manner and with chemical dosages as approved by the Engineer prior to starting normal development work.

14.6.3 Testing

The contractor shall test each tubewell under the direction of the Engineer as described herein. Upon completion of the development operations the tubewell shall be permitted to recover for a minimum period of one hour. During this recovery period, the tubewell shall be sounded. If the comparison of the depth by sounding and the length of the casing string indicates that there is more than 6.00 feet of material in the tubewell, it shall be cleaned to within 2.0 feet of the bottom of the casing by bailing.

At the end of the first five minutes of pumping, the sand content of the water shall be determined by using a 40 inches Imhoff cone or other device approved by the Engineer. The sand content of the water at this time shall be less than 100 mg/l. A second sand content determination shall be made 10 minutes after the start of pumping. The sand content at this time shall be less than 30 mg/l. If the sand content tolerances are exceeded at this time, or at any subsequent time upto the time of final acceptance of the installation, sand content determinations, water level, and discharge measurements during the remainder of the one hour sand test period shall be made as directed by the Engineer.

When the sand test has been satisfactorily completed, the tubewell shall be further developed for 4 hours by surging and backwashing with the test pump at five to ten minute intervals. Following the development period, the tubewell shall again be pumped for a period of one hour during which time the sand test shall be repeated. The specific capacity of the tubewell shall be determined from the water level measurements and flow rates obtained during the pumping periods. If the specific capacity obtained from the second pump test is found to be more than 10 percent greater than that obtained in the first pump test, the development shall be continued as directed by the Engineer.

Upon satisfactory completion of the above one hour pumping period the tubewell shall be permitted to recover for a period of one hour. Upon the completion of this recovery period, a four hour multiple step pump test shall be performed by pumping the tubewell for one hour at each of approximately four equal increments.

14.6.4 Summary

The following is a summary of the development and testing procedure:

14.6.5 Development

Development time	6 hours (minimum)
Recovery	1 hour (minimum)

14.6.6 Testing

Pumping Period	1 hour
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Development	4 hour
Pumping period	1 hour
Recovery	1 hour (minimum)
Step pumping	4 hour
Pumping period	2 hours

14.6.7 **Equipment**

The Contractor shall furnish all necessary equipment for testing the tubewell, including a water lubricated or oil lubricated test pump, a valve for fine adjustment of the discharge, an electric measuring device to determine the drawdown during each stage of the test and Imhoff cones to measure sand content. If oil lubricated test pumps are used, the contractor shall exercise all reasonable precautions to keep the leakage of lubricating oil into the tubewell at a minimum and shall promptly remove all oil which collects on the water surface in the tubewell by the addition of detergents or other suitable chemicals and pumping the emulsified oil from the tubewell. In the event the Contractor fails to keep the leakage of oil into the tubewell within acceptable limits or to promptly remove oil accumulations from the tubewell, the Engineer will order the use of oil lubricated test pumps discontinued and the Contractor shall use water lubricated pumps for testing of the tubewells. The actual depth of setting for the test pump will be determined by the Engineer after the tubewell has been developed. Piping, gauges, orifices, meters, wire boxes or other measuring devices shall be furnished, installed and removed by the Contractor and will remain his property. All measuring devices and testing equipment shall be subject to approval by the Engineer.

14.6.8 **Measurements and Data**

The Contractor shall take drawdown and discharge measurements and other pertinent data during each test at intervals as specified by the Engineer. All such data shall be recorded on forms approved by the Engineer, and the original of such forms shall be delivered to the Engineer at the completion of the development and testing operations.

The contractor shall collect water sample from tubewell, after completion of the D & T. Water samples shall be completely tested from any approved laboratory and result shall be submitted to the engineer at the completion of the tubewell.

14.6.9 **Disinfection and Sterilization**

After development and testing of the tubewell has been satisfactorily completed, and when approved by the Engineer, the Contractor shall disinfect the tubewell by dispersing chlorine solution throughout the entire depth of the well to obtain a minimum chlorine content of 50 mg/l. The procedure and equipment used to introduce and disperse the chlorine in the tubewell shall be subject to approval by the Engineer.

14.6.10 Sealing of the Well

Upon completion of the tubewell the Contractor shall seal the tubewell with a ¼ inch thick steel plate cap welded to the pump housing at few points using Arc welding, or by some other method approved by the Engineer. Compliance with this requirement will not relieve the Contractor of his responsibility for the safeguarding of any part of the tubewell completed until the Certificate of Acceptance is issued for the entire tubewell installation.

14.7 MEASUREMENT AND PAYMENT

14.7.1 Drilling

Measurement and payment for drilling will be made in accordance with the provisions given hereafter.

14.7.1.1 Method of Measurement

Measurement for drilling of tubewells will be made of the actual depth in feet of each bore hole drilled, measured from the top of pump pedestal for the depth of bore hole specified by the Engineer. No measurement will be made of over drilling required because of sloughing, caving ground or for the Contractor's use in setting casing, for tubewells abandoned due to jammed tools, caving ground or negligence on the part of the Contractor, or for tubewells not constructed in accordance with all the requirements of these Specifications.

No measurement for taking soil samples after every 5 ft. depth. Lump sum will be the basis for payment.

No measurement for taking samples of water from each bore log. Lump sum will be the basis for payment.

No measurement for providing and fixing of MS cap to cover the pump housing. Lump sum will be the basis for payment.

14.7.1.2 Basis of Payment

Payment will be made for the depth of bore hole per linear foot bid in the Bill of Quantities.

Description

Unit

Drilling of bore hole below ground level	L.ft.
Taking soil samples after every 5 ft. depth or from each strata change, testing and submission of complete results of strata analysis.	Each
Taking samples of water from each bore log and complete physical and chemical analysis and submission of complete results (two set of bottles).	Lumpsum
Provide and fix MS cap to cover the pump housing.	Each
Provide and lay block of concrete Class-A 3' x 3' to house casing complete in all respects i/c two Nos. clamps, nuts and bolts etc.	Lump sum

14.7.2 Installation of Tubewell Casing

Measurement and payment for installation shall be made in accordance with the provisions given hereafter.

14.7.2.1 Method of Measurement

Measurement for installation of casing will be made of the total length in feet of pump housing and tubewell casing actually provided & installed in the tubewell, including length of concentric reducers. The measurement of length will be taken from the elevation of the top of the pump housing casing to the bottom of the tubewell casing. For measurement of length, concentric reducers will be considered as casing. No measurement will be made of centralizers, bail plugs or other accessories required for the complete installation.

Basis of Payment

Payment will be made for the actual cased depth at the unit price per foot bid in the Bill of Quantities and shall constitute full compensation for all the works related to the item.

Description	Unit
Installation of tubewell casing	
As per BOQs	

14.7.3 Gravel Shrouding

Measurement and payment for gravel shrouding shall be made in accordance with the provisions given hereafter.

14.7.3.1 Method of Measurement

Measurement for payment shall be made of the depth in feet of gravel provided & filled, as shown on the Drawings and as directed by the Engineer.

14.7.3.2 Basis of Payment

Payment will be made for the actual depth of gravel shrouding at the unit price per linear foot bid in the Bill of Quantities, & shall constitute full compensation for all the works related to the item.

Description	Unit
Provide and fill gravel shrouding around, above and below bail plug/sand trap, well screen & blind pipe.	C. ft.

14.7.4 Grouting of Pump Housing Case

Measurement and payment for grouting shall be made in accordance with the provisions given hereafter.

14.7.4.1 Method of Measurement

Measurement for payment will be made for the theoretical volume of grout provided & placed, as shown on the drawings and as directed by the Engineer.

14.7.1.2 Basis of Payment

Payment will be made for the volume of grout measured as above at the Unit price per linear foot bid in the bill of quantities, & shall constitute full compensation for all the works related to the item.

Description	Unit
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Cement sand grouting annular space around housing pipe.	L.ft.
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14.7.5 Development and Testing

Measurement and payment for development, testing, disinfection and sealing shall be made in accordance with the provision given hereafter.

14.7.5.1 Method of Measurement

No measurement for development and testing will be made lump sum will be the basis for payment.

14.7.5.2 Basis of Payment

Payment for the accepted development, testing disinfection and sealing work shall be made on lump sum basis at the contract price. This price and payment shall constitute full compensation for all operations including furnishing all plant, tools, machinery, material, labour, 20 hours of development and testing, disinfection and all incidentals to complete the work. Payment shall be made as shown in the Bills of Quantities.

Description	Unit
Development, testing and disinfection of completed well.	Lump sum.

SECTION - 15

TUBEWELL PUMPING FACILITIES

15.1 SCOPE

The work shall consist of furnishing, installing and commissioning deep well turbine pumps involving all mechanical and electrical works and construction of pump houses in accordance with these specifications and in reasonably close conformity with the lines, grades, and dimensions shown on the plans or established by the Engineer.

15.2 MATERIALS AND CONSTRUCTION REQUIREMENTS

Materials and construction requirements shall conform all Civil, Mechanical and Electrical Works.

Depending upon the strata, it is likely that the design of tubewell will require certain changes in the deepwell turbine pumps. Under such a deviation from the provisional design shown on the Drawings, capacity of motor (below or excess of the specified) shall form the basis for measurement and payment of such a deviation.

The installation, testing and commissioning of turbine pumps shall be strictly in accordance with the instructions of the manufacturer of such machinery.

15.3 CIVIL WORKS

Building for the pump house, fences and gates shall be constructed in accordance with the relevant specifications and Drawings or as directed by the Engineer.

15.4 MECHANICAL WORKS

15.4.1 General

The work shall consist of providing, installing & commissioning pumps, motors and accessories, furnishing all plant, labour, equipment, appliances and materials, and of performing all operations in connection with mechanical works in strict accordance with this section of the specifications and the applicable drawings and subject to the terms and conditions of the contract. Equipment damaged by the Contractor during the course of installation shall be repaired or replaced by the Contractor at his own expense.

15.4.2 Approval of Materials and Equipment

As soon as practicable and within 30 days after receipt of notice to proceed and before any material or equipment is purchased, the Contractor shall submit for approval by the Engineer a complete schedule, in triplicate, with the names and addresses of the manufacturers and their catalogue cuts, diagrams, drawings and such other descriptive data as may be required by the Engineer. No consideration will be given to partial lists submitted from time to time. Approval of materials and equipments under this provision shall not be considered as authorized, any deviation from the specifications unless the attention of the Engineer has been directed to the specific deviations.

15.4.3 Material and Equipment

Materials and equipment shall conform to the respective specifications and other requirements specified hereinafter and shall be new and unused.

15.4.3.1 Water Pumps

Pumps shall be of the open line shaft water lubricated vertical turbine type for installation and operation in tubewells and shall be suitable for use with vertical, hollow-shaft, squirrel cage, induction type motors. All pumps shall consist of pump bowl assembly, column pipe, line shaft and surface discharge head assembly, including water pre-lubrication system as required and all other parts and appurtenances to provide a complete operating pump in accordance with these specifications.

15.4.3.1.1 Design

The material, design, fabrication and assembly of equipment shall be in strict accordance with American Water Works Association Standard A 101-61 Entitled "American Standard for Vertical Turbine Pump", or latest revision and the following requirements:

i) General

Water Pumps shall be vertical shaft centrifugal pumps with rotating impellers and discharge from the pumping elements coaxial with the shaft. The pumping element shall be suspended by the conductor system which encloses a system of vertical shafting used to transmit power to the impellers, the prime mover being external to the flow stream. The basic pump shall consist of the following three elements:

- **Pump Bowl Assembly**

The pump bowl assembly shall be either a single or multistage, centrifugal vertical pump with discharge coaxial with the shaft.

- **Column and Shaft Assembly**

The column and shaft assembly shall consist of the column pipe which suspends the pumps bowl assembly from the head assembly and serves as conductor for the fluid from the pump bowl assembly to the discharge head. Contained within the column pipe shall be the line shaft which shall transmit the power from the driver to the pump shaft. The line shaft shall be supported throughout its length by means of bearings which are lubricated with water.

- **Head Assembly**

The head assembly shall consist of the base (from which the column-and shaft-assembly and the bowl assembly shall be suspended) the discharge head which directs the fluid into the desired piping system and the driver.

ii) **The Driver Coupling**

The driver coupling is the mechanism, which transmits the power to the top shaft. It shall contain means for impeller adjustment and provide a bearing to carry the thrust load.

iii) **Discharge Head**

A cast iron flange shall be integrally cast on the discharge head. The discharge flange shall have a companion flange suitable for connection to the discharge pipe.

iv) **Motor Mounting Flange**

The motor mounting flanges of pumps shall match the NEMA flanged base plates of motors and base plates of right angle gears.

15.4.3.1.2 **Manufacture**

The pumps shall be as manufactured by M/s KSB or equivalent of the types as specified in this section. The pumps shall be manufactured to meet the characteristics specified in drawing

i) **Pump Elements**

The impellers shall be the enclosed skirt seal type constructed of bronze meeting the requirements of ASTM Standard B 145-61 entitled "Leaded Red Brass and Leaded Semi-Red Brass Sand Casting". Impellers shall be accurately fitted, smoothly finished, and dynamically balanced at the normal pump speeds. The bowls shall be constructed of close-grained cast iron. The inside of each bowl shall be hand finished to mirror-like smoothness. Three or four stage pumps as approved by the Engineer shall be supplied by the Contractor. Each suction bowl shall be fitted with a grease-packed bronze bearing and suction case plug. A suction case and collar shall be provided to protect the bearings. Each pump bowl shall have a fluted rubber bearings above each impeller and shall be designed for the future installation of bronze or cast iron wear rings. Each discharge bowl shall be equipped with a bronze bearing. The pump and line shaft shall be of stainless steel, conforming to ASTM Standard A 276-60 entitled "Hot-Rolled and Cold-Finished Corrosion Resisting Steel Bars", type 416, and shall be of suitable size to transmit the loads and to maintain correct alignment without distortion or vibration. The pump shaft shall be turned, ground and polished and shall be threaded for connection to the line shaft.

ii) **Column Pipe and Line Shaft**

The column pipe shall be furnished in interchangeable sections having a normal length of 10 feet. Wall thickness shall be minimum 0.234 inches. The ends of each column pipe section shall be faced parallel and perpendicular to the axis of the pipe. The threads shall be machined so that adjoining sections of column pipe will butt together to ensure proper alignment on assembly. The line shaft shall be ground carbon steel shafting in accordance with ASTM Standard A 108-61T entitled "Cold-Finished Carbon Steel Bars and Shafting" Grade 1020 or 1045 and shall be furnished in interchangeable sections having a nominal length of 10 feet. The ends of the shaft sections shall be faced parallel and perpendicular to the axis of the shaft. Adjoining sections of the line shaft shall be connected by means of threaded, sleeve-type couplings of the same material as shall be supported by fluted, oil resistant, rubber bearings designed to be lubricated by water. The bearings shall be mounted in bronze bearing retainers which shall be threaded into the column couplings and butted against the adjoining section of column pipe. The rubber bearing shall be replaceable within the bronze bearing retainers and shall be spaced at intervals of not more than 10 feet along the line shaft.

iii) **Surface Discharge Head**

Each surface discharge head shall be of the above ground type and shall be a suitable base for supporting the specified electric motor and the pump column. The discharge head shall be of cast iron conforming to ASTM Standard A 48-62 entitled "Standard Specification for Grey Iron Casting" Class 30 A or an approved equal quality of casting. Each surface discharge head shall be furnished with an integral ASA 125-pound flange conforming to ASA B16-1-1948 "Cast Iron Pipe Flanges and Flanged Fittings, Class 125". The discharge heads shall include half couplings connecting to discharge pressure and suction pressure to accommodate gear cooling water lines as required by the gear drive unit.

iv) **Pre-lubrication System**

The contractor shall furnish a manually operated, water pre-lubrication system complete with all valves, piping and storage tank for each turbine pump. The piping for pre-lubrication system shall be complete with necessary valves, lines and fittings to permit filling of the pre-lubrication tank from the pump discharge and to permit the water to be manually released prior to starting pump. The pre-lubrication tank shall be an enclosed tank of sufficient size to adequately lubricate the line shaft bearing before pump start-up and shall be equipped with an opening in the top through which it may be filled from the pump discharge or from an outside source.

15.4.3.1.3 Quality Control Tests

The manufacturer shall perform all the quality control tests as specified hereafter and all test results and anticipated field performance curves shall be submitted, in triplicate, to the Engineer.

i) **Standard Running Test**

The pump bowl assembly shall be operated from zero capacity to the maximum capacity shown on the performance curve submitted with the manufacturer's bid. Readings shall be taken at a minimum of 5 capacity points, including one point within $\pm 2\%$ of design capacity specified. The pump shall be operated at a speed within $\pm 5\%$ of the design speed.

ii) **Capacity Measurement Test**

The capacity of the pump shall be measured by means of a standard venturi tube, nozzle orifice plate or pitot tube traverse.

iii) **Head Measurement Test**

For head measurement in excess of 36 ft. calibrated bourdon or other gauges with equivalent accuracy and reliability shall be used. All gauges shall be calibrated before and after each series of tests.

iv) **Test for Velocity**

The average velocity in the pump column used to determine the velocity head shall be calculated from dimensions obtained by actual measurement of the pipe and shaft or enclosing tube diameter and the velocity head shall be obtained from actual measurement of the inside diameter of the discharge pipe at the point where the pressure tap is located.

v) **Horsepower Input Test**

The power input to the pump shall be determined with vertical dynamometer or a calibrated electric motor. Calibrated laboratory type electric motors and transformers shall be used to measure the power input to all motors.

vi) **Measurement of Speed**

The rotating speed of the pump shall be obtained by a hand counter, electronic computer or a counting slip.

vii) **Hydrostatic Test**

A standard hydrostatic test on the pump bowl assembly shall be made at 1 1/2 times the shutoff head developed by the pump bowl assembly or at twice the rated head, whichever is greater.

15.4.3.2 Motors

The pump motors shall be vertical, hollow shaft fan cooled totally enclosed weather protected squirrel cage, induction type and shall have 4 poles with approximately speed of 1460 rpm on 400 volts, 3 phase, 50 cycle. The motor horse power for each site shall be indicated in the Bill of Quantities. When operating continuously at full rated load, the temperature rise shall not exceed 40

degree centigrade above an ambient temperature of 50 degree centigrade. The motor shall have a service factor of 1.15 times the rated horsepower, and horsepower loadings shall not exceed the name plate at any point on the pump performance curve. The motors shall conform to NEMA Standard MG 1, entitled "Motors and Generators" for a class B design and shall have low starting current and normal starting torque. The locked rotor input shall not exceed 5.6 KVA per horsepower. The winding shall have Class B insulation and shall be suitable for operation under conditions of high humidity and at an ambient temperature of 55 degree centigrade. Each motor shall be equipped with three thermal devices embedded and symmetrically spaced in the stator winding. These devices shall operate on temperature rise to de-energize the control circuit of the motor thus disconnecting it from the power source. The thermal devices shall be so located in the winding and so constructed that they will prevent motor damage due to overheating resulting from overload, lack of ventilation, single phasing, stalling, high ambient temperature or voltage imbalance. The pump motors shall be designed for mounting on the surface discharge head and for direct connection to the line shaft. A thrust bearing of adequate capacity to carry the weight of all rotating parts, plus the hydraulic thrust, shall be provided on each motor. The motors shall be provided with a completed oil or grease-lubrication for each bearing. Each motor shall be provided with a non-reverse ratchet to prevent reverse rotation of the pump.

15.4.3.2.1 **Motor - Control**

The motor controls for each motor shall consist of motor starter and control switches with all necessary components for a complete installation. Each motor control shall be suitable for controlling and protecting 400 volts, 3 phase, 50 c/s electric motor. Motor controls shall be furnished in complete accordance with the applicable provisions of NEMA Standard I CI, entitled "Industrial Controls", shall have a minimum insulation level for 600-volt class equipment, and shall be designed to provide short circuit protection in all phases and overload protection in all three phases. The thermal overload relay reset device shall be mounted to be operatable without the necessity of opening the casing. Each motor control shall be furnished complete as a unit with all component parts and accessories completely wired to conform to NEMA Class II construction, Class B wiring. The conductor shall be 600 volt, heat-resistant, thermoplastic insulated wire suitable for 75°C operating temperature. A weather proof enclosure NEMA Type III with a lockable outer door, shall be provided.

15.4.3.3 **Piping**

Piping for mechanical equipment shall be accomplished as indicated and shall conform to the relevant specification section "PIPES, PIPE LAYING AND APPURTENANCES".

Installation

Installation shall include all bolts, nuts, washers, shims, fittings, grout and other materials required for proper installation of the equipment which are not supplied as part of the equipment. Equipment damage during the course of installation shall be repaired or replaced by the Contractor at his own expense.

15.4.3.4.1 Pumps and Motors

The Contractor shall carefully clean, assemble, align and install the pumps in accordance with the manufacturer's recommendations. Care shall be taken that all connections are clean and free from burrs and foreign material so as to ensure tight fit and proper alignment. Connections between adjoining sections of column pipe and line shaft shall be correctly assembled and tightened to maintain accurate alignment. A suitable thread lubricant shall be used on all threaded connection to facilitate disassembly for maintenance. The pumps and motors shall be installed in tubewell in accordance with the manufacturer's instructions. The surface discharge heads shall be accurately set on the concrete pump platforms shown on the drawings and shall be aligned with pump housing casing. The surface discharge heads shall be rigidly connected to the reflux (check) valve and the dresser-type couplings. All the fittings shall be properly installed as shown on the drawings. In order to ensure the accurate and proper alignment of the pump, anchor bolts shall set only after the pump has been set and aligned. Anchor bolt holes may be formed in the concrete platform as the concrete is placed or may be drilled in the concrete after the concrete has set thoroughly. The anchor bolts shall be minimum 5/8 inch diameter and minimum 12 inches long with nut and lock washer, and shall be set in the anchor bolts holes with sufficient extension to permit the full threads of the nuts to be engaged by the anchor bolt. The anchor bolts shall then be set in cement grout. Where holes are drilled after the concrete has set thoroughly, expansion bolts or lead expansion anchors may be installed at the option of the contractor in lieu of grouting anchor bolts. Non-shrink grout shall be placed under the entire surface of the discharge head to provide proper support for the pump. Non-shrink grout shall conform to the applicable requirements set forth in the Specifications for concrete.

15.5 ELECTRICAL WORKS

15.5.1 General

The work shall consist of furnishing all plant, labour, equipment, appliances, and materials and of performing all operations in connection with the electrical work in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

15.5.2 Regulation

All electrical installation work shall conform to the Electricity Act, 1910 and the

Electricity Rules 1937, as adopted and modified by the Government of Pakistan from time to time and WAPDA Specifications; and the requirements specified herein. Except where otherwise shown or specified all electrical equipment shall be suitable for operation 230 volts, 50 cycles, and alternating current power supply. All electrical materials shall be new. Defective equipment or equipment damaged during installing or testing shall be replaced or repaired by the Contractor at his own expense.

15.5.3 Coordination

The drawings indicate the extent and the general location and arrangement of equipment, conduit and wiring. The Contractor shall study building plans and details so that the outlets and equipment will be properly located and readily accessible. Lighting fixture equipment and outlets shall be located to avoid interference with mechanical or structural features; otherwise, lighting fixtures shall be symmetrically located according to building arrangement. If any conflict occurs necessitating departure from the drawings, details of departure and reasons therefore shall be submitted as soon as practicable for written approval of the Engineer.

15.5.4 Standard Products

Material and equipment used for this work shall be standard products from manufacturers regularly engaged in producing such equipment and shall be the manufacturer's latest standard design complying with specification requirements.

15.5.5 Material and Equipment Schedules

As soon as practicable and before starting installation of any material or equipment, the Contractor shall submit 6 copies of a complete list of materials and equipment proposed for installation to the Engineer for his approval. The list shall include manufacturer's names and materials or equipment identification such as styles, types, or catalogue numbers, to permit ready and complete identification.

15.5.6 Workmanship

All materials and equipment shall be installed in accordance with recommendations of the manufacturer subject to approval by the Engineer and in such a manner as to conform to the contract documents.

15.5.7 Grounding

All electrical equipment, including motors, meters, lighting and distribution panels, switchgear and similar items shall be grounded. All exposed non-current-carrying metallic parts of electrical equipment, raceway systems and neutral conductor of the wiring system shall be grounded. Earth plates for the

grounding system shall consist of copper plates of the minimum size of 24 inches square and 1/8 inch thick. The top earth plate shall be 8 feet below the ground level with critical watering arrangement or at the natural water level whichever is easy to install. A minimum six inch layer of charcoal and rock salt shall be provided underneath each earth plate and a minimum 18 inch layer of charcoal and rock salt shall be provided above each earth plate. The ground connection from the earth plate shall be securely bolted by a copper nut and bolt and additionally soldered to the plate. The ground connection including earth plate shall be kept clear of the structure foundation. The earth plate shall be located not nearer than 6 feet from the outer face of the building wall. Ground connections indicated as 1/8" x 1" copper tape may be made with number 4/0 AWG or SWG cable. Ground connections indicated as 1/8 inch by 1/2 inch copper tape may be made with number 2/0 AWG or SWG cable. All ground connections shall run vertically and horizontally exposed on the surface of the wall and shall run concealed in the floor. Connections and splices shall be of the brazed, welded, bolted, or pressure connector type, except that pressure connectors or bolted connections shall be used for connections to removable equipment. Ground connection from the building to the earth plate shall be run at a depth not less two feet below ground level.

15.5.8 Conduit

Unless otherwise indicated, electrical wiring shall be run in galvanized steel (G.I.) conduit or P.V.C. Pipe according to the specification PVC pipe shall not be used as conduit for buried or embedded run. Minimum size of raceways for branch circuit wiring shall be 3/4 inch. Conduit pipes shall be exposed on walls and ceilings but shall run concealed in floors. Conduit shall be continuous when passing through wall or floor. Conduits installed on the surface of walls shall be supported and secured at intervals of not more than 3 feet and shall be installed parallel or perpendicular to walls, structural members or inter-sections of vertical planes and ceilings. Field-made bends and offsets shall in general be avoided, but if so required these shall be made with an approved method or by conduit bending machine. Changes in direction of runs shall be made with symmetrical bends or cast-iron fittings. Crushed or deformed raceways shall not be installed. Trapped raceways in damp and wet locations shall be avoided where possible. Care shall be taken to prevent the lodgment of plaster, dirt or trash in raceways boxes, fittings, and equipment during the course of construction. Colgged raceways shall be entirely free of obstructions or shall be replaced. Raceways crossing expansion joints in concrete slabs shall be provided with suitable expansion fittings or other suitable means to compensate for expansion contraction. Raceways installed underground or under slabs shall be coated with an approved type of protective coating.

15.5.8.1 Galvanized Iron (G.I.) Conduits

The galvanized iron (G.I.) conduits shall have minimum wall thickness of .065 inch (i.e. 16 SWG) and shall have the diameter indicated on the drawings.

Damaged portions of galvanizing at joints shall be cleaned and painted with a silver-coloured rust inhibitive paint. Conduit shall be cut and threaded in such a manner that there are no sharp edges. Conduit bends shall be uniform and shall have minimum radius of 5 times the diameter of the conduit or shall be made through pull or junction boxes.

15.5.8.2 P.V.C. Pipe

P.V.C. pipe and specials shall conform to British Standard Specification BS-3505:1962 "Unplasticized P.V.C. pipe (Type 1420) for Cold Water Supply" and shall be class B. The entire conduit system shall be completed by cutting the P.V.C. pipes and jointing and sealing to respective specials with P.V.C. solution as recommended by the P.V.C. pipe manufacturers.

15.5.8.3 Additional Requirements for Exterior Conduit

All joints between sections of conduit, conduit and specials, and conduit and switches or lights shall be made water proof in an approved manner. Except where otherwise indicated, conduit shall be supported at least every 3 feet. Drainage fittings or seep holes shall be provided at unavoidable low points where moisture can collect. A maximum of two 90-degree bends will be allowed between boxes. Conduits shall be buried underground at minimum of 18 inches below finish grade. Bearing of conduit shall be uniform throughout its length in bottom of trench. Backfilling shall be in 4-inch to 6-inch layers, compacted to 95 percent of maximum density.

15.5.9. Conductors

15.5.9.1 General

Conductors shall be new and shall be of polyvinyl chloride (PVC) insulated copper unless otherwise specified. Wire connector of insulating material or solderless pressure connectors properly taped shall be utilized for all splices where possible soldered mechanical joints insulated with tape shall be kept to a minimum. Vinyl plastic tape of suitable quality is acceptable in lieu of rubber and friction tapes. The entire conduit system shall be completed and anchored prior to installing the wiring.

15.5.9.2 Conductor Sizes

Conductor sizes for tubewell motor main cables shall be as indicated in the drawings. Control circuit conductors shall not be smaller than number 12 AWG except that for circuits of more than 100 feet from panel to load centre number 10 AWG shall be used.

15.5.9.3 Conductor Insulation

In normally dry locations, conductors number 8 AWG or larger shall have rubber or thermoplastic insulation of a heat resistant grade RH, RW, RHH or THW. Conductors smaller than number 8 AWG shall have a heat resistant rubber insulation type RH or RH-RW or thermoplastic insulation, type T or TW.

15.5.10 Boxes and Supports

Boxes shall be provided wherever required for pulling of wires, making connections, and mounting devices or fixtures. Boxes for metallic raceways shall be of the cast iron hub type when located in normally wet locations. Boxes in other locations shall be sheet steel except that non-metallic boxes may be used with nonmetallic conduit system. Steel boxes shall be fabricated of structural quality flat rolled minimum 18-gauge sheet of steel free from irregularities, mill scale and surface corrosion shall be neatly and accurately formed with corners squared and sides jointed by welding. Each box shall have the volume required for the number of conductors enclosed in the box. Boxes for mounting lighting fixtures shall be not less than 4 inches. Cast iron boxes installed in wet locations and boxes installed flush with the outside of exterior surfaces shall be gasketed. Boxes for use with raceway systems shall not be less than 1 1/2 inches deep. Exterior pull boxes, junction boxes, boxes for exterior electrical supply points, switch boxes and all other boxes required for exterior electrical work shall be weather proof, heavy-duty, galvanized steel.

15.5.11 Lamp Fixture and Accessories

All incandescent lighting fixtures shall be suitable for bayonet base lamps. All accessories such as straps, mounting plates, nipples or brackets shall be provided as required for proper installation. The exterior light points shall be provided with all fittings, accessories, metal clad switches, weatherproof light fixtures, holders, bulbs and covers.

15.5.12 Electrical Supply Points (Outlet Connections)

Electrical supply points shall be provided where indicated on the drawings. Electrical supply points shall have the types of receptacles suitable for the plugs of the equipment to be connected to these points. Where receptacles are not available to match the plugs of equipment, standard receptacles shall be used and plugs on equipment supply leads shall be replaced by the contractor with plugs to match standard receptacles. Each electrical supply point shall be complete with a switch. Exterior electrical supply points shall be provided where indicated. Exterior electrical supply points shall be weather proof, complete with switch and of the type suitable for the plugs of the equipment to be connected to these points.

15.5.13 Flexible Connections

Flexible connections of short lengths shall be provided for all motors and equipment. The flexible connections shall be water tight.

15.5.14 Fuse Circuits and Fuse Boxes

The Contractor shall provide proper fuse boxes for each circuit. The fuse boxes and the switches shall be metal clad and suitable for the load for which the circuit is designed. All fuse boxes shall be complete with proper size fuse strips fitted to fuse bridges.

15.5.15 Power Switchgear Assemblies

Power switchgear assemblies shall be metal enclosed and air circuit breaker type. The type and make of the circuit breaker shall be subject to approval of the Engineer.

15.5.16 Exterior Switches

Except where otherwise indicated exterior switches shall be of the push button weatherproof type.

15.5.17 Testing

Before any electrical system is put into service, the entire system installation shall satisfactorily pass the tests prescribed by the Electricity Department and the following tests. The Contractor shall furnish all instruments and personnel required for the tests, and the Employer will furnish the necessary electric power.

15.5.17.1 Insulation Resistance

The insulation resistance shall be measured by applying voltage between earth and the entire system of conductor or any section thereof, with all fuses in place and all switches on. A direct current voltage of not less than twice the working voltage shall be applied. The insulation resistance of the installation measured as above shall not be less than 25 mega ohms divided by the number of points in the circuit. The metal conduit shall be tested for electrical resistance. The electrical resistance of such conduits measured between the main switch and each point shall not exceed 2 ohms.

15.5.17.2 Operating Test

After the wiring system has successfully passed by the insulation resistance test, and at such time as the Engineer may direct, the Contractor shall conduct an operating test for approval. The equipment shall be demonstrated to operate in accordance with the requirements of this specification. The test shall be performed in the presence of the Engineer.

15.5.17.3 Earth Plate Resistance

Resistance to each earth plate shall be tested by a standard earth tester, not sooner than 72 hours after a rain and without prewetting ground. The resistance of each earth plate shall not be more than 10 ohms. The test shall be performed by the contractor in the presence of the Engineer. Earth plates having a resistance of more than 10 ohms shall be replaced and retested. The Contractor shall submit in writing to the Engineer upon completion of the project, the measured ground resistance of each earth plate, indicating the location of the earth plate and the resistance and the soil conditions at the time, the measurements were made.

15.5.18 Repair

The work shall be carefully laid out in advance. Cutting, channeling, chasing or drilling of floors, walls, partitions, ceilings or other surfaces as necessary for the proper installation, support or anchorage of the conduit, raceways or other electrical work shall be carefully done. Damage to building surfaces, piping and equipment (including pointing work) shall be repaired to its original condition by skilled mechanics of the trades involved at no additional cost to the Employer.

15.6 POWER TRANSFORMER

15.6.1 GENERAL

The power transformer shall be indoor type, oil immersed, self cooled, designed and built to give efficient and reliable service at their full rated capacity on the climatic conditions given in the general information of these specification. Transformer s built to the following standard will be acceptable.

- 1) British Standards: BS 171-1970 or other relevant latest British Standard
- 2) V.D.E VDE 0532

15.6.1.1 CONSTRUCTION

The transformer tank shall be constructed of welded sheet steel plates and provided with external radiating tubes.

The transformer shall be fully tropicalized for temperature rise, humidity, altitude etc. The local conditions shall be taken into account while following the above standards. The transformer shall be complete with oil filling, all accessories and attachments detailed in these specifications or otherwise required and the contractor shall provide all details, drawings, data and complete test results for final approval before installation. The tank and radiating tubes shall be designed to withstand, without developing any deformation, pressure at least 25% greater than the maximum operating pressure. The steel plate cover shall be bolted to the tank, using gasket for perfect oil seal. Two earth terminal shall be provided at the base of the tank.

The oil preservation system shall utilize on expansion the conservative tank fitted with silica gel breather and oil level indicator.

The transformer core shall be built of high grade electrical steel laminations, each lamination insulated to reduce eddy current losses. The core laminations shall be clamped and bolted effectively to reduce 'humming'

The winding core shall be of high grade electrolytic copper conductor, flat or round paper insulated, thoroughly dried and impregnated as desired.

The high voltage leads shall be brought out and terminated to glazed porcelain insulator bushings for external connection.

The low voltage three lines and neutral leads shall be brought out and terminated to glazed porcelain insulator bushings for connection to L.V. side by copper bus bars or cables. The transformer neutral shall be earthed.

Off-load operated tap changer shall provided on the tank cover. The tapping shall be $-7 \frac{1}{2}\%$, $+5\%$, $+2 \frac{1}{2}\%$. A clear marking illustrated by diagram shall be provided to indicate the tap positions.

The transformer shall be provided with the following accessories.

- i) Oil filling valve for vacuum filling of oil
- ii) Oil drain plug
- iii) Bi-directional rollers fixed to the base steel channel, for rolling in the directions of both center lines of the transformer.
- iv) Lifting lugs, for handling and un-tanking the transformer
- v) Dial type thermometer for indicating oil temperature and having two hands, one showing existing oil temperature and other showing maximum oil temperature reached since the hand was last reset.

15.6.1.2 DRAWINGS AND DATA

The manufacturer shall supply complete structural drawings showing plan and elevations with complete dimensions and all relevant details of technical data of the offered transformer.

15.6.1.3 TRANSFORMER TECHNICAL DATA

KVA rating:	As shown on drawings
No load ratio:	11kv/415 V
H.V. Winding Line to line volts:	11000
Connections:	Delta
L.V. Winding Line to line volts:	415
Connections:	Star
Vector Group:	DY 11
Tapping on H.V side:	-7 ½%, +5%, +2 ½%
H.V Termination:	Bushing
L.V cable size:	7x300 mm ²
L.V Termination:	Bushing
Impedance voltage:	4.5 – 6%
Losses in watts:	
Iron at no load) Copper at full load)	to be furnished by tenderer
Cooling:	ON
Temperature rise over 50 deg. C ambient:	
Oil:	40 deg. C
Winding:	50 deg. C

15-16

15.7 LIFTING GEAR (CHAIN PULLY)

The contractor shall supply an over head mono rail chain pully block suitable for lifting and transportation of such parts of plant as are necessary for the maintenance and replacement of whole plant.

15.8 CHLORINATION EQUIPMENT

15.8.1 Chlorinator

Chlorinator shall be of vacuum solution feed, manually set, wall mounted type. Chlorinator shall be capable of meeting requirements of water flows ranging from 0.5 cusecs to 2 cusecs and delivering upto 1 lb/hr. of chlorine gas in solution to give a maximum dosing rate of 2 ppm. The chlorinator shall be supplied complete with all standard accessories and complete in all respects to ensure satisfactory operation.

15.8.2 Chlorinator Accessories

The chlorinator should include among its accessories an injector, a water booster pump with electric controls, a chlorine gas inlet connected via pressure regulating valve, a linear feed rate indicator, a feed rate adjuster, a pressure relief valve, a drain relief valve, and chlorine pressure gauge.'

15.8.3 Booster Pump

The Contractor shall supply alongwith each chlorinator a water pump for booster water pressure to meet requirement of the chlorinator. The pumps shall have adequate pumping capacity and to ensure proper mixing of chlorine and water in the injection assembly of chlorinator. The pumps shall be electrically driven by single phase motor capable of operation on 220 V, 50 hz. with ± 10 percent fluctuation in voltage. The pumps shall be supplied complete with suction and delivery isolating valves, check valves, pressure gauge and appropriate starters.

15.8.4 Empty Gas Cylinders

The Contractor shall supply with each chlorinator two 150 lb. empty chlorine cylinder designed and fabricated in accordance with AWWA or A.S.T.M. Specifications or equivalent. The welded seams shall be fully stress relieved after fabrication. A corrosion allowance of 1/16 inch shall be provided for the design thickness of the cylinders. Material of construction shall be according to ASTM A-515 Grade 60 or ASTM A-285 Grade C or equivalent.

Cylinder shall be provided with matching outlets corresponding to chlorinator offered under this Contract. Each cylinder shall also have a protection cap provided along with the cylinder.

15.9 GUARANTEE

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

15.10 OPERATION AND MAINTENANCE MANUAL

The Contractor shall furnish 6 copies of an illustrated operation and maintenance manual with each piece of equipment furnished under this section.

15.11 SPARES AND TOOLS

The Contractor shall furnish common spares such as O- rings, bushing, bearing, other similar items and special tools for each piece of equipment furnished under this section for its efficient service for over 3 years period.

15.12 MEASUREMENT AND PAYMENT

Measurement and payment for the civil, mechanical and electrical works will be made in accordance with the provisions of the clauses specified hereinafter.

15.12.1 Method of Measurement

15.12.1.1 Civil Works

Measurement of various items of building work will be made in accordance with the relevant sections of specifications and as shown in Drawings or as directed by the Engineer. No measurement of quantities for the electrical items will be made.

Excavation for construction of masonry walls in earth will be measured for payment as a separate item as provided in Section 1.

Brickwork for construction of walls will be measured for payment as a separate item as provided in Section 3.

Measurement of concrete in the roof slab, lintels and other items will be measured as a separate item as provided in Section 2.

Measurement of Damp Proofing, Surface Rendering, Roof Insulation and Flooring work items will be made for payment as a separate item as provided in Section respectively of the specifications.

Doors, windows, ventilators and glazing will be measured for payment as a separate item as provided in Section 8 of the specifications.

Item not included above will be measured for payment as separate items as provided in Section 16 of the specifications.

15.11.1.2 Electrical and Mechanical Works

No measurements of quantities will be made. Lump sum will be the basis for payment. Deviation in the capacity of additional (less) capacity of drive motor shall be on the basis of kwt hr.

15.12.2 Method of Payment

Quantities for the various items in accordance with the specifications and shall constitute full compensation for furnishing all materials, equipment and labour and for performing all operations necessary to complete the work.

15.12.2.1 Basis of Payment

The items will be paid for at the contract unit price which price and payment shall be full compensation for furnishing, installing and commissioning all machinery and equipment for Electrical and Mechanical works and chlorination equipment complete in all respects as shown in the Drawings including all labour, tools, equipment and incidental to complete the work. When the Bill of Quantities calls for a quantity and unit price for additional (less) Kwt. hr. capacity of the drive motor than the specified one, it will be full compensation for furnishing, installing and commissioning of the turbine pump and machinery.

Description	Unit
Electrification of tube well chamber/Site office including light fittings, fixtures, fans, 5A/15A sockets, distribution board and power sockets complete in all respects as per drawings.	Lump sum

Provide and fix chain pully block to the satisfaction of Engineer.	No.
Provide install and lower tubewell as per BOQs and drawings.	No.
Provide and install LT-Panel and power cables upto pump motor including earthing of pumps/motors as per drawings and specifications.	No.
Provide and install wall mounted chlorinator including accessories such as ejectors, multistage centrifugal monoblock water booster pump, chlorine gas inlet, feed rate adjuster, pressure relief valve, drain relief valve, chlorine pressure gauge & 2- 150 lbs chlorine gas cylinders. All items to be provided complete in all respects as per specification in working order and to the satisfaction of the engineer.	Lump sum
Provide install test and commission transformer of rating as shown in the BOQ including WAPDA charges for electric connection.	Lump sum

SECTION - 16

MISCELLANEOUS

16.1 SCOPE

The work covered by this section of the specifications consists of furnishing all plants, labour, equipment and materials and of performing all operations in connection with the miscellaneous items in strict accordance with this section of the specifications and the applicable drawings or as directed by the Engineer.

16.2 MATERIALS AND CONSTRUCTION

16.2.1 Steel Work

Structural steel work shall comply in all respects with B.S. 449. Steel for rolled sections shall comply in all respects with B.S. 16. Welding of steel work shall comply with B.S. 1856. High strength bolted connection shall comply with B.S. 3294.

16.2.2 Steel Ladder/Stairs

Steel access ladders shall comply with B.S 4211 unless otherwise stated. Stringers shall be rectangular section measuring 2-1/2 inches by 1/2 inches spaced 15 inches apart and rungs shall be 3/4 inch diameter spaced at 12 inches centre. Hoops shall be of circular pattern and shall be bolted to the stringers so as to be removable. Ladders shall be painted with black enamel paint of an approved make.

Steel stairs shall be as shown on the Drawings or as directed by the Engineer.

16.2.3 Brick Pavement

Bricks for pavement in the water works areas shall comply with the requirements of Section-3 of the technical specifications. Excavation and compacted backfill shall be in accordance with the requirements of Section-1 of the Technical Specifications. Bricks joints shall be sand grouted. Pavement shall be constructed in accordance with the Drawings or as directed by the Engineer.

16.2.4 Level Indicator

Level indicators shall be installed in accordance with the applicable drawings and as directed by the Engineer. The contractor shall be responsible for manufacturing and fixing of all components involved to make it a complete working unit.

16.2.5 Lightning Arrester

Lightening Arrester including all associated copper strip shall be installed strictly in accordance with the applicable drawings and as directed by the Engineer. The Contractor shall be responsible for providing and fixing all copper strips and other components to make it a complete working unit.

16.2.6 Disinfection of Overhead Water Tanks

All water tanks shall be disinfected with the application of 50 ppm. dose of chlorine solution in accordance with the procedure specified by the Engineer.

16.2.7 Rungs

Malleable cast iron rungs of sizes as shown on the Drawings shall be provided.

16.2.8 Manhole Cover

- (a) Manhole covers and frames shall be of Mild Steel. The frame shall be firmly embedded in Class B concrete, as shown in drawing.
- (b) Manhole covers shall be of concrete class 'A' with reinforcement and frame as shown in the drawing.

16.2.9 Vents

Vents shall be of cast iron and shall conform to the requirement of the Section-10. The Contractor shall supply and install vents of type as shown on the Drawing or as directed by the Engineer for circulation of air through tanks after the roofs have been completed. Vents shall be fitted with cowl or wire mesh balloon.

16.2.10 Service Ducts

Contractor shall provide and lay underground concrete service duct of the type and at the location as shown on the drawing, or as directed by the Engineer, for the crossing of the service lines. The work shall include excavation of the trench, laying of duct and backfilling.

The open ends of the duct shall be properly plugged to avoid blocking of the duct.

16.2.11 (a) Bar Screen

Contractor shall provide and fix Bar Screen at the location as shown on the drawing, or as directed by the Engineer. The screen shall be fixed with concrete and painted. The work shall include fixing of the Bar Screen in the concrete and painting the bars.

(b) Galvanized Mild Steel Grating

Contractor shall provide and fix galvanized mild steel grating at the location as shown on the drawing, or as directed by the Engineer. The grating shall be flush with concrete and painted. The work shall include fixing of grating and painting the bars.

16.2.12 Toilet Fixtures and Plumbing Works

Toilet fixtures and plumbing works as approved by the Engineer shall be fixed according to standard drawings. The Contractor shall be responsible for proper fixing of the plumbing works strictly in accordance with engineering practice. This work include complete items to make the system functional.

16.2.13 Exhaust Fans

Contractor shall provide and fix Electric Fan of the approved make and brand. The fan shall be properly fixed including all necessary accessories. The work shall include fixing and making the working functional.

16.2.14 Operator's Quarter

(a) General

The work shall consist of furnishing all plant, labour equipment, appliances and materials and in performing all operations in connection with construction of Operator's quarter including plumbing and internal electrification in accordance with these specifications and in reasonably close conformity with the lines, grades and dimensions shown in the drawings or directed by the Engineer.

(b) Material

Building for Operator's quarter, fences and gates shall be construction in accordance with the relevant specifications and Drawings or as directed by the Engineer.

16.2.15 Septic Tank

The work shall consist of furnishing all plant, labour equipment, appliances and materials and in performing all operations in connection with construction of Septic Tank including excavation, brick/block work, plastering, concreting, inlet and outlet pipes, manhole covers etc. in accordance with these specifications in the relevant sections and in reasonably close conformity with the lines, grades and dimensions shown in the drawings or directed by the Engineer.

16.2.16 Penstock Gate

The work shall consist of providing and fixing of penstock gate in the screening chamber of sewage pumping station. The penstock shall be of cast iron and shall be fixed in such a way that its gate operates without hinderance and when in closed position completely blocks the flow.

16.3 MEASUREMENT AND PAYMENT

16.3.1 Miscellaneous Items

Measurement and payment for miscellaneous items will be made in accordance with the provisions of this clause specified hereinafter.

16.3.1.1 Method of Measurement

Rolled Section Steel will be measured by the length in linear ft. for the work satisfactorily completed as shown in the Drawings or as directed by the Engineer.

Steel ladder/stairs will be measured by the length in linear ft. for the work satisfactorily completed as shown on the Drawings or as directed by the Engineer.

Brick Pavement will be measured by the area in square foot for the work satisfactorily completed as shown on the Drawings or as directed by the Engineer.

Level indicators shall be measured by the number for the work satisfactorily completed as shown on the Drawings or as directed by the Engineer.

Lightening Arrester shall be measured by the number for the work satisfactorily completed as shown on the Drawings or as directed by the Engineer.

Disinfection of overhead water tanks will be measured by the number for the work satisfactorily completed as shown on the Drawings or as directed by the Engineer.

Malleable cast iron rungs shall be measured by the number for the work satisfactorily provided & laid as shown on the drawing or as directed by the Engineer.

Manhole covers shall be measured by the number for the work satisfactorily completed as shown on the Drawings or as directed by the Engineer.

Air vents shall be measured by the number for the work satisfactorily completed as shown on the Drawings or as directed by the Engineer.

Concrete service ducts shall be measured by the number of linear foot of duct satisfactorily provided & laid as shown on the drawing or as directed by the Engineer.

Mild steel bar screen and galvanized mild steel grating shall be measured by the area in the square ft. for the work satisfactorily provided & installed as shown on the drawings or as directed by the Engineer.

No measurement for fixtures along with plumbing works will be made. Lump sum will be the basis for payment.

Measurement will be made for each item of fan and accessories all acceptably supplied and installed by the contractor as a complete unit.

Septic Tank along with items as shown in the drawing shall be measured by the number for the work satisfactorily completed as directed by the Engineer.

Penstock gate alongwith complete assembly and fixation as shown in the drawing shall be measured by the number for the work satisfactorily completed as shown on the drawing or as directed by the Engineer.

16.3.1.2 Basis of Payment

Payment will be made in accordance with the unit prices in the Bill of Quantities of the various items in accordance with the specifications and shall constitute full compensation for furnishing all materials, equipment and labour and for performing all operations necessary to complete the work.

Description	Unit
Provide, fix and paint rolled steel section.	L.ft.
Provide and fix C.I. ladder including painting as per drawings and specifications.	L.ft.
Provide and lay brick pavement as shown on drawings or as directed by the Engineer.	Sft.

Provide and fix level indicator complete in all respects as per drawings and specifications or as directed by the Engineer.	No.
Provide and fix lightening arrester, copper earth strips and all other accessories complete in all respects as per drawings or as approved by the Engineer.	No.
Clean, test and disinfect overhead water tank.	No.
Provide and fix malleable cast iron rungs as shown on drawings or as directed by the Engineer.	No.
Provide and fix Manhole covers of sizes as shown on drawings or as directed by the Engineer.	No.
Provide and fix 4" dia Air vent on roof of over head tank as per drawings or as directed by the Engineer.	No.
Provide and lay underground concrete service ducts of types as shown on the drawings or as directed by the Engineer.	Lft.
Provide and fix mild steel screen bar and galvanized mild steel grating as shown on the drawings.	Sft.
Provide and fix all toilet fixtures along with plumbing works complete with all accessories fittings, manhole chambers, gully traps, as shown in drawings or as directed by the Engineer	Lump sum
Provide and install exhaust fans accessories.	No.
Construction of Control Room, Generator	

Room complete in all respects as per drawings and specifications.

Item wise
BOQ Provided

Construction of septic tank complete in all respects as per drawings and specifications.

No.

Provide and install penstock gate on screening chamber as shown on the drawing or as directed by the Engineer

No.

SECTION - 17

CLEARING AND GRUBBING

17.1 SCOPE

This work shall consist of the removal to a depth as designated, and disposal of all trees, stumps, bushes, roots, vegetation, logs, rubbish and other objectionable materials as and when required by the Engineer. It shall also include the removal and disposal of structures that obstruct, encroach upon or otherwise obstruct the work except when otherwise provided for on the drawings.

17.2 CONSTRUCTION REQUIREMENTS

17.2.1 Grubbing

In roadway cut areas all stumps and roots larger than 3 inches in diameter shall be removed to a depth of not less than 20 in. below the subgrade. In areas under roadway embankment from which unsuitable materials are to be removed or which are designated to be compacted all stumps and roots larger than 3 inch in diameter shall be removed to a depth of at least 30 inch below the finished ground surface.

17.2.2 Clearing

Such individual trees as the Engineer may designate and mark in white paint shall be left standing and uninjured. In order to minimize damage to trees that are to be left standing, trees shall be felled towards the centre of the areas being cleared if so required by the Engineer.

When necessary to prevent injury to structures or other trees or property or to minimize danger to traffic, trees shall be cut in sections from the top downwards.

All timber obtained as a result of clearing shall be handed over to the client. All bush, stumps, roots, rotten wood and other refuse from the clearing and grubbing operations shall be burnt or completely removed from within the right of way.

When the area on which an embankment is to be placed has been cleared the Engineer may order the surface of the existing ground to be scarified so that the filling material will bind into the original ground. The cost of such work, if so required shall be included in other items of work.

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

17.2.3 Protection and Restoration

The Contractor shall prevent damage to all pipes, conduits, wires, cables or structures above or below ground. No land monuments, property markers, or official datum points shall be damaged or removed until the Employer/ Engineer has witnessed or otherwise referenced their locations and approved their removal. The Contractor shall so control his operations as to prevent damage to trees and shrubs which are to be preserved. Protection may include fences and boards lashed to trees to prevent damage from blasting or machine operations. The Contractor shall carefully cut off all branches of trees hanging within 16.0 ft. above any part of the roadway or which have been broken or injured during construction. Where soil over the roots of trees to be preserved has become compacted it shall be restored by proper cultivation to a condition to permit adequate aeration of the soil.

17.3 MEASUREMENT AND PAYMENT

17.3.1 Method of Measurement

Clearing and grubbing will be measured for payment only on areas so designated in writing by the Engineer or shown on the drawings. The quantity to be paid for shall be the number of 100 square feet satisfactorily cleared and grubbed.

Clearing and grubbing carried out by the Contractor in cuts and borrow pits shall not be measured for direct payment.

Tree (a woody perennial plant having a main stem larger than 3" dia and one feet or more above in ground) removed shall be paid for at the contract unit price per number for tree removal as provided in the B.O.Q. The payment shall be full compensation for felling, removing, transporting and handing over of the trees to the concerned authority/department. Trees with diameter less than 6" shall not be considered for payment.

17.3.2 Basis of Payment

The quantities determined as provided above will be paid for at the contract unit price for the pay item mentioned below and shown in the Bill of Quantities which price and payment shall be full compensation for all the costs involved in the proper completion of the work prescribed in this item.

Description	Unit of Measurement
Clearing and Grubbing	Sft.

SECTION - 18

COMPACTION OF NATURAL GROUND

18.1 SCOPE

Prior to the construction of the embankment/paved area is commenced, the Engineer may order in writing the compaction of the cleared surface.

18.2 CONSTRUCTION REQUIREMENTS

This work shall consist, where applicable, of the compaction of the cleared surface of the original ground prior to commencement of embankment construction in accordance with these specifications, as shown on the Drawings or as required by the Engineer.

18.3 COMPACTION REQUIREMENTS

The cleared surface of the original ground shall be compacted to a depth of 8 inch and to a density of 90% modified AASHTO, At-180 Method-D subject to the provision of Section-23 for formation of embankment.

18.4 MEASUREMENT AND PAYMENT

18.4.1 Method of Measurement

The quantity to be paid for shall be the number of 100 square feet as are shown on the Drawing or directed to be compacted and accepted by the Engineer for payment. The volume of soil placed to bring level of Natural Ground to the original level as before compaction shall not be measured for Payment.

18.4.2 Basis of Payment

The area determined as provided above shall be paid for at the contract unit price for the pay item listed below and shown in the Bill of Quantities which price and payment shall constitute full compensation for all the costs necessary for the proper completion of the work prescribed in this item.

Description

Unit of
Measurement

Compaction of natural ground

Sft

SECTION - 19

CLASSIFICATION OF EXCAVATION

19.1 ROADWAY EXCAVATION

Roadway Excavation shall comprise of all the excavation that is not classified as Structural Excavation which is excavated within the limits of the roadway including permanent drainage, ditches and side slopes in cut.

19.2 BORROW EXCAVATION

Borrow Excavation shall comprise of all the excavation taken from borrow pits. Material from borrow pits shall normally be used for the construction of embankment or for the backfill when there is, no suitable material available from roadway excavation or structural excavation. Permission to use material from borrow shall first be obtained in writing from the Engineer. Nevertheless the total amount of material from roadway excavation and structural excavation after deduction of the material declared unsuitable by the Engineer shall be considered available for use in the work and no other surplus material as a result of embankment construction from borrow excavation shall be considered for replacement of the suitable material from roadway or structural excavation as described above. In either case the material to be sub-grade thickness of nine inches shall have A-4 or A-2-4 classification of the AASHTO STANDARD and as directed by the Engineer incharge. The material used in violation of the above instruction shall neither be measured nor be paid.

Borrow pits shall be at least 100 ft. from boundaries of the scheme unless otherwise authorized by the Engineer. The distance of borrow pits shall not be ground for extra payment or revision of contract prices.

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

The consent of the landowner or tenant for the excavation of borrow material and hauling along private access roads shall be secured by the Contractor who shall if required pay for such concession. Borrow pits shall be left in a condition acceptable to the landowner and/or tenant and to the Engineer. No borrow material shall be allowed to be excavated from within Housing Society limits.

19.3 MATERIAL CLASSIFICATION

19.3.1 Common Material

Common material shall comprise all excavation that is not rock or structural

excavation.

When the material is conglomerate and in the opinion of the Engineer is not so firmly consolidated as to require drilling and blasting, the Contractor shall use an excavator with suitable steel tines, or other appropriate equipment for its removal. Such work shall be considered as common material.

19.3.2 Loose Earth or Loose Rock

The individual size of the boulder of which is greater than 9 cu.ft shall be removed when required by the Engineer. The payment shall be made as provided in section 20 or 21 as the case may be.

Where between two successive cross-sections of the roads, the proportion by volume of rock boulders, in size larger than 9 cubic feet to earth is less than 50%, the excavation shall be wholly considered common.

Or

When ordered in writing by the Engineer, the Contractor shall excavate decayed vegetable matter or other unsuitable material which is more than 1 ft. below ground level to such depth as the Engineer may require. This work shall be considered as common excavation and paid for under Item 20.1 of Section 20.

19.3.3 Rock Material

Rock material shall consist of excavation of material that in the opinion of the Engineer requires drilling and blasting with explosives for its removal.

or

Where between two successive cross-sections of the road the proportion of rock boulders, in sizes larger than 9 Cu.ft. to earth is more than 50 percent the excavation shall be considered wholly as rock.

Rock material above original ground level such as stones, boulders, piles of stones and dry stone walling whose individual sizes are greater than 9 Cu.ft. shall be removed and disposed off if directed in writing by the Engineer and this work shall be considered as rock excavation.

SECTION - 20

EXCAVATION OF UNSUITABLE OR SURPLUS MATERIAL

20.1 SCOPE

Unsuitable or Surplus Material arising from roadway excavation which is declared in writing by the Engineer to be unsuitable for use or surplus to the requirements of the project.

20.2 CONSTRUCTION REQUIREMENTS

All suitable material excavated within the limits and scope of the project shall unless provision is expressly made to the contrary in these specifications be used in the most effective manner for the formation of the embankment and for widening the roadway/paved area, for backfill or for other works included in the contract.

Any material surplus to this requirement or any material declared in writing by the Engineer to be unsuitable shall be disposed off and leveled in thin layers by the contractor outside the right of way or as directed by the Engineer and the cost of the material disposal shall be deemed to be included in other pay items.

When unsuitable materials ordered to be removed and replaced, the soil left in place shall be compacted to a depth of 8 in. to the density as specified in Section 18 Sub-Clause 18.3. Payment for such compaction shall be included in the contract prices for the payment of unsuitable materials.

If the unsuitable material which is removed is below standing water level and the replacement material is gravel or a similar self-draining material of at least 12 in. in depth, the compaction may be dispensed with if approved by the Engineer.

20.3 MEASUREMENT AND PAYMENT

20.3.1 General

Only material which is surplus to the requirements of the project or is declared in writing by the Engineer to be unsuitable will qualify for payment under Pay Item 20.1.

The cost of excavation of material which is used anywhere in the project shall be deemed to be included in the pay items relating to the part of the work where the material is used.

The under mentioned Pay Item shall include the cost of obtaining the consent of the owner or tenant of the land where the disposal of surplus or unsuitable material is made.

20.3.2 Method of Measurement

Unsuitable or surplus material shall be measured in its original position and its volume shall be calculated in 100 cubic feet.

20.3.3 Basis of Payment

The quantities determined as provided above shall be paid for at the contract unit price for the pay item listed below and shown in the Bill of Quantities which price and payment shall constitute full compensation for all costs involved in the proper completion of the work prescribed in this item.

Description	Unit of Measurement
Excavation of unsuitable or surplus common material from roadway.	Cft.

SECTION - 21

STRUCTURAL EXCAVATION AND BACKFILL

21.1 SCOPE

Structural excavation shall consist of excavation in earth or rock within the limits of the work as specified herein or as shown in the drawings or as directed by the Engineer, and shall include the removal of all material, of whatever nature, necessary for the construction of foundations of R.C.C. culverts, pipe drainage, open/covered drains, manholes, inlets and other structures not otherwise provided for in these specifications and in accordance with the plans or as directed by the Engineer. It shall include the furnishing of all necessary equipment and formwork shoring etc., which may be necessary for the execution of the work. It shall also include the subsequent removal of formwork and the placement of all necessary backfill as hereinafter specified. It shall also include the disposing off excavated material, which is not required for backfill, in a manner and at locations so as not to affect the carrying capacity of any channel/drain or as directed by engineer.

21.2 MATERIAL REQUIREMENTS

21.2.1 Backfill

Backfill shall consist of granular material or other common materials as noted on the drawings or as approved by the Engineer.

21.3 CONSTRUCTION REQUIREMENTS

21.3.1 General

Structural Excavation shall be limited to the excavation for culverts, retaining walls, head walls, wing walls, catch basins, manholes, inlets and other structures not otherwise provided for in these specifications for the whole or part of the structure, according to its measurement as defined in clause 21.1. The price of structural excavation shall include backfilling, (except when granular backfill as specified in clause 21.4.1 is ordered in writing by the Engineer), to these structures with material approved of by the Engineer, disposing off surplus material, all necessary draining, pumping, bailing, sheeting, shoring, the construction of cribs and cofferdams and their subsequent removal, and the removal of existing structures or parts thereof which obtrude or encroach upon the structural excavation. Backfilling behind walls or box structures (culverts, underpass, etc.) shall be placed simultaneously on both side of the structures.

During the progress of excavation the Engineer will examine the nature of material taken out and shall have authority to stop the excavation for bearing tests at contractor's cost. The Engineer may require the contractor to excavate below the elevations shown on the drawings, depending upon where suitable foundation material is encountered.

21.3.2 Drain Excavation

Drainage excavation means excavation required for installation or salvation of pipe culverts, pipe siphons, pipe drains and sewers or excavation required in the shape of slopes or ditches to form inlet basins to culverts and in construction of miscellaneous structures specifically mentioned on drawings or ordered by the Engineer or excavation required in construction of inlet ditches, outlet ditches, drain ditches, canals, Channel changes, and other ditches.

Trenches shall be of sufficient width to enable the pipe to be properly laid and joined. The Contractor shall keep the trenches and other excavation quite free from water, so that works may be constructed in dry conditions. All backfilling shall consist of approved excavated material deposited in layer not to exceed 8 inches in depth and rammed to reach a specified compaction standard of 95% of maximum dry density according to AASHTO T-180 Method D.

21.3.3 Preservation of Channel/Drain

Unless otherwise specified, no excavation shall be made outside of formwork and the natural stream bed adjacent to the structure shall not be disturbed without permission from the Engineer. If any excavation or dredging is made at the site of structure before formwork is in place, the Contractor shall, without extra charge, after the foundation base is in place, backfill all such excavation to the original ground surface or channel/drain bed with material satisfactory to the Engineer. Material deposited within the stream area from foundation or other excavation shall be removed and the stream bed freed from obstruction thereby.

21.3.4 Depth of Footings

The elevations of the bottom of footings, as shown on the drawings, shall be considered as approximate only and the Engineer may order, in writing, such changes in dimensions or elevation of footings as may be necessary to secure a satisfactory foundation.

21.3.5 Preparation of Foundations for Footings

- All rock or other hard foundation material shall be freed from all loose material, cleaned and cut to a firm surface, either level, stepped, or roughened, as may be directed by the Engineer.
- When masonry is to rest on an excavated surface other than rock, special care shall be taken not to disturb the bottom of the excavation, and the change of surface elevation shall not be made until just before the masonry is to be placed.

21.3.6 Inspection

After each excavation is completed the Contractor shall notify the Engineer, and

no masonry/concrete shall be placed until the Engineer has approved the depth of the excavation and the character of the foundation material.

21.4 BACKFILL MATERIALS

21.4.1 Granular Backfill

Granular backfill shall be placed in the position and to the required depth, shown on the drawings or where and as required in writing by the Engineer and it shall be well compacted in layers not exceeding 8 inches in thickness to 95% of maximum dry density according to AASHTO T-180 METHOD-D as shown on the Drawings or as specified by the Engineer.

Granular backfill material shall give the following grading requirements.

GRADING REQUIREMENT

<u>MM</u>	<u>Inch</u>	<u>A</u>	<u>B</u>
25.00	1"	100	100
19.00	3/4"	60-100	75-100
4.75	No.4	50-85	55-100
2.00	No.10	40-70	40-100
0.425	No.40	25-45	20-50
0.075	No.200	10-26	6-20

or material satisfying the requirements of coarse sand falling under soil classification A-3. In case, coarse sand is utilized for granular fill it shall be ensured that the same is confined properly with approved material.

21.4.2 Common Backfill

Common backfill shall consist of earth free from large lumps, wood and other organic materials and of a quality acceptable to the Engineer. It shall be placed in the position and to the required depths shown on the Drawings and/or as required in writing by the Engineer and it shall be well compacted in layers not to exceed 8 inches in depth to the density shown on the drawings or as specified by the Engineer.

21.4.3 Special Backfill

This work shall consist of selected material as defined hereinafter, furnished, placed and compacted in layers against the inside faces of abutments and over the extrados of arches, in accordance with these specifications and in conformity with the requirements shown on the plans. Selected material for special backfill may be either gravel, brick, crushed brick or stones or sand. Gravel crushed brick and crushed stones shall consist of sound durable, particles, all of which shall be retained on a No.4 sieve as determined by ASSHTO T-27. Any material not suitable for water percolation shall not be used.

Fill placed around structures shall be deposited on both sides to approximately the same elevation at the same time. Adequate provision shall be made for the thorough drainage of all backfill.

No backfill shall be placed against any masonry/concrete foundation or culvert until permissions have been given by the Engineer and preferably not until the masonry/concrete has been in place for fourteen (14) days, or until test cylinders show the strength to be twice the working stress used in the design.

21.5 MEASUREMENT AND PAYMENT

21.5.1 Method of Measurement

The quantities of structural excavation to be paid for shall be the number of 100 cubic feet of material measured in its original position computed by the average end-area method, and structural excavation to the satisfaction of the Engineer.

Structural Excavation will be classified as "Structural Excavation in Rock" or as "Structural Excavation in Common Material", according to the excavation in rock or earth as defined in Section-19.3, and shall be paid under respective items for measurement and payment.

The volume of earth or rock to be measured for structural excavation shall consist of a prismoid bounded by the following planes:

- The vertical limits for computing pay quantities are as shown on the Drawings.
- The upper limit for payment of structural excavation shall be the ground surface as it existed prior to the start of construction operations, except where structural excavation is performed within roadway excavation or ditch excavation areas the upper limit shall be the planes of the bottom and side slopes of said excavated areas.
- The lower limits for computing pay quantities of structural excavation or structural backfill shall be a plane at the bottom of the completed footings, foundations or structures.

Measurement for structural excavation shall not include material removed below the footing grade and beyond specific limits to compensate for anticipated swell or as a result of effective swell resulting from slides, slips, cave-ins, silting or fillings, whether due to the action of the elements or to the carelessness of the Contractor. The depths of the footings shown on the drawings are approximate only and any variation found to be necessary during construction shall be paid for at the contract unit price.

a) Granular Backfill

The quantities of Granular Backfill to be paid for shall be the number of 100 cubic feet of material laid in place within the limits defined in Section-21.4 above, computed and accepted by the Engineer.

b) Common Backfill

The quantities of Common Backfill to be paid for shall be the number of 100 cubic feet of material laid in place within the limits defined in Section-21.4 above, computed by the average end-area method, compacted and accepted by the Engineer.

c) Special Backfill

The quantities of Special Backfill to be paid for shall be the number of 100 cubic feet of material laid in place within the limits defined in Section-21.4 above, computed by the average end-area method, compacted and accepted by the Engineer.

21.5.2 Basis of Payment

The quantities determined as provided above shall be paid for at the contract unit price respectively, for each of the particular pay item listed below that is shown in the Bill of Quantities, which price and payment shall be full compensation for all the costs involved in the proper completion of the work prescribed in this item.

Description	Unit of Measurement
Structural Excavation in Common Material	Cft.
Structural Excavation in Rock Material	Cft.
Granular Backfill	Cft.
Common Backfill	Cft.
Special Backfill	Cft.
Provide, place and compact Sand filling under floor	Cft.
Spreading sand @15Cft/100 Sft Over brick on edges	Sft.

SECTION - 22

REMOVAL OF EXISTING STRUCTURES

22.1 DESCRIPTION

The work specified in this Section consists of the removal and disposal of the materials from existing structures. The structures to be removed shall be (1) those structures, or portions of structures, shown on the plans to be removed; (2) those found within the limits of the area to be cleared and grubbed, and directed by the Engineer to be removed and (3) those structures or portions of structures which, in the opinion of the Engineer, it is necessary to remove in order to construct the new structures.

22.2 REMOVAL

The structure shall be removed in such a way as to avoid damage to the materials and to leave no obstructions to any proposed new structures or to any waterways. In the case of timber structures, all bolts, nails etc., shall be entirely removed from all useable materials, as determined by the Engineer, except that nail removal will not be required from two-inch by four-inch decking unless specifically required by the plans. All piling shall be pulled or cut, or shall be broken off two feet below the finished excavated surface of the original ground surface. Structural steel members shall be marked as directed, for identification. Where a portion of the existing structure is to remain in place explosives shall not be used to remove reinforced concrete. Under ground structures and chambers shall be demolished to the depth shown on the Drawings. They shall be properly cleared out and filled with suitable material and compacted to the specified density.

The concrete bridges to be partially removed and widened, concrete shall be removed by manually or mechanically operated pavement breakers, concrete saws or chipping hammers. Wherever concrete is to be removed to neat lines the outlines of the works shall first be made with small trenches or grooves about one inch deep cut in the existing concrete surface. Care shall be taken to confine the breakage to the correct outline.

22.3 DISPOSAL

All waste materials shall be disposed of, as directed by the Engineer, within 3000 ft. haul. All useable material, as determined by the Engineer shall be stacked in neat piles within the right of way.

22.4 MEASUREMENT & PAYMENT

22.4.1 Method of Measurement

The unit of measurement for Removal of Existing Structure will be job item, for the entire area of the project designated for Removal of Existing Structures.

22.4.2 Basis of Payment

The lump sum rate shall be full compensation for all costs of complying with the provisions of this Section and includes costs of all materials, labour and machinery etc.

Description	Unit of Measurement
Removal of Existing Structures	Lump sum

SECTION-23

FORMATION OF EMBANKMENT

23.1 SCOPE

This work shall consist of the formation of embankment in accordance with these specifications and the specifications for other work items involved and in conformity with the lines, grades, sections and dimensions shown on the drawings or as required by the Engineer.

23.2 MATERIAL REQUIREMENTS

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

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

- a) Contractor shall use AASHTO Class A-1, A-2, A-3, A-4 or A-5 soil as specified in AASHTO M-145 or other material approved by the Engineer.
- b) CBR of the material shall not be less than seven (7) percent, determined in accordance with AASHTO T-193. CBR value shall be obtained at a density corresponding to the degree of compaction required for the corresponding layer.
- c) Swell value of the material for embankment formation shall not exceed five tenth (0.5) percent. However, while establishing the swell value, surcharge weights representing the overburden will be used. In case sandy material is used for embankment formation, it shall be properly confined at on extra payment with a material and to the extent as approved by the Engineer and sandy material shall not be used on slopes of embankment.
- d) In areas subjected to flood and prolonged inundation of the embankment, such as at bridge sites, the material used in embankment, unless rock, shall be AASHTO Class A-1-a, A-1-b and A-2-4, soils. Other soils may be used only with the written consent of Engineer.

23.3 CONSTRUCTION REQUIREMENTS

23.3.1 Formation of Embankment with Common Material

Material for embankment, obtained and approved as provided above, shall be placed in horizontal layers of uniform thickness and in conformity with the lines,

grades, sections and dimensions shown on the Drawings or as required by the Engineer. The layers of loose material other than rock shall be not more than 8 inches thick, unless otherwise allowed by the Engineer after a trial section is prepared and approved.

The material placed in all embankment layers and the material scarified to the designated depth shall be compacted to the density specified below:

Depth in inches below Subgrade Level	Percent of AASHTO T-180 (Method-D) Maximum Dry Density
00 to 12	95%
12 to 30	93%
more than 30	90%

In-place density determinations of the compacted layers shall be made in accordance with AASHTO T-191 or other approved methods. For all soils, with the exception of rock fill materials, containing more than 10% oversize particles (retained on 3/4 inch), the in-place density thus obtained shall be adjusted to account for such oversize particles as directed by the Engineer. Subsequent layers shall not be placed and compacted unless the previous layer has been properly compacted and accepted by the Engineer.

Material for embankment at points inaccessible to normal compaction equipment shall be placed in horizontal layers of loose material not more than 8 inches thick and compacted to the densities specified above by the use of mechanical tampers, or other appropriate equipment.

The compaction of the embankment shall be carried out at the designated moisture content consistent with the available compacting equipment. In forming the embankment the contractor shall take steps to ensure that the work can be drained free of rain water, and he shall make due allowance in the height and width of the work for swelling or shrinkage.

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

When materials of widely divergent characteristics, such as clay and chalk or sand, drawn from different sources, are to be used in the embankment they shall be deposited in alternate layers of the same material over the full width of the

embankment to depths approved by the Engineer. Rock, clay or other material shall be broken up, and no accumulation of lumps or boulders in the embankment will be permitted. No surplus material shall be permitted to be left at the toe of the embankment or at the top of cut sections.

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

23.3.2 Excavation in Embankments

Unless otherwise specified in the specification and drawings the Contractor may choose with the approval of the Engineer to excavate for service ducts etc after the embankment has been placed. Any space remaining after the placing of such structures and deducting for specified bed or backfill, shall be filled with material approved by the Engineer and compacted as follows:

- Layers not more than 8 inches in loose thickness shall be placed and compacted in succession, with mechanical tampers or tires or tracks of motor driven equipment operated transversely to the roadway, to the densities specified in Clause 23.3.1. Moisture content shall be adjusted as directed by the Engineer.
- The excavation in embankment and the placing of backfill for the purposes described above shall not constitute any claims for payment but shall be covered under the contract unit price paid for other works in which the operation is involved.

23.3.3 General Requirements

To avoid interference with the construction of structures the Contractor shall, at points to be determined by the Engineer, suspend work on embankments and/or in cuts forming the approach to any such structure until such time as the construction of the latter is sufficiently advanced to permit the completion of the approaches without the risk of interference or damage to the structures works. The cost of such suspension of work shall be included in the contract unit prices for embankment. In carrying embankments up to or over culverts or pipe drains care shall be taken by the Contractor to have the embankments brought to equally on both sides and over the top of any such structure.

When as a result of settlement, an embankment requires the addition of material up to 12 inches in thickness to bring it up to the required grade level, the top of the embankment shall be thoroughly scarified before the additional material is placed, and no extra payment shall be made for the scarification.

The Contractor shall be responsible for the stability of all embankments and shall replace any portions that in the opinion of the Engineer have been damaged or

displaced due to carelessness or neglect on the part of the Contractor.

Embankment material which may be lost or displaced as a result of natural causes such as storms, cloud-burst or as a result of unavoidable movement or settlement of the ground or foundation upon which the embankment is constructed shall be replaced by the Contractor with acceptable material from excavation or borrow. No additional compensation will be allowed for the replacement except that the quantity of material required will be paid for at the contract price for the type of material used.

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

23.3.4 Shoulders Ditches and Slopes

The roadway, including the slopes and all drainage structures shall be substantially completed before the construction of pavement is started.

During the construction of the pavement, a shoulder at least 3 ft. wide shall be maintained in place to properly support the edges of the pavement. Upon completion of the pavement, the earth shoulders, slopes and ditches shall be completed and shaped to surface which is within 0.1 foot above or below the true surface shown on the Plans. The shoulder lines shall not vary more than 0.1 foot horizontally from the true lines shown on the Plans.

Hand dressing of shoulders, slopes or ditches etc. will not be required except where necessary and directed by the Engineer.

Material which contains weeds, roots or other unsuitable matter shall not be used in the construction of shoulders.

23.4 MEASUREMENT AND PAYMENT

23.4.1 Method of Measurement

The quantities to be paid for shall be the number of 100 cubic feet in the volume of embankment compacted in place, after clearing, grubbing and stripping, accepted by the Engineer formed with material resulting from:

- i) Roadway Excavation
- ii) Borrow Excavation

Material from Roadway Excavation as defined in Clause 23.1 which is placed in the embankment and accepted by the Engineer will be paid for only in the

embankment and such payment will be deemed to include the cost of excavating and hauling and all other costs in connection with this material in constructing the embankment.

Material from Borrow Excavation as defined in Clause 23.2 which is placed in the embankment and accepted by the Engineer will be paid for only in the embankment and such payment will be deemed to include the cost of excavation. Payment of royalties to landowners and/or local communities, the cost of hauling and all other costs in connection with this material in constructing the embankment.

23.4.2 Basis of Payment

The quantities, determined as provided above shall be paid for at the contract unit price, respectively, for each of the particular pay items listed below and shown in the Bill of Quantities, which price and payment shall be full compensation for all the costs necessary for the proper completion of the work prescribed in this item.

Description	Unit of Measurement
Formation of Embankment from Roadway Excavation in Common Material.	Cft.
Formation of Embankment from Borrow Excavation in Common Material.	Cft.
Sweet earth fill from Borrow Excavation.	Cft.

SECTION - 24

SUBGRADE PREPARATION

24.1 SCOPE

The subgrade is that part of the work on which the sub-base is placed or, where there is no sub-base, the support level for the base course.

The work shall consist of preparing the completed subgrade to receive the sub-base, base course, surface course, shoulders, curbs, gutters and shall include shaping the subgrade surface to elevations and cross-section as shown on plans or as directed by the Engineers for final compaction and proof rolling prior to construction of overlying courses and structures. The subgrade shall be constructed so that when completed it will conform to the alignment, grades and cross-sections as shown on the plans as directed by the Engineer.

24.2 CONSTRUCTION REQUIREMENTS

24.2.1 Prior Works

Culverts, drain pipes, service-ducts and any other minor structures below the subgrade level, including the fully compacted backfill over them, if necessary, within 12 inches below the subgrade level; ditches, drains and outlets for drainage, Head walls and wing walls for culverts, shall be in such operative condition as to ensure prompt and effective drainage and to avoid damage to the subgrade by storm water. No work shall be started on the prepared subgrade until the prior works herein described have been approved by the Engineer.

24.2.2 Material

The material requirement shall apply to layers to a depth of 12 inches below the finished subgrade elevation. The material shall meet all the requirements of the embankment material with minimum (4 days soaked) CBR as 12% or as specified on drawings, unless otherwise permitted by the Engineer. Swell value should not be less than 0.3%. For improvement of available material, Geotechnical Laboratory may be consulted.

24.2.3 Compaction Requirements

All materials down to a depth of 12 inches below the subgrade elevation shall be compacted to at least 95 percent of the maximum dry density as determined according to AASHTO T-180 Method-D.

24.2.4 Subgrade Level in Earth Cut

When subgrade is in earth cut the finished compacted surface levels shall not vary than the permissible limits for the specified levels. The soil shall be compacted to a depth of 12 inches with approved rollers to the density specified in Clause 24.2.3 and prior to compaction the moisture content shall be adjusted by watering with approved sprinklers or by drying out as may be required, in order that the specified degree of compaction may be attained.

If the soil in the cut has a CBR below that required for the project according to laboratory testing, the unsuitable material shall be removed and replaced by suitable material to a depth determined by the Engineer.

24.2.5 Subgrade Level in Rock Cut

For rock cuts, the subgrade is to be prepared as per Clause 24.2.8.

24.2.6 Subgrade Level on Embankment

When the subgrade is formed in embankment, its width shall be the full width of top of embankment and material placed in the upper part of embankment down to a depth of thirty centimeters below subgrade level shall meet compaction requirements of 24.2.3. Soils having a minimum value of C.B.R. of seven (7) percent and swell value of not more than 0.3 percent shall be used. C.B.R. less than seven (7) percent may be used in case, the design allows for it. Unsuitable material if encountered within the existing formation layer as per laboratory specified test, shall be removed, disposed of and replaced by suitable one as per direction of the Engineer of which the payment will be made under relevant items of work.

Rollers and other equipments of approved size and type, accepted by the Engineer, shall be used for compaction. Water shall be added to obtain optimum moisture content, if necessary. Contractor shall ensure proper compaction in restricted areas by use of special equipments and rollers. No compensation shall be made for extra work due to restricted space.

Performance of this item of work shall not be paid for under this section but shall be deemed to be conveyed by the contract price for pay item 23.4.2 (formation of embankment).

24.2.7 Templates and Straight Edges

The Contractor shall provide for the use of the Engineer, satisfactory templates and straight edges in sufficient numbers to check the accuracy of the work, as provided in these specifications and no subsequent work shall be permitted until the subgrade levels have been checked and approved by the Engineer.

24.2.8 Allowable Acceptance Limits for Level Variation in Cut and Fill

The subgrade shall be checked and approved by the Engineer before construction of sub-base, base course or surface course, etc. The Engineer may stop construction work at any time the subgrade is not in proper condition for receiving the overlying course.

The surface of the subgrade shall be within the following limits of elevations and smoothness.

The variation of any point of the subgrade surface from the theoretical elevations as determined from plans and cross-sections must not be outside the following limits.

In earth cut and fill	± 1.25 , inches maximum
In rock cut	± 2.00 , inches maximum

24.2.9 Proof Rolling

The work shall consist of bringing the bottom of excavations and top of embankment of the roadway, between the outer limits of subgrade width, to a surface conforming to the grades, lines and cross sections shown on the plans, of uniform density, ready to receive the subbase, base or surfacing.

24.2.10 Traffic on Subgrade

Traffic shall not be permitted on subgrade once it is finished and approved for construction of subsequent layers.

The finished subgrade shall be maintained at all times in a smooth and compacted condition and well drained until the sub-base has been laid on it. The subgrade shall be covered with the fully constructed sub-base, or base as the case may be as soon as possible.

In case the sub-base course is not constructed within ten (10) days of the approval of the subgrade, the subgrade shall have to be approved again.

24.2.11 Tolerances

The allowable tolerance will be as under:

Thickness (Inch)	Level (Inch)	10 feet straight Edge (Inch)	Cross fall Grade in 100 feet (%)	Longitudinal
NA	+ 3/4 -- 3/2	9/8	+ 0.5 -- 0.5	+ 0.1 -- 0.1

24.3 MEASUREMENT AND PAYMENT

24.3.1 Method of Measurement

The work shall not be paid separately and shall be deemed as included in item "Formation of Embankment".

SECTION - 25

GRANULAR SUBBASE

25.1 SCOPE

This item shall consist of furnishing, spreading in one or more layers and compacting granular subbase according to the Specifications and Drawings and/or as directed by the Engineer. Granular subbase shall consist of natural or processed aggregates such as gravel, sand or stone fragments which shall conform to the following requirements.

25.2 MATERIAL REQUIREMENTS

The subbase material shall be clean and free from organic matter and other deleterious substances, and shall be of such nature that it can be compacted readily under watering and rolling to form a firm stable base.

The material shall comply with the following grading and quality requirements:

- The subbase material shall have a gradation curve within the limits for Grading B, C as given below:

TABLE - A

GRADING REQUIREMENTS FOR SUBBASE MATERIAL

Sieve Designation		Mass Percent Passing	
Alternate	Standard	Grading-B	Grading-C
(2.1/2) inch	60.00 (mm)	-	-
2 in.	50.00 (mm)	100	-
1 in	25.00 (mm)	35-85	100
3/8 in.	9.50 (mm)	40-70	50-85
No. 4	4.75 (mm)	30-60	35-65
No. 10	2.00 (mm)	20 -50	25-50
No. 40	0.425 (mm)	10-30	15-30
No. 200	0.075 (mm)	5-15	5-15

The Coefficient of Uniformity D_{60}/D_{10} shall be not less than 3, where D_{60} and D_{10} are the particle diameters corresponding to 60% and 10%, respectively, passing (by weight) in a grain size analysis.

- The Material shall have a CBR value of at least on 96 hours soaked sample 50% - 60%, determined according to AASHTO T-193. The CBR value shall be obtained at a density corresponding to 100% of the maximum dry density determined according to AASHTO T-180 Method D.
- The coarse aggregate material retained on sieve No.4 shall have a percentage of wear by the Los Angeles Abrasion to AASHTO T-96 of not more than 50 percent.
- In order to avoid intrusion in the subbase of silty and clayey material from the subgrade, the ratio D15 (Sub-base)/D85 (Sub-grade) shall be less than 5.
- The fraction passing the No. 200 (.003 inch) sieve shall not be greater than the two-third of the fraction passing the No. 40 (.017 inch) sieve. The fraction passing the No. 40 sieve shall have a liquid limit not greater than 25 and a plasticity index of 6 or less.

25.3 CONSTRUCTION REQUIREMENTS

25.3.1 Spreading

Granular subbase shall be delivered to the road bed as a uniform mixture. Segregation shall be avoided during spreading and the final compacted layer shall be free from concentration of coarse or fine materials.

Granular subbase shall be deposited on the road bed in a quantity which will provide the required compacted thickness without resorting to spotting, picking up or other shifting the subbase material.

Where the required thickness is 6 inches or less, the aggregates may be spread and compacted in one layer. Where the required thickness is more than 6 inches, the aggregates shall be spread and compacted in 2 or more layers of approximately equal thickness, and the maximum compacted thickness of any one layer shall not exceed 6 inches. All subsequent layers shall be spread and compacted in a similar manner.

Granular subbase shall be spread with equipment that will provide a uniform layer conforming to the specified item both transversely and longitudinally within the tolerances as specified in Clause 25.3.5 (Table-B).

25.3.2 Compaction

The moisture content of subbase material shall be adjusted prior to compaction by watering with approved sprinklers mounted on trucks or by drying out, as required, in order to obtain the required compaction.

The subbase material shall be compacted by means of approved vibrating rollers or steel wheel rollers (rubber tyre rollers may be used as a supplement), progressing gradually from the outside towards the centre, except on super elevated curves, where the rolling shall begin at the low side and progress to the high side. Each succeeding pass shall overlap the previous pass by at least one third of the roller width. While the rolling progresses, the entire surface of each layer shall be properly shaped and dressed with a motor grader, to attain a smooth surface conforming to the required lines and grades.

Any area inaccessible to rolling equipment shall be compacted by means of mechanical tampers.

The compaction of the subbase layer shall be continued until the specified density is achieved.

If the layer of subbase material, or part thereof does not conform to the required finish, the Contractor shall, at his own expense, rework, water, and recompact the material before next layer of the pavement structure is constructed.

Immediately prior to the placing of first layer of base course the subbase layer (both under the traveled way and the shoulders) shall be brought to the required level and shape. Any watering and reshaping of the surface of the subbase will be at the Contractor's expense.

No material for construction of the base shall be placed until the subbase has been approved by the Engineer.

25.3.3 **Compaction Requirements**

The relative compaction of each layer of the compacted subbase shall not be less than 98% of the maximum dry density determined according to AASHTO T-180 Method D. The field density shall be determined according to AASHTO T-191 or other approved method. For all materials, the field density thus obtained shall be adjusted to account for oversize particles *(retained on 3/4 inch sieve) as per AASHTO T-224 or as directed by the Engineer.

25.3.4 **Trial Sections**

At least 10 days before the main work of subbase construction is started the Contractor shall spread and compact a trial section at the actual alignment as directed by the Engineer. The object of the trial section is to check the suitability of the materials and the efficiency of the equipment and construction methods proposed to be used by the Contractor. Therefore, the Contractor shall use the same material, equipment and procedures that he proposes to use for the main work. One trial section of about 5000 square feet shall be made for every type of material and/or construction equipment/ procedure proposed for use.

After final compaction, the Engineer may carry out compaction tests, field CBR

tests and such other tests, which he finds necessary.

If a trial section shows that the proposed material, equipment or procedures in the Engineer's opinion are not suitable for subbase, the material shall be removed at the Contractor's expense, and a new trial section shall be constructed.

If the basic conditions regarding type of material, equipment or procedures change during the execution of the main work, new trial sections shall be constructed when directed by the Engineer.

The Engineer may allow that the compaction requirements be changed based on results from the trial sections.

25.3.5 Tolerance

The subbase shall be compacted to the desired level and cross slope as shown on the drawings. The allowable tolerance shall be as under:

TABLE - B
ALLOWABLE TOLERANCES

Thickness(inch)	Level (inch)	10 feet Straight Edge (inch)	Crossfall %	Longitudinal Grade in 100 feet (%)
+ 3/8	+ 3/8	3/4	+ 0.3	+ 0.1
- 3/4	- 3/8	-	- 0.3	- 0.1

25.3.6 Acceptance Sampling and Testing

Acceptance sampling and testing with respect to materials and construction requirements shall be in accordance with Table-A, B & C of Section-25.

25.4 MEASUREMENT AND PAYMENT

25.4.1 Method of Measurement

The quantity of Granular subbase to be paid for shall be measured by the theoretical volume acceptably placed as shown on the Drawings or as directed and approved by the Engineer. No allowance will be given for materials placed outside the theoretical limits shown on the cross- sections. Trial sections shall not be measured separately but shall be included in the quantities above.

NOTE (a) : For 3 or more tests, average value must be equal to or greater than 100% as specified in Clause 25.3.3 no individual test shall yield less than 98%. Test locations shall be selected by random method.

SECTION – 26

WATERBOUND MACADAM BASE

26.1 SCOPE

This work shall consist of furnishing, placing and compacting in one or more courses of crushed stone base with filler on a prepared sub-grade or sub-base course surface in conformity with the lines, grades, thickness and typical cross-sections shown on the drawings or in accordance with these specifications.

26.2 MATERIAL REQUIREMENTS

Aggregate grades shall conform to either grading A or B given in the following table.

GRADING REQUIREMENTS FOR COARSE AGGREGATE:

Sieve Designation	PERCENTAGE BY WEIGHT PASSING SQUARE MESH SIEVES	
	Grading A 1-1/2" - 2-1/2" Size	Grading B 1" - 2" Size
3"	100	100
2-1/2"	90-100	100
2"	25-75	90-100
1-1/2"	0-15	35-70
1"	--	0-15
3/4"	0-5	--
1/2"	--	0-5

The above coarse aggregate shall have the following quality requirements.

- The coarse aggregate (material retained on sieve No. 4) shall consist of material of which at least 50% by weight shall be crushed particles, having a minimum of one fractured face.
- The coarse aggregate shall have a percentage of wear by Los Angeles Abrasion test (AASHTO T-96) of not more than 40.
- The material shall have a loss of less than 12 % when subject to five cycles of the Sodium Sulphate Soundness test according to AASHTO T-104.

- The sand equivalent determined according to AASHTO T 176 shall not be less than 45, or
- The material shall have a Liquid Limit of not more than 25 and a Plasticity Index of not more than 6 as determined by AASHTO T-89 and 90, respectively.
- The material passing the 0.76-inch sieve shall have 96 hours soaked CBR value of minimum 50% - 80%, tested according to the AASHTO T-193. The CBR value shall be obtained at the maximum dry density determined according to AASHTO T-180, Method D.

Fine aggregate (filler material or screenings) shall consist of crushed stone screenings free from clay lumps, dirt and other objectionable material. The fine aggregate shall be of the following gradation:

US Standard Sieve Sizes	Percent Passing by weight
9.50 mm (3/8 inch)	100
4.35 mm (No.4)	85-100
0.15 mm (No.100)	10-30

The material passing the No.40 sieve shall have a Liquid Limit of 25 (maximum) and a Plasticity Index between 4 and 6.

26.3 CONSTRUCTION REQUIREMENTS

26.3.1 Preparation of Previously Constructed Sub-grade or Sub-base

All loose or foreign material shall be removed. Any ruts or soft yielding places that appear on the sub Grade or sub Base course shall be corrected and rolled until firm. Necessary sub-grade or sub-base course material shall be added to conform to proper grade and cross section.

Sub-grade or sub-base course shall be rolled to even, firm foundations.

26.3.2 Weather Limitations

Water Bound Macadam work shall not be constructed during freezing weather or on a wet or frozen sub-grade or sub-base course.

When temperature is below 40° F. completed base course shall be protected

against freezing, until it dries out, by a sufficient covering of straw, hay, or other approved material.

26.3.3 Thickness of Layers

The base course shall be constructed in complete layers of not less than 3" or more than 4-1/2" compacted thickness. The compacted thickness of layer more than 4-1/2" may be allowed if the Contractor can demonstrate that he can achieve the specified densities throughout the depth of the course to the satisfaction of the Engineer by using special rolling equipment. When it is necessary to construct the base in more than one layer to conform to the required finished thickness, each layer shall be constructed as described below:

26.3.4 Spreading Coarse Aggregate

Sufficient coarse aggregate shall be uniformly spread to give the required thickness for each layer when compacted.

All patches or areas of fine or undersized aggregate shall be removed and replaced with suitable aggregate.

The thickness of each layer shall be set by the use of depth blocks.

Coarse aggregate shall not be spread more than 15000 sq. ft. and never more than 500 linear ft. in advance of rolling and application of screenings.

26.3.5 Compaction

Immediately after the spreading of the coarse aggregate, it shall be compacted to the full width by rolling with a power roller weighing at least 10 tons. The rolling shall begin with the outside rear wheel covering equal parts of shoulder and coarse aggregate and the roller shall be run forward and backward until the shoulder and coarse aggregate are firmly bound together.

When shoulders and edges of the base course have been firmly rolled, the rolling shall progress gradually from the edges to the centre, each preceding rear-wheel track being uniformly lapped by one-half the width of such track, and shall continue until the entire area of the course has been rolled by the rear wheels. Rolling shall be continued until the aggregate is well keyed and does not creep ahead of the roller and until the surface is firm, even and true to line, grade, and crown. Places inaccessible to roller shall be compacted by mechanically operated or hand tampers or as directed by the Engineer.

26.3.6 Applying Screenings

Immediately after the compaction of the coarse aggregate, sufficient clean, dry screenings shall be uniformly applied, to fill all voids. Dry rolling shall be

continued while screenings are being applied. Hand brooms shall be used if the roller is not equipped with a broom. Screening shall be spread in thin layers at a uniform and slow rate to insure filling all voids.

Spreading screenings, brooming, and rolling shall be continued until the voids are completely filled. The grading requirements for screenings shall be either of the following two classes as approved by the Engineer.

Grading/ Classification	Size of Screening	Sieve Designation	Percent by weight passing the sieve
A	1/2 "	1/2"	100
		3/8"	90-100
		4"	10-30
		150 micron	0.8
B	3/8"	3/8"	100
		4"	85-100
		150 micron	10-30

26.3.7 Sprinkling

Immediately after the voids of a layer have been filled with screenings, the macadam shall be sprinkled with water, the sprinkler being followed by the roller. All excess screenings forming in piles or cakes on the surface shall be scattered by light sweeping. The sprinkling and rolling shall continue, and additional screenings shall be applied where necessary, until all voids are completely filled and the coarse stone firmly set and bonded. The quantity of screenings and water shall be sufficient to completely fill and bond the entire depth of the coarse aggregate and to produce a granular surface.

Provision shall be made by the Contractor for furnishing water at the site of the work by equipment of ample capacity and of such design as to assure uniform application.

26.3.8 Density Requirements

As soon as proper conditions of moisture are attained the density tests shall be performed in accordance with AASHO T-191 or other approved method modified to include only material passing a 2 inches sieve. For all materials the field density thus obtained shall be adjusted to account for oversize particles (retained on 3/4 inch sieve) as per AASHTO T-224 or as directed by the Engineer. If the density is less than 100 per cent of the maximum density as determined by AASHO T 180 (Modified Proctor), the contractor shall perform additional rolling as may be necessary to obtain that density.

26.3.9 Tolerances

The surface shall be true to the established grade. The surface shall not vary more than 3/8 inches in 10 feet from the true profile and cross section. The thickness shall not be less than 1/4 inches from that required for the layer being constructed.

26.3.10 Reconstructing Damaged Base Course

Should the sub-grade or sub-base at any time become soft or churned up with the base-course material the contractor shall, without additional compensation remove the mixture from the affected portion, reshape and compact the subgrade or sub-base, and replace the removed section in accordance with the foregoing requirements.

26.3.11 Maintenance and Protection of Base Course

The surface of any layer shall be maintained in its finished condition until the succeeding layer or pavement is placed.

26.4 MEASUREMENTS AND PAYMENTS

26.4.1 Method of Measurement

The quantities of the base course to be paid for shall be measured by the theoretical volume in place as shown on drawings or as directed and approved for construction by the Engineer Incharge, placed and accepted for the completed Water Bound Macadam Base Course. No allowance will be made or given for materials placed out side the theoretical limits shown on the cross section.

26.4.2 Basis of Payment

The accepted quantities measured as provided above shall be paid for the contract until price per 3 meter of the Water Bound Macadam Base Course for item price and payment shall constitute full compensation for furnishing all the materials, hauling, placing, watering, rolling, labour, equipment, tools and incidental works necessary to complete the job.

Description

**Unit of
Measurement**

Water Bound Macadam Base Course

Cft.

**SCHEDULE FOR SAMPLING AND TESTING
(W.B.M BASE COURSE)**

Work Item	Material	Test		Sampling and Testing Frequency
		Method	AASHTO	
Base Course	Aggregate	Gradation	T 27	3/source plus 1/1000 C.ft
		Plasticity Index	T89 & T90	3/source plus as required based on visual observation
		CBR	T180, T193	3/source plus as required based on visual in observation
		Abrasion	T96	3/source plus 1/5000 C.ft.
		Sodium Sulphate Soundness	T104	3/source plus 1/5000 Cft.
		Fractured Faces	Visual	3/source plus as required based on visual observation
		Flat and Elongated Particles	Visual	--- do ---
		Moisture Density	T180	1/1000 cu.m
		Field Density	T191 or T238 & T239	4/layer/1000 ft. laid 3/minimum/layer if less than 4000 ft. laid.

Note (a) : For number of tests 3 or more, average value must be equal to or greater than 100% as specified in Section 26 and no individual test shall yield less than 98%. Test locations are selected by random method.

SECTION - 27

ASPHALTIC MATERIALS

27.1 ASPHALT CEMENT

Asphalt Cement shall be an oil asphalt, or a mixture of refined liquid asphalt and refined solid asphalt, prepared from crude asphaltic petroleum. It shall be free from admixture with any residues obtained by the artificial distillation of coal, coal tar, or paraffin and shall be homogeneous and free from water. No emulsification shall occur when a thirty (30) gram sample is boiled for two (2) hours with two hundred and fifty (250) cubic centimeters of distilled water in a five hundred (500) cubic centimeters Erlenmeyer flask equipped with a reflux condenser.

Asphalt Cement shall be classified by penetration and when tested in accordance with the standard methods of tests of the AASHTO, the grades of asphalts shall conform to the requirements set forth in Table 27.2. The grade of asphalt to be used shall be in accordance with these specifications or the Special Provisions or as directed by the Engineer.

27.2 ENVIRONMENTAL FACTORS

In areas where highly frost susceptible soils and severe low temperature conditions are encountered, it may be necessary to remove and replace soils susceptible to frost heave or take other precautions prior to pavement construction. In extremely hot climates, asphalt mixes should be designed to resist rutting and maintain stiffness at high temperatures. Because asphalt mixtures are influenced by temperature, it is recommended that different asphalt grades be used where different temperature conditions prevail. Table below gives recommended asphalt grades for various temperature conditions.

SELECTING ASPHALT GRADE

Temperature Condition	Asphalt Grade *
Cold, mean annual air temperature ≤ 7 degree C (45 degree F)	AC-10 AR-4000 80/100 pen
Warm, mean annual air temperature between 7 degree C (45 degree F) and 24 degree C (75 degree F)	AC-20 AR-8000 60/70 pen

Temperature Condition	Asphalt Grade *
Hot, mean annual air temperature ≥ 24 degree C (75 degree F)	AC-40 AR-16000 40/50 pen

* Both medium setting (MS) and slow setting (SS) emulsified asphalts are used in emulsified asphalt base mixes. They can be either of two types; cationic (ASTM D 2397 or AASHTO M 208) or anionic (ASTM D977 or AASHTO M 140)

The grade of emulsified asphalt is selected primarily on the basis of its ability to satisfactorily coat the aggregate. This is determined by coating and stability test (ASTM D 244, AASHTO T 59). Other factors important in the selection are the water availability at the job site, anticipated weather at the time of construction, the mixing process to be used, and the curing rate.

27.3 CUT-BACK ASPHALT

Liquid asphalts (cut back) shall consist of materials conforming to the following classifications. When tested in accordance with the standard methods of tests of the AASHTO, the grades of liquid asphalt shall conform to the requirements specified in the Tables 27.3 and 27.4.

Medium curing products designated by letters MC, shall consist of asphalt cement fluxed or blended with a kerosene solvent.

Rapid curing products designated by the letters RC, shall consist of asphalt cement with a penetration of Grade 80-100, fluxed or blended with a naphtha solvent.

27.4 EMULSIFIED ASPHALT

Asphaltic emulsions shall be composed of a bituminous base uniformly emulsified with water and an emulsifying or stabilizing agent. They shall be classified according to use as Rapid Setting or Slow Setting, and shall conform to the requirements specified in Table 27.5.

The bituminous base used in manufacturing RS-1 type emulsion shall be asphalt cement of Grade 120-150 or Grade 200-300, as designated by the Engineer.

The bituminous base used in manufacturing SS-1 type emulsion shall be paving asphalt, Grade 60-70 or Grade 120-150, as designated by the Engineer.

APPLICATION TEMPERATURE
TABLE 27-1
Application Temperature Range, Degree C

	<u>Spray</u>	<u>Mix</u>
a) Asphalt Cement (all grades)	170 (Max)	As required to achieve viscosity of 70-150 centistoke. Saybolt-Furol or as required to achieve a Kinematic Viscosity of 150-300 centistoke.
b) Cut-back or Emulsified Asphalts.		
MC-70, RC-70		27-65
MC-250		38-93
RC-250		38-79
MC-800		85-127
RC-800		71-107
SS-1, SS-1h		-
RS-1		-
RS-2		-

TABLE 27.2
Requirements for Asphalt Cement (AASHTO M-20)

	PENETRATION GRADE							
	40 - 50		60 - 70		80 - 100		120 - 150	
	Min	Max	Min	Max	Min	Max	Min	Max
Penetration at 77°F (25°C) 100g 5 sec.	40	50	60	70	85	100	120	150
Flash point, Cleveland open Cup, °F (°C)	450 (232)	-	450 (232)	-	450 (232)	-	425 (218)	-
Ductility at 77°F(25°C) 5 cm per min., cm.	100	-	100	-	100	-	100	-
Solubility in trichloro- ethylene percent	99	-	99	-	99	-	99	-
Thin-film oven test, 1/8 in. (3.2 mm), 325°F (163°C) 5 hr. Loss on heating, percent	-	0.80	-	0.80	-	1.0	-	1.3
Penetration, of residue, percent of original.	58	-	54	-	50	-	46	-
Ductility of residue at 77°F	-	-	50	-	75	-	100	-

TABLE 27.3

Requirements for Medium Curing Type Asphalts (AASHTO M82)

	MC - 70		MC - 250		MC - 800	
	Min	Max	Min	Max	Min	Max
Water percent	-	0.2	-	0.2	-	0.2
Flash point (tag open cup) Degree C	38	-	66	-	66	-
Kinematic Viscosity at 60°C (140°F) (See Note 1) centistoke	70	140	250	500	800	1600
Distillation test: Distillate, percentage by volume of total distillate to 30°C (68°F)						
to 225 °C (437 °F)	0	20	0	10	-	-
to 260 °C (500 °F)	20	60	15	55	0	35
to 315 °C (600 °F)	65	90	60	87	45	80
Residue from distillation to 360°C (680°F) volume percentage of Sample by difference	55	-	67	-	75	-
Tests on residue from distillation: penetration, 100.g. 5 sec.. at 25°C (77°F)	120	250	120	250	120	250
Ductility 5 cm/min cm(see note 2)	100	-	100	-	100	-
Solubility in Tichlomethylene percent	99	-	99	0	99	-

Note-1 As an alternative, Saybolt Furol Viscosities may be specified as follows:

Grade MC-70 Furol viscosity at 50°C (122°F) 60 to 120 centistoke.
 Grade MC-250 Furol viscosity at 60°C (140°F) 125 to 250 centistoke.
 Grade MC-800 Furol viscosity at 82.2°C (180°F) 100 to 200 centistoke.

Note-2 If penetration of residue is more than 200 and its ductility at 25°C (77°F)

is less than 100 cm., the material will be acceptable if its ductility at 15.5°C (6°F) is more than 100 cm.

27-5

TABLE 27.4

Requirements for Rapid Curing Type Asphalts (AASHTO M-81)

	RC - 70		RC - 250		RC - 800	
	Min	Max	Min	Max	Min	Max
Water percent	-	0.2	-	0.2	-	0.2
Flash point (tag open cup degree C)	-	-	27	-	27	-
Kinematic Viscosity at 60°C (140°F) (See Note 1)	70	140	250	500	800	1600
Distillation test: Distillate, percentage by volume of total distillate to 30°C (88°F)						
to 190 °C (374 °F)	10	-	-	-	-	-
to 225 °C (437 °F)	50	-	35	-	15	-
to 260 °C (500 °F)	70	-	60	-	45	-
to 315 °C (600 °F)	85	-	80	-	75	-
Residue from distillation to 360°C (680°F) volume percentage of Sample by difference	55	-	65	-	75	-
Test on residue from distillation Penetration 100g: 5 sec., at 25°C (77°F)	80	120	80	120	80	120
Ductility 5 cm/min of 25°C (77°F) cm	100	-	100	-	100	-
Solubility in Tichlomethylene percent	99	-	99	0	99	-

Note-1 As an alternative, Saybolt Furol Viscosities may be specified as follows:

- Grade RC-70 Furol viscosity at 50°C (122°F) 60 to 120 centistoke.
- Grade RC-250 Furol viscosity at 60°C (140°F) 125 to 250 centistoke.
- Grade RC-800 Furol viscosity at 82.2°C (180°F) 100 to 200 centistoke.

**TABLE 27.5
REQUIREMENTS FOR EMULSIFIED ASPHALTS(AASHTO M-140)**

Type Grade	Rapid Setting				Slow Setting			
	RS - 1		RS - 2		SS - 1		SS - 1h	
	Min	Max	Min	Max	Min	Max	Min	Max
Test on Emulsions								
Viscosity, Saybolt Furol at 77°F (25°C). centistoke.	20	100	-	-	20	100	20	100
Viscosity, Saybolt Furol at 122°F (50°C). centistoke.	-	-	75	400	-	-	-	-
Settlement 5 days, percent (a)	-	5	-	5	-	5	-	5
Storage stability test, 1 day (b)	-	1	-	1	-	1	-	1
Demulsibility, 35 ml. 0.02 CaCl ₂ percent(C)	(60)	-	(60)	-	-	-	-	-
Cement mixing test, percent	-	-	-	-	-	2	-	2
Sieve test, percent	-	0.10	-	0.10	-	0.10	-	0.10
Residue by distillation, percent	55	-	63	-	57	-	57	-
Test on residue from distillation, Test Penetration, 77°F (25°C) 100g. 5 Sec	100	200	100	200	100	200	40	90
Ductility 77°F (25°C), 5 cm/min. cm.	40	-	40	-	40	-	40	-
Solubility in Tichlomethylene, percent	97.5	-	97.5	-	97.5	-	97.5	-
Suggested uses	Surface treatment penetration macadam tack coat.		Surface treatment & penetration macadam		Plant or road mixture with graded and fine aggregates a substantial quantity of which passes a No.8 (2.3 mm) sieve and a portion of which may pass a No.200 (0.075 mm) sieve; slurry seal treatment.			

- Notes:
- a) The test requirement for settlement may be waived when the emulsified asphalt is used in less than 5 days time; or the Engineer may require that the settlement test be run from the time the sample is received until it is used, if the lapsed time is less than 5 days.
 - b) The 24-hr. (1 day) storage stability test may be used instead of the 5-day

- settlement test.
- c) The demulsibility test shall be made within 30 days from the date of shipment.

SECTION - 28A

BITUMINOUS PRIME COAT

28A.1 DESCRIPTION

This work shall consist of furnishing all plant, labour, equipment material and performing all operations in applying a liquid asphalt prime coat on a previously prepared and untreated; earth sub grade, water bound base course, tops of roadway shoulders, (and as otherwise shown on the plans) in strict accordance with the specification and in conformity with the lines shown on the drawings.

28A.2 MATERIAL REQUIREMENTS

Asphaltic material shall conform to the requirements of the Section 27 "Asphaltic Materials", either cutback or Emulsified Asphalt, which ever is specified in the Bill of Quantities.

28A.3 CONSTRUCTION REQUIREMENTS

Prime coat shall be applied when the surface to be treated is dry; except that when emulsified asphalt is used, the surface may be reasonably moist. The application is prohibited when the weather is foggy or rainy, or when the atmospheric temperature is below fifteen (15) degree C unless otherwise directed by the Engineer. Prior to the application of the prime coat, all loose materials shall be removed from the surface and the same shall be cleaned by means of approved mechanical sweepers or blowers and/or hand brooms, until it is as free from dust as is deemed practicable. No traffic shall be permitted on the surface after it has been prepared to receive the bituminous material. Prior to the application of prime coat on bridge decks and concrete pavements, the surfaces shall be cleaned of all loose materials. All expansion joints shall be cleaned and filled with bituminous material as directed by the Engineer. Areas to be primed will be classified as under

- i) The top of earth surface or water bound base courses from a point twenty (20) centimeters outside the edge of the pavement line to the line point on the opposite side of the roadway.
- ii) The top of the shoulders from the inter-section of embankment slope and top of subgrade to the edge of the pavement line.
- iii) The bridge wearing surface from curb to curb and end to end of bridge wearing surface.
- iv) Other surfaces as shown on the plans or ordered by the Engineer.

28A.3.1 Equipment

The liquid asphaltic material shall be sprayed by means of a pressure distributor of not less than 1136 liter capacity, mounted on pneumatic tyres of such width and number that the load produced on the road surface will not exceed hundred (100) kg per cm width of tyre. It shall be recognized manufacture.

The tank shall have a heating device able to heat a complete charge of asphaltic liquid upto one hundred eighty (180) degree C. The heating device shall be so that overheating will not occur. Consequently, the flames must not touch directly on the casting of the tank containing the asphaltic liquid or gases therefrom. The Contractor will be responsible for any fire or accident resulting from heating of bituminous materials. The liquid shall be circulated or stirred during the heating. The tank shall be insulated in such a way that the drop in temperature when the tank is filled and not heated, will be less than two (2) degree C per hour. A thermometer shall be fixed to the tank in order to be able to control continuously the temperature of the liquid. The thermometer shall be placed in such a way that the highest temperature in the tank is measured. The tank shall be furnished with a device that indicates the contents. The pipes for filling the tank shall be furnished with an easily interchangeable filter.

The distributor shall be able to vary the spray width of the asphaltic liquid in steps of maximum 10 cm, to a total width of four (4) cm. The spraying bar shall have nozzles from which the liquid is sprayed fan-shaped on the road surface equally distributed over the total spraying width.

The distributor shall have a pump for dosing the liquid driven by a separate motor, or the speed of the pump for dosing the liquid driven by a separate motor, or the speed of the pump shall be synchronized with the speed of the distributor. The pump shall be furnished with an indicator showing the performance in liters per minute. At the suction side the pump shall have a filter easily exchangeable. A thermometer shall be fixed, which indicates the temperature of the liquid immediately before it leaves the spraying bar.

The distributor shall be furnished with a tachometer indicating the speed in meter per minute. The tachometer shall be visible from the driver's seat. The function of the distributor shall be so exact that the deviation from the prescribed quantity to be spread on any square meter does not exceed 10%. The distributor shall be equipped with a device for hand spraying of the bituminous liquid.

28A.3.2 Application of Asphaltic Material

Immediately before applying prime coat, the full area of surface to be treated shall be swept with a power broom to remove all dirt and other objectionable material. If required by the Engineer, the surface shall be made moist but not saturated. Asphaltic Materials shall be applied at temperature stated in section 27 by approved pressure distributors operated by skilled workmen. The spray

nozzles and spray bars shall be adjusted and frequently checked so as to ensure uniform distribution. Spraying shall cease immediately upon any clogging or interference of any nozzle and remedial measures taken before spraying is resumed.

The rate for application of asphaltic material (cut back/emulsified) shall be as under:

Type of Surface Liters per Square Meter

	<u>Minimum</u>	<u>Maximum</u>
1. Earth Surfaces, shoulders Water bound base courses	0.65	1.75
2. Bridge, Wearing Surfaces Concrete Pavement	0.15	0.40

However, the exact rate shall be specified by the Engineer determined from field trials.

The test methods shall be determined by the Engineer and performed by the Contractor in the presence of Engineer.

The prime coat shall be left undisturbed for a period of at least 24 hours, and shall not be opened to traffic until it has penetrated and cured sufficiently so that it will not be picked up by the wheels of passing vehicles. The Contractor shall maintain the prime coat until the next course is applied. Care shall be taken that the application of bituminous material is not in excess of the specified amounts; any excess shall be blotted with sand of similar treated. All areas inaccessible to the distributor shall be sprayed manually using the device for hand spraying from the distributor.

The surface of structures and trees adjacent to the area being treated shall be protected in such manner as to prevent their being spattered or marred.

Where no convenient detour is available for traffic, operations shall be confined to one-half the roadway width at a time. The Contractor shall provide proper traffic control so that vehicles may proceed without damage to the primed area. Work shall not be started on the portion previously covered until it has dried and is ready for traffic.

28A.4 MEASUREMENT AND PAYMENT

The quantities of liquid asphalt, either cut-back or emulsified, to be paid for shall be measured in units of 100 Sft. When asphalt material is obtained from commercial plants, the weight of liquid asphalt as determined by the scales of the

mixing plant will be accepted as the basis for computing pay quantities of liquid asphalt (weight out minus weight in). The Contractor shall furnish certified weight tickets in duplicate to the Engineer.

Blotting material will not be measured for payment and shall be considered subsidiary to the prime coat. The payment for liquid asphalt, measured as stated above shall be paid for the contract unit price per 100 Sft for the particular type, which payment shall be full compensation for furnishing all labour, material, tools, equipment and incidentals and for performing all the work involved in applying prime coat, complete in place, as shown on the Drawings and in accordance with these specifications

Description	Unit of Measurement
28A.a Cut-Back Asphalt for Bituminous Prime Coat	Sft.
28A.b Emulsified Asphalt for Bituminous Prime Coat	Sft.

SECTION - 28B

ASPHALT CONCRETE WEARING COURSE - PLANT MIX.

28B.1 DESCRIPTION

This work shall consist of furnishing aggregate and asphalt binder at a central mixing plant, to a specified temperatures transporting, spread and commenting the mixture in an approved, primed or tacked, base, sub-base, sub-grade, bridge deck or concrete pavement in accordance with these specifications and in conformity with the lines, grades and typical cross-sections shown in the drawings or as directed by the Engineer.

28B-2 MATERIAL REQUIREMENTS

28B-2.1 Mineral Aggregates

The Aggregates shall consist of coarse aggregates, fine aggregates and filler material, if required and shall be clean based, tough, durable and sound particles of uniform quality and from decomposed material, vegetable matter shall clay, lumps and other deterious substances.

Course aggregate which is the material retained on an AASHTO No.4 Sieve, shall consist of one hundred (100) % crushed rock or crushed gravel having two (2) faces mechanically crushed. The type of source shall be uniform throughout the quarry location from where such a material is obtained. The course aggregate shall be free from an excess of flat elongated particles.

Fine aggregate which is the material passing on AASHTO No.4 sieve, shall consists of 100% crushed material from rock or boulder. Fine aggregate shall be stored separately, and no natural sand will be allowed in the mix.

When the combined grading of the coarse and fine aggregates is deficient in material passing the AASHTO No.200 sieve, mineral filler material shall be added as approved by the Engineer. The filler shall consist of finely divided mineral matter such as rock dusts, hydrated lime, hydraulic cement or other suitable mineral matter free from lumps, balls or other deleterious material and shall confirm to the following gradation:

<u>US Standard Sieve</u>	<u>Percent Passing by Weight</u>
No.30 (0.600 mm)	100
No.50 (0.300 mm)	95-100
No.200 (0.075 mm)	70-100

The coarse and fine aggregates shall meet the following requirements:

28B-1

- a) The percent of wear by the Los Angeles Abrasion test (AASHTO T 96) shall not be more than thirty (30).
- b) The loss when subjected to five cycles of the Sodium Sulphate Soundness test (AASHTO T 104) shall be less than twelve (12).
- c) The Sand Equivalent (AASHTO T 176) determined after all processing except for addition of asphalt cement shall not be less than 45.
- d) All aggregates shall have a liquid limit of not more than twenty five (25) and a Plasticity Index of not more than four (4) as determined by AASHTO T-89 and T-90.
- e) The portion of aggregate retained on the 9.5mm (3/8 inch) sieve shall not contain more than 15 percent by weight of flat and/or elongated particles (ratio of maximum to minimum dimension = 5:1).
- f) The three dimensions of particles shall be nearly equal. For at least eight (80) % of the particles, the proportion between the largest and smallest dimension shall be two and a half (2.5) or less and for at least ninety five (95) % of the particles and same proportion shall be three (3) or less.

The percentage of particles having certain proportions between their largest and smallest dimensions (i.e between the largest distance the particles can fill out between two parallel planes that will permit the particle to pass), shall be determined in the following way:

- i. Form a sample of course aggregates, all particles passing No.4 sieve are eliminated. The sample shall be of sufficient quantity that at least 100 particles remain.
- ii. By means of a sliding caliper, the largest and smallest dimensions, as defined above, are determined for each particle and its proportion calculated (with one decimal).
- iii. The total weighs of particles having the proportions two and a half (2.5) or less and three (3) or less, are determined and their percentage in relation to the total sample are calculated.

28B.2.2 Asphaltic Material

Asphaltic binder to be mixed with the aggregate to produce asphaltic base shall be asphalt cement penetration grade 40-50, or 60-70 as specified by the Engineer. Generally it will meet the requirement of AASHTO M-20.

28B.2.3 Asphalt Concrete Wearing Course Mixture

The composition of the asphaltic concrete paving mixture for wearing course shall conform to Class A and/or Class B shown in the following table.

**TABLE 28B-1
ASPHALT CONCRETE WEARING COURSE REQUIREMENTS**

Mix Designation	Class A	Class B
Compacted Thickness	50-100 mm	35-60 mm
Combined Aggregate Grading Requirements		
US Standard Sieve Sizes Percent Passing by Weight		
1" (25 mm)	100	-
3/4" (19 mm)	90-100	100
1/2" (12.5 mm)	-	75-90
3/8" (9.5 mm)	56-70	60-80
No.4 (4.75 mm)	35-50	40-60
No.8 (2.38 mm)	23-35	20-40
No.50 (0.30 mm)	5-12	5-15
No.200 (0.075 mm)	2-8	3-8
Asphalt Concrete weight percent of total mix.	3.5 (Min.)	3.5 (Min)

The asphalt concrete wearing course mixture shall meet the following Marshal Test Criteria:

Compaction, number of blows⁷⁵
each end of specimen

Stability	1000 Kg (min)
Flow, 0.25 mm (0.01 inch)	8-14
Percent air voids in mix	5-8
Percent voids filled with bitumen	65-75
Percent voids in mineral aggregates	14 (Min)
Loss of Stability	20% (Max)

28B.2.4 Job-Mix Formula

At least one week prior to production a Job-Mix Formula (JMF) for the asphaltic wearing course mixture or mixtures to be used for the project, shall be established jointly by the Engineer and the Contractor.

The JMF shall be established by Marshall Method of Mix Design according to the procedure prescribed in the Asphalt Institute Manual Series No.2 (MS-20), May 1984 Edition or the latest Edition.

The JMF, with the allowable tolerances, shall be within the master range specified in Table 28B-1. Each JMF shall indicate a single percentage of aggregate passing each required sieve and a single percentage of bitumen to be added to the aggregates.

After the JMF is established, all mixtures furnished for the project represented by samples taken from the asphalt plant during operation, shall conform with the following ranges of tolerances:

Combined aggregates gradation

Passing No.4 and larger sieves $\pm 6.0\%$
Passing No.8 to No.100 sieves $\pm 4.0\%$
Passing No.200 $\pm 2.0\%$

Asphalt Content

Weight percent of total mix $\pm 0.3\%$

In addition to meeting the requirements specified in the preceding items, the mixture as established by the JMF shall also satisfy the following physical property.

Loss of Marshall Stability by Immersion of specimen in water at sixty (60) degree C for twenty four (24) hours as compared with the stability measured after immersion in water at sixty (60) degree C for twenty (20) minutes shall not exceed twenty (20) percent. If the mixture fails to meet this criterion, the JMF shall be modified or an anti-stripping agent shall be used.

Should a change of sources of materials be made, a new job Mix Formula shall be established before the new material is used. When unsatisfactory results or other conditions make it necessary, a new job Mix Formula will be required.

28B.2.5 Asphalt Additives

Cellulose Fibers shall be used as an asphalt additive with the aim of eliminating bleeding tendencies. Normally 0.2 to 0.25% by weight of the total mix will be required. The fibers shall be fed into the pugmill by a separate feeder system or by hand into every batch. The weight of the fibers shall be determined in accordance with the percentage specified in the job-mix-formula.

28B.3 CONSTRUCTION REQUIREMENTS

28B.3.1 Bituminous Mixing Plant

Plants used for the preparation of bituminous mixtures shall be "Batching Plants" conforming to AASHTO M 156, and of adequate capacity, coordinated and operated to produce a mixture within the limits of these specifications.

28B.3.2 Preparation of Aggregates

Before being fed to the dryer, aggregates for the asphaltic base courses shall be separated into two or more sizes and stored separately in cold bins. One bin shall contain aggregate of such size that eight (80) percent will pass sieve No.4 and the other bin shall contain aggregate of such size that eighty (80) percent will be retained on sieve No.4. Should fine material, be incorporated in the mix, separate bin shall be provided in addition to the two bins mentioned above. If filler is used as a separate component it will also be stored and measured separately and accurately before being fed into the mixer.

Asphalt cement shall be heated within a temperature range of hundred and thirty five to hundred and sixty three (135-163) degrees centigrade at the time of mixing. All material reheated more than forty two (42) degrees centigrade above maximum shown shall be considered overheated and shall be rejected until material is sampled and tested.

Dried aggregate weighed and drawn to pugmill shall be combined with proportionate amount of asphalt cement according to the job mix formula. Temperature of asphalt, except for temporary fluctuations, shall not be lower than fifteen (15) degrees centigrade below the temperature of the aggregate, at the time, the two (2) materials enter into the pugmill.

In placing the materials in bins or in moving them from bins to the mixer, any method which causes segregation or uncontrolled combination of materials of different grading, shall be discontinued and the segregated or degraded materials shall be rescreened, or washed, and, if necessary passed through the dryer before being mixed.

Each aggregate ingredient shall be heated and dried at temperature not to exceed hundred and sixty three (163) degree centigrade. If aggregate contain sufficient moisture to cause foaming in the mixture or their temperature is in excess of

hundred and sixty three (163) degrees centigrade, they shall be removed from the bins and returned to their respective stock piles. In no case, shall the temperature of asphaltic mix exceed 163 degree centigrade when discharged from the pugmill.

Immediately after heating, the aggregates shall be screened to required sizes and stored in separate bins for batching and mixing with bituminous material.

28B.3.3 Hauling Equipment

Dump truck used for hauling bituminous mixtures shall have tight, clean, smooth metal beds which have been thinly coated with an approved material to prevent adhering of material to the beds. Each truck shall have a cover of canvas or of other suitable material of sufficient size as to protect the mixture from the weather. The mixture will be delivered on the road at a temperature not less than hundred and thirty (130) degree C.

28B.3.4 Bituminous Pavers

Bituminous pavers shall be self-contained, power-propelled units, provided with an automatically controlled activated screed or strike-off assembly, heated if necessary, capable of spreading and finishing courses of bituminous plant mix material in lane widths applicable to the specified typical section and thicknesses shown on the plans. Pavers used for shoulders and similar construction shall be capable of spreading and finishing course of bituminous plant mix material in widths shown on the plans.

The paver shall be equipped with a receiving hopper having sufficient capacity for a uniform spreading operation. The paver shall be equipped with automatic feed controls, properly adjusted to maintain a uniform depth of material ahead of the screed.

The screed or strike-off assembly shall be capable of producing a finished surface of the required evenness and texture without tearing, shoving or gouging the mixture.

When laying the mixtures, the paver shall be capable of being operated at forward speeds consistent with satisfactory laying of the mixture. The paver shall be operated at speeds which will give the best result for the type of power being used.

The mixed material shall be delivered to paver in time to permit completion of spreading, finishing and compaction of mixture during day light hours.

The paver shall be equipped with automatic screed controls with sensors for either or both sides of the paver, capable of sensing grade from an outside reference line, sensing the transverse slope of the screed and providing the

automatic signals which operates the screed to maintain the desired grade and transverse slope. The sensor shall be so constructed that it will operate from a reference line or a ski-like arrangement.

The transverse slope controller shall be capable of maintaining the screed at the desired slope within plus or minus 0.4 percent variation.

Manual operation will be permitted in the construction of irregularly shaped and minor areas.

Whenever a breakdown or malfunction of the automatic controls occurs, the equipment may be operated manually or by other methods in order to allow the contractor to use the asphalt already produced at the plant or transit, provided this method of operation will produce results otherwise meeting the specifications.

Reference lines will be required for both outer edges of the travelled way for each main line roadway for vertical control. Horizontal control utilizing the reference line will be permitted. The grade and slope for intermediate lanes shall be controlled automatically from reference lines or by means of a ski and a slope control device or a dual ski arrangement. When the finish of the grade prepared for paving is superior to the established tolerance and when in the opinion of the Engineer, further improvement to the line, grade, cross sections and smoothness can best be achieved without the use of the reference line, a ski-like arrangement may be substituted subject to the approval of the Engineer. The use of the reference lines shall be reinstated immediately whenever the Contractor fails to maintain a superior pavement. The Contractor shall furnish and install all pins, brackets, tensioning devices, wire and accessories necessary for satisfactory operation of the automatic control equipment.

28B.3.5 Rollers

Rollers shall be steel wheel, pneumatic tyre or vibratory, or a combination thereof. The roller(s) shall be in good condition, capable of reversing without backlash, and shall be operated at speeds slow enough to avoid displacement to the bituminous mixture. The number and weight of rollers shall be sufficient to compact the mixture to the required density while it is still in a workable condition. Vibratory rollers shall be acceptable for bituminous mixture compaction. The use of equipment which results in excessive crushing of the aggregate will not be permitted.

28B.3.6 Preparation of Base or Existing Payment Surface

Before spreading materials the surface of base or existing pavement on which the mix is to be placed shall be conditioned by application of a prime or tack coat as specified.

After a prime coat is applied, it shall be left undisturbed not less than twenty four (24) hours. The Contractor shall maintain the primed surface until the mix material has been placed. This maintenance shall include the spreading of sand or other approved material, if necessary to prevent adherence of the prime coat to the tyres of vehicles using the primed surface, and patching any breaks in the primed surface with additional bituminous material or any area of primed surface with additional bituminous material. Any area of primed surface that has become damaged shall be repaired before the mix is placed.

After a tack coat is applied, it shall be allowed to dry until it is in the proper condition of tackiness to receive the mix. The tack coat shall be applied only as far in advance of the placing of mix, as is necessary to obtain the proper condition of tackiness. Any breaks in the tack coat shall be repaired.

When the surface of the existing pavement or old base is irregular, it shall be brought to uniform grade and cross-section by leveling course as directed. The leveling course mixture shall conform to the requirements of item 28B-2.

A thin coating of bituminous material shall be placed on contact surface of curbing, gutters, manholes, and other structures, prior to the bituminous mixture being placed against them.

28B.3.7 Spreading and Finishing

The mixture shall be laid upon an approved surface, spread and struck off to the section and elevation established. Bituminous pavers shall be used to distribute the mixture either over the entire width or over such partial width as may be practicable.

The longitudinal joint in one layer shall offset to that in the layer immediately below, by approximately 15.0 cm; however, the joint in the top layer shall be at the centerline of the pavement if the roadway comprises two lanes of width, or at lane lines if the roadway is more than 2 lanes in width.

On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable, the mixture shall be spread, raked and luted by hand tools. For such areas the mixture shall be dumped, spread and screened to give the required compacted thickness.

When production of the mixture can be maintained and when practical, pavers shall be used in echelon to place the wearing course in adjacent lanes and shoulders.

All mixtures shall be spread at a temperature of not less than hundred and thirty (130) degree C and all initial rolling or tamping shall be performed when the temperature of the mixture is such that the sum of the air temperature plus the temperature of the mixture is between 165 degree C and 190 degree C. The

mixture shall not be placed on any wet surface or when weather conditions will otherwise prevent its proper handling or finishing.

28B.3.8 Compaction

After spreading and strike off and as soon as the mix condition permits the rolling to be performed without excessive shoving or tearing, the mixture shall be thoroughly and uniformly compacted. Rolling shall not be prolonged when cracks appear on the surface.

Initial or breakdown rolling shall be done by means of either a tandem steel roller or three wheeled steel roller. Rolling shall begin as soon as the mixture will bear the roller without undue displacement.

The number and weight of rollers shall be sufficient to obtain the required compaction while the mixture is still in workable condition. The sequence of rolling and the selection of roller types shall provide the specified pavement density. Initial rolling with a tandem steel roller or a three-wheeled steel roller shall follow the paver as closely as possible.

Unless otherwise directed, rolling shall begin at the lower side and proceed longitudinally, parallel to the road centerline, each trip overlapping one-half of the roller width, gradually progressing to the crown of the road. When paving in echelon or abutting a previously placed lane, the longitudinal joint should be rolled first followed by the regular rolling procedure. On super elevated curves the rolling shall begin at the low side and progress to the high side by overlapping of longitudinal trips parallel to the centerline. Intermediate rolling with a pneumatic tyred roller shall be done behind the initial rolling. Final rolling shall eliminate marks from previous rolling. In no case shall the temperature be less than hundred and twenty (120) degree C. for initial break down rolling while all other compaction operations shall be completed before the temperature drops down to hundred and ten (110) degree C.

Rollers shall move at a slow but uniform speed with the drive roll or wheels nearest the paver. Rolling shall be continued until all roller marks are eliminated and a minimum density of ninety seven (97) percent of a laboratory compacted specimen made from asphaltic material obtained for daily marshall density.

Any displacement resulting while reversing of the direction of a roller, or from other causes, shall be corrected at once by the use of rakes and addition of fresh mixture when required. Care shall be exercised in rolling not to displace the line and grade of the edges of the bituminous mixture.

To prevent adhesion of the mixture to the rollers, wheels of rollers shall be kept properly moistened with water or water mixed with very small quantities of detergent or other approved material. Excess liquid will not be permitted.

Along forms, curbs, headers, walls and other places not accessible to the roller,

the mixture shall be thoroughly compacted with hot hand tampers, smoothing irons or with mechanical tampers. On depressed areas, a tampers be used or cleated compression strips may be used under the roller to transmit compression to the depressed area.

Any mixture that become loose and broken, mixed with dirt, or is in any way defective in finish or density shall be removed and replaced with fresh hot mixture, which shall be compacted to conform with the surrounding area. Any area showing an excess or deficiency or bituminous material shall be removed and replaced.

28B.3.9 Frequency of Testing for Cores

Core shall be taken for each seven hundred fifty (750) square meters of base, or fraction thereof, in special cases. If the core so taken is failed against the specified density, then two (2) additional cores shall be taken in the longitudinal alignment of the road at an interval of three (3) meters on either sides with respect to the failing core and shall be tested against field density. If these cores pass, then the individual compaction of the core shall not be less than ninety three (93) percent and average of these three cores, in no case be less than ninety five (95) percent. If average of the cores further fails against compaction, then retake the cores at a distance of fifteen (15) meters on either side and compaction shall be checked in the same fashion. In case of failure of the average of these five cores, the failed area shall be removed and subsequently be replaced by specified mix in an approved manner under the expense of contractor.

28B.3.10 Pavement Thickness and Tolerances

The asphalt concrete wearing course shall be compacted to the desired level and cross slope as shown on the drawing or as directed by the Engineer.

The tolerances in compacted thickness of the wearing course shall be \pm five (5) percent from the desired thickness shown on the drawings. For determination of the average thickness, six (6) cores per kilometer shall be taken as specified in the Special Provisions or as directed by the Engineer. If the average thickness so determined is deficient by more than \pm 5 percent, the Engineer shall decide whether to accept the deficit thickness or to direct reconstruction.

The surface of the wearing course shall be tested by the Engineer using a 3 meter straight edge at selected locations. The variation of the surface from the testing edge of the straight edge between any two contacts, longitudinal or transverse with the surface shall at no point exceed five (5) millimeters. The cross fall (camber) shall be with \pm 0.2 percent of that specified, and the level at any point shall be within \pm 5.0 millimeter of the level shown on the drawings. All humps or depressions exceeding the specified tolerance shall be corrected by removing the defective work and replacing it with new material, by overlaying, or by other means satisfactory to the Engineer.

28B.3.11 Acceptance Sampling and Testing

Acceptance for samples and testing of materials and construction requirements, shall be governed by the relevant, "Table for Sampling and Testing Frequency" or as approved by the Engineer.

28B.3.12 Weather Limitations

Hot asphaltic mixtures shall be placed only when the air temperature is four (4) degrees centigrade or above and no asphalt shall be laid under foggy or rainy weather or over moist surface.

28B.4 MEASUREMENT AND PAYMENT

28B.4.1 Measurement

The quantities of asphaltic wearing course shall be measured by Area in place and completed.

Limits for payment of asphaltic wearing course are as provided in drawings or as directed by the Engineer. Any asphalt laid beyond the agreed limit will not be paid.

28B.4.2 Payment

The quantity determined as provided above shall be paid for at the contract unit price respectively for each of the particular pay items listed below and shown in the Bill of Quantities, which prices and payment shall constitute full compensation for all the costs necessary for the proper completion of the work prescribed in this item.

Description	Unit of Measurement
Asphaltic Concrete for Wearing Course (Class A)	Sft
Asphaltic Concrete for Wearing Course (Class B)	Sft

28B-12

SECTION - 28

BITUMINOUS SURFACE TREATMENT

28.1 SCOPE

This work shall consist of furnishing and application of one, two or three courses of asphaltic material of the specified type and grade with one, two or three covers of aggregates respectively in accordance with these specification to the width shown on the Drawings or as directed by the Engineer.

28.2 MATERIAL REQUIREMENTS

28.2.1 Aggregate

Aggregate shall consist of clean, dry hard, tough, angular, sound crushed stone, or crushed gravel of uniform quality, free from dust, clay, and other deleterious materials and from excess of flat or laminated pieces. All aggregate materials shall have a percentage of wear by the Los Angeles Abrasion test (AASHTO T-96) of not more than 40 percent.

The portion of aggregate retained on the 3/8-inch (9.5 mm) sieve shall not contain more than 15 percent of particles by weight so flat or elongated, or both, that the ratio between the maximum and the minimum dimensions exceeds 5:1.

The percentage composition by weight of aggregate shall conform to the following gradations:

US Standard Sieve	Percentage Passing by Weight		
	Size No.1	Size No.2	Size No.3
1" (25.00 mm)	100	-	-
3/4" (19.00 mm)	90-100	-	-
1/2" (12.50mm)	20-55	100	-
3/8" (09.50 mm)	0 - 15	85-100	100
1/4" (06.30 mm)	-	-	90-100
No.4 (04.75 mm)	0 - 5	10-30	60-85
No.8 (02.38 mm)	-	0-10	0-25
No.16 (01.18 mm)	-	0-5	0-5
No.200(0v0.075 mm)	-	0-2	0-2

28.2.2 Asphaltic Material

The asphaltic material shall conform to the requirements of AASHTO M-20, M-81, M-82 and M-140. The type shall be the following or as instructed by the Engineer.

Single surface treatment : AC 80-100, RC-250
RC-70, RS-1 or RS-2,

Double surface treatment : AC 80-100, RC-250
RS-1 or RS-2,

Triple surface treatment (TST): AC 80-100, RC-250
RS-1 or RS-2,

28.3 CONSTRUCTION REQUIREMENTS

Surface treatment shall be applied when the weather is warm and dry, and the road surface is clean and dry, spraying shall not be done unless the road temperature has been above 20 degree Centigrade for at least one hour prior to the commencement of spraying operations, and the temperature shall not be less than 20 degree centigrade during spraying. Prior to applying the asphaltic material, dirt and other objectionable materials shall be removed from the surface. If so directed by the Engineer, the surface shall be cleaned preferably by power booming until all loose and foreign materials are removed.

28.3.1 Equipment

The liquid asphaltic material shall be sprayed by means of a pressure distributor of not less than 240 gallon capacity, mounted on pneumatic tyres of such width and number that the load produced on the road surface will not exceed 560 lb per inch width of tyre. It shall be of recognized manufacturer.

The tank shall have a heating device able to heat a complete charge of asphaltic liquid upto 180 degree Centigrade. The heating device shall be such that overheating will not occur. Consequently, the flames must not touch directly on the casting on the tank containing the asphaltic liquid or gases therefrom. The Contractor will be responsible for any fire or accident resulting from heating of bituminous materials. The liquid shall be circulated or stirred during the heating. The tank shall be so insulated that the drop in temperature when the tank is full and not being heated will be less than 2^o C/hour.

A thermometer shall be fixed to the tank to enable continuous control of the temperature of the liquid. The thermometer shall be placed in such a way that the highest temperature in the tank is measured. The tank shall be furnished with a

device that indicates the quantity. The pipes for filling the tank shall be furnished with an easily interchangeable filter.

The distributor shall be such that the spray width of the asphaltic liquid can be varied in steps of maximum 4 feet to a total width of 13 ft. The spraying bar shall have nozzles from which the liquid is sprayed in fan shaped pattern on the road surface with uniform distribution over the total spraying width.

The distributor shall have a pump driven by a separate motor for dosing the liquid or the speed of the pump shall be synchronized with the speed of the distributor. The pump shall be furnished with an indicator showing the performance in gallons per minute. At the suction side the pump shall have an easily exchangeable filter. A thermometer shall be fixed, which indicates the temperature of the liquid immediately before it leaves the spraying bar.

The distributor shall be furnished with a tachometer indicating the speed in feet per minute. The tachometer shall be visible from the driver's seat. The function of the distributor shall be so exact that the deviation from the prescribed quantity to be spread on 10 square feet does not exceed 10%. The distributor shall also be equipped with a device for hand spraying of the bituminous liquid.

28.3.2 Application of Asphaltic Materials

Asphalt cement, liquid asphalt and emulsified asphalt shall be applied by means of pressure distributor at the temperature specified for the type and grade of asphalt being used. The rates of application shall be within the range given in Table 28.1. However, the exact rate shall be determined by the Engineer.

The spread of bituminous materials shall not be more than 6 inch wider than the width covered by the aggregate from the spreading device.

28.3.3 Spreading of Aggregate

Immediately after applying the asphaltic material, dry aggregate shall be uniformly and evenly distributed over the treated surface from an approved mechanical aggregate spreader. The truck carrying the aggregate shall move back-ward as it spreads the same so as to prevent the tyres of the truck and the mechanical aggregate spreader from driving directly on the newly sprayed asphalt. No portion of the binder shall remain uncovered for a period in excess of 20-minutes after spraying.

Immediately after spreading of the aggregate, the treated surface shall be rolled with a self-propelled pneumatic-tyred roller having a minimum contact pressure of 40 psi. A steel-wheeled roller weighing between 6 to 8 tons should be used as a second roller. Rolling shall continue only until a smooth, thoroughly compacted surface is obtained.

Any place where binder shows on the surface shall be covered with additional aggregate and further rolled and broom-dragged until an even surface results, and does not adhere to wheels of vehicles.

The quantity of aggregate to be applied shall be within the ranges specified in Table 28.1, however, the exact rate shall be determined by the Engineer.

TABLE 28.1
Quantities of materials for Bituminous Surface Treatment

Surface Treatment		Aggregate		Bituminous Material	
Type	Application	Size No.	Quantity Kg./Sq. m	Quantity Liters/Sq. M	Type
Single	Single	2	12.5	1.19	(a)
				1.63	(b)
Double	First	1	24.0	1.90	(a)
				2.14	(b)
	Second	2	12.5	1.19	(a)
				1.63	(b)
Tripple	First	1	24.0	1.90	(a)
				2.14	(b)
	Second	2	12.5	1.19	(a)
				1.63	(b)
Third	3	6.5	0.68	(c)	

Notes: Bituminous material types are (a) asphalt cement, (b) cut-back or emulsified and (c) asphalt cement, cut-back and emulsified.

28.4 MEASUREMENT AND PAYMENT

28.4.1 Material Requirements

28.4.1.1 Method of Measurement

Measurement will be made of the number of 100 square feet area over which double and single as the case may be Bituminous Surface Treatment is acceptably applied as a whole to the lines and dimensions shown on the Drawings or established by the Engineer. No allowance will be made for surface treatment

applied outside the limits shown on the Drawings.

28.4.1.2 Basis of Payment

Payment will be made for the number of square feet of double and single bituminous surface treatment as the case may be measured as provided above at the Contract unit price per square feet for each of the particular pay item listed below that is shown in the Bill of Quantities, which price and payment shall constitute full compensation for furnishing all labour, materials, tools, equipment, mixing, hauling, placing, compaction and all other work related to the item.

Description	Unit of Measurement
Single Surface Treatment	Sft
Double Surface Treatment	Sft
Triple Surface Treatment (TST)	Sft

SECTION - 29

BRICK EDGING

29.1 SCOPE

This item shall consist of providing one layer of bricks along the edge of the roadway at locations shown in the drawings or as directed by the Engineer.

29.2 MATERIAL REQUIREMENTS

29.2.1 Bricks

The bricks shall meet the requirements as specified in Section-3 or as approved by the Engineer.

29.2.2 Joint Filler

The sand free from organic matter and deleterious contents shall be used for filling the joints between bricks.

29.3 CONSTRUCTION REQUIREMENTS

29.3.1 Stacking of Bricks

The bricks shall be delivered at site in stacks 10 courses high and 2 bricks thick for the convenience of proper inspection.

29.3.2 Placing of Bricks

The bricks shall be laid on end as called for in the plans.

29.4 MEASUREMENTS AND PAYMENTS

29.4.1 Method of Measurement

Brick edging when laid and finished to the required thickness and grade line shall be measured by length. The unit of measurement will be L.ft.

29.4.2 Basis of Payment

Payment shall be made as measured above and shall be full compensation for preparing and shaping the bricks on end laid at edge of side walk, replacement of unstable material, provision and laying of the bricks, filling the voids with sand, compaction and includes material, labour, equipment, tools and incidentals necessary to complete the work prescribed in this section.

Description	Unit of Measurement
Brick Edging	L.ft.

SECTION - 30

SIDE WALK & KERB STONES

30.1 BRICK PAVING

30.1.1 SCOPE

This item shall consist of one or more layers of bricks laid in sand and with the joints filled with sand with suitable bonding, over a prepared sub grade of the road or sidewalk or on prepared embankment slopes etc.

30.1.2 Material Requirements

30.1.2.1 Bricks

Bricks shall be manufactured with such clays containing 20 to 30% fine sand, clay shall not contain more than 0.5% soluble salts, more than 0.2% sulphate, and more than 4% organic contents. It shall not contain any gravel, coarse sand, kankar, roots of grass and plants.

The standard size of bricks is 9" x 4.5" x 3". They will be well burnt without being vitrified. They shall be of uniform colour regular in shape and size with sharp and square corners and parallel faces. They must be homogenous in texture and emit a clear ringing sound when struck. They shall be free from flaws and cracks. They shall not absorb more than 1/6th of their weight of water after being soaked for one hour, and shall show no signs of efflorescence on drying. Compressive strength shall not be less than that of Class C.

30.1.2.2 Joint Filler

The sand free from organic matter and deleterious content shall be used for filling the joints between bricks.

30.1.3 Construction Requirements

30.1.3.1 Sub-Grade

The sub-grade shall be prepared as specified in Section-24.

Shoulder and embankment slopes shall be dressed and compacted to the specified density and grades as per Section 23.

30.1.3.2 Stacking of Bricks

The bricks shall be delivered at site in stacks 10 courses high and 2 bricks thick for the convenience of proper inspection.

30.1.3.3 Placing of Bricks

The bricks shall be laid closely packed as per pattern shown on plans and/or directed by the Engineer at site. The bricks shall be laid on edge, in one or two courses as called for in the plans. If more than one course is to be laid the joints in the successive courses will be staggered. Each course shall be properly rolled and joints filled with sand before laying the next course.

30.2 BRICK PAVED SIDEWALK

30.2.1 Scope

This work shall consist of the construction of brick paved sidewalk in accordance with the specifications and to the line, grade, levels and dimensions shown on the drawings or as required by the Engineer.

30.2.2 Material Requirement

30.2.2.1 Bricks

The bricks shall meet the requirements as specified in the Section-3 or as approved by the Engineer.

30.2.2.2 Joint Mortar

The joint mortar shall consist of one part cement and three parts of approved sand with water added as necessary to obtain the required consistency.

30.2.2.3 Bed Course Material

The bed course material shall consist of sub base material meeting the requirements as specified in Section-25 and sand filling.

30.2.3 Construction Requirements

30.2.3.1 Excavation

Excavation shall be made to the required depth and width as shown on the drawing or as directed by the Engineer. The foundation shall be shaped and compacted to a firm even surface conforming to the section shown on the

drawings. All soft material shall be removed and replaced with acceptable material.

30.2.3.2 Placing of Bed Course Material

The bed course material shall be placed as indicated on the drawings or as directed by the Engineer. The bed course material shall be compacted in layers not exceeding 4 in to the depth shown on the drawings and to the line and grade of the finished sidewalk surface.

30.2.3.3 Placing of Bricks

The bricks shall be laid on the prepared bed course material as per pattern shown on the drawing or as directed by the Engineer. The bricks shall be laid on edge in a single course as indicated in the plans. All joints shall be properly filled with cement sand mortar as specified above.

30.3 CEMENT CONCRETE SIDEWALK

30.3.1 Scope

This work shall consist of the construction of cement concrete sidewalk, in accordance with these specifications and to the lines, grades, levels and dimensions shown on the drawings or as directed by the Engineer.

30.3.2 Material Requirements

The concrete shall be as indicated on the drawings and in conformance with Section-2

30.3.3 Bed Course Material

Bed course material shall consist of cinders, sand, gravel, crushed stone or other approved material of such gradation that all particles will pass through a 1/2 inch sieve.

30.3.4 Construction Requirements

30.3.4.1 Excavation

Excavation shall be made to the required depth and to a width that will permit the installation and bracing of the curbs. The foundation shall be shaped and compacted to a firm even surface conforming to the section shown on the drawings. All soft material shall be removed and replaced with acceptable material.

30.3.4.2 Placing of Bed Course Material

The bed course material shall be placed where indicated on the drawings or as directed by the Engineer. The bed course material shall be compacted in layers not exceeding 4 inches to the depth shown on the drawings and to the line and grade of the finished footpath surface.

30.3.4.3 Placing the Cement Concrete Material

The mixing, placing, finishing and curing of concrete shall be as provided under Section-2. However, the concrete shall be placed in alternate slabs at one foot interval in longitudinal direction. Before the concrete has set, the surface of the concrete shall be troweled until it is of uniform smoothness and is true to the lines, elevations, and surface required.

30.4 CONCRETE KERB

30.4.1 Scope

This item shall consist of kerb constructed of the following materials and in accordance with the specifications at the location and of the form, dimensions and designs shown on the drawings or as required by the Engineer.

30.4.2 Material Requirements

30.4.2.1 Precast Concrete Kerb

Precast concrete kerbing units shall consist of Concrete A conforming to the requirements of Section-2 and other details shown on the drawings. Kerbing which shows surface irregularities of more than 3/16 inch under a 10 feet straight edge or surface pits more than 1/2 inch in diameter will be rejected. The base slab and haunch of Precast Kerb, shall be cast in situ and shall conform to the requirements of Section-2 and other details shown in drawings.

30.4.3 Construction Requirements

30.4.3.1 Excavation and Bedding

Excavation shall be made to the required depth as shown on the drawings. All soft and unsuitable material shall be removed and replaced with a suitable material acceptable to the Engineer.

Bedding and haunching shall consist of Class B concrete.

30.4.3.2 Placing

The precast concrete curbs shall be set in 1 inch of cement-sand mortar to the line level and grade as shown on the drawings or as directed by the Engineer.

30.4.3.3 Joint

Joints between consecutive curbs shall be 1/8 to 1/4 inch wide and filled with cement-sand mortar to the full section of the curb.

30.4.3.4 Back-filling

Backfilling shall be tamped in layers.

30.5 BRICK MASONRY KERBS

30.5.1 Scope

This item shall consist of providing brick kerbs 9"x9" and in accordance with specification at the locations of side walks as shown on the drawing or as directed by the Engineer.

30.5.2 Construction Requirement

30.5.2.1 Excavation and Bedding

Excavation shall be made to the required depth as shown on the drawings. All soft and unsuitable material shall be removed and replaced with suitable material compacted to a firm and even surface acceptable to the Engineer.

Bedding shall consist of 3" thick brick layer grouted with 1:3 Cement Sand mortar.

Brickwork

Brickwork shall conform to Section-3.

30.6 INTERLOCKING CONCRETE PAVERS

30.6.1 Sidewalk

This work shall consist of the construction of paved sidewalk with Interlocking Concrete Pavers in accordance with the specifications BS 6717 part-I 1986 for precast concrete paving blocks and to the line, grade, levels and dimensions shown on the drawings or as required by the

Engineer.

30.6.2 Material Requirement

30.6.2.1 Interlocking Concrete Pavers Concrete Block Paving

The Interlocking Concrete Pavers shall meet the requirements as specified in the drawing or as approved by the Engineer.

30.6.2.2 Joint Mortar

The joint mortar shall consist of sand added as necessary to obtain the required consistency and workability.

30.6.2.3 Bed Course Material

The bed course material shall consist of sub base material meeting the requirements as specified in the drawing and sand filling.

30.6.3 Construction Requirements

30.6.3.1 Excavation

Excavation shall be mad to the required depth and width as shown on the drawing or as directed by the Engineer. The foundation shall be shaped and compacted to a firm even surface conforming to the section shown on the drawings. All soft material shall be removed and replaced with acceptable material.

30.6.3.2 Placing of Bed Course Material

The bed course material shall be placed as indicated on the drawings or as directed by the Engineer. The bed course material shall be compacted in layers not exceeding 4 in to the depth shown on the drawings and to the line and grade of the finished sidewalk surface.

30.6.3.3 Placing of Interlocking Concrete Pavers

The Interlocking Concrete Pavers shall be laid on the prepared bed course material as per pattern shown on the drawing or as directed by the Engineer. The Interlocking Concrete Pavers shall be laid in a single course as indicated in the plans. All joints shall be properly filled with specified sand as mentioned above.

The Kerb Stones with Haunch shall be laid on the prepared bed course material as shown on the drawing or as directed by the Engineer. The Curb Stones with Haunch shall be laid in a single course as indicated in the

plans. All joints shall be properly filled with mortar.

30.7 TUFF-TILES CONCRETE BLOCK PAVING

30.7.1 Sidewalk

This work shall consist of the construction of paved sidewalk with tuff-tiles in accordance with the specifications BS 6717 part-I 1986 for precast concrete paving blocks and to the line, grade, levels and dimensions shown on the drawings or as required by the Engineer.

30.7.2 Material Requirement

30.7.2.1 Tuff-Tiles Concrete Block Paving

The Tuff-Tiles shall meet the requirements as specified in the drawing or as approved by the Engineer.

30.7.2.2 Joint Mortar

The joint mortar shall consist of sand added as necessary to obtain the required consistency and workability.

30.7.2.3 Bed Course Material

The bed course material shall consist of sub base material meeting the requirements as specified in the drawing and sand filling.

30.7.3 Construction Requirements

30.7.3.1 Excavation

Excavation shall be mad to the required depth and width as shown on the drawing or as directed by the Engineer. The foundation shall be shaped and compacted to a firm even surface conforming to the section shown on the drawings. All soft material shall be removed and replaced with acceptable material.

30.7.3.2 Placing of Bed Course Material

The bed course material shall be placed as indicated on the drawings or as directed by the Engineer. The bed course material shall be compacted in layers not exceeding 4 in to the depth shown on the drawings and to the line and grade of the finished sidewalk surface.

30.7.3.3 Placing of Tuff-Tiles

The Tuff-Tiles shall be laid on the prepared bed course material as per pattern

shown on the drawing or as directed by the Engineer. The Tuff-Tiles shall be laid in a single course as indicated in the plans. All joints shall be properly filled with specified sand as mentioned above.

The Kerb Stones with Haunch shall be laid on the prepared bed course material as shown on the drawing or as directed by the Engineer. The Curb Stones with Haunch shall be laid in a single course as indicated in the plans. All joints shall be properly filled with mortar.

30.8 MEASUREMENT AND PAYMENT

30.8.1 Method of Measurement

Brick paving when laid and finished to the required thickness and grade line shall be measured by superficial area. The unit of measurement will be square feet.

30.8.2 Basis of Payment

Payment shall be made as measured above and shall be full compensation for preparing and shaping the shoulders and embankment slope, replacement of unsuitable material, provision and laying of the bricks, filling the voids with sand and rolling the whole width for proper compaction and includes material, labour, equipment, tools and incidentals necessary to complete the work prescribed in this item.

Description	Unit of Measurement
Brick Paving (Single Course)	Sft.
Brick Paving (Double Course)	Sft.

30.8.3 Brick Paved Side Walks

30.8.3.1 Method of Measurement

The quantity to be paid for shall be the number of square feet of brick paved sidewalk complete in place and accepted, measured in the place of the sidewalk surface.

30.8.3.2 Basis of Payment

The quantity as determined above shall be paid for at the contract unit price per 100 sq.ft. for the pay item listed below & shown in the B.O.Q., which price and payment shall constitute full compensation for furnishing and placing all materials, such as bricks, cement, sand and subbase etc. for excavating and compacting the foundation bed, for compacting sub-base course and for all labour, equipment, tools and incidentals necessary to complete the item.

Description	Unit of Measurement
Brick Paved Side Walk as per drawings and Specifications including Granular Base 4" thick and Sand 3/4" thick.	Sft.

30.8.4 Cement Concrete Side Walk

30.8.4.1 Method of Measurement

The quantities to be measured for shall be the number of square feet of cement concrete footpath complete in place and accepted of the footpath surface.

30.8.4.2 Basis of Payment

The quantities as determined above shall be paid for at the contract unit price per 100 Sft. for the pay item listed below, and as shown in the B.O.Q. which price and payment shall constitute full compensation for furnishing and placing all materials, tools, equipment, and transportation, and for excavation, concreting, backfilling and incidentals necessary to complete the work as prescribed in this item.

Description	Unit of Measurement
Concrete paved sidewalks complete as per drawings.	Sft.

30.8.5 Concrete Kerbs

30.8.5.1 Method of Measurement

All kerbs shall be measured by the linear feet as acceptably placed and positioned.

Concrete and mortar that may be required for bedding, hunching to precast concrete kerbs as shown in the drawings shall not be paid for as separate items, but the cost shall be included in the contract unit price for Precast Concrete Kerbs.

30.8.5.2 Basis of Payment

The accepted quantities of curb shall be paid for at the contract unit price per linear feet as shown in the Bill of Quantities, which payment shall constitute full compensation for furnishing and placing all materials for concrete, for reinforcing steel if required on the drawing, for expansion joints, materials, forms for drainage opening, excavations, backfilling, dumping, disposal of surplus unsuitable materials and for all labour, equipment tools and incidentals necessary to complete the item.

Description	Unit of Measurement
Precast Concrete kerb with haunches & base etc.	Lft

30.8.6 Brick Masonry Kerbs

30.8.6.1 Method of Measurement

All curbs shall be measured by the length along the front face of the section at the finished grade elevation. Deductions in length will be made for drainage structures installed in the kerbings such as catch basin and drop inlet, etc.

30.8.6.2 Basis of Payment

The accepted quantities of curb shall be paid for at the contract unit price per linear ft. for pay item listed below and shown in the Bill of Quantities, which payment shall constitute full compensation for furnishing and placing all materials required on the drawings, for expansion joints

materials, forms for drainage opening, excavations, backfilling and dumping and disposal of surplus materials and for all labour, equipment, tools and incidentals necessary to complete the item.

Description	Unit of Measurement
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Brick masonry kerb as per drawings.	Lft
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30.8.7 Interlocking Concrete Pavers

30.8.7.1 Method of Measurement

The quantity to be paid for shall be the number of Interlocking Concrete Pavers in square feet of paved sidewalk complete in place and accepted, measured in the place of the sidewalk surface.

The quantity to be paid for Kerb Stones with Haunch shall be the number of in liner feet complete in place and accepted.

30.8.7.2 Basis of Payment

The quantities as determined above, shall be paid for at the contract unit price per square feet for pay item listed below and shown in the Bill of Quantities, which price and payment shall constitute full compensation for furnishing and placing all materials such as Interlocking Concrete Pavers, compacting the foundation bed, for compacting sub-base course and for all labour, equipment, tools and incidentals necessary to complete the item.

The quantities as determined above, shall be paid for at the contract unit price per liner feet for pay item listed below and shown in the Bill of Quantities, which price and payment shall constitute full compensation for furnishing and placing all materials such as Curb Stones with Haunch, compacting the foundation bed, and for all labour, equipment, tools and incidentals necessary to complete the item.

Description	Unit of Measurement
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Interlocking Concrete Pavers or equivalent including 4" thick granular base as per drawings and specifications or as directed by the Engineer Sft.

30.8.8 Tuff Tiles

30.8.8.1 Method of Measurement

The quantity to be paid for shall be the number of Tuff-Tiles in square feet of paved sidewalk complete in place and accepted, measured in the place of the sidewalk surface.

The quantity to be paid for Kerb Stones with Haunch shall be the number of in liner feet complete in place and accepted.

30.8.8.2 Basis of Payment

The quantities as determined above, shall be paid for at the contract unit price per square feet for pay item listed below and shown in the Bill of Quantities, which price and payment shall constitute full compensation for furnishing and placing all materials such as Tuff-Tiles, compacting the foundation bed, for compacting sub-base course and for all labour, equipment, tools and incidentals necessary to complete the item.

The quantities as determined above, shall be paid for at the contract unit price per liner feet for pay item listed below and shown in the Bill of Quantities, which price and payment shall constitute full compensation for furnishing and placing all materials such as Curb Stones with Haunch, compacting the foundation bed, and for all labour, equipment, tools and incidentals necessary to complete the item.

Description	Unit of Measurement
Tuff-Tiles or equivalent including 4" thick granular base as per drawings and specifications or as directed by the Engineer	Sft.

30.9 CULVERTS

30.9.1 General

The Contractor shall so schedule the construction of drainage works that the discharge of runoff from rain or other sources, both during and after construction, is properly provided for.

To avoid damage to works in course of construction, the Contractor shall provide in due time adequate means of protection, including all necessary temporary outlet ditches, Culverts, ditches, or other drainage works for the discharge of runoff water either during or after construction shall not be built until adequate facilities for the inflow and outflow of the water have been completed and they shall be kept clear of all obstructions that might impede the flow of water.

All culverts, ditches and other drainage works shall be fully operative before work is begun on the construction of sub-grade, sub-base or shoulders.

These requirements shall be met without additional payment and all costs thereof shall be included in the bid prices for any items under the contract.

The types and characteristics of the culverts, ditches, and other drainage structures shown on the drawings and their estimated total quantities entered in the Bill of Quantities are not to be taken as final. The final types, characteristics and quantities will be decided by the Engineer, who will inform the Contractor of them in writing in due time in relation to the approved schedule of works submitted by the Contractor.

30.10 CONCRETE SLAB CULVERTS

30.10.1 Description

This work shall consist of the construction of culverts in accordance with these specifications and the specifications for other work items involved, and in conformity with the lines, grades and dimensions shown on the drawings or ordered by the Engineer.

The work shall include the furnishing and laying of reinforced concrete as shown on the drawings or as required by the Engineer to his satisfaction.

30.10.2 Material Requirements

30.10.2.1 Form work

Form work shall be in accordance with clause 5.3.

30.10.2.2 Steel Reinforcement

Steel reinforcement shall be in accordance with clause 5.4.

30.10.2.3 Concrete

Concrete shall be Class A or Class C and/or lean concrete as specified on the drawings or as directed by the Engineer, and shall be in accordance with Section 2.

30.10.2.4 Brickwork and Cement Plaster

Brickwork and cement plaster shall be as per relevant sections of the specifications

30.10.3 Construction Requirements

30.10.3.1 Excavation

Excavation within the design line and grade, where necessary shall be done, upto the designated levels without disturbing the foundation.

30.10.3.2 Formwork

Formwork shall be supplied and fixed in positions required for the concrete to be cast as shown on the drawings or as required by the Engineer, and shall be supplied, erected and removed as specified in Section 2.

30.10.3.3 Steel Reinforcement

Steel reinforcement shall be furnished, bent and fixed where shown on the drawings or where required by the Engineer and its furnishing, bending and fixing shall be in accordance with Section 2.

SECTION - 31

TRAFFIC ROAD SIGNS AND SAFETY DEVICES

31.1 DESCRIPTION

This work shall comprise furnishing and installing traffic signs, permanent safety devices and post assemblies in accordance with these specifications and to the details shown on the Drawings. All sign faces and lettering shall be in accordance with relevant drawings. Prior to manufacture and fabrication of the signs the contractor shall submit to the Engineer for approval detailed drawings showing letter sizes, traffic symbols and sign layout. The permanent safety devices shall consist of road posts and hazard markers and will be provided as per specifications, drawings or as directed by the Engineer.

31.2 MATERIALS REQUIREMENTS

31.2.1 Sign Panels

Signs panels for regulatory, warning and informatory signs shall be manufactured from enamelled steel or aluminium alloy plates of three (3) mm thickness as shown on the drawings.

31.2.2 Reflective Sheeting

The reflecting sheeting used on the road signs shall consist of spherical lens elements embedded within a transparent plastic having a smooth, flat surface with a protected pre-coated adhesive which shall be pressure sensitive for manual application or tack free heat activated for mechanical vacuum-heat application.

The minimum reflective brightness values of the retro-reflective sheeting as compared to magnesium oxide (MgO) shall be:

Colour	Angle of Incidence (in Degree)	Angle of Divergence (in Degree)	Reflective Value Compared with MgO
Red	-4	0.5	15
	20	0.5	10
	50	0.5	3
White	-4	0.5	75
	20	0.5	70
	50	0.5	70

Yellow	-4	0.5	35
	20	0.5	35
	50	0.5	10
Blue	-4	0.5	6
	20	0.5	4.5
	50	0.5	0.5

The brightness of the reflective sheeting totally wet by rain, shall be at least ninety (90) % of the above values.

The reflective sheeting shall be sufficiently flexible as to permit application over and adhesion to a moderately embossed surface. It shall not show damage when bent ninety (90) degree over a fifty (50) mm diameter mandrill.

The sheeting shall be solvent resistant so as to be capable of withstanding cleaning with petrol, diesel fuel, mineral spirits, turpentine and methanol.

The sheeting shall show no cracking or reduction in reflection after being subjected to the dropping of a twenty five (25) mm diameter steel ball from a height of two (2) meters onto its surface.

The adhesive shall permit the reflective sheeting to adhere securely forty eight (48) hours after application, at temperatures of upto ninety (90) degree Centigrade.

The reflective material shall be weather resistant and following cleaning, shall show no definite fading, darkening, cracking, blistering or peeling and not less than seventy five (75) % of the specified wet or dry minimum brightness values when exposed to weathering for five (5) years.

Samples of the reflective sheeting shall be approved by the Engineer prior to the Contractor placing his order.

31.2.3 Metal Posts

Wide flange of 10 x 10 centimeters metal posts shall be fabricated from structural steel conforming to the Specifications of ASTM A 283 Grade D.

In lieu of wide flange steel posts the Contractor may use tubular steel posts of

minimum internal and external diameters of sixty three (63) mm and seventy five (75) mm respectively conforming to the specifications of ASTM A 501.

All posts shall be thoroughly cleaned, free from grease, scale and rust, and shall be given one coat of rust inhibitive priming paint and two coats of grey paint. Length of the posts shall be such that their top flushes with the top of the sign panel, where as bottom of sign panel is atleast hundred and eighty (180) centimeters above shoulder level.

31.2.4 Plates

- a) Plates shall be non-porous, smooth, flat, rigid, weather proof and shall not rust or deteriorate otherwise. It shall be so cut that there are no sharp edges and that the corners are rounded off to a radius of thirty seven and half (37.5) mm. Any trade mark or other printing shall be carefully removed with liquid thinner.
- b) The Engineer grade sheeting for the background should cover the whole area of the sign plate.
- c) Prior to application of the Engineer Grade reflective sheeting, the sign plate shall be cleaned and shall be wax free. They shall be decreased by vapour or by alkaline emersion and etched by scrubbing with abrasive cleaner. The plate shall be rinsed thoroughly and dried with hot air before applying the sheets.
- d) The sheeting after application to the sign base shall not come off the edges which shall be sealed nor shall it peel off nor warp. The surface shall be smooth and free from any bubbles, pimples, edge chipping or edge shattering. It shall be washable and weather-proof.

31.2.5 Nuts and Bolts

All nuts and bolts and metal washers shall be of heavily glavanized quality ten (10) mm dia (G.I). The bolt heads to be such that they do not protrude out too much not show very much on the front face of the plate. The heads should be flush with the plate face and covered with scotchlite.

31.2.6 Rubber Washer

All rubber washers shall have thick walls and shall not get dry and brittle when exposed to weather at the site after they are in position during the life of the sign.

31.2.7 Caps Over the Pipes

These can be of heavy plastic or of aluminium well fitted so that they cannot be removed any good adhesive can be used.

31.2.8 General

- a) Very large signs need not be made of one piece; in that case the various pieces of sheet shall be joined by angle-irons in anticorrosive materials, and, if necessary, with connecting cross pieces in order to ensure the solidity of the joint and with slanting struts embedded in the concrete as directed by the Engineer.
- b) All the nuts and bolts and metal washers must be heavily galvanized or may be of stainless steel of high quality.
- c) Relevant holes to receive ten (10) mm bolts shall be drilled into the pipes and the plates and not punched. These to be drilled through the plates before the application of scotchlite.
- (d) After the plates are fixed with nuts and bolts, the nuts shall be TACK WELDED to the bolts against pilferage.

31.2.9 Concrete Foundation Blocks

The concrete for the foundation blocks shall be in situ Class A in accordance with **Item 401.1.1.** and shall be of the size 450 x 450 x 650 mm for category 1&2 and 600 x 600 x 750 mm for category 3.

31.2.10 Road Posts and Hazard Markers

The road posts and hazard markers used as permanent safety devices shall conform fully with the requirements of the statutory instruments, current British standards and chapter four (4) of the Traffic signs manual. The safety devices shall consist of delineators and detectors of specified types such as verge master, flex master, edge master, passing place post, and chevrolite etc. and will be manufactured from highly durable "Ultraflex" a tough plastic material with standing vehicular impact. These shall be highly reflective for maximum visibility by both day and night and consequently be resistant to impact damage and vandalism.

31.3 CONSTRUCTION REQUIREMENTS

31.3.1 Excavation and Backfilling

Holes shall be excavated to the required depth of the bottom of the concrete foundation as shown on the Drawing.

Backfilling shall be carried out by using the surplus excavated material if approved by the Engineer and shall be compacted in layers not exceeding fifteen (15) cm in depth.

Surplus excavated material shall be disposed of by the Contractor as directed by the Engineer.

31.3.2 Erection of Posts

The posts shall be erected vertically in position inside the formwork of the foundation block prior to the placing of the concrete and shall be adequately supported by bracking to the prevent movement of the post during the setting process of the concrete. The posts shall be located at the positions shown on the Drawings.

31.3.3 Sign Panel Installation

Sign panels shall be installed by the Contractor in accordance with the details shown on the Drawings. Any chipping or bending of the sign panels shall be considered as sufficient cause to require replacement of the panels at the Contractor's expense.

The exposed portion of the fastening hardware on the face of the sign shall be painted with enamels matching the background colour. All newly erected traffic road signs shall be covered with sacking or other material until their uncovering is ordered by the Engineer.

31.3.4 Categories of Signs

Traffic road signs shall be of three categories according to type of construction.

a) Warning Sign

Constructed with single post and sign of equilateral triangle shape each side ninety (90) cm long, category 1.

b) Regulatory Signs

Construction with single post and sign of circular shape 90 cm dia meter category 2.

c) These signs shall be rectangular in shape and constructed with one, two or three numbers of posts or as shown on the drawings. Dimensions may vary according to the requirements, however total area of sign shall be as under:

Category 3 a	=	One Sq. meter
Category 3 b	=	Two Sq. meter
Category 3 c	=	As shown on drawings

d) Additional Panel

If any panel is required to be installed, it shall be of the sizes 60x30 cm or 90x30 cm.

31.3.5 Installation of Safety Devices

Safety devices comprising of road posts and hazard markers viz, vergemastor, flexmaster chevrdflex, bigmax, edgemaster and passing place post etc., shall be installed in accordance with the techniques and methods laid down in the manufacturer's manual or guide and in conformity to the line and level and locations shown on the drawings or as directed by the Engineer to ensure maximum visibility and safety, even in adverse weather conditions. These shall be constructed strictly with the specifications and full assistance by the manufacturer for installation with precision. These safety devices shall be used as delineators at sharp curves of highways verges, high embankments, culverts, bridges, as a visual and physical deterrent for a prohibiting car parking on grass verges and protecting kerb-side areas on public and private roads.

31.3.6 Sign Faces

a) Design

All sign faces shall be of the type colour, design and size as shown in the plans. Size and spacing of letters shall be as under:

1. The Urdu writing shall be in "Persian" character
2. The Urdu and English writing shall be about the same in length, width and spacing.
3. English letters are to be in italics except the first letter of the word which is to be in capital.
4. Height of Capital letters 21 cm
5. Height of italics letters 17 cm
6. Stroke Width and Width of border 3.5 cm
7. Space between words and border (at least) 5 cm
8. Space between Words 5 cm
9. Space one line will occupy 4 cm
10. Space between digits of numerals 4 cm

- | | | |
|-----|---|---------------------|
| 11. | Height of manuals numeral same as capital letters | 23 cm |
| 12. | Space between lines (at least) | 5 cm |
| 13. | Size of letter for km Height | K-23cm
m 8cm |
| 14. | Width of letters for km including spacing | kg 8 cm
m-9.6 cm |
| 15. | Width of dividing line | 2.0 cm |
| 16. | The size and spacing for Urdu letter and Words will generally conform to the dimensions shown above for English letters | |
| 17. | The spelling of place names in Urdu and in English shall be as written in the Survey of Pakistan maps. | |

b) Shop Drawings

The contractor shall submit to the Engineer for approval three (3) copies of drawings for all special sign faces and all sign faces bearing messages, showing the design and/or arrangement and spacing of both the Urdu and English sign messages. Official down names and their spelling shall be as provided by the Engineer. Size and style of lettering shall be as shown on the plans or as otherwise approved by the Engineer.

31.3.7 Storage of Signs

Signs delivered for use on a project shall be stored off ground and under cover in a manner approved by the Engineer. Any signs damaged, discoloured or defaced during transportation, storage or erection shall be rejected.

31.4 MEASUREMENT AND PAYMENT

31.4.1 Measurement

The quantities of traffic road signs and safety devices to be paid for shall be measured in number of each category of sign supplied and installed at site as directed by the Engineer.

31.4.2 Payment

The quantities measured as determined above shall be paid for at the contract unit price for the pay items listed below and as shown in the Bill of Quantities which price and payment shall be full compensation for furnishing all labour, materials, tools, equipment, and for excavation, concreting, backfilling and erection of posts, installation of sign panels and all incidental costs necessary to complete the work as prescribed in this item.

Description	Unit of Measurement
Traffic Road Signs Category I	Each
Traffic Road Signs Category II	Each
Traffic Road Signs Category III	Each

SECTION - 32

TERMITE CONTROL TREATMENT

32.1 SCOPE

The scope of work for anti termite treatment includes injection of insecticide in sides and bottom of foundation trenches, spraying on stockpiled backfill material and injections of the insecticide in floor sub-grade of the building. The scope also covers treatment of all wood works with insecticides before installation in position.

32.2 CODES AND STANDARDS

All methods of termite protection used herein shall be in accordance with the standard practice of National Pest Control Association, U.S.A. and the British Wood Preserving Association.

32.3 SUBMITTALS

32.3.1 Samples of all the materials to be used for termite control for approval of the Engineer and testing in accordance with the specified standards.

32.3.2 Method statement for application of anti-termite chemical.

32.4 QUALITY ASSURANCE

32.4.1 Manufacturer's Instructions

In addition to the requirements of these specifications, the manufacturer's instructions and recommendations for the work, including preparation of substrata and application shall be complied with.

32.4.2 Application

A professional operator shall be engaged who shall have license in accordance with regulations of governing authorities for application of soil treatment solution.

32.4.3 Guarantee

The Contractor is to guarantee that the building shall be free from termites (white ants), wood bores and other pests which cause damage to wood or other organic material for ten years from the date of acceptance of the building.

In the event of any damage caused within the guaranteed period, the Contractor shall replace at his own cost such damaged material, finishes affected and suitably preserve and treat the entire premises with the best method known to the trade to prevent the spreading of termites.

32.5 MATERIAL

32.5.1 An emulsible concentrated insecticide shall be used for dilution with water, specially formulated to prevent infestation by termites. Fuel oil will not be permitted as a diluent. Provide a working solution of one of the following chemical with clean portable water in ratio 1:40 unless other wise specified by the manufacturer/ supplier.

32.5.1.1.1 Termidor

32.5.1.1.2 Biflex

32.5.1.1.3 Dursban

32.5.2 Insecticide shall be obtained from the Sole distributor, in sealed drums in quantity necessary for the requirement of works.

All mixing shall be done at site and mixing proportion of insecticide with water shall be verified by the Engineer.

32.5.3 Pure turpentine shall be used for dilution of insecticide, in approved proportion for application to woodwork where such application is required.

32.6 METHOD AND EXTENT OF APPLICATION

32.6.1 Insecticide solution shall be applied with approved pressure spraying equipment maintaining a pressure of 150psi to all applications to, on or in earth.

32.6.2 Soil treatment shall begin after all work of preparation of earth prior to installation of concrete has been done. After application, no additional earth moving or work upon sub grade should be done. No covering of earth or concrete should be applied over soil treatment until at least 24 hours after treatment has been made. Solution should not be applied during wet weather, or when the earth surface is excessively wet. Application should be made to all areas beneath concrete slabs-on-grade, including sidewalks and paving abutting buildings for distance of at least 2 meter beyond building line. Solution shall be applied in amounts of not less than 6.00 litter /sq.m of area. If applied over gravel or sand fill, application shall not be less than 7.50litre /sq.metre of area. Insecticide shall penetrate to a depth of 25-mm minimum in porous earth at bottom and 50 mm to 75 mm at sides of excavations.

32.6.3 Sides of foundation excavations, grade beam, and similar areas shall be treated with solution at a rate of 0.37 gallon per square feet upon inner sides of such excavations, and at all locations where concrete slabs for platforms and similar work abut the building. Similar treatment shall be made at all locations where expansion joints, control joints, column bases and similar work occur at or below grade slabs.

32.6.4 In the areas of application signs shall be fixed to show that soil treatment has been applied. Such signs shall be removed when areas are covered by other construction.

32.6.5 Care shall be exercised to insure that no marks or damage occurs to the finished structure as a result of the work under this section.

32.6.6 All woodwork for the entire project is to be insecticide treated (before application of solignum). Insecticide shall be sprayed on all surfaces of all the wooden work viz., door frames, blocking, furring, planks, boards etc. before installation. Spraying is to be done at the site, after delivery and before installation. No spraying shall be necessary after field sawing, jointing or installation of such material.

32.7 MEASUREMENT & PAYMENT

32.7.1 General

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

- 32.7.1.1 Termite control treatment on wood works.
- 32.7.1.2 Turpentine & Water required for mixing insecticide solution.
- 32.7.1.3 Transportation of material and storage at site.
- 32.7.1.4 Anti-termite treatment on stock piled backfill material.
- 32.7.1.5 Tool, plant & equipment required for Termite control treatment

Description	Unit of Measurement
Application of anti termite treatment.	Sft.

32.7.2 Termite Control Treatment

32.7.2.1 Measurement

Measurement of acceptably completed works of termite control treatment will be made on the basis of number of square feet of area treated by measuring the two dimensions (length & breadth) of treated surface.

32.7.2.2 Payment

Payment will be made for acceptable measured quantity of termite control treatment on the basis of unit rate per square Feet quoted in the Bills of Quantities & shall constitute full compensation for all the works related to the item.

SECTION - 33

CARPENTRY AND JOINERY

33.1 SCOPE

The work covered under this section of Specifications consists of providing all material, labour, plant, equipment, appliances and performing all operations connected with the fabrication and erection of all woodwork, mill work, construction assembly, surface finish treatment and building of all cabinet type items, supports of wood or metal and incidentals, associated woodwork appurtenances, procuring and applying preservatives, installation of "Finish Hard Ware" in connection with finish woodwork as per details shown on the Drawings or as directed by the Engineer. The scope of this section is covered with detailed specifications as laid down herein.

33.2 APPLICABLE STANDARDS

Latest editions of following British and ISO Standards are relevant to these specifications wherever applicable.

ISO (International Organisation for Standardisation)

- 1891 Bolts, screws, nuts and accessories-Terminology and nomenclature.
- 1097 Plywood - Measurement of dimensions of panels.
- 1098 Veneer ply wood for general use-General requirements.
- 2427 Veneer ply wood with rotary cut veneer for general use- Classification by appearance of panels with outer veneer of beech.
- 2429 Ply wood - Veneer ply wood with rotary cut veneer for general use- Classification by appearance of panels with outer veneers of brand leaved species of tropical Africa.
- 3804 Ply wood-Determination of dimension of test pieces.
- 3805 Ply wood-Determination of density.
- 3806 Ply wood-Determination of moisture content.
- 6442 Door leaves-Measurement of defects of general flatness.
- 6443 Door leaves-Measurement of dimensions and of defects of squareness.
- 6444 Door leaves-Test of behaviour under humidity variations.

BSI (British Standards Institution)

- 459 Wooden doors.
- 1186 Quality of timber and workmanship in joinery.
- 1127 Hinges
- 1331 Builder's hardware for housing.
- 1567 Wood door frames and linings nails.
- 1202 Nails
- 1203 Specifications for synthetic resin adhesive for ply wood.

- 1204 Synthetic resin adhesives for wood.
- 1282 Guide to choice, use and application of wood preservatives.
- 1494 Fixing accessories for building purposes.
- 1579 Connectors for timber.
- 3842 Treatment of ply wood with preservatives.

33.3 MATERIALS

33.3.1 Timber

Hard Wood

Hard wood shall comprise of Oak, beech, Walnut Mahogany, Teak, Iroko and Sheesham.

Soft Wood:

All soft wood shall consist of pines, spruce, hemlock and douglas fir or cedrous deoder (referred in the document as deoder) having density of 500-600 kg/square metre , wood locally known as 'Partial' to be used in framing where specified.

General Characteristics:

All the timber shall be in accordance with the requirements of BSI No: 1186, 'Quality of Timber and Workmanship in Joinery'.

The whole of the timber shall be from the heart of sound and fully grown tree, uniform in substance, straight in fiber, first class quality properly seasoned, free from large or loose deadknots, open shakes and excessive sapwood. The scantlings of all timbers shall be bright, sound and square edged. The moisture content of timber shall not be more than ten (10) percent.

Preservation of Wood:

Prior to installation of all finish wood works in their respective positions, preservatives shall be applied to safeguard the wood work against fungus, termite and bores.

The preservatives shall be of the best available quality as approved by the Engineer. The method of application shall be strictly in accordance with the manufacturer's instructions. The treatment and application of all the preservatives shall comply with the requirements of BS-CP 98:1964.

Adhesive:

The adhesives shall conform to the requirements of BSI No. 745 "Animal Glues for Wood" or as directed and approved by the Engineer.

Nails and Screws:

All nails and screws shall comply with requirements of BSI NO. 1202 and BSI NO. 1210 respectively.

33.3.2 Ply Wood

The ply wood shall comply in all respects with BSI No. 1455:1963. All the ply wood shall only be obtained from manufacturers approved by the Engineer.

Ply wood used for doors, panellings and other similar works shall be to the thickness and size as shown on the Drawings or as directed by the Engineer. The

grade shall be first quality and the face and back shall be free from end joints, dead knots, overlaps, patches and other similar defects. The surfaces shall be free, smooth for painting or polishing.

The veneer shall be of the required thickness and quality including base veneer and shall be impregnated with an approved adhesive and machine compressed. Such machine pressed veneered wood shall be fixed on all sides of the inner core wood (soft wood of approved quality) after it has been treated with water resistant hot setting glue.

33.3.3 Chipboard

The chipboard shall comply with BS 5669 and shall be if the density specified on the drawings chipboard shall be used in accordance with the recommendations of the chipboard promotion association.

33.3.4 Plastic Laminate (Fomica)

The decorative plastic laminate sheeting shall comply with BS3794 class 1 as manufactured by formite. The colour, shade and quality of laminate shall be subject to the approval of the Engineer.

33.4 SAMPLES

33.4.1 Samples of Materials

All samples of the material used for the work under this Section of Specification shall be approved by the Engineer and same type of material shall be used throughout the work. If the Engineer desires to get the material tested, this will be got done by the Contractor at his own cost from a laboratory approved by the Engineer.

33.4.2 Shop Drawings

The Contractor shall submit detailed shop Drawings on the basis of the drawings, specifications including fittings, fixtures and hardwares to the Engineer before fabrication.

33.4.3 MOCK-UP SAMPLE

After approval of shop drawings and tests etc., the contractor shall submit at his own cost one mock-up sample of each type of wood works complete with all fixing, fixtures accessories prior to the actual fabrication of the bulk. The samples shall be returned to the Contractor for incorporation in the works after installation of at least 80% of the works.

33.5 FABRICATIONS

33.5.1 General

'Unwrought' timber shall be used. Sawing shall be done true to the size and dimensions to finally meet the requirements of specified sizes and dimensions of the finished work.

All framing shall be joined as shown on the Drawings or as directed by the Engineer. All joints shall be secured with sufficient number of nails. The Contractor shall perform all necessary mortising, tensioning, grooving, matching, tonguing, housing, rebating and all operations required for the correct jointing. The Contractor shall also provide all metal plates, screws, nails and other fixing material that may be ordered by the Engineer for the proper execution of the joinery work. Fabrication that develop defects due to bad workmanship or

unsound materials not conforming to these specifications and the directions of the Engineer, shall be cut out and replaced at Contractor's own expense before the expiry of the maintenance period.

33.5.2 Doors

Verify design and size of doors required for each opening. Door thicknesses shall be (1.5") 40 mm unless otherwise indicated.

Fabricate flush wood doors in accordance with the following requirements.

Cores: Edging of doors and shutters shall be of hard wood and cores shall be soft wood (solid core) planed to a smooth uniform thickness. All doors and shutters shall have teak wood lipping on all edges.

Face Panels

Door facing on each side of shutter shall consist of three or more veneered plies of commercial ply/teak ply or Sheesham ply as shown on the Drawings

Veneer plies shall have total minimum thickness of 3mm before sanding.

Door veneers shall be bonded to each other, and to core unit with approved adhesive and machine compressed.

Plastic lminate (Formical) wherever specified shall be renured on the commcial ply with approved acheseive and machine compressed.

33.6 PROTECTION OF MATERIALS

All materials and assembled units shall be protected from weather and stored in such a way as to prevent decay and attack by fungus and termites.

33.7 WOODEN DOORS

Materials

First class Deader wood as approved by the Engineer shall be used for the door frames and full/half glazed and panelled shutters.

The ply wood and veneering shall be of selected best quality as approved by the Engineer.

Architrave shall be of Deader wood of specified sizes and fixed as per details shown on Drawings.

Ground, Blocking & Nailing Strips

Ground, blocking and nailing strips shall be provided as necessary to receive the work included herein and as required for the work of other trades.

Except as otherwise shown or specified, ground blocking and nailing strips shall be secured in place as follows:

To steel--- by means of 9.53mm diameter bolts spaced not over 900mm.

To concrete block----by the use of cut nails spaced not more than 400mm apart and driven directly into the block.

To poured concrete----by means of 6.35mm diamemter galvanized expansion bolts spaced not more than 400mm apart or by any approved method.

Exterior and Interior Door Frames

All exterior and interior door frames shall be constructed of given thickness nailed in place, jambs and beads shall be housed and nailed and glued together.

The door frames shall be secured in place by means of mild steel anchors screwed in place and built into the masonry as it is being constructed. There shall be one such anchor near the top and bottom of each jamb but not over 900mm intervals between the top and bottom anchors.

Exterior and Interior Wooden Doors

The exterior and interior wooden door shall, unless otherwise shown or specified, be of the flush, swing, and louvered type as shown on the Drawings or as directed by the Engineer.

Flush door shall comply with BSI 459 Part-2 and shall consist of solid core teak ply veneer (1.5") 37mm thick shutters as shown on drawings.

Door Shutters

The shutters will be fixed to the frames with approved quality brass fittings as per hardware schedule.

All doors, shutters shall be fabricated in a workman- manner strictly to the correct sizes and shapes as shown on the Drawings or as directed by the Engineer.

The door shutters shall have solid core as shown on the Drawings. It shall be built in sections, properly jointed and glued together, both sides being covered with commercial ply veneer of the required thickness and approved quality. The surfaces shall surface shall be prepared for painting or polishing.

The arrangements of inner core for solid shutters shall be approved by the Engineer. It shall be so adjusted that circulation of air is free and uninterrupted. Minute holes shall be provided in edges at suitable places to admit and exit air.

Each door shall be constructed so as to permit the installation of hinges, knobs and locks in the position shown on the Drawings.

Completed doors shall be sound, rigid and free from defects and warp. All edges shall have teak wood lipping and shall be aligned and smooth, joints shall be close fitting, hard wood dowelled or mortised framed and of a strength to maintain frame and of strength to maintain the structural properties of the member connected. All adjoining faces and edges shall be flush and smooth. Edges shall be rectangular and solid.

Fitting, Hanging and trimming

All the doors shall be fitted, hung and trimmed as hereinafter specified and as indicated on the Drawings.

Doors shall have a clearance of 4 mm at sides and top unless otherwise directed by the Engineer and shall have 5 mm clearance at bottom. Doors shall be hung and trimmed with hardware as specified. All the locks shall be installed at the same height and shall be located at height as directed by the Engineer.

Hardware

Hardware shall be of best quality local make extra heavy duty and first class finished material. The Contractor shall obtain prior approval from the Engineer for quality, shape, pattern, and brand of all the hardware materials by providing samples and

catalogues, etc., and shall provide and fix only the approved hardware materials. The fittings shall included but not necessarily be limited to the following:-

	Items	Shutters		Remarks
		Si n g l e	D o u b l e	
	Brass push plate	o n c	t w o	100 200 mm x 200mm 18 gauge
	Brass Kick plate	t w o	fo ur	200 m high 18 gauage
	Mortize lock (Japanese origin)	o n c	o n c	Except Except W C Doors
	Brass Tower/Sliding Bolt	o n c	f o u r	W.C Both Side
	Brass Hinges	fo ur	ei g ht	
	Room number Brass (65mm x 65mm)	o n c	o n c	Except Toilets.
	Door Closer	o n c	t w o	Except Toilets.
	Door Stoper	o n c	t w o	Except Toilets.

Hardware shall be carefully and securely fitted. Upon handing over the work, hardware shall be demonstrated to operate freely. Keys shall be placed into respective locks and upon acceptance of the work keys shall be tagged and delivered to the Engineer.

33.8 Quality Assurance

Tolerances: Doors shall be fabricated to following tolerances

Size: Plus or minus 1.6 mm overall dimensions

Maximum Warp: 3 mm

Squareness: Maximum diagonal difference 3mm (between length of diagonal measured on face of door from upper right corner to lower left corner and length of diagonal measured from upper left corner to lower right corner).

33.8.1 Manufacturer's Qualifications:

The manufacturer of doors herein specified shall have been in business of manufacturing doors of type specified for minimum period of five years. The manufacturer/Suppliers/Sub Contractor of Wood Work shall be subject to the approval of the Engineer.

33.8.2 Submittals

Provide manufacturer's literature completely describing products.

Provide shop drawings showing door types, details and locations, referred to the door type and hardware group shown on door and hardware schedules.

Provide certificates stating that doors were constructed with timber of the species specified having moisture content and meeting equilibrium and relative humidity requirements.

Submit samples of face veneers for selection of colour and pattern.

Procurement of materials shall be made only after the shop drawings and samples have been approved by the Engineer.

33.8.3 Product Delivery, Storage and Handling

Deliver and store products in waterproof, protective containers with seals unbroken and labels intact until time to use.

Keep products dry, stack products off ground on level platforms, fully protected from weather, including direct sunlight.

Identify type, size and location of each door before delivery in order to permit installation at correct location.

33.8.4 Installation

Install doors at correct openings and assure smooth swing and proper closer with frames.

Install finish hardware in accordance with manufacturer directions.

33.9 WOODEN RAILING

Material for wooden hand rail system shall be superior quality Teak/Sheesham / Deader Wood as shown on the drawings and specified in the BOQ. It shall be fabricated and installed in accordance with the design shown on the Drawings or as approved by the Engineer. Samples for decorative wood works of hand rail shall be submitted to the Engineer for approval prior to starting the work. Shop drawing for stair case hand rail system shall be submitted to the Engineer for his approval prior to start of work. Hand rail shall be installed to line, level and plumb.

33.10 KITCHEN CABINET, WOODEN BENCHES, PERGOLA AND JAFRI (TRELLIS)

All wooden kitchen cabinet, wooden benches, pergola and jafri (trellis) works shall be fabricated by approved sub contractor/manufacturer and shall be of best quality.

33.10.1 Shop Drawings

The details of these items shown on the drawings are tentative and shows basic configuration and design of these items

The contractor shall submit detailed shop drawings of these items on the basis of tentative detail shown on the drawings including all fitting, fixtures and hardware for the proper execution of kitchen cabinet, wooden benches, pergola and jafri for the approval of the Engineer before fabrication..

33.10.2 Installation

All the works, shall be installed in position by the manufacturer's skilled workmen specialized in the job. Works shall be executed in accordance with approved shop drawings and or as directed by the Engineer.

All works shall be thoroughly protected from damage at all times by suitable methods approved by the Engineer. Adjacent works shall similarly be protected from damage. Any damage or disfigurement shall immediately made good at Contractor's expense.

33.11 SQUASH COURT HARD WOOD FLOORING

Hard Wood Flooring shall be fabricated by approved sub contractor/ manufacturer and shall be of best quality as shown on drawings..

Shop Drawings

The details of wooden flooring shows on the drawings are tentative and shows basic configuration.

The contractor shall submit detailed shop drawings of this items on the basis of tentative detail shown on the drawings for the proper execution of Hard Wood Flooring for the approval of the Engineer before fabrication.

Installation

All the works, shall be installed in position by the manufacturer's skilled workmen specialized in the job. Works shall be executed in accordance with approved shop drawings and or as directed by the Engineer.

33.12 DEFECTIVE WORK

In the event of non-conformance to specification and drawings, the wood works shall be rejected by the Engineer and the Contractor shall remove and replace the rejected work by new work of same specifications.

33.13 SURFACE PREPARATION

The surfaces of all wood works shall be prepared in the manner as directed by the Engineer for polishing and painting.

33.14 MEASUREMENT & PAYMENT

General

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

- Glass and glazing including other materials and accessories required for installation and finishing.
- Prime coat, painting and polish lacquer in carpentry and joinery works.
- Anti termite treatment to all wood works.
- Adhesives
- Timber batten, counter sunk screw for teak wood moulding, skirting, beading, wooden flooring & wall panelling.
- Hardware/Iron mongery for wood works.
- Formica veneer on commercial ply for toilet doors.
- Bitumen coating of wooden subframe for Wooden flooring etc .

Wooden Doors (Flush and Panelled)

Measurement

Measurement of acceptably completed works of each type of wooden doors (Flush and Panelled) will be made on the basis of net actual area in square feet fabricated and installed in position as shown on the Drawings or as directed by the Engineer.

Payment

Payment will be made for acceptable measured quantity of each type of wooden door (Flush and Panelled) on the basis of unit rate per square foot quoted in the Bill of Quantities and shall constitute full compensation for all the works related to the item.

Kitchen Cabinets, Wooden Benches and Jafri (Terris)

Measurement

Measurement of acceptably completed works of Kitchen Cabinets, Wooden Benches and Jafri (Terris) will be made on the basis of net actual area in square feet fabricated and installed in position as shown on the Drawings or as directed by the Engineer.

Payment

Payment will be made for acceptable measured quantity of Kitchen Cabinets, Wooden Benches and Jafri (Terris) on the basis of unit rate per square foot quoted in the Bill of Quantities and shall constitute full compensation for all the works related to the item.

Description	Unit of Measurement
Solid Panel Door.	Sft.

Flush Door.	Sft.
Flushed Door veneered with formica	Sft.
Kitchen Cabinet	Sft.

Wooden Pergola and Sheesham wood decorative bracket

Measurement

Measurement of acceptably completed works of Wooden Pergola and Sheesham wood decorative bracket will be made on the basis of Each number fabricated and installed in position as shown on the Drawings or as directed by the Engineer.

Payment

Payment will be made for acceptable measured quantity of Wooden Pergola and Sheesham wood decorative bracket on the basis of Each number quoted in the Bill of Quantities and shall constitute full compensation for all the works related to the item.

SECTION - 34

FLOOR AND WALL FINISHES

34.1 SCOPE

The work done under this section of the Specification consists of furnishing all plant, labour, equipment, appliances and materials and performing all operations in connection with the installation of cement concrete floors and floor finishes including bases, skirting wainscots and exterior wall finishes complete in strict accordance with this section of the specifications and the applicable drawings and subject to the terms and conditions of the Contract. The scope of this section of specifications is covered with detailed specifications as laid down herein.

34.2 APPLICABLE STANDARDS

Latest editions of following Pakistan, ISO, British & ASTM standards are relevant to these specifications wherever applicable.

Pakistan Standard

- 232 Ordinary Portland Cement
- 511 Terrazzo tiles
- 531 Cement Concrete Floor Tiles

ISO (International Organization for Standardization)

- R 680 Chemical analysis of cements Main constituents of Portland Cement.
- R 681 Chemical analysis of cements Minor constituents of Portland cement.

ASTM (American Society for Testing and Materials)

- C 482 Bond strength of ceramic tile to Portland cement.
- C 648 Breaking strength of ceramic tile.
- C 650 Resistance of ceramic tile to chemical substances.
- C 798 Colour permanency of glazed ceramic tile.
- D 2859 Flammability of finished materials vinyl-asbestos tile or flooring.
- D 3564 Application of floor polishes to maintain vinyl- asbestos tile or flooring.
- E 84 Surface burning characteristics of building materials
- F 141 Resilient floor coverings, definitions of terms.
- F 510 Resistance to abrasion of resilient floor coverings.

BSI (British Standards Institutions)

- 882 Pt.2 Course and fine aggregates from natural sources.
- 1199 Sands for external renderings, internal plastering with lime and Portland cement and floor screeds.
- 1201Pt.2 Aggregates for granulithic concrete floor finishes.
- 1281 Glazed ceramic tiles and tile fittings for internal walls.
- 1286 Clay tiles for flooring
- 3260 PVC (vinyl) asbestos floor tiles.
- 3261 Unpacked flexible PVC flooring.

5385	Internal Ceramic wall tiling and mosaics in normal conditions.
5442	Classification of adhesives for use in Construction pt-1 Adhesives for use.
203	Sheet and Tile flooring
204	In-situ Floor Finishes.
209 Pt.1	Care and Maintenance of floor surface, wooden flooring.

34.3 SUBMITTALS

Prior to the execution of work and sufficiently in advance, the Contractor shall submit to the Engineer:

34.3.1 Methodology

Method statements detailing his proposed plans and programmes in respect of all the important and critical items of work or parts thereof for technical scrutiny. He should obtain approval from the Engineer in time so that the Work schedule is not affected adversely.

34.3.2 Specimen Samples

Specimen samples of all the materials, elements, components and embedded parts (if any) for prior approval by the Engineer. The Contractor shall retain and store the approved samples throughout the entire period of Works. Three samples shall be submitted of each type of all available colour and pattern for approval.

34.3.3 Technical Literature

Technical literature, brochures and documents relevant to the items of Works and the materials or components that he intends to use in the Works. The literature shall include manufacturer's/supplier's specifications/recommendations.

34.3.4 Test Certificates

Test Certificates in respect of the materials/products from the manufacturers/suppliers. In case of supplies, the Contractor shall ensure that the materials supplied are from genuine source and from the original manufacturers.

34.4 TOLERANCES

The tolerance in surface level of terrazzo and ceramic tiles shall be 1/8" (3mm) over a length of 10 feet (2 meters).

34.5 TESTING

34.5.1 Tiles

The Contractor shall provide samples of tiles for selection, testing and approval of the Engineer. The samples shall be in finished sizes and shapes and adequate in number for testing in the laboratory as and when ordered by the Engineer.

The Contractor may also be required to lay samples of finished items of tile work fixed in position before he is allowed to proceed with the work on a particular item.

34.5.2 Adhesion to Base

The adhesion between the screed or topping and base of tile shall be tested by tapping the surface with a rod or a hammer. A hollow sound shall be considered to indicate poor adhesion. When poor adhesion is accompanied by visible or measurable lifting of tiles at the edges of bays or the tile cracks then the adhesion shall be considered to be unsatisfactory and it shall be necessary to renew the whole of the affected bay or bays.

34.6 DELIVERY AND STORAGE

- 34.6.1 Materials shall be delivered in manufacturer's original sealed containers with labels intact and legible, identifying brand name and contents.
- 34.6.2 Manufactured materials shall be protected from moisture and extreme of heat and cold.
- 34.6.3 The aggregate shall be stored on properly constructed paving as directed by the Engineer.
- 34.6.4 There shall be a physical partition between the stockpiles of coarse and fine aggregate.

34.7 MATERIAL

34.7.1 Gray/ White Cement

Cement shall be ordinary Portland cement conforming to B.S. 12 or PS 232.

34.7.2 Sand

All fine sand shall be obtained from sources approved by the Engineer. The grading shall conform to B.S 882 Grading Zone 1 and 2 of which the gradation limits are as follows:

Percentage (by weight) passing

Sieve	Grading Zone 1	Grading Zone 2
3/8" (9.53mm)	100	100
3/16" (4.76mm)	90-100	90-100
No. 7	60- 95	75-100
No. 14	30- 70	55- 90
No. 25	15- 34	35- 59
No. 52	5- 20	8- 30
No. 100	0- 10	0- 10

34.7.3 Coarse Aggregate :

Coarse aggregate shall be crushed or uncrushed gravel or crushed stone, angular or rounded in shape and shall have granular, crystalline or smooth surface free from friable, flaky and laminated pieces, mica and shale. It shall not contain matters injurious to concrete. All coarse aggregate shall conform to BSS NO.882 and shall be graded as follows:

Sieve	% Passing by weight
25.40mm (1")	100
19mm (3/4")	90-100
9mm (3/8")	20- 55
4.67mm (3/16")	0- 10

The aggregate shall be stored on properly constructed paving or as directed by the Engineer.

There shall be a physical partition between the stockpiles of coarse and fine aggregate. If required aggregates shall be washed and screened to the satisfaction of the Engineer. Sieve analysis of all the aggregates to be used in the works and shall be carried out as and when required by the Engineer. All aggregate shall be subject to the approval of the Engineer.

Any aggregates not found to be of the specified/approved standard shall be rejected by the Engineer and all such rejected material shall be removed from site with-out delay.

Floors, sub-base or base constructed with rejected aggregates shall be dismantled and rebuilt at the expense of the Contractor.

34.7.4 Brick Ballast :

Brick Ballast as Sub base of floors shall be obtained from well burnt or overburnt bricks which are hard, durable and strong. Brick ballast shall be free from impurities, quarry sap, dust, dirt and solubility characteristics

34.7.5 Water

Water used for mixing concrete, curing or any other operation of the works specified herein shall be fresh, clean and free from organic or inorganic matters in solutions or in suspension. Only water of the approved quality shall be used for all constructional purposes.

34.7.6 Terrazzo Tiles

Terrazzo tiles shall be first grade mechanically compressed type conforming to PS-531. Tiles shall be of sizes specified on the drawings with a topping of ½" (10mm) thickness composed of 1:2 cement marble chips, the base being 1:2 cement mortar. The colour quality and size of chips and colour of cement shall be as per approved sample.

34.7.7 Ceramic Tiles (Glazed , Matt tiles)

Ceramic tiles shall be export quality white or coloured. The size, colour pattern and shade of Ceramic tiles shall be selected and approved by the Engineer, and shall conform to BS 1281 as per samples.

34.7.8 Cleaning Compound

The compound used for cleaning of terrazzo shall be an approved neutral chemical cleaner free from acid and alkali or any other material that will affect the colour or otherwise damage the terrazzo and shall not affect the conductivity of terrazzo floors.

34.7.9 Division Floor Strips

34.7.9.1 Glass Floor Division Strips

Division strips of glass shall be cut from 5mm thick plate glass in widths as specified in the drawings or as directed by the Engineer.

34.7.9.2 Brass or Aluminium Floor Division Strips

Floor dividing strips of brass and aluminium shall be at least 1/8 inch (3 mm) thick and 1½ inch (38 mm) wide or as required in the drawings.

34.7.9.3 Marble Floor Division Strips

The marble dividing strips shall be ½ inch (12mm) thick and 1½ inch (38 mm) wide or as directed by the Engineer.

Pigment and Joint Filler

- 34.7.9.4 The mineral pigment for coloring the matrix of terrazzo shall be of the best quality, purity and shall be alkali resistant, sun proof and lime proof with a specific gravity similar to that of Portland cement.
- 34.7.9.5 Joint filler shall be white Portland cement grout which shall bond to dry tile, shall be non-shrinking, stain resistant, permanent in colour and shall not in habit fungus and bacterial growth. It shall be odorless and non-toxic, of smooth consistency for early preparation and neat rapid installation and shall contain non-metallic material. Grout shall be water resistant and shall not wash out under water.
- 34.7.9.6 Commercial product for polish shall be of the best quality as approved by the Engineer.

34.7.10 Marble Chips

Marble chips shall be crushed marble of specified grade and colour shall be of approved quality from quarries in Pakistan. It shall have an abrasive hardness of not less than 16. Before any material is purchased, the contractor shall submit to the Engineer for approval samples in duplicate. The material used in the work shall correspond with the approved samples in quality, colour texture and finishes etc.

34.7.11 Precast concrete interlock Pavers

The type, colour, pattern and shade of Pavers shall be selected and approved by the Engineer. The minimum compressive strength of interlock paver shall be 7000psi as approved by the Engineer.

- 34.7.12 The pre cast cement concrete tiles (clad stone) for the floors and walls shall be from the approved manufacturers.

The size, colour, shade and patterns shall be as shown on the drawings and as approved by the Engineer.

34.8 EXECUTION

34.8.1 CEMENT CONCRETE FLOORING

The materials for P.C.C flooring shall be same as already specified under clause 7, "Materials".

34.8.1.1 Preparation

The ground surface shall be cleared and grubbed of top soil and all grass, roots and loose material removed in any. Surface shall be dry, levelled and any fill or backfill under the floors done as per section Earth work Sub-Section 6 of these Specifications.

34.8.1.2 Sub-Base

The floor sub base shall be either brick ballast or lean concrete or R.C.C Slab as shown in the drawings.

33.8.1.2.1 Brick Ballast

The brick ballast shall be of 1:6:12 using coarse aggregate as brick ballast and laid in position. It shall be properly watered and rammed to get the required thickness.

33.8.1.2.2 Lean Concrete

Lean concrete shall have a strength of 1000psi., and shall conform to Section Plain and Reinforced Concrete of these Specifications. It will be screeded in position to required depth and or surface elevations.

The surface of the sub base concrete shall be brushed with a stiff broom just before it hardened to remove all litanies and loose aggregate and at the same time to roughen the surface to improve the bond. The hardened base shall be thoroughly cleaned, wetted preferably overnight, the surplus water removed and a grout of cement and water brushed into the surface just ahead of the application of the topping.

34.8.1.3 Panels

Before laying the cement concrete flooring, the surface of the sub-base shall be divided into panels of required size as shown on the Drawings. Panels shall be made of plate glass, division strips or as specified. The top of the division strips shall conform to the specified level of the finished floor surface.

34.8.1.4 Floor

Mixing and placing of first botom layer of 3000psi. concrete shall be in accordance with **Section 2300-"Plain and Reinforced concrete"**. Concrete may be conveyed in any suitable manner from the place of mixing provided there is no segregation or loss of any ingredients and provided it is placed in its final position before initial setting takes place, that is within 30 minutes of addition of water to the mix. The concrete will be laid in a manner so as not to cause the aggregate to separate from the mortar and laid in alternate panels, each panel shall not exceed the area as directed by the Engineer. Dividing strips shall be provided unless otherwise specified on the Drawings and BOQ. The floor concrete panels shall have the thickness as shown on the Drawings. The concrete shall be rammed and thoroughly consolidated and finished rough.

34.8.1.5 Finishing

Immediately after consolidation, the surface, shall be levelled with a wooden trowel. Excessive trowelling in the early stage shall be avoided. The surface shall be tested with a straight edge to detect undulations, which, if found, shall be eliminated. The finer components in the concrete which come to the surface with the stroking shall be quickly but carefully smoothed with the steel trowel. When the concrete has hardened sufficiently, trowelling shall be done with steel trowels. No dry cement or a mixture of dry cement with sand shall be sprinkled on the surface for hardening the surface.

34.8.1.6 Dado/Skirting

The plaster on the portion of the wall to be provided with skirting or dado shall be left in a rough state by brooming or by using wire brushes of approved type so as to provide a bond between this base plaster and the dado or skirting. The surface of the wall shall be cleaned of all foreign matter and shall be thoroughly wetted to control the suction. Only so much mix shall be mixed with water that could be utilized within 30 minutes. This mix of cement and coarse sand in the ratio of 1:2 shall be applied to the wall in a thickness as specified and trowelled hard to a smooth surface, proper in line both vertical and horizontal.

34.8.1.7 Curing

Curing shall be carried out in accordance with the Specifications given under Section - Plain and Reinforced Concrete.

34.9 INSTALLATION OF TILE FLOORING

The base in cement concrete and if required the sub-base in lean concrete shall be prepared as provided in Sub-Section 8.1 "Cement Concrete flooring". The thickness of sub-base if any and base shall be as shown in the Drawings, BOQ or directed by the Engineer. The surface of concrete base shall be rough finished. The curing period of base shall be at least 72 hours before laying the tile work.

34.9.1.1 General

The sub-base and base shall be prepared by laying cement concrete of specified grade and thickness as shown on the drawings, or as specified in the Bill of Quantities.

The Tiles shall be laid to the required levels and grades over a setting bed of $\frac{3}{4}$ " thick cement sand screed comprising of one part cement to three part of sand of volume unless otherwise shown in the Drawings or specified in the BOQ. As large an area of setting bed shall be spread at one time as can be covered with tiles before the mortar has set. Surplus mortar shall be removed. The thickness of setting bed in any space shall not be less than $\frac{1}{2}$ " or as shown on the drawings.

Floor and wall surfaces to receive the tiles shall be thoroughly cleaned of all dirt, dust, oil and other objectionable matters. Tiles shall be laid out from the center line of each space in an outward direction and the pattern should be made symmetrical with a minimum number of cut tiles and shall be laid to straight edges. Tiles shall be cut with a suitable cutting tool and rough edges shall be rubbed smooth.

After each piece is laid, it shall be firmly pressed into place so as to embed it and to even the surface before the mortar takes its initial setting.

Joints between the tiles shall be of uniform width and shall be grouted full with a plastic mix of grey or white cement (as directed by the Engineer) immediately after a suitable area of tiles has been set.

34.9.1.2 Terrazzo Tiles

The terrazzo tiles will be laid to the required lines, levels and grades over a setting bed of $\frac{3}{4}$ inch thick cement sand mortar. The thickness of cement concrete subbase and base shall be as per Bill of Quantities.

After seven days of tile laying, the terrazzo tile floors shall be machine grinded to a true even surface using various grades of abrasive stones, as required and directed by the Engineer. After the first grinding the floor shall be grouted with cement mortar of the same colour composition as used for its manufacture. The grout shall be of the consistency of thick cream and shall be brushed over the floor to fill in the joints and after 72 hours the grouting coat shall be removed by grinding till a smooth and even surface is obtained. Areas and portion of the floor inaccessible for the grinding machine shall be grinded and rubbed by hand. After the floor has been machine finished, it should be covered with white, non-staining sand or rags to protect it while other work is being done. After removal, the floor shall be thoroughly scrubbed. The final gloss shall be given by chemical polishing the surface to the satisfaction of the Engineer. Preservative treatment for terrazzo floor shall produce a water-proof finish which will not be impaired by immersion in water at room temperature for a period of 2.5 hours, approximately 18 hours after the floor is finished by buffing, as specified. The preservative material shall not discolour

the buffing, as specified the terrazzo nor leave a tacky or sticky finished film on the surface after buffing.

34.9.1.3 Ceramic Tiles

The glazed and matt finished ceramic tiles shall be laid to the required lines, levels and grades over a setting bed of cement sand mortar comprising of one part of cement and 3 parts of sand by volume and the joints filled with neat white cement mixing with matching colour pigment including vertical and horizontal covers. The tile floor/wall shall be kept wet for at least 72 hours and no traffic should be allowed on the tiles during curing period.

34.9.2 TERRAZZO CAST IN-SITU

34.9.2.1 FLOORING

33.9.2.1.1 Mix

The terrazzo mixes shall be composed by volume as follows:

9.2.1.1.1 Plain terrazzo for all floors and basis indicated as terrazzo and not otherwise specified, shall be composed of one part cement (white or gray) and 2 parts of marble chips of the sizes colours and pigment as shown on the Drawings specified in BOQ specified and/or as directed by the Engineer.

33.9.2.1.2 Preparation for Terrazzo

The grade and thickness of subbase and base concrete as shown on the drawings shall be laid to receive terrazzo. The surface of the bed shall be roughened for bounding with the terrazzo finish. If the surface is too smooth it shall be roughened with a toothed chisel and, prior to laying the terrazzo the bed shall be cleared of all dirt, oil grease and extra loose material.

33.9.2.1.3 Division Strips

The underbed consisting of 3000 psi. concrete screed shall be spread and brought to a level not less than ½ inch (15mm) below the finished floor level, the dividing strips shall be installed in the green underbed.

Terrazzo floors underbed shall be divided by marble/glass, aluminium/brass strips as specified and approved by the Engineer. The division strips between field work and borders shall have exposed tops in full width of the strips. The strips being partially embedded therein, securely anchored to the under bed and grouted solid.

All division strips shall be set, straight to lines and to the proper level to ensure that the tops of the strips will show uniformly after grinding and smoothing operations are completed and joints and intersections shall be fitted tight. Strips shall be braced to prevent bulging during the placing of terrazzo.

Unless otherwise shown on the drawings, the divisions in field work of large areas shall not exceed 3ft x 3ft and in small areas shall not exceed 2ft x 2 ft

Edging strips shall be placed at door ways between terrazzo and types of flooring and along the edges of all terrazzo bases or borders and adjoining other types of floor finishes or floor covering. The edging strips at door ways shall be placed in line

with the step face of doors. All edging strips shall be anchored and grouted solid in the underbed or to the concrete sub-floor and braced to prevent bulging as specified for divisions strip.

33.9.2.1.4 Laying Terrazzo

The sub-surface shall be swept clean, thoroughly moistened, but not saturated, and slushed with a coating of neat cement grout approximately 1/8 inch (3 mm) in thickness. The underbed consisting of 3000 psi. concrete screed shall be spread and brought to a level not less than 1/2 inch (15mm) below the finished floor level, the dividing strips shall be installed in the green underbed. The cement and marble must be mixed dry in such quantities as are sufficient for a unit of specified shade. Water shall be added to only such quantities as can be mixed thoroughly and consumed in less than 30 minutes, the quantity of water being the minimum for workability. Mixing must be done on water tight platform and any mix not used within 30 minutes shall be discarded and removed from the Site. A layer of cement and marble chipping mixture should be well trowelled into the surface of the base concrete before filling to the top level of the screeds. The layer should be well compacted and all voids shall be filled in. A layer of neat cement, of the specified colour shall then be well trowelled into the surface leaving a plain smooth surface.

33.9.2.1.5 Seasoning

The completed terrazzo shall be allowed to season for 6 days during which time it shall be kept moist and free of traffic. The curing shall be accompanied by (1) covering with approximately one inch thickness of sand; or (2) covering with building paper or mats; or (3) springing with water at every 10 hour interval.

33.9.2.1.6 Surface

Following the curing period, the terrazzo shall be machine ground to a true, even surface using a No.24 grit followed by a No. 80 grit or finer abrasive stone. After the first grinding, the floors shall be thoroughly grouted with the same cement and colour composition as specified for the matrix of the terrazzo mix. The grout shall be of the consistency of thick cream, and shall be brushed over the floor to eliminate all pits and thoroughly fill the surface for final grinding.

33.9.2.1.7 Finishing

Not less than 72 hours after application, the grouting coat shall be removed by grinding. In the later stages of grinding, the grit stones or other abrasive used in the grinding machine shall be of a grain of fineness that will give the surface smooth finish. Small areas, inaccessible portions and corners which cannot be reached by the grinding machine shall be grinded and rubbed by hand.

34.9.2.2 Terrazzo Dado and Skirting

The plastered surface over which the dado/skirting is to be applied shall be well roughened and watered, cement mortar of specified ratio shall then be plastered over this well roughened surface to the indicated thickness. Before the base course has set the layer of terrazzo mixture shall be well trowelled into the surface of the base to a thickness which after grinding shall

result in the finished thickness. A layer of neat cement of the specified colour shall then be well trowelled into the surface leaving a plain smooth surface. After the period specified for floors above, the Contractor shall start finishing as for floors specified above. Terrazzo skirting shall be provided around all terrazzo floors unless shown otherwise. Skirting and dado shall be straight, level and in plumb. Intersections at floors shall be straight and flush.

34.9.2.3 **Terrazzo on Stairs**

The stair risers and treads shall be provided in 3000 psi. concrete according to exact sizes including the terrazzo topping making allowance for grinding of terrazzo. The nosing shall be flush with the terrazzo toppings, and shall be protected by aluminium angles as specified or shown on the Drawings. The angles shall be firmly secured, by means of counter-sunk brass screws, and cast together with the step.

34.9.2.4 **Washed Terrazzo On Walls**

The work to be done by the contractor consists of providing $\frac{3}{4}$ " thick washed terrazzo in white cement with approved pigment, laid on $\frac{1}{2}$ " rough plaster in 1:3 cement sand mortar in panels with $\frac{3}{4}$ "x $\frac{3}{4}$ " thick Aluminium "U" channel on walls, and other surface as shown on the Drawings.

33.9.2.4.1 **Sub Grade**

The sub grade under terrazzo top shall be $\frac{1}{2}$ thick cement sand rough plaster in 1:3. The sub grade shall be constructed in accordance with the applicable stipulations and requirements of section Cement Plaster of these specifications. The sub grade surface be kept wet for proper adhesion of terrazzo topping, which shall be laid when the sub grade is still green.

33.9.2.4.2 **Topping**

The terrazzo topping shall consist of one part of white cement and one and half parts of marble chips mixed by volume with approved water cement ratio. The dividing panels of Aluminium "U" section shall be fixed with stainless steel or brass screw in the size as directed by the Engineer. Before laying terrazzo topping the surface shall be thoroughly cleaned so as to be free from dust or foreign matter. The topping shall be laid while the bottom sub grade surface is still plastic preferably the next day, after the sub grade is laid if the surface is not plastic a slurry of neat cement shall be brushed on to it immediately before the topping is laid.

33.9.2.4.3 **Rough Finish**

Before the terrazzo is hardened the top surface shall be brushed down, plenty of water being used in this process. The brushing shall continue till the matrix is removed and each piece of marble chips is clearly exposed. If brushing of surface does not produce desired results tooling process shall be carried out by Kango Hammer. After whole of the area is evenly exposed the surface shall be sprayed with water and lightly brushed down cleaning all the adhering mortar and revealing the true colour on the marble chips.

34.9.3 Protection

All surfaces of the finished work of other trades shall be properly protected from damage and spoiling during the process of grinding and washing of the terrazzo.

After the final grinding has been completed and the surface treatment and polish applied, the terrazzo work shall be covered and protected with material approved by the Engineer until completion of the work of all other trades.

34.9.4 Cleaning and Coating

Prior to placing the protective covering, the terrazzo floor shall be approved by the Engineer. After the work of all other trades has been completed and the protective covering removed, all terrazzo work shall be washed with cleaning compound, mixed with water and using a fine abrasive where necessary to remove any stains or cement smears. The terrazzo shall be allowed to dry thoroughly and shall be given a sealing application of preservative material. The sealing material shall be applied in accordance with the manufacturer's directions, leaving all terrazzo work in clean condition as approved by the Engineer. The final glass shall be given by polishing with chemical polish the surface, with wax polish of approved manufacturer, to the satisfaction of the Engineer.

34.9.5 PRE CAST CONCRETE INTERLOCK PAVERS

The pre cast interlock concrete pavers of specified size, shape and colour shall be laid to the required lines, levels and grades over a well compacted setting bed of 100mm thick sand mixed with 37mm down crushed stone over 50mm thick sand cushion. The joints between the paver shall be filled with neat sand.

The laid paver shall be compacted with the compactor as specified by the Manufactures. Care shall be taken that full pavers are used as far as possible. Where this is not possible, the edge pavers shall be neatly cut with an electric saw and the edges rubbed smooth, in case of patterned pavers, the pavers shall be laid in such a way that the pattern ends symmetrically on two sides.

34.9.6 PRE CAST CEMENT CONCRETE TILES ON FLOOR AND WALLS

The subbase and base shall be prepared by laying cement concrete of specified grade and thickness as shown on the drawings, or specified in the Bill of Quantities.

The Tiles shall be laid to the required levels and grades over a setting bed of $\frac{3}{4}$ " thick cement sand screed comprising of one part cement to three part of sand of volume unless otherwise shown in the Drawings or specified in the Bill of Quantities. As large an area of setting bed shall be spread at one time as can be covered with tiles before the mortar has set. Surplus mortar shall be removed. The thickness of setting bed in any space shall not be less than $\frac{1}{2}$ " or as shown on the drawings.

Floor and wall surfaces to receive the tiles shall be thoroughly cleaned of all dirt, dust, oil and other objectionable matters. Tiles shall be laid out from the center line of each space in an outward direction and the pattern should be made symmetrical with a minimum number of cut tiles and shall be laid to straight edges. Tiles shall be cut with a suitable cutting tool and rough edges shall be rubbed smooth.

After each piece is laid, it shall be firmly pressed into place so as to embed it and to even the surface before the mortar takes its initial setting.

Joints between the tiles shall be of uniform width and shall be grouted full with a plastic mix of neat grey or white cement (as directed by the Engineer) immediately after a suitable area of tiles has been set.

34.10 MEASUREMENT AND PAYMENT

34.10.1 General

Except otherwise specified herein or elsewhere in the Contract Documents, no measurement and payment will be made for the under mentioned specified works related to the relevant items of the Bill of Quantities.

The cost thereof shall be deemed to have been included in the quoted unit rate of the respective items of the Bill of Quantities.

34.10.1.1 Loss and wastage of material due to consolidation, erosion, settlement and during transportation.

34.10.1.2 All type of joints (expansion, contraction and construction joint etc.).

34.10.1.3 1:3 cement sand setting mortar for ceramic, terrazzo tiles and precast cement concrete tiles etc.

34.10.1.4 Finishing, washing, grinding and polishing works of ceramic tiles terrazzo cast in-situ, terrazzo tile and washed terrazzo etc.

34.10.1.5 Rough plaster and Cement sand mortar as Adhesive for fixing of tiles.

34.10.1.6 Any steel sec. for fixing of tiles on wall.

34.10.1.7 4 Inch (100 mm) thick Setting bed cement concrete and 2 inch (50 mm) thick sand for interlock pavers.

34.10.1.8 Providing & fixing of specified dividing strips for cast in situ terrazzo.

34.10.1.9 3000 psi. cement concrete as base for terrazzo or any type of floor.

34.10.1.10 Colour Pigment.

34.10.1.11 Aluminium "U" channel and ½ inch (12mm) thick rough plaster for Washed terrazzo on wall.

34.10.2 Tiles on floor

34.10.2.1 Measurement

Measurement of acceptably completed works of respective type of tile on floor will be made on the basis of net actual area in square feet of floor laid in position to the line, level & grade as shown on the Drawing or as directed by the Engineer.

34.10.2.2 Payment

Payment will be made for acceptable measured quantity of respective type of tile on floor the basis of unit rate per square feet quoted in the Bills of Quantities and shall constitute full compensation for all the works related to the item.

34.10.3 Tiles on walls

34.10.3.1 Measurement

Measurement of acceptably completed works of respective type of tiles in dado and on wall will be made on the basis of net actual area in square feet laid in position to the line, level & grade as shown on the Drawing and as directed by the Engineer.

34.10.3.2 Payment

Payment will be made for acceptable measured quantity of respective type of tile in dado and on walls on the basis of unit rate per square feet quoted in the Bills of Quantities and shall constitute full compensation for all the works related to the items.

34.10.4 Terrazzo Skirting/Dado

34.10.4.1 Measurement

Measurement of acceptably completed works of Terrazzo skirting/dado will be made on the basis of net actual area in square feet laid in position to the line, level & grade as shown on the Drawing and as directed by the Engineer.

34.10.4.2 Payment

Payment will be made for acceptable measured quantity of Terrazzo skirting/dado on the basis of unit rate per square feet quoted in the Bills of Quantities and shall constitute full compensation for all the works related to the items.

34.10.5 Terrazzo Cast-in-situ Floor

34.10.5.1 Measurement

Measurement of acceptably completed works of Terrazzo Cast-in-situ floor will be made on the basis of net actual area in square feet of floor laid in position to the line, level & grade as shown on the Drawing or as directed by the Engineer.

34.10.5.2 Payment

Payment will be made for acceptable measured of Terrazzo Cast-in-situ floor on the basis of unit rate per feet quoted in the Bills of Quantities and shall constitute full compensation for all the works related to the item.

34.10.6 Terrazzo Tiles.

34.10.6.1 Measurement

Measurement of acceptably completed works of Terrazzo Tiles on floor will be made on the basis of net actual area in square feet of floor laid in position to the line, level & grade as shown on the Drawing or as directed by the Engineer.

34.10.6.2 Payment

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

34.10.7 P.C.C Floor

34.10.7.1 Measurement

Measurement of acceptably completed works of P.C.C floor will be made on the basis of net actual area in square feet of floor laid in position to the line, level & grade as shown on the Drawing or as directed by the Engineer.

34.10.7.2 Payment

Payment will be made for acceptably measured quantities of P.C.C floor will be made on the basis of unit rate per Sq. feet quoted in the Bills of Quantities and shall constitute full compensation for all the works related to the item.

34.10.8 Washed Terrazzo on walls

34.10.8.1 Measurement

Measurement of acceptably completed works of washed terrazzo on walls will be made on the basis of net actual area in square feet, laid in position to the line & level as shown on the Drawing or as directed by the Engineer.

34.10.8.2 Payment

Payment will be made for acceptably measured quantities of washed terrazzo will be made on the basis of unit rate per Sq. feet quoted in the Bills of Quantities and shall constitute full compensation for all the works related to the item.

34.10.9 Ceramic Tile Decorative Border

34.10.9.1 Measurement

Measurement of acceptably completed works of Ceramic Tile Decorative Border on walls will be made on the basis of net actual Length in running feet, laid in position to the line & level as shown on the Drawing or as directed by the Engineer.

34.10.9.2 Payment

Payment will be made for acceptably measured quantities of Ceramic Tile Decorative Border will be made on the basis of unit rate per running feet quoted in the Bills of Quantities and shall constitute full compensation for all the works related to the item.

34.10.10 Precast Cement Concrete Tiles and Interlock floor pavers

34.10.10.1 Measurement

Measurement of acceptably completed works of Precast Cement Concrete Tiles and Interlock floor pavers will be made on the basis of net actual area in square feet, laid in position to the line & level as shown on the Drawing and/or as directed by the Engineer.

34.10.10.2 Payment

Payment will be made for acceptably measured quantities of Precast Cement Concrete Tiles and Interlock floor pavers will be made on the

basis of unit rate per square feet quoted in the Bills of Quantities and shall constitute full compensation for all the works related to the item.

Description	Unit of Measurement
PCC 1-1/2" thick topping .	Sft.
Glazed Ceramics tiles on floor.	Sft.
Glazed Ceramics tiles on walls	Sft.
Terrazo Tiles 12"x12" on floor	Sft.
4" high and 1/2" thick Terrazo skirting	Sft.

SECTION - 35

MARBLE

35.1 SCOPE

The work done under this section of specifications, consists of providing all material, labour, plant, equipment, appliances and performing all operations required for providing and installing marble natural stone slab and tile finishes in floor, skirting, stair case portion of exterior walls, kitchen and toilet counters, flower beds, and verandahs etc. as shown on the drawings, complete in accordance with this section of the specification and the applicable Drawings.

35.2 SUBMITTALS

35.2.1 Manufacturer's/Supplier's Product Data

The Contractor shall submit manufacturer's specifications and other product data for each type of marble stone and fixtures required, including instructions for handling, storage, installation and protection.

35.2.2 Shop Drawings

Shop Drawings shall be submitted showing sizes, dimensions, sections and profiles of slab and tile units, arrangement and provisions for jointing, anchoring, fastening and supports and other necessary fixing details. Indicate locations, layouts and pattern arrangements for each stone type and colour.

35.2.3 Samples

Submit three sets of range samples not less than 300mmx300mm in size of each type for different colour, grade and finish required include in each set the full range of exposed colour and texture, including material blemishes which may be characteristic of marble selected and to be expected in the complete work.

35.3 DELIVERY, STORAGE AND HANDLING

Materials shall be protected from damage during loading, shipment, delivery and storage. Non-staining materials for blocking and packing shall be used. Stack marble units at site in accordance with manufacturer's recommendations and as required to prevent staining, scratching, etching or breakage. Marble slabs/tiles shall be delivered finished unless otherwise approved. Damaged slabs/tiles with chipped edges or cracking will not be accepted if such defects are noticeable at a distance of one metre under normal light conditions. Decision of rejection shall be final.

35.4 TOLERANCES & TESTING

35.4.1 Tolerances

Fabricate marble Slab/Tiles in accordance with the followings unless otherwise shown.

- Length and Width 1mm (1/16")

- Thickness (depth) 1mm (1/16")
where visible 6mm (1/4")
(where not visible)
- Horizontal and vertical alignment 1mm (1/16")
(deviation from straight lines parallel to 3 M (10ft.) of length
centre line)
- Out of Square (differences in Length of 1mm (1/16)
two diagonal measurements) 3 M (10ft.)

35.4.2 Testing

The tests for marble shall be made as per B.S. Standards for the determination of:

- Weight %age Absorption
- Modulus of Repture
- Compressive Strength
- Resistance to Abrasion
- Flexural Strength

35.5 MATERIALS

35.5.1 General

Obtain each marble stone type from a single quarries from Pakistan and ensure consistent colour range and texture through out the work. It shall have a specific gravity of about 2.7 and of hardness number on Moh's scale shall range 3 to 4.

Provide marble slabs or tiles of specified sizes in floor, wall areas and countertops as shown on drawings.

Provide marble slabs of type, colour and finish for each area as per approved samples by the Architect/Engineer.

Provide marble of specified thickness. Saw-cut the back surfaces that are meant to be concealed in finished work.

Provide irregular shaped units, staircase units and skirting base units and counter tops to the profiles of required shape, with arises sharp, true and matched at joints, polished exposed edges.

35.5.2 Beds and Backings

Where applicable, standard cementitious screed and mortar beds and backings, mixed and proportioned by volume shall be as follows:

ordinary	
Portland Cement	1 part
Sand:	3 parts
Water:	Clean, fresh and free from deleterious substances

35.5.3 Adhesives, Grouts and Sealants

Proprietary adhesives, joint grouts and sealants of approved type as required and recommended by the manufacturer for specific application shall be used. The colour of the joint grout and the sealants shall match with the colour of stone.

35.5.4 Setting Shims or Buttons

Lead buttons of the thickness required for the joint size shown or specified, and of the size required to maintain uniform joint width.

35.5.5 Connection Materials

Provide necessary anchorages loose steel plates, clip angles, seat angles, anchors, dowels, clamps, hangers, and other miscellaneous steel shapes for securing marble units to other supporting and adjacent members. Provide at least two anchors for each piece.

35.6 FABRICATION

35.6.1 Fabrication Qualification

Fabrication of Marble shall be by a firm which has successfully fabricated marble similar to the quality specified for a period of not less than five years.

35.6.2 General

Fabricate as shown and as detailed as final shop drawings. Provide holes and sinkages cut or drilled for anchors, fasteners and supports as shown and as necessary to secure marble in place. Cut and back check as required for proper fit and clearance. Shape beds to fit supports. Provide reinforcing backing as required for adequate strength firmly adhered in place.

35.6.3 Contiguous Work

Provide chases, reveals, openings and similar spaces and features as required for contiguous works.

Co-Ordinate with drawings and final shop drawings showing contiguous work.

1.1.1 Cut openings for lavatories, plumbing fittings and similar items indicated on the drawings, as specified in other drawings and as required.

35.7 EXECUTION

35.7.1 General

The Contractor shall employ skilled and trained marble workers for doing this job. He may be allowed to employ a specialist Sub-Contractor for this item of work with the approval of the Engineer. The surface over which marble slab/tile are required to be fixed shall be clean of all dirt and dust and shall be properly hocked so that the mortar sticks well to the surface.

Do not use marble Slab/Tile with chips, cracks, stains or other defects which might be visible in the finished work. Clean stone before setting by thoroughly scrubbing with fiber brush followed by a through drenching with clear water.

35.7.2 Paving, Flooring, Skirting and Stair

Apply cement slurry coat over surfaces of concrete substrate immediately prior to placing setting bed. Limit area of application to avoid premature drying out. Install setting bed of required thickness and set stone units before initial set occurs. Apply a thin layer of cement paste to bottom of each unit. Set, tamp and level units immediately. Set units in required pattern with uniform joint widths.

Point joints as soon as possible after initial set. Force grout into joints, strike flush and tool slightly concave.

Remove mortar and grout from surfaces while still moist and as the work progresses.

Do not permit traffic on finished surface during setting and for a minimum of 24 hours after final pointing of joints.

35.7.3 BASE

The base in cement concrete if required, the sub base in brick ballast plus sand or lean concrete shall be prepared as provided in "Section Floor and Wall Finishes" cement concrete flooring. The thickness of sub-base if any and base shall be as shown on the drawings or directed by the Engineer. The surface of the concrete base shall be rough finished. The curing period of the base shall be at least 72 hours before laying the marble work.

35.7.4 Repair and Cleaning

Remove and replace marble units which are broken, chipped, stained or otherwise damaged. Where directed, remove and replace units which do not match adjoining stonework or are not in line and level as shown on Drawings. Provide new matching units, install and point joints to eliminate evidence of replacement. Repoint defective and unsatisfactory joints to provide neat, uniform appearance.

Clean stonework not less than 6 days after completion of work, using clean water and bristle brushes. Do not use wire brushes, acid or caustic type cleaning agents or other cleaning compounds which may be detrimental to the stone finish or joint grout.

35.7.5 FINISHING AND POLISHING

The Contractor shall make suitable arrangements for giving final finish to the marble tile work such as cleaning, washing and chemical polishing as specified or as directed by the Engineer.

The marble shall be polish finished to a glossy surface that will reflect light to emphasize the colour and marking, produced by a chemical polish applied to a honed surface. All finished surfaces shall be of uniform texture, colour and appearance and shall be in conformity with the sample approved by the Engineer.

35.7.6 Protection

Provide covers, boards, supports and all other necessary materials to protect finished work from collapse, deterioration, discolouration or damage during installation and until contract completion.

35.8 MEASUREMENT AND PAYMENT

35.8.1 General

Except otherwise specified herein or elsewhere in the Contract Documents, no measurement and payment will be made for the under mentioned specified works related to the relevant items of the Bill of Quantities. The cost thereof shall be deemed to have been included "Instructions to Tenderers" are attached.

- Finishing, washing, polishing, repair cleaning and protection of marble slab, tiles, in position.
- Appropriate adhesives, joint grouts and sealants for fixing marble tiles, where specified on the Drawings or directed by the Engineer.
- 3:4 thick 1:3 cement sand setting mortar for marble stone/tiles.
- Preparation of concrete substrate for laying marble tiles on floor.
- M.s. angle framing and fixing accessories for marble slab on vanity counter if required
- Cost of factory chemical polish for pre polished marble tile/ slab.

35.8.2 Marble Works

Measurement

Measurement of acceptably completed marble works, will be made on the basis of net actual area in square feet of marble slab provided and laid in position as shown on the Drawings or as directed by the Engineer.

Payment

Payment will be made for acceptably measured quantity of marble slab, will be made on the basis of unit rate per square feet quoted in the Bill of Quantities and shall constitute full compensation for all the works related to the item.

Description	Unit of Measurement
-	
4" high and 1/2" thick Marble skirting	Sft.

SECTION- 36

ELECTRICAL WORKS

CLIMATIC CONDITIONS

The Contractor/Constructor is deemed to be familiar with climatic conditions of the project area. The Contractor/Constructor in submitting a tender will be assumed to warrant that all materials and items of equipment are suitable for continued use and/or operation in the various climatic conditions encountered.

STANDARD AND STATUTORY REGULATIONS

The works shall be carried by a registered Contractor/Constructor approved by the relevant authority for each particular classification of work. All material and workmanship shall conform to the specifications and to the following:

REGULATION

Notwithstanding anything to the contrary contained herein pertaining to this installation, it shall be the Contractor's/Constructor's responsibility to ensure that all the works are in strict accordance with the following statutory obligations, regulations and specifications together with any amendments made thereto:

- a. British Standards Institution or other approved international standards.
- b. 16th Edition of the UK I.E.E. Wiring Regulation.
- c. Building Control Act and Regulations
- d. Building Energy Code of Pakistan
- e. Electrical Act, 1910
- f. Electrical Rules, 1937
- g. Any other local authority having jurisdiction

SCOPE OF WORK

The work shall include furnishing all materials, labors, plant and supporting services for complete supply, installation, testing and commissioning of the following

- a) RCC pipes, cable ducts and other raceway for power and communication system.
- b) Primary underground service line as required for the project.
- c) Distribution equipment including LT Cabling, Sub-Main Distribution Boards, MCCs, Distribution Boards. Motor Control Centre Panel (MCC) and Distribution Boards.
- d) A system of interior lighting and power wiring including feeders, circuits, sub-circuits and point wiring.
- e) A system of interior Luminaries for common areas.
- f) Earthing & Lightning Protection System

SAMPLES

The Contractor/Constructor shall submit for approval one set of labeled samples as follows:

- Conduits/Pipes, fittings and supports.
- Wires and cables
- Switches and sockets
- Light fixtures
- Telephone CAT-5E cable and rosette.
- CCTV cables
- Fire Alarm cables
- BGM Speakers, volume controller and cables.
- MATV socket, tap off units, splitters, F-connectors, Amplifier and wire. RJ-45 faceplates, DATA CAT-6 cables.

Earthing/Lightning Protection conductor, rod, earth plate, Air terminal, saddles, earth point. The Consultant (Engineer reserved the right to require samples which show the fabrication techniques and workmanship of component parts, and the design of accessories and other auxiliary items, before any installation work proceeds.

The Contractor's/Constructor's shall submit to the Consultant/Engineer for endorsement manufacturer's specification and installation instruction for trade products.

SHOP & AS-BUILT DRAWINGS

The Contractor/Constructor shall submit for the Consultant/ Engineer's approval shop drawings in a timely manner according to the construction Program. Within 14 days of being notified of the intent to award the contract, the contractor shall submit the submission program for approval. The submission program shall include the following details:

- List of shop Drawings
- Proposed submission dates
- Proposed approved date to meet the installation and Authorities submissions' program.

The shop drawings must be of sufficient detail to satisfy the installation requirements to the approval of the Consultant/Engineer. The shop drawings shall show all location of equipment, cable trucking/tray routing, conduits, and joints for wiring, anchors, supports, hangers, test points, measurement instruments, and the like. As built drawings shall be similarly submitted at Completion.

36.1 CABLE SUPPORT SYSTEM

Cable Support System

Steel Conduit:

Conduits shall be of heavy gauge steel conforming to British Standard. They shall be solid drawn or seamed by welding. Both ends of the conduit shall be screwed. Conduits shall be galvanized to Class 4 type of BS 4568:1970 and be of approved reputable manufacture. Adequate protection against corrosion shall be applied to both conduit interior and exterior.

Flexible conduits shall be of mild steel complying with BS 731: Part 1:1952. Where the situation requires, they shall be PVC covered.

Fittings:

Fittings shall be those intended for use with screwed conduits and shall comply with BS 4568: Part 2:1970. However, bends, elbows and tees shall not be installed. Adapters used with flexible conduits shall conform to BS 731: Part 1:1952.

Circular Boxes:

Circular boxes shall be of malleable cast iron, galvanized and of standard pattern with spout(s), cover plates of similar make complete with brass fixing screws.

Rectangular Boxes:

Rectangular boxes (adaptable boxes) shall be of mild steel not less than 2.4 mm gauge and galvanized, with lids of the same gauge with brass fixing screws.

Boxes for Accessories:

Boxes for accessories shall be suitable for surface mounting or recessed mounting. Surface mounted boxes and accessories shall be of metal clad pattern. Recessed boxes and accessories shall be complete with insulated molded type cover plates.

PVC/PVC Conduit:

Conduits shall conform to BS 6099: Part 1 and shall be heavy gauge of wall thickness of 1.9 mm rigid tubes which are unscrewed without coupling and with plain ends. All conduits used shall not be less than 25 mm in diameter. PVC conduit mounted outside building will not be accepted. PVC conduits shall not be used where liable to mechanical damage.

PVC/PVC Conduit Accessories:

Accessories used for conduit wiring shall be of an approved type complying with BS 4607. Plain conduits should be joined by slip type of couplers with manufacturer's standard sealing cement. PVC-switch and socket boxes with round knockouts are to be used. The colors of these boxes and the conduits shall be the same. Standard PVC circular junction boxes are to be used with conduits for intersection. Tee-junction angle junction and terminal. For the drawing-in of cables, standard circular through boxes shall be used.

All jointing of PVC conduits shall be by means of adhesive jointing. Adequate expansion joints shall be allowed to take up the expansion of PVC conduits.

Cable Tray and Trucking:

Metal trucking shall comply with BS 4678 and shall be manufactured in minimum lengths of 2m from 18 SWG GI sheet. Covers are to be held in place by screws. Conduit entries to trucking shall be made with couplings and brass male bushes. Turnings shall not contain more cable than allowed by the space factors described in the IEE Regulations.

All supports and hangers shall be of hot-dipped galvanized mild steel construction to BS

729:1971 Part 1 with min. coating thickness of 85 and 210 for indoor and outdoor installation respectively. All bolts and nuts shall be electroplated with zinc or cadmium to BS 3382: Parts 1 and 2 with min. plating thickness of 25.

Cable tray shall be of perforated type and constructed of minimum 1.6 mm hot dipped galvanized mild steel. Cable trays shall be supported by electro-galvanized 'U' channel with galvanized threaded rod for indoor suspended tray and hot dipped galvanized for area subject to weather.

Cable trucking shall be manufactured from 1.6 mm minimum electro-galvanized sheet steel to BS 1449:Part 1:1983 finished in oven-baked electro-statically coated epoxy powder coating Cable trucking, subject to weather, shall conform to BS 729, hot dipped galvanized and painted.

External flanges shall be provided to avoid ingress of water.

Conduit Installation:

The whole conduit system shall be installed to comply fully with IEE Wiring Regulation.

- 1 PVC conduit Electrical Grades shall be used for concealed wiring.
- 2 PVC pipe class D/RCC pipe class A/GI pipe light grade for underground wiring.
- 3 MS pipes for wiring of Fire Alarm/security system.
- 4 Flexible PVC conduit with appropriate glands shall be used for termination of all connections to recessed light fixtures in false ceiling.
- 5 Flexible steel conduit, to BS 731/6099, shall be used for final connection to motor and other equipment subject to vibration and movement.
- 6 Under floor runs of conduits shall have at least 50 mm of concrete cover and be well sealed against the ingress of moisture.
- 7 Cable tray and ladder for power cable routing and covered trunking under-floor or above false ceiling for voice/data utility cables.
- 8 All accessories fittings and glands used for outdoor installation shall be corrosion proof and weatherproof type.
- 9 Factory-made bends, joints, elbow, riser, tee, reducer and accessories with same material shall be provided throughout the installation for tray and trucking.
- 10 Copper earth link bar shall be fixed at every joint of the cable tray and trucking run.
- 11 All hangers for cable trays/trucking shall be installed at 1 meter intervals.

36.2 CABLE AND WIRING

Cables and Wiring

8700/11000 -Volts XLPE Power Cables:

Only Cu XLPE cables of a suitable rating shall be used. All XLPE cables shall be manufactured to BS 7870-4.10:1999.

600/1000-Volt PVC, XLPE/PVC, PVC/PVC, XLPE/SWA/ PVC and

PVC/SWA/PVC Cables

Cables shall utilize standard copper conductors only. All cables shall be made in accordance to the following standard. BS 6346:1997 BS 7870-3.1:1996 BS 6004:1995. Insulation colors and wire sizes shall be in accordance to IEE Regulations. PVC insulated, PVC sheathed copper conductor cable for internal power distribution.

Circuit and sub-main wiring shall have an adequately sized earth continuity conductor. The maximum continuity resistance from any point of the installation including the earth continuity to the earth electrode shall not exceed one Ohm.

Wiring shall be continuous between terminations and use of connectors or joint will not be allowed (joints in point to point cable runs are prohibited). Cables for 3 phase 4 wire system shall be colors coded red, yellow, blue for phases, black for neutral and green/yellow for earth. For flexible cords the minimum size shall be 1.5 sq. mm. Flexible cords connecting into lighting fittings shall be 3 core heat resistant Butyl' rubber insulated.

Wiring to light points, 5A & 15A Power Outlets:

450/750 volt grade PVC insulated/sheathed copper conductor cables single multi core shall be used for circuit wiring of light points and sockets. Power wiring shall be kept separate and distinct from lighting wiring. All wiring must be done from distribution boards. A separate earth wire will run all along the power wiring and will be properly earthed.

Terminations and Cable Glands:

.-It cables entry into the main or distribution switch boards, shall be through approved glands adequately sized for all cables. All accessories, fittings and glands used for outdoor installation shall be corrosion proof and weatherproof type to approval. Conductor connections and terminations shall be made with compression ferrules and lugs to BS 91 using a hydraulic crimping tool.

Installation methods:

Unless otherwise specified, all outdoor wiring shall be PVC/SWA/PVC for core single core cable direct buried in the ground and heavy duty PVC or RCC pipes under driveway, pavement, hard core area etc.

36.3 ACCESSORIES

Accessories

Switch and Socket Outlet Boxes:

Gang outlet boxes shall be used where two or more devices are grouped in one location. These outlet boxes shall be made of 1.63 mm. sheet steel with protective black enamel paint coating inside and outside the box.

Before applying black enamel the cleaned surface of sheet steel box shall be given lead oxide antirust coating inside and outside the box. The cover of such outlet box shall be approved amazonite, Teflon, Bakelite or plastic. Where switch and socket outlet boxes

are to be installed on surface in an exposed conduit wiring system, these shall have, in addition to the protective coating, color paint coating to match the color of the walls etc.

Weatherproof enclosure shall be of the high impact water resistant to IP 56. The isolator provided shall be complete with a lockable device.

Switches:

Switches controlling light and fan points shall be single pole. These shall be made of Bakelite or plastic and suitable for flush mounting in an outlet box. Where more than one switch is to be installed at one location, the switches are formed in gangs. Switches shall be rated at 10 ampere (Logic Grids), 250 Volt. Switches for external use shall be of weatherproof construction with IP 65 rating.

Switched Socket Outlets:

Only switched socket outlets shall be used. Socket and plug unit shall be 5A 5 pin universal for utility outlets, 3-pin 13/15/20 Amps for power outlets at 250 Volts and 220/115 volt for shaver socket outlet. These shall be made of Bakelite and suitable for mounting flush with wall or column or for surface mounting as required. Where socket and switch units are installed outdoor, or in a damp or wet area, they shall be IP65 rated.

Installation of Switches and Socket Outlets:

Switches and socket and plug units shall be installed flush in the wall. All switches shall be installed at a height of 1.2m from finished floor level- Socket plug and switch units shall have its centerline at 300mm above finished floor level.

36.4 LIGHT FITTINGS AND FIXTURES

Fluorescent Light Fixture:

Fluorescent light fittings shall be supplied complete with the lamps and ballasts of required wattage. The fluorescent tube shall be TLD color 83 type, totally enclosed and suitable for 220 volts, 50Hz single-phase supply. The wiring diagram along with the voltage, wattage and current values shall be printed on the body of the ballast. The internal wiring of the fluorescent light fittings shall be completed at the factory, with heat resistance wires having a minimum cross-sectional area of 1.5 sq. mm. The body of the light fittings shall be of minimum 22 SWG sheet steel. The luminaries shall have white, impact resistant coating of synthetic enamel.

Lamp Holder:

The Lamp holders shall be bi-pin, spring loaded of robust construction and designed to retain positively the lamp caps independently of the contact springs. Contact springs shall be of phosphor bronze material.

Ballast:

Control units shall be electronic type.

Capacitors:

Power factor correction capacitors shall be manufactured to BS4017 or equivalent approved standard and rated for 250 V RMS working when connected in a phase to neutral configuration, rated 440 V RMS when connected in-line with the ballast. Correct to not less than 0.90 lagging in all luminaries rated at more than 20 watts. Each fitting shall be fitted with radio interference filter suitable for suppression mains-borne interference generated from the lighting fitting to meet the limits specified in BS 800 "Limits of Ratio interference". Power factor correction capacitors with built-in (internal) fuses shall not be accepted

Exit Lights:

Emergency Exit light fixture shall have a powder coating rigid steel box having Fluorescent tubes. The exit light shall be maintained with additional mains fluorescent tube. In the event of power failure emergency lighting application shall be triggered automatically.

Fans:

Fans, to BS 5060, shall be of the capacitor type, with ball bearings, complete with appropriate sized down rods, canopies, mounting brackets, 5 speed regulators or solid state fan speed regulator (with radio interference suppression to BS800), self-closing louvers, etc. :Mounting of all fixtures and fittings shall be mechanically and electrically sound.

36.5 LOW VOLTAGE SWITCHGEAR**Low Voltage Switchgear****Switchboards:**

Main and sub-main panels, distribution boards, and lighting panels, to BS 5486/4752, shall be of the cubicle type, totally enclosed, dust-proof: floor/surface/flush-mounting type, fabricated from 16 gauge sheet steel, derusted degreased, rust-proofed, with two coats QI2incchromate/rod-lead, and painted with two coats of enamel, with hinged covers, and metal safety plates. The equipment shall be rated 400 volts, and be suitable for operation on the utility supply. Boards shall be factory assembled ready wired, and shall be complete with adequately rated electrolytic copper phase, neutral, and earth bus bars; suitable clamps, jointing and termination accessories, line-up terminals, earthing bolts, etc.

Miniature circuit breakers (MCBs) and molded case circuit breakers (MCCBs), to IEC 60947-2, shall be of the molded-type with operating lever protruding through the metal

safety plate Switch-fuses and bad break switches (AC 23), m BS 5419, incorporating HRC fuses, to BS 88, shall be of the heavy duty, metal-clad type, complete with all accessories. Motor starters, to BS 4941, shall be of the push-button, magnetic-contractor (AC-3) type, with single-phasing prevention, ambient-temperature compensated, overload relays, and with Type 2 short-circuit protection to IEC 60947.

Indicator lights, push buttons, etc- to BS 4099 IEC 60947, shall be rated 250 v, and CTs shall be of Class 0.5 for tariff metering purposes, and 1.5 for indicating purposes The CTs shall have suitable burden and over-current (saturation) factors.

All-switchgear shall be installed as per manufacturer's instructions. Wall and flush-monitoring boards shall be fitted with proper holdfasts. Tropes-sired knockouts in the panel bodies shall be made to accommodate conduit entries and glands, so that the entry of dust, vermin, etc., is excluded.

The short circuit ratings (dynamic. and thermal) of all switch gear assemblies shall be equal to or greater than the SC level (IEC 947-2, ICU at 415V). The KA rating for lighting circuit shall be not less than 10 KA and for power it shall be 15 KA. The characteristics of the protective devices shall be such as to provide selective discrimination. All switchgear will be rated at 50 0C with ICV = 100% ICS.

SWITCH GEAR:

Vacuum VSF6 insulated 11kV breakers for WAPDA HT panels, Air circuit Breakers, Moulded Case Circuit Breakers For low voltage cable protection. MCBs/ELCBs/RCDs, for lighting utility and conditioned power circuits.

Motor Control Centre (MCC):

In addition to compliance to above, motor-starter feeders, as shown, with MCCB back-up protection (type 2 to IEC 947) Motor - protection (AC3-duty) magnetic contactors, 3-pole differential-type thermal overload relay with "hand/auto-reset" "on/off" push buttons, "hand/off/auto" selector switch, "on/off/trip (Definite overload)" indicating lights, 2 CIO space auxiliary contacts, CT and ammeter (with overload/starting range). PTC thermistor relay (19kw & larger), remote-control/indication provisions, remote audio/visual alarm for each outgoing circuit.

36.6 EARTHING

Earthing

General:

The contractor/Constructor shall install a complete earthing system. The contractor/Constructor shall install a complete earthing system comprising a main earth electrode system, main earthing conductor, earth bars (in Distribution Boards etc.), earth

continuity conductors, potential equalizing bars and potential equalizing (bonding) conductors.

High Voltage Earth:

Separate and independent HV earth shall be installed to comply with the WAPDA and relevant regulations.

Main Earth Electrode System:

In the vicinity of the Main LT Panel and Generator Panel, an earth electrode system shall be installed by the Contractor/Constructor to achieve less than one ohm resistance to earth. If the required resistance cannot be achieved in the specified configuration, additional ground earthing plate shall be installed and added to the system, provided that they are installed not less than 5 meters away from the existing earth plate.

It shall be constructed of 610 mm x 610 mm x 6 mm copper plate exothermically (Cadweld) welded to (minimum 95 sq. mm.) bare copper earth wire laid horizontally 7500 mm under the ground surface.

Main Earthing Conductor:

Main Earthing conductor shall comprise two 70 Sq mm copper conductors cadwelded to the main earth electrode and connected to the main earth bar with an approved type double crimp double hole compression hugs. The conductors shall be labeled with a permanent label: "Main Earthing Conductor - do not remove"

Main Earth Bar:

Main Earth Bar shall consist of a (minimum 200mm wide 6mm thick) high conductivity tinned copper bar of a suitable length (minimum 600 mm), installed next to the LT panel, Distribution Boards. The bar shall be easily accessible, wall mounted over the cable duct on approved insulating spacers installed at intervals not exceeding 300mm. The bar shall be predrilled card equipped with necessary (cadmium plated) bolt / locking washer / double nut arrangement for connection of the earthing conductors.

LT Panel, MCCs, DBs and Generators Earthing Conductors:

The Main Earth Bar shall be connected to the LT Panel; earth bar with two insulated 70 Sq.mm copper conductors. The conductors shall be labeled with a permanent label at both ends: "Do not remove - Main Earthing Conductor - LT PANEL". Main Earth bar shall be connected to the Generators earth Bar with two insulated 70 Sq.mm copper conductors. The conductors shall be labeled with a permanent label at both ends: "Do not remove - Main Earthing Conductor - Generators".

Earth Continuity Conductors:

Insulated earth continuity conductors of adequate cross-section shall be run from the LT Panel earth bar to electrical equipment power from the LT, together with phase and neutral

cables.

Potential Equalizing Conductors:

Insulated potential equalizing conductors of adequate cross-section shall be run from the Main Earth Bar to all bonded to earth structures and potential equalizing bars in various areas.

The earthing system shall be bonded to the rebar's of the building foundation and UG water tank, with approved rebar clamps or welding of already laid steel reinforcement bars within the structural concrete around the entire periphery of the basement retaining wall to form a continuous loop with clamps to vertical rebar at column positions

36.7 TRANSFORMER

As per WAPDA Specifications.

36.8 DIESEL GENERATING SETS

As per Specifications given by Siemens/Caterpillar.

36.9 AREA ELECTRIC POLE AND LIGHT FIXTURE

As per drawings and instructions of the Engineer.

Section-37: Solar System

TECHNICAL SPECIFICATION

1. Solar Panels

Parameters	Min. Specifications required
Module Make	Tier 1, Brand should be verifiable for the procurement year
PV Module Capacity	400 Watts or above (as per design)
PV Module Type	Poly-crystalline/Monocrystalline
Cell Quality	A Grade (verifiable)
Module Efficiency	19% or higher
Power Tolerance	Must be + 3% or more
Operating Cell Temperature	-40 ^o C to +85 ^o C
Temperature Coefficient	-0.40% / ^o C or less
Bypass Diode	As per design
Bus Bar	4 or higher
Certification	IEC 61215, IEC 61730, IEC 61439, IEC 60947-3 as amended to date, PID free Modules
Frame	Must Withstand 5400 PA impulse Load
Junction Box	IP 67 or better
Cable	4 mm ² (IEC), 1000mm or per design
Connectors	MC4 or Comparable weatherproof
Front Cover	3.2 mm prism type tempered glass or higher
Product Warranty and guarantee	10 years' product replacement warranty. Power output within 10 years shall not fall below 90% Power output within 25 years shall not fall below 80%
	10 years' full replacement of module, if the major component/s malfunctioning. PV module performance guarantee 25 years or more. Type of performance guarantee shall be linear after 1st Year.

2. On-Grid Solar Smart Inverter

Parameters	Min. Specifications required
Inverter Make	1 GW or above deployment in last two years. Renowned and verifiable brand having successful history in similar climatic conditions.
Inverter Type	Grid synchronized Pure Sine wave,
Parameters	Min. Specifications required

	also, able to synchronize with generators on site.
Output Voltage Range	230VAC/400 VAC $\pm 5\%$ for string/micro inverters. for central inverters select as per design
IP Protection	IP 65 or better (IEC 60529) / outdoor use with natural heatsink. (Dust protected with natural heat sink
Standby power consumption	Max 3 Watt.
EU/CEC efficiency Euro-eta	$\geq 95\%$ or above
Protections	Short Circuiting <ul style="list-style-type: none"> • Surge Protection • PV reverse polarity protection • Anti-Islanding Protection • Leakage current protection • High Insulation Input • Over voltage (PV) (if built-in) • Harmonics filter as per IEC standards • Output • Over voltage (AC)
Operating temperature	-5°C to 55°C
Communication	<ul style="list-style-type: none"> • With Remote Monitoring Feature, Mobile App, Webserver user interface, Cloud Connected. • Real Time System Monitoring. Alerts, Faults and Warning data display. System Statistics – System Parameters, • PV predicted values, forecasted values, Load data, Energy Data, Net Metering Data Control
Humidity	10 ~ 90% RH
THD	$< 3\%$. As per relevant IEC clauses.
Performance guarantee	5 years Replacement of inverter, 10 years equipment life
Warranty	10 Years or above transferrable warranty from the original inverter manufacturer shall be provided.
Input Voltage Range	150-950V or above (depend upon the selected design)
Power Factor	0.9 leading 0.9 lagging
Minimum Applicable Standards and Compliances	IEC:62109-1, IEC:62109-2, IEC 61683, IEC 62116, IEC61727, UL:1741/IEEE:1547, 60068-2.

3. Hybrid Solar Inverter

Parameters	Min. Specifications required
Inverter Make	500MW or above deployment in last five years. Renowned and verifiable brand having successful history in similar climatic conditions. Pure Hybrid Inverter
Inverter Type	Grid synchronized Pure Sine wave, Hybrid
Phase	3 Phase IN /3 Phase OUT
Parameters	Min. Specifications required

	Also, able to synchronize with generators on site.
PV INPUT	
Max DC Input Voltage	900 VDC
Minimum MPPT Range	250~850 VDC
Reverse Polarity Protection	Yes
Photo voltaic array isolation control	Yes
AC Grid Connection	Three-Phase
Management	Intelligent Energy Management System
AC INPUT	
Minimum AC Input Voltage Range	180~260 VAC per phase
GRID OUTPUT	
Nominal Output Voltage	230 VAC (P-N)/400 VAC (P-P)
Output Voltage Range	184~265 VAC per phase
Environmental	
Ambient Temperature Range	-5°C~+55°C
Relative Humidity	4...100% condensing
Acoustic noise emission level	<50 dB@ 1m
Safety and EMC standard	IEC/EN 62109, IEC/EN 62109-2, IEC 62477-1, EN 61000-6-3, EN 61000-3-2, EN 61000-3-3, EN61000-3-11, EN61000-3-12
IP Protection	IP 20 or better
Frequency	50Hz +/- 3%
Standby power consumption	Max 3 Watt.
Max. efficiency / Euro-eta	95% or above
Protections	Short Circuiting <ul style="list-style-type: none"> • Surge Protection • PV reverse polarity protection • Leakage current protection • High Insulation Input <ul style="list-style-type: none"> • Over voltage (PV) (if built-in) • Harmonics filter as per IEC standards Output <ul style="list-style-type: none"> • Over voltage (AC)
THD	≤ 3%, As per relevant IEC clauses.
Genset	Compatible with Auto start/stop feature
Communication	With Remote Monitoring Feature, Mobile App, Web server user interface, Cloud Connected
Performance guarantee	3 years Replacement of inverter, 10 years equipment life guarantee
Warranty	5 Years or above transferrable warranty from the original inverter manufacturer shall be provided.

4. Charge Controller

- IEC:62509
- Maximum Power Point Tracking (MPPT) tracing efficiency > 98%
- External/Built-In charge controller with Hybrid Inverter
- Minimum 2 independent MPPT's.
- Warranty- 5 Years transferrable warranty from the original manufacturer.

5. Smart Energy Storage:

Minimum Technical Specifications of Energy Storage System:

- 15 Years life
- Batteries must not be more than 6 months old at the time of installation.
- High Energy, Compact packs.
- Elegant, highly compact and energy dense
- Battery Management Unit (BMU), BMS (Battery Management System) controls cell temperature, over charging, DOD, Voltage levels & Cell charging current
- Fast and Efficient Charging
- Extended Cycle Life minimum 5000 cycles at 80% DoD.
- Temperature control unit.
- IEC 61427 certified
- Warranty- 5 years

The following technical data but not limited to shall be provided wherever applicable for, such as inverter, charge controller, batteries

1.	Characteristic
2.	Manufacturer
3.	Model number/Date of Manufacture
4.	Specifications
5.	Properties
6.	Introduction Guide

6. PV Mounting Structure

Description	Requirement
Tentative outlines, design will be site dependent and may varies	
Roof Structure	Hot Dip Galvanized (min 90 Micron) or Aluminum Frame. With more than 20 years of proven life
In case of Pole Mounting	The height of the pole shall not be less than (3) meters. Also be used for parking purpose, strong supporting structure, made of stainless steel or hot dip galvanized iron with minimum galvanization of 90 Microns.
Theft Protection	The mounting structure must come with an anti-theft protection to impede demounting of modules.

Material Gauge	SWG 14 or better / as per design. Fasteners, Nut, Bolts, Clamps must be of stainless steel
Wind loading	Mounting structure to support the module must be made of durable material, resistant to sandstorms, high wind speeds (up to 40 m/s), corrosion (passing the salt spray test IEC 61701, among other verification), and UV induced degradation. The material must be compatible with the module frame material so as to avoid any adverse electrolytic/galvanic effects.
Civil work	<ul style="list-style-type: none"> ▪ Structure should support the existing roof top/ground mounting ▪ The stability of the supporting structure after installation shall be guaranteed by the bidder. ▪ To avoid the drilling in roofs, use appropriate arrangements for strengthen the structure without damage the roofs. ▪ Pointed dead-loads on rooftop surface must be avoided. ▪ Additional beams can be casted to avoid drilling on roofs ▪ Water drainage must not be considered; separate water channels must be maintained for water drainage. ▪ The supporting structure must be grounded for short-circuit and lightning protection through independent earthing

7. Cabling, Combiner Boxes and Earthing

- All exposed wiring (with the possible exception of the module interconnects) must be covered in conduits/duct. Wiring through roofing, walls and other structures must be protected through the use of bushings. Wiring through roofing must form a waterproof seal (applicable for wiring only).
- For conduit and duct flexible PVC material with suitable size must be use, so that $\frac{3}{4}$ spaces in a conduit should be empty.
- Field installed wiring must be joined using terminal strips or screw connectors. Soldering or crimping in the field must be avoided if at all possible. Wire nuts are not allowed. The rated current carrying capacity of the joint must not be less the circuit current rating. All connections must be made in junction boxes. Fittings for lights, switches, and polarity sensitive socket outlets may be used as junction boxes where practical.
- All wiring shall be color coded as per IEC standards and labeled at termination point.
- No conduit or fitting shall be attached directly to thatch or any other non- supportive surface
- Especially avoid installing the conduit direct over the roof; there must be distance not less than 2 inches between the roof surface and conduit/duct.
- Cables must be joined by the use of unction boxes, screw-connectors, and block connectors, MC 4 or equaling connectors must be used for PV joints.
- All wires must be terminated with proper end sleeves and wire thimbles with different colors for positive and negative polarity.
- Size, voltage grade and manufacturer name should be printed on every cable
- Cable voltage drop specifications are as followed that must be verified through software simulation/ Calculations.
- Earthing as per NEPRA net metering rules for all sites.

Item	Requirement
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1. PV to inverter:	Voltage drop less than 2% tin coated (Stranded and flexible), 99.9 % pure copper fire resistive insulation (Stranded) All open/ Exposed cables must be UV resistive.
2. Grid / LV DB to Inverter	Voltage drop less than 2%, 99.9 % pure copper fire resistive insulation (Stranded)

7.1 PV Combiner Box (Junction Box)

Parameters	Description
PV Input	As per design
PV Max. Input Voltage	1000VDC (IEC) or Higher
Number of PV array inputs	As per design
Protections	Lightening Protection DC over voltage protection Short circuit Protection Fuse/Breaker Protection. AC & DC disconnect
Protection Class	IP 66 or better
Relative humidity	10~90%

8. Enclosure Cabinet for Inverters and Batteries

- The hybrid inverters, batteries, charge controller and any protection devices such as fuses and circuit breakers shall be mounted in an enclosure cabinet. Should be theft proof.
- The enclosure cabinet along with the components shall be installed inside the building. The selection of the required space shall be made by the contractor, approved by the employer.
- The cabinet shall have maximum three compartments.
 - Inverter and Charge Controller
 - Protection devices, breakers/fuses, isolation switch
 - Battery/Electricity storage system
- Adequate natural ventilation shall be present for efficient cooling and prevent excessive heat build-up. The compartment design shall ensure that each component will be operating within its operating temperature.
- The enclosure shall be made of M.S sheet with 18 SWG or better, power coated to matt finish.
- The IP rating of the enclosure cabinet shall be IP 54 or higher.

9. Lightning/air termination rod and Surge Protection devices

Parameters	Min. Specifications Required
Air termination rod material	99 % Copper
Air termination rod length	As per design
Earthing Pit	Less than 2 Ohm (NEC Codes) 99 % Pure copper plate/ rod Size & weight of plate/rod varies from site to site
Air termination rod diameter	As per design

Air termination rod	As per design
Cable for structure	2.5 mm ² or higher, 99.99% pure copper (strip)
Cable for interconnecting/ Grounding metal structure	6 mm ² or higher, 99.99% pure copper
Insulated Spacer	As per design
Cable Bracket	As per design
Stand – Fang Fix system	As per design
Recommended method for calculation	Rolling sphere method
Functional Compliance	IEC 62305-3 (EN62305-3) IEC62305-3 (EN 62305-3) or equivalent

10. Surge Arrester

Parameters	Min. Specifications required
Applications	Both DC side & AC sides
Discharge current (I max)	min. 20kA (8/20 μ sec.)
Impulse current (I imp)	min. 25kA (10/350μ sec.)
Response time	≤ 50 n sec
Leakage current	≤ 1 mA
Dielectric strength	2000 V AC @ 1 minute
Protection Class	Class 2(Type2) minimum
Discharge voltage	600 V DC (Line to earth) or above (matching the size of
Ingress Protection	Minimum IP20 (placed in IP 65 Box along with other protections)
Short circuit withstand	min. 30kA

ADDITIONAL SPECIFICATIONS AS PER REQUIREMENT OF THE PROJECT.

1. SYSTEM DESIGN

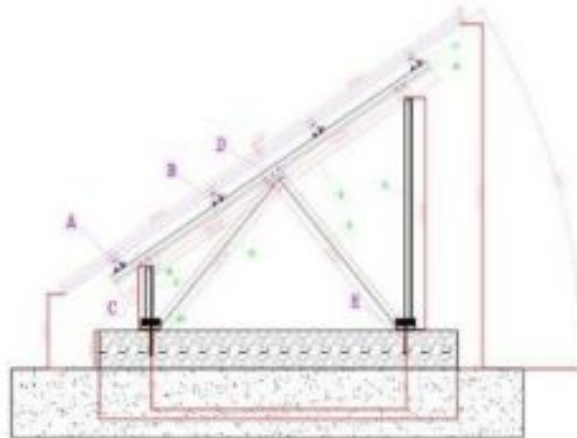
The contractor shall provide all design calculations for the output of the proposed installation before the start the execution of works and completion of first payment milestone This shall include the following:

- Solar irradiation at the site, detailing the average and monthly the Global Horizontal Irradiance and Direct Normal Irradiance
- Output of each module and total number of modules required • Module type, performance specifications and warranties
- Mounting arrangements, inclination and orientation of modules, Shop drawings with Layout out plan and SLD, Design calculation for for PV mounting structure with stud analysis
- PV system losses
- Electrical system losses
- Temperature co-efficient
- Total Energy Produced
- Performance Ratio
- Total Energy output in kWh to grid per year for power plant with nominal power output verified through software Simulation (PV-syst, HelioScope etc)

2. PANEL MOUNTING STRUCTURE:

- a. The panel mounting and structure should be made of hot dipped (90 microns Average) galvanized steel of minimum thickness of **3.00 mm Angle/ 2.5mm C Shape Channel** (Profile Sketch Attached for Reference).
- b. A sketch of the mounting frame (As per Actual Site Requirements) showing dimensions of the frame parts should be provided at the time of supply.
- c. Fixed Mounting Structure
- d. The main mounting structure will be fixed tilted at an appropriate angle, facing south and will be made of Steel Hot Dip Galvanized material with vertical posts supported by concrete foundations base 3 inches above roof top level.
- e. The mounting structure must be engineered for wind resistance of 130km/h
- f. Module should be fixed with the frame through pure SS bolts. The bolts should be tightened at the required angle.
- g. The Nuts, Bolts & Washers for modules & Mounting structures must be stainless steel material with appropriate gauge.
- h. Shading shall be avoided all over the year (around) from 30 minutes after the sunrise to 30 minutes before sunset (For installation purpose only).
- i. To allow regular cleaning of the solar modules, they should be easily accessible for personnel (For installation purpose only).

- j. Each panel frame structure shall be so fabricated as to be grouted using rawal bolts in cement concrete foundation with steel frame structure at the site
- k. Foundation/mounting structure will be fabricated and installed to achieve full life of 25 years under the local climatic conditions.



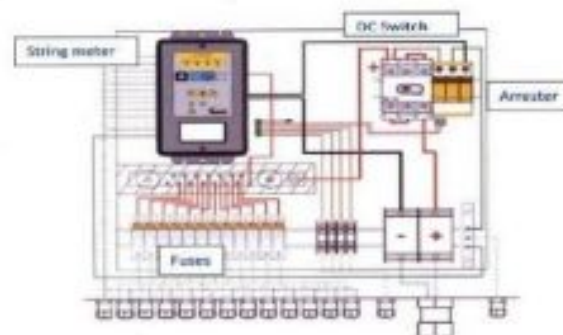
3. Junction Boxes

SMART Junction boxes with the multi-function of string monitor to detect each string's voltage, current, and power, plus fault detection and surge protection function. The array junction box has been suitably designed to be integrated into the PV plant. The junction boxes shall have suitable arrangement for the followings.

- Provide arrangement for disconnection for each of the groups.
- Provide a test point for each sub-group for quick fault location.
- To provide group array isolation.
- The current carrying ratings of the junction boxes shall be suitable with adequate safety factor to inter connect the Solar PV array.
- To include data collector for Monitoring System.

A DC string meter is integrated into a DC box to provide the capability of collecting the required data/information of string level.

The system diagram of junction box is shown below.



4. CIVIL WORK:

The following civil works should be carried out.

- i. Cutting and clearing of trees/plantation to remove the shadow.
- ii. Drilling exploratory bore holes for earthing and consolidation of the area pertaining to the installation of SPV modules.
- iii. Embedment of concrete structures suitable for mounting PV modules.
- iv. Laying of earthing equipment /structures and connecting to the main ground mat as per the statutory requirements.
- v. Construction work where necessary
- vi. Cutting of cable trenches etc. wherever necessary
- vii. Cutting of the concrete where trenches will be built.
- viii. Underground civil works for cable layout (Sand, Bricks & Warning Tape etc)

5. EXCEPTIONS AND VARIATIONS:

Any exceptions and variations to the specifications must be explicitly stated. The scope and reasons for each listed exception and variation must be fully explained with supporting data.

6. OTHER FEATURES:

1. The PV Module(s) should be warranted for a minimum period of 25 years from the date of supply, inverter with five years and the battery should be warranted for a period of 05 year from the date of installation. The warranty card to be supplied with the system must contain the details of the system. The manufacturers can also provide additional information about the system and conditions of warranty as necessary.
2. Adequate space should be provided behind the PV module/array for allowing unobstructed airflow for passive cooling.
3. Cable of appropriate size should be utilized to keep electrical losses to a bare minimum (e.g. length of the wire from module to combiner Box and Combiner Box to Hybrid Inverter should be as minimum as possible).
4. The control electronics should not be installed directly with the battery. All wiring should be in proper conduit of capping casing. Wire should not be hanging loose.
5. Instruction and O&M manuals
6. Two copies of Instruction and Operation and Maintenance Manual in English and local language should be provided with the system.
7. The manual shall be furnished at the time of dispatch of the equipment and shall include the following aspects:
8. Precautions during unpacking
9. Instructions for handling at site.
10. Erection drawings with written assembly instructions that would enable the Employer to carry out erection with his own personnel if opted by him.
11. Detailed instructions and procedures for the installation operation and maintenance.
12. Pre-commissioning tests.

13. About solar PV system – its components and expected performance.
14. Clear instructions about mounting of PV module (s)
15. About electronics
16. DO's and DONT's
17. Principle of Operation of various equipment
18. Safety and reliability aspects
19. Metering scheme
20. About power conditioning units' software and controls
21. Clear instructions on regular maintenance and troubleshooting of solar power plant.
22. Name and address of the person or service center to be contacted in case of failure or complaint.
23. Outline dimension drawings showing relevant cross-sectional views, earthing details, constructional features. Rated voltages and current etc.

7. CCTV Security and Monitoring Specifications

S.No	Night Vision/Day and Night CCTV Surveillance System with Remote Monitoring	Complete System with below items but not limited to.
1	Outdoor Bullet POE Camera	1080, 1/2" CMOS, H.265+ /H.265, IR Range= 20-30m, Fixed Lens 2.8 mm, IP67 Rated,
2	Indoor Dome POE Camera	1080, 1/3" CMOS, H.265+/H.265, IR Range=20-30m, Fixed Lens 2.8 mm, IP66, IK10 Rated,
3	NVR along with enough capacity of HDD Surveillance Grade for 24/7, 30 Days storage capacity	16 CH H.265+/H.265/H.264/H.264+ video formats, Connectable to the third-party network cameras, recording at up to 8 MP resolution, Supports live view, storage, and playback of the connected camera at up to 8 MP resolution, HDMI/VGA independent output, 2 SATA up to 8 TB, interfaces connectable for recording and backup, 1 self- adaptive 10/100/1000 Mbps network interface, along with 5m HDMI and allied accessories
4	16/24/48 POE Switch	Min 260W POE Budget, 10/100/1000 Mbps.
5	LED 49" Display	3840 x 2160 4K Resolution, along with allied accessories (Power, HDM Cable, Mouse, keyboard), Reputable Original Verifiable Brand, 2 Years OEM warranty
6	Passive Equipment	Cat6 Ethernet Cable including PVC or Dura Duct including clamps, elbows, socket and all allied material.

8. OPERATION AND MAINTENANCE:

SCOPE OF SERVICES (O&M)

The contractor must provide operation and maintenance services for a period of 3 years including one (01) year defect liability period following which it must provide the Government institutes with comprehensive Operation and Maintenance manuals. The responsibility of the contractor includes but are not limited to ensure remote monitoring facility at site specified by the client, periodic preventive maintenance, corrective maintenance, capacity building of govt. institute personnel and reporting must be provided as per the O&M form.

The contractor will provide a preventive schedule of maintenance, activities to be carried out during maintenance, skill, and competency of the maintenance personnel. The contractor will provide date of visit and list of authorized personnel to visit the Government institutes for maintenance activities. All maintenance personnel must carry identity card to enter the facility. The Government institute may seek a police verification report for maintenance workers.

The PV Generator is designed for an operation lifetime of at least 20 years. Its optimal performance is sensitive to best-in-class O&M practices, which will ensure the best performance during the 20-years period. The bidder is required to describe in detail his definite plans how to execute the below described requirements for the O&M period. As part of that the bidder shall provide an organizational chart and CVs of the key O&M staff as well as the locations where staff and facilities (e.g., spare parts inventory) will be located.

GENERAL SCOPE OF WORK (O&M)

The contractor has to warrant the performance of the PV Generator within its area of influence, as well as the availability and time consumed for detection of malfunctions and its repair.

This shall include, but not be limited to, the following items:

- Preventive maintenance will be done quarterly according to maintenance programs, such as periodic preventive maintenance of inverters, and PV modules etc., according to manufacturers' requirements.
- Scheduled inspection routines: e.g., PV modules to check for discoloration, first signs of delamination, loose wires in the electronics, corrosion of mounting structures, erosion.
- Maintenance of spare parts inventory (prompt replenishment of used spare

parts) including continuous reporting of status and consumption. Corrective maintenance with guaranteed response and reaction times, including all repair and replacement costs which shall not be more than 7 days (backup units must be provided during this period for the supply of uninterrupted power). Technical operation of the PV Generator including presence of O&M personnel close to the Project site as required to fulfil all O&M Contract obligations.

- Regular cleaning of the PV Generator site every 15 days, preventive and corrective maintenance of civil works.
- Relocate, install and commission the complete solar system if and when required by the client during the O&M period.
- Smooth functioning of data communications over Remote Monitoring System.
- Provision of regular service reports about performance, repairs, maintenance, and tests.
- Regular performance of variance analysis of the entire fleet of PV Generators.
- Ensuring that any warranties and insurance policies for the PV Generator are assignable / transferrable to Employer
- Provision of all O&M personnel trained and certified as far as applicable. The staffing concept and selected key employees shall be presented to the Employer for approval.
- Capacity Building/Training of the Govt. Institute personnel for preventive and corrective maintenance.
- Online Complaint Management System should be provided for proper/timely management of the sites.
- 24/7 Helpline contact numbers must be placed near the inverters/DB in metal embossed for emergency/trouble shooting.
- Equipment damaged during this period as a result of improper operations, inadequate maintenance or poor security measures shall be replaced or repaired by the contractor at their expense.
- The contractor shall detail all personnel requirements, security measures, scheduled equipment replacements, maintenance schedules and operational procedures for each year.
- The contractor shall include a guarantee of annual minimum energy output for the PV power plant quoted. Any shortfall in output below this guaranteed minimum shall be paid by the contractor to the client at rates charged by Wapda per kWh at the time of the shortfall.
- This minimum energy output shall be detailed by the contractor in their proposal by completing the table below:

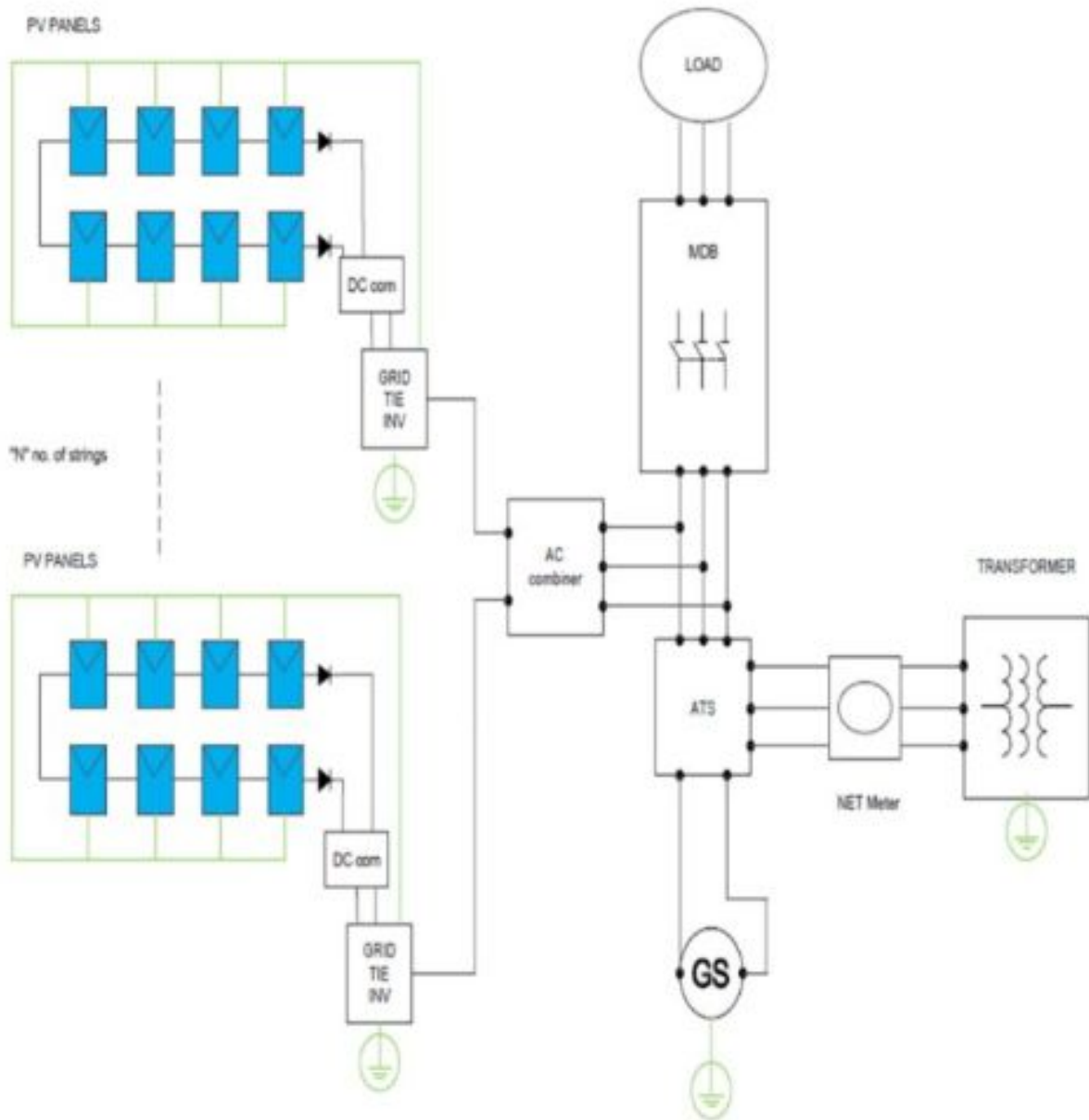
Size of PV Plant	Total energy output in kWh to grid per year	Guaranteed minimum annual output to the grid (kWh)

O&M Operations should be performed as per below format. Log should be maintained submitted to PEECA and client after every 3 months for all the mentioned public institutes duly signed as and when applicable as per the conditions mentioned above.

Any minor equipment and material not specifically mentioned in these specifications but required to make the system complete in every respect in accordance with technical specification shall be deemed to have been covered under the scope of this specification and shall be provided by the tenderer/supplier within the quoted price.

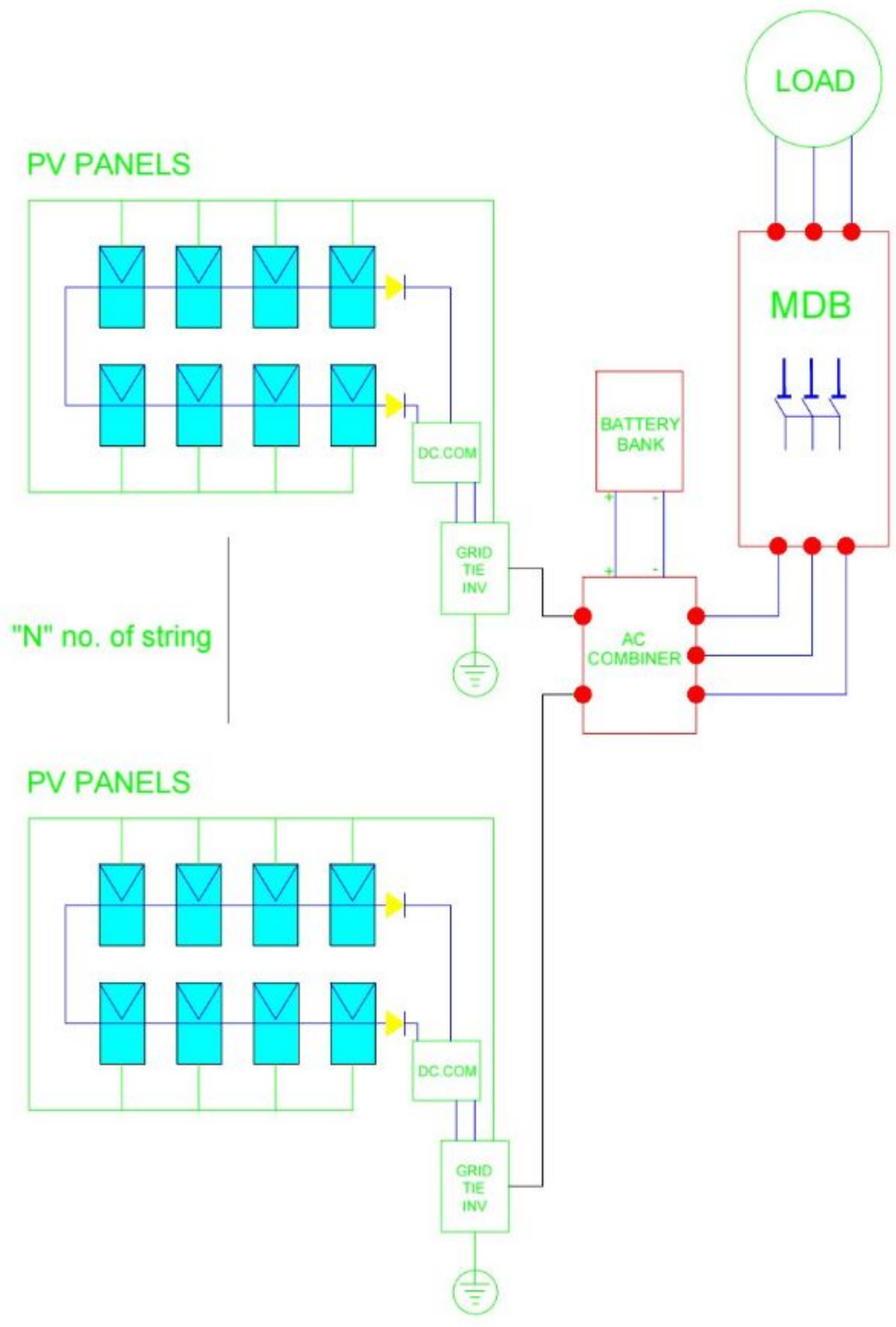
INSPECTION AND TESTING: Inspection and Testing of all the equipment will be done as per standard testing procedure at the time of pre-supply, complete solar PV system functionality after installation and at any time whenever required. Cost related to Sample testing of equipment from the third party will be borne by the contractor. All Equipment must comply with the all-prevailing rules and regulations including but not limited to SRO 604(I)/2019.

On Grid Solar System SINGLE LINE DRAWING



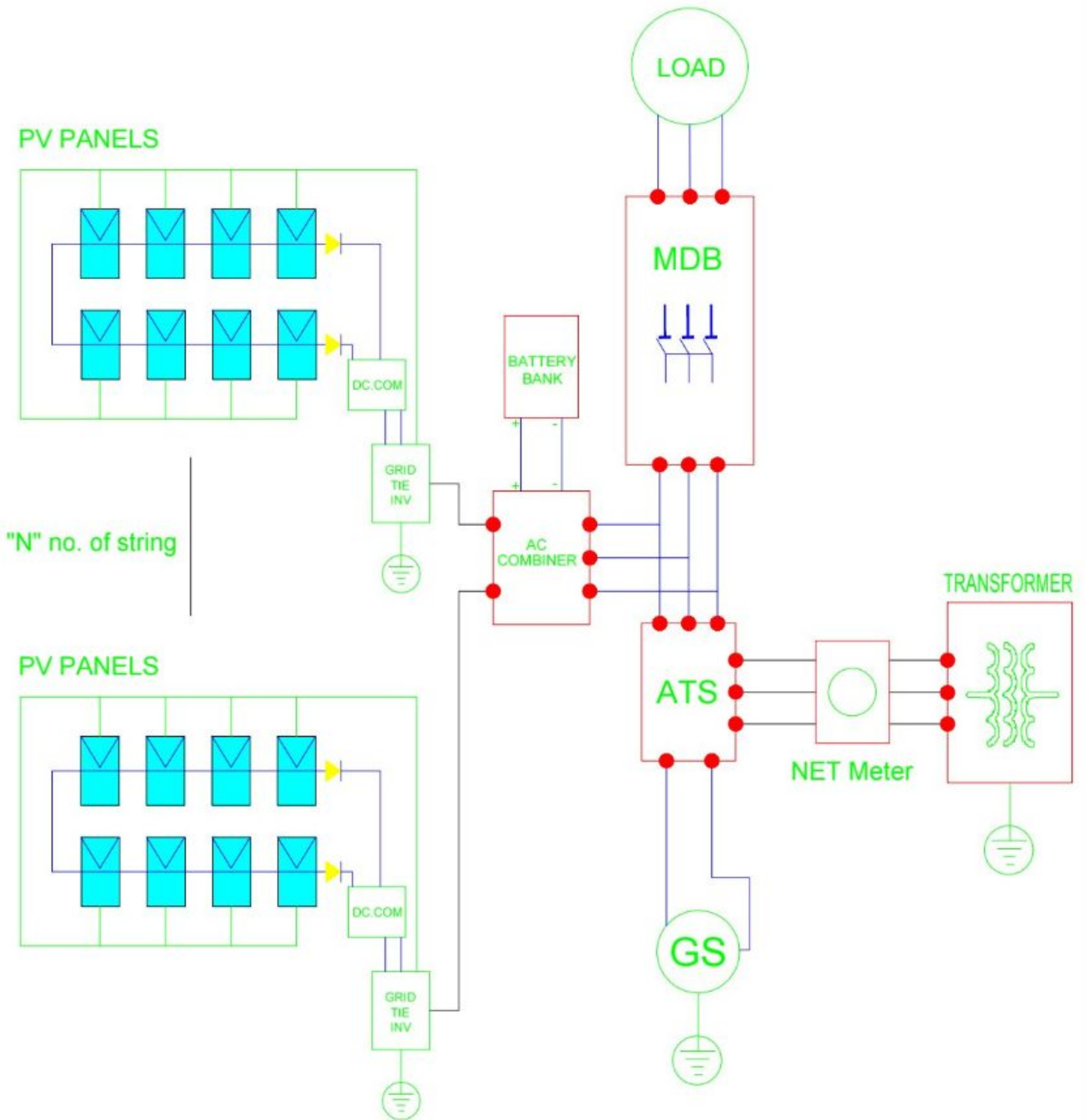
Off-Grid Solar System

SINGLE LINE DRAWING



HYBRID SOLAR SYSTEM

SINGLE LINE DRAWING



Section-38: Performance Data for Machinery & Equipment

Specifications of Machinery & Equipment

Sr No.	Item	Description
Electronics & IT Equipment		
1	LED Screen (75")	Technology Type: UHD Android TV, Display Resolution: 4K, Panel Resolution: 3840 x 2160, Screen Size: 75", Speaker: 2 Operating System: Android or Tizen CPU: Quantum or equivalent HDR10, Contrast Ratio: 5000:1 (typ.), Audio Video IN, Headphone, HDMI x 2 or more USB: 2 or higher, Bluetooth Connectivity: Bluetooth 5.0, Wi-Fi Connectivity: Internet Link: 2.4GHz Wi-Fi 802.11 b/g/n 2T2R Ethernet Network (RJ45), Accessories: Stand, Cables and mountings, Warranty: 1 year
2	LED Screen (65")	Technology Type: UHD Android TV, Display Resolution: 4K, Panel Resolution: 3840 x 2160, Screen Size: 65", Speaker: 2 Operating System: Android, or Tizen CPU: Quantum or equivalent HDR10, Contrast Ratio: 5000:1 (typ.), HDMI x2 or higher Audio Video IN, Headphone, USB: 2 or higher, Bluetooth Connectivity: Bluetooth 5.0, Wi-Fi Connectivity: Internet Link: 2.4GHz Wi-Fi 802.11 b/g/n or ac Ethernet Network (RJ45), Accessories: Stand, Cables and mountings, Warranty: 1 year
3	LED Screen (55")	Technology Type: UHD Android TV, Display Resolution: 4K, Panel Resolution: 3840 x 2160, Screen Size: 55", Speaker: 2 Operating System: Android or Tizen CPU: Quantum or Equivalent HDR10,

		<p>Contrast Ratio: 5000:1 (typ.), HDMI x 2 or higher</p> <p>Audio Video IN, Headphone, USB: 2 or higher, Bluetooth Connectivity: Bluetooth 5.0, Wi-Fi Connectivity: Internet Link: 2.4GHz Wi-Fi 802.11 b/g/n or ac Ethernet Network (RJ45), Accessories: Stand, Cables and mountings, Warranty: 1 year</p>
4	LED Screen (32") + Gym	<p>LCD 32", Panel Type: HD, Resolution:1366*768, Viewing Angle:178°/178° Refresh Rate: 60Hz, Contrast Ratio: 3000:1, Colors: 16.7 M(8bit) HDMI: 2 or higher Component IN: Yes, A/V IN: Yes, A/V Out: Yes, SPDIF Out: Yes USB: 1 or higher</p>
5	LED Screen for conference room table	<p>162B9T Philips + HP, Dell or equivalent ci5 10gen or higher 8gb 10gb (4 ms, 60 Hz, LFT LCD (TN) Panel, HD (1366 x 768), Touch Glass Hardness: 7H, Low-Blue mode, SPEAKER 2W x 2, (VGA, DVI-D, HDMI & Display Port), (Adjustments: Folding, Height & Tilt))</p>
5	Interactive LED 65"	<p>Display Backlight D-LED Backlight (Resolution: 3840*2160) Brightness: 350 cd (Contrast: 4000:1) -Screen Size: 1428.5*803.5 Aspect Ratio 16:9 View Angle 178° Screen Mode 16:9/4:3/dot to dot/full Color Dep: 10bit, 1.07Billion colors Panel Response Time: 8ms Support Resolution 1280*960/1280*1024/1360*768/1440*900/1600*1200/1920*1080/3840*2160@60HZ Android Specification Android 8.0 2 x ARM Cortex-A73@1.5GHz 2 x ARM Cortex-A53@1.5GHz ARM Mali-G51450MHz Ram: 4G Storage: 32G Front: USB2.0*3 (support both PC and Android) , HDMI1.4 (Max support 1920*1080/60Hz)*1, Touch USB B Type*1 Accessories Pen*2, HDMI Cable*1, Touch USB, Power Cable*1, Software CD*1, Remoter*1</p>
7	Sound System (30 table mikes +1 FM mike +	<p>Speak and Request indication Built-in loudspeaker, volume control, GSM immunity. Speak and Request indication. Built-in loudspeaker, volume control, GSM immunity. 30 cm or higher microphone stem. Configurable either as a participant or</p>

	<p>speakers +Amp)</p>	<p>chairperson's device or separate chairperson unit in addition to 29 delegate units. Connections: Female connector with cable locking recess – for loop through connection of Discussion and chairperson's Devices. 1 x 3.5 mm stereo headphones socket on device. 1 compatible x 2 m cable with male connector with cable lock</p> <p>Control Unit (Qty = 01)</p> <p>Plug-and-play functionality. control to turn on or off Delegate Units. Open microphone control. Should support upto 80 or higher delegate units. Built-in digital recorder with internal memory of 256 MB or higher and to record discussion and USB/Memory Card recording. Discussion control, Open mode, Override mode, Voice activation mode, push to talk (PTT) mode. Built-in monitor loudspeaker</p> <p>Controls and Indicators Buttons: Mains power on/off button, buttons/control for setting the volume range of all connected Devices, Microphone-mode button/Control for selecting one of the microphone operating modes, Open microphone button/Control for selecting the number of microphones that can be activated at the same time</p> <p>Note: Mic and Control Unit must be of same brand and vendor will install the audio system on sites</p> <p>Speaker (Qty Mention as per requirement Max Qty 4):</p> <p>Power: 20W or higher. Rated power :30 W or better. Power tapping: 30/15/7.5/3.75 W. Sound pressure level: 105/90 dB (SPL) or better. Effective frequency: 100 Hz to 18 kHz or better. Rated impedance: 8/163/333 ohm. Include other accessories/ cables/ hardware to connect with Projector for audio output.</p> <p>Mixer Amplifier 120Watt (Qty 1)</p> <p>02 or higher microphone/line inputs and volume knobs. 01 or higher music source inputs. Call station input with priority. zones and announcement only output. Voice activated emergency override. 120-Watt Power. LED/LCD for output. Master volume Control. Frequency response: 50 Hz to 20 kHz or better</p> <p>Note: Speaker and Amplifier must be of same brand and vendor will install the system on sites.</p> <p>2x 3.5mm compatible in and out cables of at least 10 meter each for integration should be included in the system</p>
<p>8</p>	<p>Sound System (5 persons mike+2 cordless mike+FM Mike)</p>	<p>Mixer Amplifier 60Watt (Qty 1)</p> <p>02 or higher microphone/line inputs and volume knobs. 01 or higher music source inputs. Call station input with priority. zones and announcement only output. Voice activated emergency override. 120-Watt Power. LED/LCD for output. Master volume Control. Frequency response: 50 Hz to 20 kHz or better</p> <p>Note: Speaker and Amplifier must be of same brand and vendor will install the system on sites.</p> <p>2x 3.5mm compatible in and out cables of at least 10 meter each for integration should be included in the system</p> <p>Speaker (Qty 2):</p> <p>Power: 20W or higher. Rated power :30 W or better. Power tapping: 30/15/7.5/3.75 W. Sound pressure level: 105/90 dB (SPL) or better.</p>

		<p>Effective frequency: 100 Hz to 18 kHz or better. Rated impedance: 8/163/333 ohm. Include other accessories/ cables/ hardware to connect with Projector for audio output.</p> <p>MIC (Chairman/ Delegate Unit) (Qty=4+1)</p> <p>Speak and Request indication</p> <p>Built-in loudspeaker, volume control, GSM immunity. Speak and Request indication. Built-in loudspeaker, volume control, GSM immunity. 30 cm or higher microphone stem. Configurable either as a participant or chairperson's device or separate chairperson unit in addition to 29 delegate units. Connections: Female connector with cable locking recess – for loop through connection of Discussion and chairperson's Devices. 1 x 3.5 mm stereo headphones socket on device. 1 compatible x 2 m cable with male connector with cable lock</p> <p>Wireless Collar Microphone & Receiver (Qty 1)</p> <p>PLL synthesized Technology</p> <p>Selectable UHF channels</p> <p>Wireless Collar microphone:</p> <p>Frequency deviation ± 48 kHz , S/N ratio >102 dB, Dynamic range >110 dB, Frequency response 50 Hz to 15 KHz 12 hours or more operation on batteries. Display, With batteries or chargeable Wireless Microphone Receiver</p> <p>Wireless Handheld Microphone & Receiver (Qty 2)</p> <p>PLL synthesized Technology</p> <p>Selectable UHF channels</p> <p>Hand held Wireless microphone</p> <ul style="list-style-type: none"> o Frequency deviation ± 48 kHz , S/N ratio >102 dB, o Dynamic range >110 dB, Frequency response 50 Hz to 15 KHz o 12 hours or more operation on batteries, LCD, With batteries or chargeable Wireless Microphone Receiver
9	<p>Laptops</p> <p>Graphic Card</p>	<p>Laptop for Graphics Purpose</p> <p>Processor: 11th Gen Intel Core i7, upto 4.2Ghz, 12 MB L3 cache, (6 cores 12 threads)/ AMD Ryzen 7 4800H (8 cores 16 thread) + NVIDIA GeForce GTX 1660 (4GB or higher)</p> <p>Memory: 32GB (16 x2) DDR4 3200mhz</p> <p>Hard Drive: 1TB SSD</p> <p>Display: 15.6-inch FHD (1920 x 1080) Display</p> <p>Battery: 4-6 Cell battery</p> <p>Connectivity Standards Gigabit Ethernet, Wifi 802.11, Bluetooth or higher</p> <p>Camera & Mic: 720P HD Camera & Mic</p> <p>Ports: 1x USB 3.1 or higher, 1x HDMI, 1x RJ45. 1x USB 3.0 or higher, 1 x Headset/mic combo jack or Higher</p> <p>Accessories:</p> <ol style="list-style-type: none"> 1. Standard charger 2. Carrying Case of Same Brand with Part # 3. Wireless mouse branded With Part # 4. Mouse Pad <p>Warranty: 1 year local/ onsite</p>

		<p>Software: All laptop and desktop computers shall come with the following original/ licensed software pre-installed:</p> <ol style="list-style-type: none"> 1. Operating System: Windows 11 Pro 64 bit for Laptop and Desktop 2. Office Suite: Microsoft Office Home & Business 2019 for Laptop and Desktop 3. Antivirus: TrendMicro Smart Protection OR Equivalent for 2 Year
10	Laptops officers	<p>Type: Processor: 12th Gen Intel Core i7, upto 4.7Ghz (Max Turbo Frequency) or higher Memory: 16GB DDR4 Hard Drive 512 GB SSD Display: 14- 15.6 inch FHD (1920 x 1080) Display Battery: 4 Cell battery with 3-4 hours battery backup or higher Connectivity Standards Gigabit Ethernet, Wifi 802.11, Bluetooth or higher Camera & Mic: 720P HD Camera & Mic Ports: 1x USB 3.1 or higher, 1x HDMI, 1x RJ45 1x USB 3.0 or higher, 1 x Headset/mic combo jack or Higher Accessories: <ol style="list-style-type: none"> 1. Standard charger 2. Carrying Case of Same Brand with Part # 3. Wireless mouse branded with Part # 4. Mouse Pad Warranty: 1 year local/ onsite</p> <p>Software: All laptop and desktop computers shall come with the following original/ licensed software pre-installed:</p> <ol style="list-style-type: none"> 1. Operating System: Windows 11 Pro 64 bit for Laptop and Desktop 2. Office Suite: Microsoft Office Home & Business 2019 for Laptop and Desktop
11	USB (64 GB)	USB 3.0 Branded
12	External Hard Disk (2 TB)	<p>Description: USB Type: micro USB to USB Type A Connection Interface: USB 3.1 Gen 1 Capacity: 2 TB Storage Media: 2.5" HDD Warranty: Two-year Limited Warranty Operating System: Microsoft Windows 7, Microsoft Windows 8, Microsoft Windows 10, Mac OS X 10.7 or later & Linux Kernel 2.6.31 or later With all accessories</p>
13	Computers	<p>Form Factor: Standard Tower Processor: Intel 12th Generation Core i7 processor 4.9 GHz (Max Turbo Frequency) or higher Graphics: Integrated Audio: Integrated HD Audio Controller Memory: 16GB DDR4 or higher Hard Disk Drives: 1) 1TB SATA HDD + 2) 128 SSD Network: Integrated Gigabit Ethernet, Wireless 802.11 standard compatible connectivity</p>

		<p>Ports: 3xUSB 3.1, 1x RJ-45, 1xHDMI, 2xUSB 2.0 or higher, DP, Audio Combo Jack or better</p> <p>Keyboard: Key Board Same brand</p> <p>Monitor: 18.5" LED or Higher</p> <p>Power Supply: Manufacturer Standard</p> <p>Warranty: 1 Year on site</p> <p>Accessories:</p> <ol style="list-style-type: none"> 1. Mouse & Mouse Pad: a) USB Mouse Same Brand, b) Branded Mouse Pad 2. All relevant cables for desktop functioning <p>Software: All laptop and desktop computers shall come with the following original/ licensed software pre-installed:</p> <ol style="list-style-type: none"> 1. Operating System: Windows 11 Pro 64 bit for Laptop and Desktop 2. Office Suite: Microsoft Office Home & Business 2019 for Laptop and Desktop
14	UPS for Computers	<p>(APC, Deutshe or equivalent)</p> <p>Capacity: 650VA or Higher</p> <p>Form Factor: Small / Mini Tower</p> <p>Topology: Line Interactive</p> <p>Surge Protection: Required</p> <p>Backup Time: 5 Minutes on 70% Load</p> <p>Power Factor: 0.7 or higher</p> <p>Typical Recharge Time: Maximum 6-8 Hours</p> <p>Battery: Maintenance Free Dry Batteries</p> <p>Status Display: LED / LCD Status Display</p> <p>Alarm Required: Should indicate Battery in Use, Battery Discharged, UPS Fault / overload</p>
15	Printer (Laser Black & White)	<p>Print Technology: Laser</p> <p>Print Speed: Up to 40ppm (A4)</p> <p>Processor: 600 MHz or higher</p> <p>Memory: 256 MB</p> <p>Printing: Duplex Automatic</p> <p>Black Print Resolution: 1200 x 1200 dpi</p> <p>Monthly Duty Cycle: Up to 40,000 pages</p> <p>Supported Paper Size: A4, Letter, Legal,</p> <p>Connectivity: standard 1 Hi-Speed USB, Gigabit Ethernet 10/100/1000BASE-T network;</p> <p>Wireless (Wi-Fi)</p> <p>Compatibility: Supported Operating System, MacOS, Windows-7,8, 10, 11.</p> <p>Accessories: Cables: 1 x USB, 1 x Power Cord</p> <p>Warranty: 1 Year</p>
16	Printer (Laser Colour)	<p>Color Network Printer - (Heavy Duty)</p> <p>Print Technology: Laser</p> <p>Print Speed (Color Normal): Upto 40 PPM</p> <p>Print Speed (Black Normal): Upto 40 PPM</p> <p>Monthly Duty Cycle: Up to 4,000 pages</p> <p>Printer Memory: 512MB or higher</p> <p>Processor: 1.2 Ghz</p>

		<p>Color Cartridges: 4 (1 each black, cyan, magenta, yellow) or equivalent</p> <p>Paper Trays: 2 Trays (1 Manual Bypass+ 1 Auto Feed)</p> <p>Supported Paper Size: A4, Letter, Legal.</p> <p>Networking: Required, RJ-45</p> <p>Connectivity: 2 Hi-Speed USB; 1 Gigabit/Fast Ethernet 10/100/1000Base-TX;</p> <p>Supported Operating System: Windows-7, 8, 10</p> <p>Accessories: Cables: 1 x USB, 1 x Ethernet Patch Cord, 1 x Power Cord</p> <p>Warranty: 1 year</p>
17	Printer Cum Scanner (3 in 1)	<p>Print/Scan/Copy/Fax</p> <p>Print Speed: 35PPM or higher</p> <p>Manual Double Sided Printing</p> <p>Up to 1,200 x 1,200 dpi Print</p> <p>USB, Network, Wireless & Wi-Fi Direct</p> <p>150 Sheet Input Tray or above</p> <p>600MHz Processor</p> <p>256MB RAM or above</p> <p>Scan Mode: Flatbed/ADF</p> <p>Scan Speed: 20IPM (B/W) or higher</p> <p>Scan Resolution: 600 x 600 dpi</p> <p>Copy Speed: 30CPM or higher</p> <p>Copy Resolution: 600 x 600 dpi or higher.</p> <p>Other standard features: LCD/LED display, print cancel button, etc., Drivers: Microsoft windows 7/8/10 supportive. Along with USB 2.0 cable and other accessories</p>
18	Photocopier Black & White	<p>Photocopier HP, Xerox or equivalent</p> <p>Function Copy, Print, Scan,</p> <p>Speed: 35PPM</p> <p>Duty Cycle: Up to 300,000 pages</p> <p>Print resolution 1200 x 1200 dpi</p> <p>Copy resolution: 600dpi x 600dpi</p> <p>Input Capacity: 2 x 500-sheet input tray</p> <p>Output Capacity: 500 sheet face-down output bin</p> <p>Duplex print options Duplex Automatic</p> <p>Media Size A3, A4, A5, letter, legal, executive</p> <p>Memory 6 GB</p> <p>Hard Drive 320 GB</p> <p>Connectivity: Ethernet 10/100/1000 Base-T, High-speed USB 3.0]</p> <p>Scanner 600 x 600 dpi</p> <p>Network Printing Yes</p> <p>Scan technology Flatbed; ADF</p> <p>Print technology Laser</p> <p>Interface Touch Screen</p> <p>Paper tray and trolley 100-sheet multi-purpose tray, 2 x 500-sheet input tray, 100 sheet ADF;</p> <p>Operating System Windows 10, Windows 7, Windows 8/8.1 Mac</p> <p>Warranty 3 Year On-site Warranty</p>

		<p>Toner Price Yield 48,000 pages Drum Price Yield 200,000 pages</p>	
	Photocopier Colour	<p>Copy Speed : 30PPM Color and Black & white Resolution: Up to 1200 x 2400 dpi image quality (Print and Copy Output) Duty Cycle: 129,000 pages per month Standard: Copy, Print, Scan-to-email/folder, Network scanning large touch screen 7" Scan to print from USB, Zoom: 25% x 400% Printing Process: Twin laser beam scanning & Electro photographic printing Paper Input: Tray 1 x 520 sheets, Tray 2 x 520 Sheets , 100 sheets Bypass Paper Size: A3-A5 Memory/Hard Drive: 4GB /320GB Quantity: 1 to 999 USB Port: Yes DADF: 130 sheets; Copy Features: Automatic two sided, Electronic pre-collation, poster mode, watermarks, ID Card copy PRINT: Speed 30PPM Printing Resolution: Up to 1200 x 2400 dpi Print Features: Print from USB, Secure Print, Connectivity: Ethernet 10/100/1000 Base-T, High-speed USB , Wi-Fi 802.11n/g/b/a and Wi-Fi Direct Warranty: 1 -Year Comprehensive warranty with Parts & Labor Trolley: Standard Trolley</p>	
19	Multimedia	<p>Projection System: DLP/LCD Full HD 1080p Resolution, 4000 ANSI lumens, Contrast Ratio: 15000:1 HDMI x 2 Up to 20,000 hours lamp life (SuperEco + mode), Aspect Ratio: 16:9 or higher Zoom: 1.1x or higher I / O Connection: VGA-In, Audio-In(RCA), Audio-In (Mini jack), Audio- Out , Microphone, USB Type A, 1x RJ45, 1 x Type A USB Accessories: Remote Control, AC Power Cord, 30M HDMI Cable Compatible with projector, Ceiling mount Kit</p>	
20	Automatic remote control Sliding Screen for multimedia	<p>Wall or Ceiling Mount, non-Tensioned, 120" Diagonal, Matte White Finish, Front Projection, With Low Voltage Controller, 120V, 60Hz. Accessories: All recommended accessories.</p>	
21	Screen for multimedia with Tripod Stand (6x8)	<p>120" Diagonal, Matte White Finish, Front Projection</p>	

22	Conferencing System	<p>Camera:</p> <p>Sensor: High Quality HD CMOS Sensor, Optical Lens: 10X or Higher, Rotation Angle: (Pan = 125 Tilt: 30) Degree or Higher, Auto/One push/Manual focus, 2D & 3D DNR, Brightness, color, sharpness, contrast adjustment. MJPG/H.264/H.265 video compression</p> <p>Microphone/Speaker:</p> <p>Speaker frequency response: 100Hz-11KHz or higher</p> <p>Speaker volume: 80dB or higher, Microphone frequency response: 100Hz-11KHz or higher. Acoustic Echo Cancellation. noise compression</p> <p>Omni Directional, 360 Degree coverage. Microphone sound-pickup diameter: 6 meters extendable. external microphones supported</p> <p>Hub:</p> <p>2x Mini DIN6 interface. Mini USB Interface. Power switch and interface. 2x mini DIN6 Data cables of at least 5 meter or higher. USB cable of at least 3 meter or higher</p> <p>Other Features:</p> <p>Support Windows, Android, IOS and Linux. Automatic recognition of cameras, microphones and speakers. wired and Bluetooth connection.</p> <p>USB plug-and-play, supports various online conference software platforms i.e., Zoom, MS Teams, Skype and other web conferencing platforms</p> <p>External Mic:</p> <p>2xCompatible External microphones of same brand</p>
23	Photography Equipment (Camera with stand)	<p>Sensor: Effective Pixels 24MP CMOS Sensor or higher</p> <p>Optics and Focus: Autofocus manual focus</p> <p>Other Features: Shutter Speed 1/4000- 30 sec, ISO range 100 – 20,000 or higher, TFT LCD Screen 3.0" diagonal or higher</p> <p>Storage: SD/SDHC/SDXC, 32GB (Class 10, 95 MB transfer rate)</p> <p>Lens: 18-55mm kit lens</p> <p>Battery: Li-ion Rechargeable battery</p> <p>Bag: Strong and Stylish bag pack with rain cover</p> <p>Tripod: 3-way adjustable head, Moveable horizontal and vertical length, tilt(right/left/forward/backward)</p>
24	Servers, Core Router, Access switch, Core switch, Ups	<p>Servers (1)</p> <p>Form Factor: 2U Rack Mounted</p> <p>Processor: Intel Xeon Silver 4310, 2.1GHz, Turbo, 12 Cores or higher processor</p> <p>CPU (Installed / Max): 2 / 2</p> <p>Memory: 4x 32GB DDR4 Memory, required minimum 24xDIMM slots</p> <p>RAID controller: RAID Controller, 12Gbps, 2GB Cache or more, Support RAID 0,1,5,6</p> <p>Hard Disk Drives: 3x 2.4TB SAS 10K HDD Hot Plug</p> <p>Optical Drives: Super Drive (Internal/External)</p> <p>Network: 4x 1G Base-T Network Ports</p> <p>Graphics: Integrated Graphics</p> <p>Ports: Required 1x VGA, at least 4 x USB 3.0 and USB 2.0 ports, Dedicated USB port for Server Management</p> <p>Keyboard & Mouse: Branded Standard USB</p>

	<p>Monitor: Same Brand LED 18.5" or higher</p> <p>Power Supply: 2xHot-plug compatible Redundant Power Supply, 2m PDU style Power Cords</p> <p>System Management: Embedded Remote Management with dedicated RJ45 port, license must include Pre-OS virtual remote KVM (Keyboard Video, Mouse) functionality to see server boot process remotely or to perform Bios, RAID controller settings etc tasks.</p> <p>Accessories: Server Rack Mounting Kit with sliding rails and Cable Management Accessory</p> <p>Warranty: Proposed Server should be quoted with minimum 3 years Hardware warranty and onsite support.</p> <p>Operating System: Licensed Windows Server 2022 standard edition minimum 24 cores.</p> <p>Services:</p> <ol style="list-style-type: none"> Assembly of Server (If required) Configuration of Raid 1and 5 Disk Partitioning Installation of Operating System Rack Mounting Volume /LUNs creation. <p>Font Panel: Quick removable front panel / cover</p> <p>Expansion Slots: Required min 3xEmpty PCIe slots other than occupied, upgradable up to Eight PCI-Express 3.0 slots</p> <p>Cooling Minimum: 6xRedundant Hot Plug Fans or higher</p> <p>Drive Slots: Chassis with 8x2.5 inch HDD slots, must support/upgradable up to 24 SFF drives</p> <p>Server must support Red Hat Enterprise Linux, SUSE Linux Enterprise Server, VMware ESXi)</p> <p>Core Router + Firewall WAN 2 Units</p> <p>Device Type: Firewall</p> <p>Form Factor: 1U or above Rack Mounted</p> <p>Ports: 1 USB, 1 Console, 2x GE RJ45 MGMT/DMZ Port, 4x GE RJ45 WAN Ports, 12x GE RJ45 Ports, 2x 10 GE SFP, 4x GE SFP Slots, 4x GE RJ45/SFP Shared Media Pairs.</p> <p>Firewall throughput: 20 Gbps</p> <p>IPS throughput: 2.6 Gbps</p> <p>NGFW throughput: 1.6 Gbps</p> <p>IPsec VPN throughput (512 bytes): 11.5 Gbps</p> <p>SSL VPN throughput: 1 Gbps</p> <p>Threat protection: 1 Gbps</p> <p>Features: Firewall should support UTM features IPS, antivirus, URL filtering, Web content filtering, Web Application Protection, Email Protection, Encryption</p> <p>Concurrent sessions: 1.5 million</p> <p>New sessions / Second: 56,000</p> <p>SSL inspection throughput (IPS, avg. HTTPs): 1 Gbps</p> <p>Application control throughput: 2.2 Gbps</p> <p>Accessories: Rack Cable, Rack Mounts, Console Cable.</p>
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		<p>AC Power Supply: 100 -240V AC, 50 – 60 Hz</p> <p>Access Switch 26 Units</p> <p>24 ports of Gigabit Ethernet (GbE) 10/100/1000 desktop connectivity</p> <p>1 GbE Small Form-Factor Pluggable (SFP) uplinks</p> <p>24 x 10/100/1000Base-T - RJ-45 PoE ports</p> <p>1 x USB Type A , 1 x console /USB/RJ 45 for management</p> <p>4 x SFP (mini-GBIC)</p> <p>Core Switch 4 Units</p> <p>Device Type: Switch – 24 Ports- L3- managed - stackable</p> <p>Form Factor: 1U or above Rack Mounted</p> <p>Ports: 24 x 10/100/1000 ports, 4 x 10 Gigabit Ethernet (2 x 10GBase-T/SFP+combo + 2 x SFP+), Multimode 1G (SFP+) upto 500M</p> <p>DRAM Memory: 256 MB (installed) or above</p> <p>Flash Memory: 32 MB (installed) or above.</p> <p>Switching Capacity: Up to 128 Gbps or higher</p> <p>Bandwidth Capacity: Up to 70 Mpps or higher</p> <p>Management Protocol: Internet Group Management Protocol (IGMP) supports 4K multicast groups and Routing Information Protocol (RIPV2)</p> <p>VLAN: Up to 4094</p> <p>Features: Flow control, layer 2 switching, VLAN support, IPv6 support, Spanning Tree Protocol (STP) support, Rapid Spanning Tree Protocol (RSTP) support, Multiple Spanning Tree Protocol (MSTP) support, Access Control List (ACL) support, Quality of Service (QoS), reset button, LACP support, Energy Efficient Ethernet, Dynamic VLAN Support (GVRP)</p> <p>MAC Table: Up to 16k entries or above a</p> <p>Network Security: DHCP snooping, Dynamic ARP, IP/MC/Port Binding, Port Security, PVE</p> <p>Management: SNA, SNMP, RMON</p> <p>Licensing: Relevant licensed IOS to support the afore mentioned features.</p> <p>Accessories: Rack Cable, Rack Mounts, Console Cable.</p> <p>5KVAx 3000W UPS (1)</p>
25	<p>IP Camera (Security System, Camera, LED and accessories)</p>	<p>Outdoor IP Camera: 64 Units</p> <p>Resolution: 4 MP (2560 x 1440)</p> <p>2.8 mm / 100° lens</p> <p>IR illuminator with range up to 50 m</p> <p>H.265+/H.265/H.264+/H.264/MJPEG video compression</p> <p>3D-DNR, DWDR, BLC video processing functions</p> <p>Access via application</p> <p>Region of interest (ROI)</p> <p>Mechanically switching IR filter</p> <p>IP67 rating</p> <p>Power: 12 VDC or PoE (802.3af)</p> <p>Indoor IP Camera: 64 Units</p> <p>Resolution: 4 MP (2560 x 1440)</p> <p>2.8 mm / 12 mm lens</p> <p>IR illuminator with range up to 30 m</p> <p>H.265+/H.265/H.264+/H.264/MJPEG video compression</p> <p>3D-DNR, DWDR, BLC video processing functions</p>

		<p>Access via application Region of interest (ROI) Mechanically switching IR filter IP67 rating Power: 12 VDC or PoE (802.3af) Network Video Recorder (NVR): Video/ Audio input: 64 Channels Network: Incoming bandwidth:320Mbps Video/Audio Output: HDMI Output:1-ch, resolution: 4K (3840*2160)/60Hz, 4K(3840*2160)/30Hz, 1920*1080P/60Hz, 1600*1200/60Hz, 1280*1024/60Hz, 1280*720/60Hz, 1024*768/60Hz</p> <ul style="list-style-type: none"> • Recording: Resolution:12MP/8MP/6MP/5MP/4MP/3MP/1080p/UXGA/720p/VGA/4CIF/DCIF/2CIF/CIF/QCIF <p>VGA Output:1-ch, resolution: 1920*1080P/60Hz, 1280*1024/60Hz, 1280*720/60Hz, 1024*768/60Hz Decoding: 2Units Capability:8-ch@1080P Live view Playback: 8MP/6MP/5MP/3MP/1080p/UXGA/720p/VGA/4CIF/DCIF/2CIF/CIF/QCIF</p> <p>Hard Disk: 8 SATA interfaces with 8 HDDs Capacity with pre-installed 6TBx8 HDDs Switch: 1 Unit</p> <ul style="list-style-type: none"> • Core Switch Layer – 2 Managed- 12 Port SFP Switch with SFP Modules upto 5Km Complete • Camera Cabling: CAT 6 Including Ducting Cat 6 UTP /STP 23AWG 3M, Schneider, or Equivalent. Transmission Frequency: 250Mhz including PVC Pipe etc 16000ft • Optical Fiber • Optical Fiber: Single Mode 8 Core • Cabling and related accessories including Digging, laying ODF Boxes, Patch cords, splicing etc with in PVC or HDPE pipe wherever required. • Patch Panels: 24 Ports Patch Panel with loaded I/O's • Tagging: Tagging of I/O, Patch Panel Ports, Cables (All Ends) 3000ft • Data Rack (30U) Branded • UPS 3kVA APC Branded with 2 x 150 A Dry Batteries <p>LED 55" (2)</p>
26	Networking solution	<p>(Cable + Wi-Fi) LAN Cabling: CAT 6 Including Ducting Cat 6 UTP /STP 23AWG 3M, D-Link, Schneider, or Equivalent. 16,000ft Transmission Frequency: 250Mhz including PVC pipe etc Face Plates & Back Boxes: Dual I/O. 128 I/O: CAT6 I/O Patch Cord: 3 Meter 64 Patch Cord: 1 Meter 64 Ducting: PVC Pipe / Dura Duct, Flexible Pipe 8000ft</p>

		<p>Patch Panels: 24 Ports Patch Panel 6</p> <p>Tagging: Tagging of I/O, Patch Panel Ports, Cables (All Ends) 1 Job</p> <p>Data Rack (42U) Branded 1 unit</p> <p>Related Services:</p> <ul style="list-style-type: none"> • Ducting and Cabling of LAN • Installation of Switches, Patch Panels, Data Rack, I/O and RJ45 Connectors. • All services related to commissioning of LAN and Internet. • Fluke testing must be performed by supplier to verify the length and quality of cable. <p>6 core Single Mod Fiber complete is all aspect including splicing fiber patch cords digging etc</p> <p>Warranty: 1 Year</p>
27	Wi-Fi controller	<p>Providing and fixing Wireless LAN Controller: Should support 5 Gbps or higher throughput. 2 or higher 10G ports with compatible SFP modules, 8 or higher GE ports. Support of MAC based authentication, 802.1X authentication, Portal authentication, should be able to support at least 100 Aps on single controller (Licenses of 35APs included).</p> <p>Should support at least 1000 users on single controller. Support of WPA, WEP, TKIP. Built-in server for portal/802.1x authentication. Support of dynamic routing protocols OSPF, BGP etc., LACP. URL filtering, support of IDS/IPS, should be able to mitigate Trojan horse, worms and buffer overflow. Should support configuration management through CLI, web based as well as SSH. Should support SNMPv1/v2/v3. Should support wireless performance monitoring of APs, wireless controller. Should be able to support both 2.4GHz and 5GHz frequency. Controller should be able to enable/disable SSID on periodic basis.</p> <p>Should support secure guest access through portal.</p> <p>Note: Wireless LAN controller must not have EOL/EOS in next 5 years.</p> <p>WLAN Access Point (PoE) (Qty 35): Enterprise model fully comply IEEE802.11a/b/g/n/ac or 802.11ax, 3X3 MIMO or higher. Should be able to operate with quoted Wireless Lan Controller as well as stand-alone in case WLC is not functional. Data rate: 5.75Gbps or higher. working in both 2.4GHz and 5GHz, Min. Antenna Gain: 1 dBi or higher on 2.4GHz and 3dBi on 5GHz. Built in antennas, MAC address authentication. 1X1GE port or higher. support of 16 SSIDs or more. Should support of 512 or more users per AP. 802.3at/af POE Power Supply (POE injector included). DHCP Snooping, WIDS, WIPS, Rouge Device Detection, AP Blacklisting and Whitelisting and other standard features.</p> <p>warranty: 3 years</p> <p>Note: Wireless Lan Controller, Access Points must not have EOL/EOS in next 5 years. 9x5xNBD warranty</p>
28	IP Telephone Exchange	<p>4 Input lines x 64 Output Lines (1 Unit)</p> <p>Supports up to 500 users and up to 75 concurrent calls</p> <ul style="list-style-type: none"> • Zero configuration provisioning of SIP endpoints

		<ul style="list-style-type: none"> • Built-in Instant Messaging (IM), Audio Conferencing & Web Meetings platform that supports access from computers, mobile devices, and SIP endpoints communications using desktops, Web, and Android/ iOS devices • API available for third-party integrations, including CRM and PMS platforms • Advanced security protection with secure boot, unique certificate and random default password to protect calls and accounts • Three Gigabit auto-sensing RJ45 network ports with integrated PoE+ and support NAT router • Automated NAT firewall traversal service facilitates secure remote connections • Enhanced reliability with support for Hot Standby High Availability and local dual deployment • Supports Full-Band Opus voice codec, jitter resilience up to 50% packet loss <p>Product Specifications</p> <ul style="list-style-type: none"> • Analog Telephone FXS Ports: (4) RJ11 ports • (3) Self-adaptive Gigabit ports with PoE+ • Maximum Call Capacity: <ul style="list-style-type: none"> • Users: 500 • Concurrent Calls (G.711): 75 • Max. concurrent SRTP calls (G.711): 75 • Maximum Attendees of Conference Badges: 5 meeting rooms and up to 75 parties <p>IP Telephone (PoE) (8 reception Sets, 56 normal sets with CLI) 2 SIP accounts, 2-line keys, 3-way conferencing, Dual-switched 10/100 mbps ports, integrated PoE HD audio on speakerphone and handset support for headsets Up to 1000 contacts, call history up to 200 records Networking (IP Telephony Cabling) 64 Units LAN Cabling: CAT 6 Including Ducting Cat 6 UTP /STP 23AWG 3M, D-Link, Schneider, or Equivalent. Transmission Frequency: 250Mhz including PVC pipe etc Face Plates & Back Boxes: Dual I/O. 10,000 Feet I/O: CAT6 I/O 64 Patch Cord: 3 Meter 32 Patch Cord: 1 Meter 32 Ducting: PVC Pipe / Dura Duct, Flexible Pipe 5000 Tagging: Tagging of I/O, Patch Panel Ports, Cables (All Ends)</p>
29	Biometric Attendance Machines	<p>Makes (Zkteco and approved equivalent) with:</p> <p>Display: 4.3-Inch Touch Screen Face capacity: 3,000 Fingerprint capacity: 4,000 Card capacity: 10,000 (Optional) Logs capacity: 100,000 Communication: TCP/IP, USB Host,</p>

		<p>Standard Functions: Automatic Status Switch, Self-Service Query, Work Code, SMS, DST, T9 Input, 9 Digit User ID, Scheduled Bell, Photo ID, Wiegand Out</p> <p>Optional Functions: ID/MiFare/HID Card, 3G, ADMS, 2000mAH Backup Battery, External Printer and Bell</p>
30	Light Control Panel	<p>Fabrication, Supply, testing and commissioning of following Light control panels (LCP), floor standing weather proof, IP 65 Rated of appropriate size, made of MS Sheet 16 SWG with hinged door, handle, catcher, 2 coats of antirust and powder coated paint of approved colour, AC3 magnetic contactor, photocell for automatic operation of lights, CBs, Hand/Off/Auto switch, push button and all necessary accessories complete in all respects. LCP shall be manufactured as per specifications; single line diagram completes in all respect up to the satisfaction of Engineer incharge.</p>
31	Inverter ACs 1 tons	<p>Inverter ACs make (Gree, Dawlance, Haier, Pell or equivalent)</p> <p>DC Inverter Technology mounted (front flow)</p> <p>Capacity ≥ 12000 BTU</p> <p>Power supply 220+10%/1 PH/50Hz</p> <p>Power Input (cooling/Heating) <1900 watt</p> <p>Running Current <9AMP</p> <p>Energy Saving 60% or above</p> <p>Low voltage function 150 or below</p> <p>Air Circulation (Indoor / Outdoor) >800/2500 CMH</p> <p>Noise level (Indoor / Outdoor) < (45/55) dB</p> <p>Panel display LCD</p> <p>Remote controlled LCD</p> <p>Temperature control thermostat or equivalent</p> <p>Auto air swing</p> <p>Speed setting cooling/Fan/Auto</p> <p>On/off timer</p> <p>Auto restart</p> <p>Refrigerant R410 / R410</p> <p>Cooling coil (Inner Grooved copper anti-corrosive fine (or better), 1 year warranty and after sale service</p> <p>10 year compressor warranty.</p>
32	Inverter ACs 1.5 tons	<p>Inverter ACs make (Gree, Dawlance, Haier or approved equivalent)</p> <p>(Inverter ACs 1.5 tons)</p> <p>DC Inverter Technology mounted (front flow)</p> <p>Capacity ≥ 18000 BTU</p> <p>Power supply 220+10%/1 PH/50Hz</p> <p>Power Input (cooling/Heating) <1900 watt</p> <p>Running Current <9AMP</p> <p>Energy Saving 60% or above</p> <p>Low voltage function 150 or below</p> <p>Air Circulation (Indoor / Outdoor) >800/2500 CMH</p> <p>Noise level (Indoor / Outdoor) < (45/55) dB</p> <p>Panel display LCD</p>

		<p>Remote controlled LCD Temperature control thermostat or equivalent Auto air swing Speed setting cooling/Fan/Auto On/off timer Auto restart Refrigerant R410 / R410 Cooling coil (Inner Grooved copper anti-corrosive fine (or better), 1 year warranty and after sale service 10 year compressor warranty.</p>
33	Cabinet Inverter ACs 2 Tons	<p>Cabinet Inverter ACs make (Gree, Dawlance, Haier or approved equivalent)</p> <p>Cabinet DC Inverter Technology Capacity 2400BTU Power supply 220+10%/1 PH/50Hz Power Input (cooling/Heating) <2600watt Running Current <15AMP Energy Saving 75% or above Low voltage function 150 or below Air Circulation (Indoor / Outdoor) >1000/2500 CMH Noise level (Indoor / Outdoor) < (45/55) dB Panel display LCD Remote controlled LCD Temperature control thermostat or equivalent Auto air swing Speed setting cooling/Fan/Auto On/off timer Auto restart Refrigerant R410 / R410 Cooling coil (Inner Grooved copper anti-corrosive fine (or better), 1 year warranty and after sale service 10 year compressor warranty.</p>
34	Ceiling Fans (56")	<p>Ceiling Fan make (Super Asia, GFC, SK, Indus, Royal or approved equivalent):</p> <p>size 56" copper motor, Double "Z" Ball Bearing, Aerodynamically designed blades & Silicon steel lamination.</p>
35	Pedestal Fan (56")	<p>Copper Wire, Ball Bearing Motor, Full Metal, Energy Efficient, High RPM.</p>

Kitchen		
1	Refrigerator	Refrigerator 20 Cubic Feet Inverter make (Homage, Pel, Haier, Dawlance and approved equivalent): 20 Cu-Ft Capacity, smart inverter, Operating voltage/ Frequency 220/50, electronic control, Power consumption 160watt maximum, Adjustable thermostat (Temperature Control), interior Light LED, Low voltage operation upto 150v, Refrigerant R-134a or R600a, Evaporator Roll Bond, Auto Defrost function, Copper Condenser, Tow Door, Shelves/Trays/Scraper/Door Pocket, 1 year warranty and after sale service.
2	Freezer Two Door	Inverter 15 Cu.ft/ 410 ltr, Convertible 4 in 1, LED top light, Static cooling technology, 1 Year Warranty,
3	Stove	Super Asia Gas Hob SHB-133 or equivalent: a) Stainless steel surface b) Cast iron support c) Burner with safety device d) SKU (20253070-PK-1401870352)
4	Cooking Range	Welcome 3 Burner Gas Cooking Range WC-555 or equivalent: a) Stainless Steel Burner Top b) 3 Standard Burners c) Two Way Thermostat d) Single Door e) Metal Top f) Tempered Oven Glass g) Baking Roasting and Grilling Oven h) Width 27, Depth 20, Height 32
5	Stove for Daig	Local material for 20 Kg daig.
6	Daig	Silver Daig with cover knob, Capacity 10kg,
7	Gas cylinder	LPG Gas Cylinder, Capacity 12Kg, Standard Quality material.
8	Microwaves	Microwave Oven 30 Liter make (Dawlance, Ecostar, Haier or approved equivalent):

		30-liter capacity, Voltage 220 ~ 240, Latest Model, Rated input power 1400W maximum, Rated output power 900W approximately, LED display, Electronic (Touch Panel) control type & 1 year warranty and after sale services.	
9	Dispensers	Water Dispensers make (Homeage, Pell, Haier, Orient or approved equivalent): 3 Tab Operation i.e., Hot, Cold and Normal, Refrigerator Cabinet 20 liters, Energy Saving, 1L or above cold-water Capacity, 3.5L or above hot water Capacity, Cooling power input 1-year complete part warranty, 1 Year after sale service	
10	Washing Machine	Washing Machine make (Homage, PEL, Haier, Kenwood, Super Asia or approved equivalent): Copper Motor, Washing Capacity 20Kg, Energy saver, Rust proof painted metal body, Steel drum with double storm pulsator.	
11	Iron	Dry Iron make (Panasonic, WestPoint, National or approved equivalent): Power 1000W, Non-Stick Soleplate, Voltage 220 ~ 240, Adjustable Swivel Cord & Temperature setting guide.	
12	Crockery	12 Person set 54 pieces, Pyrex	
13	Cutleries	12 Person set 52 pieces, Material Stainless steel	
Gym & Sports Equipment			
1	Treadmill (5 Horse Power Motor)	Motor Power: 4HP or above AC Motor Continuous Commercial Grade Electronic Display: 10.1 inch TFT Colour Touch Screen Display, Programs, Speed, Distance, Time, Calories, Pulse Hand Rails: Convenient Speed +/-, Start/Stop buttons and hand pulse grips to monitor heart rate Speed Range: 1 – 20 KM/H Incline: 18 Levels Power Incline Safety: Safety Key for Emergency Stop	

		<p>Space Saving: Easily folds for space-saving and moving wheels for transportation</p> <p>Deck Cushion: SPAX Shock absorbent cushions for reduced impact on your joints</p> <p>Running Surface: W20.2 x L60 inches</p> <p>User Weight Limit: Maximum 180KG</p>
2	Elliptical	<p>ELLIPTICAL GYM AND FITNESS MACHINE</p> <p>a) Frame: Stride length = 20, Fly wheel = 8.5kgs</p> <p>b) Computer Display: 6.5 LCD</p> <p>c) Resistance type: ECB, 32 LEVELS</p> <p>d) Incline level: Power, 20 levels</p> <p>e) Cooling Fan & Hand pulse rate measurement</p> <p>f) Max. User weight: 150 Kg</p>
3	Recumbent Bike	<p>a) Power Source: Adaptor DC 9V/1A</p> <p>b) Fly wheel weight: 7 Kg, Stride length: 340 mm</p> <p>c) Resistance Type: ECB Magnetic</p> <p>d) Q factor: 210 mm</p> <p>e) Hand Pulse sensors, Cup holder, Transport wheels</p> <p>f) Max. User weight: 120 Kg</p> <p>g) Read Out: Time, Distance, RPM, Speed, Calories, Pulse, Body fat, HR control, Pulse recovery</p>
4	Gym Mats	Rubber Hard material.
5	Weights (Plates, Rubber coated, Dumble, Rods)	<p>Plates Rubber 230kg,</p> <ul style="list-style-type: none"> - 10 Plates 2.5Kg (Total= 25kg) - 10 Plates 5kg (Total= 50kg) - 5 Plates 10kg (Total = 50kg) - 3 Plates 15kg (Total = 45kg) - 3 Plates 20kg (Total = 60kg) <p>Dumble Rubber 125Kg:</p> <ul style="list-style-type: none"> - 4 sets 1Kg (Total= 4kg) - 4 sets 2kg (Total= 8kg) - 4 sets 3kg (Total = 12kg) - 4 sets 4kg (Total = 16kg) - 4 sets 5kg (Total = 20kg) - 2 sets 7.5kg (Total = 15kg) - 2 sets 10kg (Total = 20kg) - 2 sets 15kg (Total =30kg) <p>Dumble Steel Rod weight and lock 100Kg:</p> <ul style="list-style-type: none"> - 4 sets each with total 25Kg Plates (Total= 100kg) <p>Rods 247kg,</p> <p>Locks 25kg,</p>
6	Benches	Abdominal Bench,
7	Stools	Back seat stool.
8	Multi-Functional Body Building Machine	<p>1) Bi &Tri,</p> <p>2) Leg pull</p>

		3) Rowing 4) Flying	
9	Aerobic Equipment	Jumping ropes 12 Yoga mate 6mm 12 Weight machine digital 2	
10	Leg Extention / Leg Curl	a) Triceps Pushdown b) Lat Pull down c) Leg Extensions d) Standing Arm Curl e) Standing Triceps Extension f) Butterfly g) Weight stack: 100 LBS	
11	Badminton Court with Accessories	Steel frame made in Taiwan. (Rs. 5000 pair) Plastic shuttle cocks. Taiwan/ china made. Average category, (Rs. 2500 per Dozan) Badminton approved floor (15-meter x 7.1 meter) (Rs. 500,000), Net pole + Net (Rs. 10,000)	
12	Table Tennis Complete Accessories	Table tennis made in china table frame with tyres 15mm thickness. Table Tennis Nett & post set. Table Tennis rackets Club standard, made in china. (3 pairs per table) Table Tennis balls Made in china. (2 per dozen per table)	
13	Billiard / Snooker Table	4.5ft* 9ft. Marble top approximately 1inch thickness. Solid Wood frame. Cloth, balls & rubber set Taiwan. Playing cues 4 no. included.	
Solar System			
1	Solar on-Grid 20Kw	Tier A Monocrystalline, Half Cut PV Modules 20 kW (Jinko/Canadian/Longi/Trina or equivalent) Maintenance Free Grid Tied Three Phase Inverters 20 kW (GoodWe or equivalent) Wireless Remote Monitoring via 4G Dongle Device for inverter & string performances 1 Distribution Box: Chint/ABB/Eqv. MCCB AC Breaker, Surge Protection Devices 1 Structure: Galvanized Iron Fixed Tilt Roof Mounted Structures, Stainless Steel Nut bolts, Civil Works - 20 kW DC Wire: 4mm ² XLPE/PVC/Tin Coated Copper Single Core 600/1000V DC (As per Actual) AC Wire: XLPE/PVC Aluminum AC Wire for Inverter & Bus Bar Connections (As per Actual) Electrical Installation: Cable Conduits, Cable Ties etc. PVC Bends, Ducts, Flexible Pipes, MC4 connectors etc (Job) Earthing bores, Earthing wire, Copper wire & Lightning Arrestors (1)	

		Net Meter documentation, installation & all dealings with respective DISCO 1
2	Solar on-Grid 30Kw	<p>Tier A Monocrystalline, Half Cut PV Modules 30 kW (Jinko/Canadian/Longi/Trina or equivalent)</p> <p>Maintenance Free Grid Tied Three Phase Inverters 30 kW (GoodWe or equivalent)</p> <p>Wireless Remote Monitoring via 4G Dongle Device for inverter & string performances 1</p> <p>Distribution Box: Chint/ABB/Eqv. MCCB AC Breaker, Surge Protection Devices 1</p> <p>Structure: Galvanized Iron Fixed Tilt Roof Mounted Structures, Stainless Steel Nut bolts, Civil Works - 30 kW</p> <p>DC Wire: 4mm² XLPE/PVC/Tin Coated Copper Single Core 600/1000V DC (As per Actual)</p> <p>AC Wire: XLPE/PVC Aluminum AC Wire for Inverter & Bus Bar Connections (As per Actual)</p> <p>Electrical Installation: Cable Conduits, Cable Ties etc. PVC Bends, Ducts, Flexible Pipes, MC4 connectors etc (Job)</p> <p>Earthing bores, Earthing wire, Copper wire & Lightning Arrestors (1)</p> <p>Net Meter documentation, installation & all dealings with respective DISCO 1</p>
3	Solar Hybrid 5Kw	<p>Tier A Monocrystalline, Half Cut PV Modules 5.4 kW (Jinko/Canadian/Longi/Trina Solar or equivalent)</p> <p>T10-HV Hybrid Maintenance Free Three Phase Inverters 1 (Alpha ESS Smile or equivalent)</p> <p>Batteries: Smile BAT 8.2 kWh Li-Ion Storage Modules with 90% recommended DOD 1</p> <p>Structure: GI fixed tilt roof mounted structure, Stainless Steel Nut bolts, Civil works 5.4 kW</p> <p>DC Wire: 4mm² XLPE/PVC/Tin Coated Copper Single Core 600/1000V DC (As per Actual)</p> <p>AC Wire: XLPE/PVC AC Wire for Inverter & Bus Bar Connections (As per Actual)</p> <p>Electrical Installation: Cable Conduits, Cable Ties etc, PVC Bends, Ducts, Flexible Pipes, MC4 connectors etc Job</p> <p>Earthing Bores, Copper Wire, Grounding Wire & Lightning Arrestors 1</p> <p>Net Meter documentation, installation & all dealings with respective DISCO 1</p>
4	Solar Hybrid 10Kw	<p>Tier A Monocrystalline, Half Cut PV Modules 10 kW (Jinko/Canadian/Longi/Trina Solar or equivalent)</p> <p>T10-HV Hybrid Maintenance Free Three Phase Inverters 1 (Alpha ESS Smile or equivalent)</p> <p>Batteries: Smile BAT 8.2 kWh Li-Ion Storage Modules with 90% recommended DOD 1</p> <p>Structure: GI fixed tilt roof mounted structure, Stainless Steel Nut bolts, Civil works 10 kW</p> <p>DC Wire: 4mm² XLPE/PVC/Tin Coated Copper Single Core 600/1000V DC (As per Actual)</p>

		AC Wire: XLPE/PVC AC Wire for Inverter & Bus Bar Connections (As per Actual) Electrical Installation: Cable Conduits, Cable Ties etc, PVC Bends, Ducts, Flexible Pipes, MC4 connectors etc Job Earthing Bores, Copper Wire, Grounding Wire & Lightning Arrestors 1 Net Meter documentation, installation & all dealings with respective DISCO 1
5	Solar Hybrid 20Kw	Tier A Monocrystalline, Half Cut PV Modules 20 kW (Jinko/Canadian/Longi/Trina Solar or equivalent) T10-HV Hybrid Maintenance Free Three Phase Inverters 1 (Alpha ESS Smile or equivalent) Batteries: Smile BAT 8.2 kWh Li-Ion Storage Modules with 90% recommended DOD 1 Structure: GI fixed tilt roof mounted structure, Stainless Steel Nut bolts, Civil works 20 kW DC Wire: 4mm ² XLPE/PVC/Tin Coated Copper Single Core 600/1000V DC (As per Actual) AC Wire: XLPE/PVC AC Wire for Inverter & Bus Bar Connections (As per Actual) Electrical Installation: Cable Conduits, Cable Ties etc, PVC Bends, Ducts, Flexible Pipes, MC4 connectors etc Job Earthing Bores, Copper Wire, Grounding Wire & Lightning Arrestors 1 Net Meter documentation, installation & all dealings with respective DISCO 1
Fire & Medical Equipment		
1	Fire Extinguisher	1. DCP type 2. CO2
2	Wheel Chairs	Chromed Steel Frame, Fixed Armrest, Fixed Footrest, Aluminum Foot Plate, 8" PVC Solid Front Castor, 46CM seat width, 24" Spoking Solid Wheel / Solid Mag Rear Wheel Stainless Steel Plate, PVC seat and back
3	Stretchers	Stretcher Type: Simple stainless steel Straight Stretcher Trolley: Chromed Steel side guard & cylinder holder.
Vehicles		
1	Lawn Mover	Providing Lawn mower tractor (Tractor + Lawn Mower + accessories)
2	Tipping Trolley	Tractor and Hydraulic tipping trolley
3	Coaster	Vehicles for academy - 1 coaster 4th generation 29 seated Higher-end Coaster 4000 CC (Toyota or Equivalent) Coaster: Speed Manual floor shift Transmission, 4.2 L Engine,

		29-seater, Air conditioner	
4	Hiace Van	Vehicle for academy - Hiace Van 2.5 Ltr-2.75 Ltr) Hiace Deluxe standard High Roof Tourer (Toyota or Equivalent) Hiace Deluxe: 14-Seater, 4 Cylinder, Inline Diesel Engine, 16 Valve DOHC, Automatic Transmission.	
5	Sedan Vehicle	Vehicle for academy - sedan (1300 CC) Sedan: (Toyota or Equivalent) 1329 CC, 4 Cylinder inline, 16 Valve DOHC, Chain Drive with Dual VVT-i INR-FE Engine' 7 speed CVT, Front disc brakes rear drum with ABS & EBD, Power Steering, Power Window, CD player with Bluetooth, Power side view mirror.	
6	Van	Vehicle for academy - Suzuki Ravi carry van (800 CC) Ravi VX 800CC Euro II, or Equivalent Security System immobilizer, Commercial.	
7	Bike	Vehicle for academy - Bike (100 CC) Honda Engine: 4-Stroke OHC Air-Cooled Transmission: 4-Speed Constant Mesh Starting: Kick Starter Final Drive: Roller Chain Fuel Tank Capacity: 9.7 Liters (Reserve: 1.5 Liters) Suspension at Front: Telescopic Fork 94 mm Travel Suspension at Back: Swing Arm 84 mm Travel	
8	Mobile Trolley	Providing, fixing, testing and commissioning of Mobile Trolley comprises of 3 Nos. of 16" dia Servis Tyres with MS Rims and Cast-Iron Hubs, Non-Clogging Horizontal Centrifugal Pump of 0.5 cusec capacity coupled with Engine in-line arrangement, Steering Handle, Hook, with Jaw and Padding Type (Cast Iron) Coupling with Rubber Neoprene Pads complete in all respects.	
Furniture			
1	Officer Table with Drawer Trolley	Size: 1200 x 600 x 760 mm Structure made of 25 x 50 mm mild steel rectangular pipe. Finished with black powder coating. Top & Back made MDF pressed with lamination on both sides. Edges covered with matching 1 mm pvc. b. DRAWER TROLLEY Standard size: All made of MDF pressed with lamination on both sides. Having 1 drawer and 1 cabinet for box file. 1 Set (1 Table + 1 Drawer Trolley)	

2	Officer Table with Side Rack & Drawer Trolley	Size: 1200 x 600 x 760 mm Structure made of 25 x 50 mm mild steel rectangular pipe. Finished with black powder coating. Top & back made MDF pressed with lamination on both sides. Edges covered with matching 1 mm pvc. With one drawer. b. SIDE RACK Size: 820 x 390 x 760 mm Complete structure made of MDF pressed with lamination on both sides. With one door and one shelf. 1 Set (1 Table + 1 Side Rack)
3	U-Shape Meeting Room Table For 40 Persons	Size: 40' x 6.5' x 2.5' Top/back made of MDF pressed with lamination on both sides. Edges covered with matching PVC. Structure made of 18-gauge rectangular mild steel pipe. Finished with black powder coating. With 10 electric sockets.
4	Round Table For 6 Persons (Activity Room)	Size: 4 Ø Structure made of 38x38 mm mild steel sq. pipe Top made of high density chipboard pressed with one side formica and other side sh. veneer.
5	Reception Desk	Size: 6' x 3' x 4' Top / structure made of MDF pressed with lamination on both sides. Edges covered with matching PVC.
6	Revolving Chair Mod. Wsc/B-9	Seat cushioned 1st quality foam covered with leatherite & back with black mesh. Complete with high quality revolving pedestal. With arms. Low back chair.
7	Officer Revolving Chair Mod. 0.39-Pp	High back chair with PP arms. Seat & cushioned with black leatherite. Completed with high quality revolving pedestal.
8	Activity Chair Mod.0.34 Armless (Cushioned)	Structure made of 20/20 mm mild steel square pipe. Finished with silver paint. Seat/back made of solid seasoned shisham wood, cushioned with leatherite
9	Rostrum Mod. Special	Size: 620 x 550 x 1170 mm (H) Structure made of high-density chipboard pressed with sh. veneer on both sides. With one shelf. Finished with N.C. lacquer TEVTA
10	Meeting Room Table For 12 Persons	Size: 12' x 6' x 2.5' Top / structure made of MDF pressed with lamination on both sides. Edges covered with matching PVC.
11	Visitor / Meeting Chair	Structure made of 25/25 mm mild steel square pipe. Finished with N.C. paint. Seat and back made

	with Arm Mod.0.30 New Mf	of solid seasoned wood cushioned with leatherite. With arms 20
12	U-Shape Meeting Room Table For 30 Persons	Size: 30' x 6.5' x 2.5' Top/back made of MDF pressed with lamination on both sides. Edges covered with matching PVC. Structure made of 18 gauge rectangular mild steel pipe. Finished with black powder coating. With digital box 10 Nos.
13	Meeting Room Table For 8 Persons	Size: 8' x 6' x 2.5' Top / structure made of MDF pressed with lamination on both sides. Edges covered with matching PVC.
14	Round Table For 6 Persons (Activity Room)	Size: 4 Ø Structure made of 38x38 mm mild steel sq. pipe Top made of high-density chipboard pressed w
15	Centre Table Mod. Wsc/Ri/2013	C.T Size: - 1200x600x450 mm (H). Structure made of high-density chipboard, pressed with shisham veneer on both sides. With solid seasoned sh. wood beading. With Glass top. Finished with N.C. lacquer.
16	5-Seater Sofa Mod. Wsc/Ri/2013	Inner structure made of solid seasoned wood. Fully cushioned with foam covered with leatherite. 1 Set (2 single seater + one 3-seater)
17	Study Table Mod.0.8080 Mf Formica	Size: 1200 x 600 x 760 mm (H) Top made of high-density chipboard pressed with one side formica and other side veneer. Structure made of 25/25 mm mild steel square pipe. Finished with N.C. silver paint.
18	Revolving Chair Mod. Wsc/B-9	Seat cushioned 1st quality foam covered with leatherite & back with black mesh. Complete with high quality revolving pedestal. With arms. Low back chair.
19	Single Bed with Side Table Mod. B-2 /B-3 A (Without Mattress)	Size: 1980 x 990 mm (Inside) Foot/head board made of high-density chipboard, pressed with shisham veneer on both sides, legs made of solid seasoned shisham wood. Side rails made of block board. Finished with N.C. lacquer. Foam mattress resting on 19 mm thick chipboard. Without foam mattress.
20	Bed Side Table Mod. B-3 A	Size: 580 x 435 x 620 mm (H) Structure made of high-density chipboard, pressed with shisham veneer on both sides, with one drawer, wooden footing. Finished with N.C. lacquer.
21	Single Bed Mattress	MOLTY ORTHO 4"
22	One set: Two Bedsheets + Two Pillows + Two Pillow Covers:	Bed sheet with 2 covers a) T-150 b) Non- Iron c) Wrinkle Resistance d) High Strength e) Durable

		<p>Pillows</p> <p>a) Cover material: same as bedsheet</p> <p>b) Size: 18 x 25 Inches</p> <p>c) Filling: 100% Polyester Ball Fiber</p> <p>d) Allergic Free Long Lasting Plush & Comfy Feel</p> <p>e) Made of soft to touch fabric</p>	
23	Blankets	<p>Double Bed Blanket Ply: 2 Ply</p> <p>Size: 220x240 Cm</p>	
24	Quilt with cover	<p>1. Single person quilt polyester</p> <p>2. Cover</p>	
25	Chadar	<p>Single person cotton,</p> <p>Good Quality.</p>	
Civil Works			
1	Murram Soil for Jogging Track	<p>Providing and laying stone dust of approved quality and grade including, placing, leveling, and spreading of stone dust material to required depth and grade complete in all respect as per specifications and as directed by the engineer incharge. (Stone dust from Dina quarry to site, actual compacted depth shall be considered for payment)</p>	
2	Chamber	<p>Construction of chambers 3' x 3' x 4' deep including RCC cover and frame, 9" thick brick masonry walls set in 1:3 cement mortar, 6" thick cement concrete 1:4:8 & 1:2:4, RCC slab (1:2:4), cement plaster 1:3 to all inside wall surfaces and top curing, excavation, backfilling and disposal of surplus earth etc. complete in all respect as shown in drawing.</p>	
3	Level Indicator	<p>Providing and installing of Level Indicator complete with Steel pully, Steel Wire, Gauge Unit including all accessories such as G.I. Pipe, level indicator needle & anchoring arrangement with Float, jointing material as per drawing and/or directed by the Engineer complete in all respect</p>	
4	OHT Disinfectant	<p>Clean, test and disinfect overhead water tank.</p>	

Section 6: Annexure-C
Environmental Management Plan
(EMP)



Punjab Intermediate Cities Improvement Investment Project

ADB



Up-Gradaation of Punjab Local Government Academy (PLGA), Campus at Lalamusa

Environmental Management Plan (EMP)

May, 2023

Table of Contents

1	SECTION 1: PROJECT DESCRIPTION	1
1.1	Project History and Background	1
1.2	Project Location	1
1.3	Objectives	2
1.4	Scope of Work.....	3
1.5	Components of Punjab Local Government Academy	3
1.6	Project Cost	3
2	SECTION 2: SUMMARY OF IMPACTS.....	4
2.1	Potential impacts of the proposed project	4
3	SECTION 3 DESCRIPTION OF PROPOSED MITIGATION MEASURES.....	6
3.1	Mitigation Measures	6
4	SECTION 4: DESCRIPTION OF MONITORING PROGRAM AND PARAMETERS.....	15
4.1	Monitoring Plan.....	15
5	SECTION 5: DESCRIPTION OF THE INSTITUTIONAL ARRANGEMENTS AND REPORTING REQUIREMENT	23
5.1	Institutional Arrangement.....	23
5.1.1	Organizational Set-up.....	23
5.1.2	Role and Responsibilities of PMU/ EC	24
5.1.3	Responsibilities of the Environmental Committee	25
5.1.4	Responsibilities of Environmental Engineer of Supervision Consultant	25
5.1.5	Responsibilities of Site Environmental Engineer of Construction Contractor.....	25
5.1.6	Non-Compliance of the EMP	26
5.1.7	EMP Reporting and Review	26
5.2	Environmental Technical Assistance and Training Plan	27
6	SECTION 6: ESTIMATED COST OF EMP.....	29
6.1	Cost of Environmental Monitoring	29
6.2	Cost of Health and Safety.....	32
6.3	Cost of EMP	33

List of Figures

Figure 1-1: Location of PLGA, Lalamusa.....	1
Figure 5-1: Organizational Setup for Implementation of EMP.....	24

List of Tables

Table 2.1: Summary of Potential Impacts of the Project	5
Table 3.1: Environmental Mitigation Plan.....	7
Table 4.1: Environmental Monitoring Program.....	21
Table 5.1: Reporting during implementation and operation stages	26
Table 5.2: Personnel Training Program	28
Table 6.1: Cost Estimate for Environmental Monitoring During the Construction and Operational Phases	30
Table 6.2: Health and Safety Cost	32
Table 6.3: Break-up for PPEs Cost	32
Table 6.4: Environmental Management Cost.....	33

1.3 Objectives

The Punjab Intermediate Cities Improvement Investment Program (PICIIP) aims to improve the quality of life of the residents living in selected cities of Punjab by addressing urban development challenges at city level including:

- integrated planning;
- improved institutional framework for urban services;
- strengthened business processes of utilities; and
- Improved urban infrastructure and services including safe, reliable, and widely available water supply, waste water management, solid waste management and urban transport infrastructure and services.

The Government of Punjab's (GoPb's) vision is to develop cities with upgraded sustainable infrastructure and connectivity for faster economic growth and higher productivity with an enhanced opportunity for inclusive growth and sustained quality of life for its citizens.

The vision of the Government is to make urban centers the engines of national growth, centers of economic activity and knowledge, and focal points for cultural change.

The overall program for PICIIP is in line with Pakistan Vision 2025, Govt. of Pakistan, Punjab Growth Strategy 2018 and Punjab Urban Development Sector Plan 2018.

The proposed investment program for PICIIP is based on the Government of Pakistan's (GOP) Vision 2025 which aims at transforming the urban areas into creative eco-friendly sustainable cities through improved city governance, effective urban planning, efficient local mobility infrastructure and better security to make urbanization an important driver of growth. Similarly, the Punjab Growth Strategy 2018 envisions sustained improvement in living standards in cities. It is linked to Sustainable Development Goals (SDG-11 Sustainable cities and communities) which states "to make cities inclusive, safe, resilient and sustainable".

Objective for up-gradation of Punjab Local Government Academy (PLGA) in Lalamusa are as follows

- To prepare adequate Space to conduct capacity building programs, seminars, conference and workshops for professional knowledge sharing and capacity building of officers of Local Government.
- To functionalize the office facility for officers from local Government and Local Government Board and elected officials.
- Interaction with international organizations for academic excellence and professional training needs of officers.
- Development of Staff Training curriculum and to build a connection between different stake holders.
- To develop labs for introduction of new short professional courses especially related to smart city components and machinery.
- To provide the necessary furniture, Electrical, IT and other Equipment for efficient use of Training Academy.

1.4 Scope of Work

The proposed site for PLGA is located in Lalamusa having geographic coordinates 32°43'5.40"N and 73°56'28.75"E, With an area of 328 Kanal (41 acres). The land is owned by the Local Government Board, LG&CD Department, Government of the Punjab.

1.5 Components of Punjab Local Government Academy

Below are the existing and new infrastructure facilities in the PLGA and future requirements of each building. The future needs of the buildings have been developed in consultation with the PLGA Lalamusa faculty.

The available buildings in premises of the academy:

1. Administration Block
2. Usman Academic Block
3. Umer Block
4. Haider Academic Block (New Building constructed under ADP Scheme)
 - i. Training center
 - ii. Hafeez Arain Research and Development Center
 - iii. Allama Iqbal E-Library and IT center
5. Abu Bakar Hostel
6. Fatima Jinnah Hostel
7. Ayesha Executive Hostel (New building ADP scheme)

2 SECTION 2: SUMMARY OF IMPACTS

2.1 Potential impacts of the proposed project

This section presents summary of the potential impacts anticipated to be produced due to construction of the PLGA building during construction and operational phase.

The potential impacts of the construction and operation of the proposed project summarized in Table 2.1 arise primarily due to the civil works during the construction phase of the proposed project. The short-term construction impact includes noise and vibration, dust, traffic jams, disturbance to nearby educational, religious and health institution, risk of worker and public safety, local soil erosion, solid & liquid waste management and ground water contamination. These impacts can be managed and mitigated with Mitigation Plan as given in Section 3.

Table 2.1: Summary of Potential Impacts of the Project

Activities	Potential Impacts	Level of Impacts	The affected Environment
Construction Phase			
Site clearing/ excavation	Soil erosion, occupational health of workers and community, disturbance to public utilities, uprooting of sixteen plants, generation of dust, air pollution, noise and vibration	This impact is medium adverse and short term and can be alleviated by applying appropriate mitigation measures.	Ambient air, adjacent buildings, students and patients in nearby institutes and hospital, land in the project area and workers & nearby community
Functioning of Construction Workers Camps	Waste Generation, air pollution due to waste burning at camp site, Discharge of sanitary effluent and rainwater run-off, Soil Erosion & Contamination, transmission of diseases from the workers to the community, Social Conflicts, Temporary visual Intrusion, Noise level increase at a single location and associated disturbance to sensitive receptors;	The impact is medium adverse and can be prevented after applying mitigation assures.	Air, groundwater & land of the project area and nearby community
Storage of construction material, excavated waste and construction debris including hazardous waste	Soil and groundwater contamination, air pollution, health & safety risks	Medium adverse but controllable	Land, air, water, workers and community
Transportation of construction materials and residual soils	Generations of dust and gaseous emission from transportation machinery, traffic issues, littering of waste and accidental oil spilling from vehicles, occupational health & safety risks	Low adverse and mitigation can be more easily applied	Air, Land, workers & nearby community
Maintenance of vehicles and machines	Waste oil and other hazardous waste from the maintenance of vehicles and construction machines	The impact is medium adverse and can be prevented after applying mitigation measures.	Soil, Groundwater and Workers
Project structural construction and finishing	Airborne Emissions, noise, accidental fire, leakage and spillage of paints or other hazardous materials, water consumption	The impact is medium adverse and can be prevented after applying mitigation measures.	Air, groundwater, workers & nearby community

3 SECTION 3 DESCRIPTION OF PROPOSED MITIGATION MEASURES

3.1 Mitigation Measures

This section sets out clear and achievable targets and mitigation measures required to control the impacts on each parameter of the environment. Table 3.1 depicts impacts, targets, mitigations and the responsible authorities for the implementation of the mitigation measures during design, construction and operational phases.

Table 3.1: Environmental Mitigation Plan

Sr. No.	Parameters	Target	Mitigation	Responsibility
<i>Construction Phase</i>				
1.	Soil	To minimize soil erosion and contamination.	<ul style="list-style-type: none"> ▪ Confining excavations to the specified spots as per the approved engineering drawings and unnecessary excavations should be avoided; ▪ Excess spoil should be reused where possible and residual spoil can be disposed of at designated site to prevent erosion; ▪ Oil separators should be installed at equipment or machinery washing yards to prevent soil contamination from oily water; ▪ Septic tanks of adequate capacities should be constructed for receiving and treating wastewater from all temporary worksite toilets and construction camps to avoid soil contamination; and ▪ Regular inspection of the wastewater disposal from construction camps. 	<ul style="list-style-type: none"> • CC • EE of SC • EC
2.	Air Quality and Dust	To minimize air pollution and maintain the air quality.	<ul style="list-style-type: none"> ▪ All excavation work should be regularly sprinkled with water to control dust. ▪ All vehicles, machinery, equipment and generators to be used during construction activities should be kept in good working condition and be properly tuned and maintained in order to minimize the exhaust emissions; ▪ All vehicles, machinery and equipment to be used for the construction should be plugged off or switched off immediately after completion of their work to avoid idling condition; ▪ Filters should be installed at the point sources (machinery or equipment's) of air emissions and 	<ul style="list-style-type: none"> • CC • EE of SC • EC

Sr. No.	Parameters	Target	Mitigation	Responsibility
			<p>should be replaced regularly;</p> <ul style="list-style-type: none"> ▪ Open burning of solid waste from the contractor's camps should be strictly banned; ▪ Only good quality oils, petroleum products, additives and spares should be used in the machinery, generators, and the construction vehicles. Usage of used oil should be strictly prohibited; ▪ PEQS applicable to gaseous emissions generated by construction vehicles, equipment and machinery should be enforced during construction works; and ▪ Air emission monitoring program for NO_x, SO₂, CO and PM₁₀ should be undertaken by the construction contractor, according to the programme specified in the Environmental Management Plan (EMP). 	
3.	Noise	To minimize the impacts of noise due to construction activities.	<ul style="list-style-type: none"> ▪ Selection of up-to-date and well maintained plant or equipment with reduced noise levels ensured by suitable in-built damping techniques or appropriate muffling devices; ▪ Confining excessively noisy work after school/office timing or on holidays, as far as possible; ▪ Providing the construction workers with suitable hearing protection like ear cap, or earmuffs and training them in their use; ▪ Heavy machinery like percussion hammers and pneumatic drills should not be used during the night without prior approval of the Client; ▪ Vehicles and equipment used should be fitted, as applicable, with silencers and properly maintained; ▪ Use of low noise machinery, or machinery with noise shielding and absorption; ▪ Contractors would comply with submitted work schedule, keeping noisy operations away from sensitive points; implement regular maintenance and repairs; and employ strict implementation of operation procedures; 	<ul style="list-style-type: none"> • CC • EE of SC • EC

Sr. No.	Parameters	Target	Mitigation	Responsibility
4.	Water Resources and Quality	To protect the ground water resources from any kind of pollution due to project.	<ul style="list-style-type: none"> ▪ Water required for construction should be obtained in such a way that the water availability and supply to nearby communities remain unaffected; ▪ Continuous withdrawal and over pumping of groundwater should be avoided. Instead, intermittent pumping be carried out to conserve the groundwater resources; ▪ Regular water quality monitoring should be carried out according to determined sampling schedule; ▪ All practical measures such as provision of septic tanks, garbage cans and other sanitation facilities should be implemented at the construction camps to prevent the wastewater and solid wastes from entering groundwater recharge areas; ▪ The contractor shall ensure that construction debris do not find their way into the drainage channel which may get clogged; ▪ Any spills should be cleaned and disposed of properly; and ▪ Open washing of machinery and vehicles should be prohibited, sealed washing basins should be provided and wastewater should be collected in sedimentation/retention pond. 	<ul style="list-style-type: none"> • CC • EE of SC • EC
5.	Solid Waste (Construction, Municipal and Hazardous Waste)	To avoid/minimize nuisance and environmental pollution in the project area due to solid waste.	<ul style="list-style-type: none"> ▪ Solid waste generated during construction and camp sites should be safely disposed of at designated waste disposal sites; ▪ Training of employees involved in the transportation of hazardous material regarding emergency procedures should be ensured; ▪ Construction workers and supervisory staff should be encouraged and educated to practice waste minimization, reuse and recycling to reduce quantity of the waste; ▪ A comprehensive plan for construction waste management should be adopted; and ▪ Waste disposal plan must be reviewed during the 	<ul style="list-style-type: none"> • CC • EE of SC • EC

Sr. No.	Parameters	Target	Mitigation	Responsibility
			entire construction phase in the light of changing weather conditions.	
6.	Construction Camps	To avoid various social and environmental impacts due to mismanagement of construction camp activities.	<ul style="list-style-type: none"> ▪ Siting of construction camp in a way so as to minimize the removal of existing macro-plants at camp sites and to avoid conflicts between residents; ▪ Formulation and implementation of a training program for the workers residing in construction camps comprised of a brief on camp rules, an orientation on awareness about the local area and its cultural norms; ▪ Formulation and implementation of a comprehensive safety and security plan for the camps which should be comprised of a training manual, use of safety equipment, emergency preparedness and code of ethics; ▪ Formulation and implementation of Waste Management Plan to ensure safe handling, storage, collection and disposal of construction wastes and the training of employees who handle waste; ▪ Camps should be designed to be self-contained to reduce demand on infrastructure and services of nearby communities; ▪ Preparation of photographic and botanical inventory of vegetation before clearing the site; and ▪ Compensatory plantation to be scheduled when construction work near ends. 	<ul style="list-style-type: none"> • CC • EE of SC • EC
7.	Discovery of Heritage Sites during Excavation	To preserve social and cultural heritage sites from damage due to project activities.	<ul style="list-style-type: none"> ▪ In case of finding any artifact, the contractor shall immediately report through Supervision Consultant to Directorate General (DG) of Archeological Department, Government of Pakistan to take further suitable action to preserve those antiques or sensitive remains. Chance finds procedure shall be adopted in case of any accidental discover of cultural heritage. 	<ul style="list-style-type: none"> • CC • EE of SC • EC Archeological Department
8.	Excavation	To avoid damaging infrastructure in the surroundings of the project	<ul style="list-style-type: none"> ▪ Soil investigation study should be carried out before construction; 	<ul style="list-style-type: none"> • CC • EE of SC

Sr. No.	Parameters	Target	Mitigation	Responsibility
		area	<ul style="list-style-type: none"> ▪ Unnecessary excavation should be avoided; ▪ Excavations should be carried out as per approved engineering drawings; ▪ Excavations should be carried out carefully to avoid damaging infrastructure of the existing adjacent buildings; and ▪ Temporary retaining structures should be provided 	<ul style="list-style-type: none"> • EC
9.	Flora and Fauna	To minimize the destruction of floral species and save the faunal species in the project area.	<ul style="list-style-type: none"> ▪ Sixty Four trees/plants will be raised in place of sixteen uprooted trees/ plants. Campsites will be established on vacant land as far as possible. ▪ The Contractor's staff and labour will be strictly directed not to damage any vegetation such as trees or bushes. ▪ Contractor will provide gas cylinders at the camps for cooking purposes and cutting of trees/bushes for fuel will not be allowed. ▪ Hunting, poaching and harassing of wild animals will be strictly prohibited and Contractor will warn their labour accordingly. ▪ The camp will be properly fenced and gated to check the entry of stray dogs, cats and other animals in search of eatable goods. Similarly, wastes of the camps will be properly disposed off to prevent the chances of eating by wild animals, which may become hazardous to them. ▪ Special measures will be adopted to minimize impacts on the wild birds, such as minimizing noise generating activities 	<ul style="list-style-type: none"> • CC • EE of SC • EC
10.	Visual Impacts & Aesthetics	To minimize negative impacts on aesthetic of the area due to project activities To minimize visual intrusion from large piles of excavated and construction material	<ul style="list-style-type: none"> ▪ The area demarcated for proposed project should be fenced and all the construction activities should be restricted within the demarcated site; ▪ Condition of the site approach road should be improved and same should be kept free of dust and mud through implementation of dust suppression measures; and ▪ Material stockpiles should be removed as soon as 	<ul style="list-style-type: none"> • CC • EE of SC • EC

Sr. No.	Parameters	Target	Mitigation	Responsibility
			<p>work is completed and the area re-landscaped to minimize visual intrusion from large piles of excavated and construction material</p> <ul style="list-style-type: none"> All temporary structures, surplus materials and wastes should be completely removed on completion of works. 	
11.	Traffic Management	To avoid traffic jams and congestion due to project activities.	<ul style="list-style-type: none"> Proper traffic management plan to avoid traffic congestion/public inconvenience, should be prepared and implemented. 	<ul style="list-style-type: none"> CC EE of SC EC Traffic police department
12.	Social/Cultural Conflicts	To minimize chances of disputes related to social cultural differences between the Contractor's workforce and the local inhabitants	<ul style="list-style-type: none"> Local labor should be preferably employed for the construction works; Careful planning and training of work force to minimize disturbance to the local people; and Public notification through print or electronic media during the entire construction phase to avoid any inconvenience in accessibility to the locals. 	<ul style="list-style-type: none"> CC EE of SC EC
13.	Health and Safety	To minimize health risks to workers and associated communities.	<ul style="list-style-type: none"> Obligatory insurance against accidents for laborers/workers; Provide basic medical training to specified work staff and basic medical service and supplies to workers; Prepare layout plan for camp site, indicating safety measures taken by the contractor, e.g. firefighting equipment, safe storage of hazardous material, first aid, security, fencing, and contingency measures in case of accidents; Work safety measures and good workmanship practices should be followed by the contractor; Construction workers should be provided with masks for protection against the inhalation of dust Ear muffs should be provided to the workers doing job in the vicinity of high noise generating machinery or equipment; 	<ul style="list-style-type: none"> CC EE of SC EC

Sr. No.	Parameters	Target	Mitigation	Responsibility
			<ul style="list-style-type: none"> ▪ Provision of adequate sanitation, washing, cooking and dormitory facilities in the camps; ▪ Provision of Personal Protective Equipment (PPEs) including protective clothing for laborers handling hazardous materials, e.g. helmet, masks, adequate footwear for bituminous pavement works, protective goggles and gloves; ▪ Ensure strict use of protective clothing and equipment during construction activities; ▪ Elaborate a contingency plan in case of major accidents; ▪ Ensure availability of adequate signage, lightning devices, barriers and marking tape during the entire construction phase to manage traffic at construction sites and access roads; ▪ All potable drinking water supplies to be tested regularly on monthly basis during the entire construction phase; ▪ Provision of first aid facility and ensuring its cleanliness and disinfection; and ▪ Ensuring the availability of a dispenser at the active construction site throughout the construction period to provide emergency treatment. ▪ There should be proper control on construction activities and particularly oil spillage/ leakage of vehicles, machinery and equipment; ▪ All labour must be medically checked so that if they interface with the local communities, undesirable transmittable disease does not spread; ▪ The labourers with different transmittable diseases should be restricted to the construction site only; ▪ Efforts should be made to create awareness about road safety among the drivers operating construction vehicles; ▪ Timely public notification of planned construction works; 	

Sr. No.	Parameters	Target	Mitigation	Responsibility
			<ul style="list-style-type: none"> Provision of proper safety and diversion signage at sensitive/accident-prone spots; Setting up speed limits in the construction areas in close consultation with the local stakeholders; Keeping out of non-working persons, particularly children, off work sites; The communicable disease of most concern during construction phase, like sexually-transmitted disease (STD) such as HIV/AIDS, should be prevented by successful initiative typically involving health awareness; education initiatives; training health workers in disease treatment; immunization program and providing health service; and Efforts should be made to prevent the spread of vector borne diseases through implementation of diverse interventions aimed at eliminating the factors that lead to disease, which include prevention of larval and adult propagation of vectors through sanitary improvements and elimination of breeding habitat close to human settlements and by eliminating any unusable impounding of water. 	
14.	Emergency Response to Natural and Man-made Disasters	To prepare a response plan in case of natural or man-made disasters.	<ul style="list-style-type: none"> Emergency Response Plan should be formulated and implemented by the contractor in close consultation with the District Rescue Service, fire-fighting department, bomb disposal squad and paramedics. In addition, training of the staff/employees regarding the emergency procedures/plans should be regularly conducted. 	<ul style="list-style-type: none"> CC EE of SC EC

KEY

DC	Design Consultant
EC	Environmental Committee
WASA	Water and Sanitation Agency
EE of SC	Environmental Engineer of Supervision Consultant
LG&CDD	Local Government and Community Development Department

CC	Construction Contractor
PMU	Program Management Unit
LWMC	Lahore Waste Management Company

4 SECTION 4: DESCRIPTION OF MONITORING PROGRAM AND PARAMETERS

4.1 Monitoring Plan

Monitoring will be carried out to ensure that the mitigation plans are regularly and effectively implemented. It will be performed at three levels. At the PMU level, the environmental committee will do EMP monitoring to ensure that the mitigation plans are being effectively implemented. The environmental engineer of Supervision Consultant will regularly monitor the EMP implementation by the contractor. At contractor's level, the environmental monitoring checklist will be filled on daily basis by their environmental manager and countersigned by environmental engineer of Supervision Consultant.

Table 4.1 outlines the parameters that will be monitored, expected frequencies of monitoring and responsible agency for monitoring.

Table 4.1: Environmental Monitoring Program

Parameter	Location	Means of Monitoring	Frequency	Responsible Agency		Cost
				Implementation	Supervision	Rs.
Construction Phase (8 Months)						
Groundwater quality	Tap water from adjacent building	Sampling and analysis of groundwater for all the parameters as given in PEQS	Quarterly	Contractor	EE of SC EC of PMU	78,000/- @ Rs. 26,000/ sample
Air Quality (dust, smoke)	Along the access and at project site	Visual inspection to ensure good standard equipment is in use and dust suppression measures(sprinkling) are in place	Quarterly	Contractor	EE of SC EC of PMU	No Marginal Cost
	Along the access road	Visual inspection to ensure dust suppression work plan is being implemented	Quarterly	Contractor	EE of SC EC of PMU	No Marginal Cost
Air Quality (PM ₁₀ , NO ₂ , SO ₂ , CO ₂ , CO)	At project site	Air quality monitoring for 24hours for the parameters specified in NEQS	Quarterly	Contractor	EE of SC EC of PMU	136,200/ @ Rs. 45,400/ sample
Noise and vibration	Close to noise generating equipment and road	24hour noise monitoring through EPA certified laboratory	Quarterly	Contractor	EE of SC EC of PMU	15,000/-@ Rs. 5,000/point
		Field observation	Quarterly	Contractor	EE of SC EC of PMU	No Marginal Cost
Waste Management	Storage and camp area	Visual inspection that solid waste is disposed of at designated sites	Quarterly	Contractor	EE of SC EC of PMU	No Marginal Cost
Spills from hazardous	Storage area	Visual inspection for leaks and spills	Quarterly	Contractor	EE of SC EC of PMU	No Marginal Cost

Parameter	Location	Means of Monitoring	Frequency	Responsible Agency		Cost
				Implementation	Supervision	Rs.
liquid storage						Cost
Road Traffic safety	Along the road	Visual inspection to ensure Traffic Management implemented	Weekly	Contractor	EE of SC EC of PMU	No Marginal Cost
Drinking water and sanitation	At construction camps	Visual inspection	Weekly	Contractor	EE of SC EC of PMU	No Marginal Cost
Safety of workers	At active construction sites	Visual inspection to ensure use of PPEs by workers	Daily	Contractor	EE of SC EC of PMU	No Marginal Cost
Reinstatement of work sites	---	Visual inspection	After completion of all works	Contractor	EE of SC EC of PMU	No Marginal Cost

5 SECTION 5: DESCRIPTION OF THE INSTITUTIONAL ARRANGEMENTS AND REPORTING REQUIREMENT

5.1 Institutional Arrangement

5.1.1 *Organizational Set-up*

The following functionaries will be involved in the implementation of EMP;

- Program Management Unit (PMU) / Environmental Committee (EC);
- Supervision Consultant's Environmental Engineer;
- Contractor's Site Environmental Engineer;

Organizational set-up for implementation of EMP is shown in Figure 5.1

PMU will be overall responsible for implementation of EMP. PMU will form up an Environmental Committee (EC), which will be responsible for the environmental management and supervisory affairs during the construction phase of the proposed project. For effective environmental management, the PMU will assign the necessary responsibilities to an Environmental Committee (EC) through Project Director, which will be responsible for monitoring of EMP. The Project Director will be assisted by an Environmental Expert and a Social Expert in implementing the mitigation measures proposed in EMP.

The Contractor will be responsible for the implementation of EMP under the Supervision Consultant. The Contractor should be bound to follow the provisions of the contract documents especially about environmental protection and apply good construction techniques and methodology without damaging the environment. Obligation of the contractor, to safeguard, mitigate adverse impacts and rehabilitate the environment should be addressed through environmental provisions in the contract document and through adequate implementation at site. Regulatory Authority will be responsible for compliance of implementation of EMP.

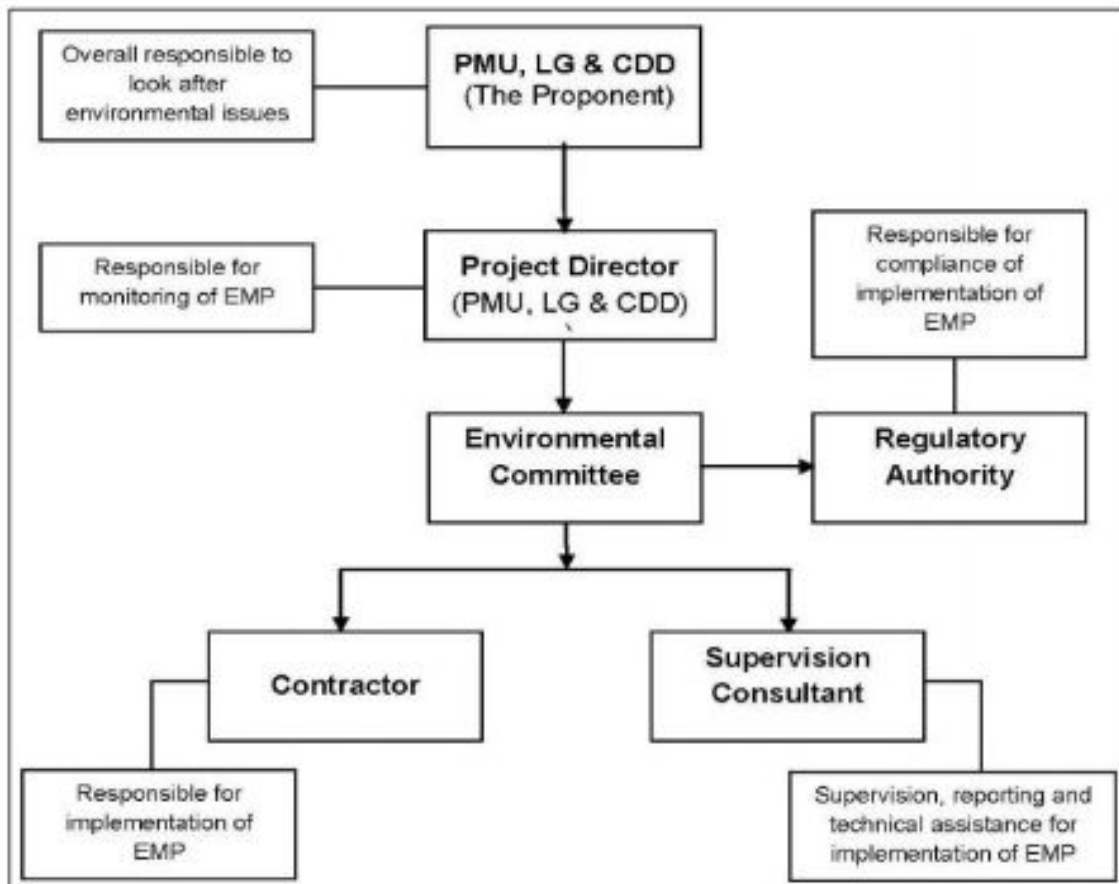


Figure 5-1: Organizational Setup for Implementation of EMP

5.1.2 Role and Responsibilities of PMU/ EC

A Program Management Unit (PMU)

Design and Construction of the project is the core responsibility of PMU-PICIIP, Local Government and Community Development Department (LG & CDD). The major role and responsibilities related to environment and social tasks are as under;

- To ensure that the Project design and specifications adequately reflected in the EMP along with the resettlement/compensation provisions documents.
- To ensure the Project compliance with the environmental regulations and donor requirements;
- To ensure that the TOR for the Supervisory Consultants adequately cover the environmental and social issues; and
- Approval of compensation budgets.

B Project Director (PD)

The specific responsibilities of Project Director are as follows:

- Setting up systems for environmental management;
- Ensuring that the Contractor(s) develop and carry out environmental implementation Plans that are consistent with the EMP;

5.1.3 Responsibilities of the Environmental Committee

The responsibilities of the Environmental Committee (EC) are as follows:

- Ensuring implementation of all the mitigation measures proposed in the EMP during the construction of the proposed project;
- Monitoring progress of the project as per planned schedule of activities;
- Exercising oversight over the implementation of environmental mitigation measures by the contractor;
- Assisting the Environmental Specialist by providing appropriate environmental advice and solutions;
- Documenting the experience in the implementation of the environmental process;
- Maintaining interfaces with the other lined departments/ stakeholders; and
- Reporting to the Bank/EPD on status of EMP implementation.

5.1.4 Responsibilities of Environmental Engineer of Supervision Consultant

Environmental Engineer (EE) of the Supervision Consultant (SC) will oversee the performance of contractor through periodic monitoring to make sure that the contractor is carrying out the work in accordance with EMP.

EE of SC will provide guidance to the contractor's Environmental Engineer for implementing each of the activity as given in EMP. EE of SC will be responsible for record keeping providing instruction through the Resident Engineer (RE) for corrective actions and will ensure the compliance of various statutory and legislative requirements. EE will maintain the close coordination with the contractor and EC for successful implementation with environmental safeguard measures. However, overall responsibilities of EE of SC are as follows:

- Directly reporting to the RE;
- Discussing various environmental issues and environmental mitigation, enhancement and monitoring actions with all concerned directly or indirectly;
- Inspect, supervise and monitor all the construction and allied activities related to the EMP for the project;
- Assist the RE to ensure the environmental sound engineering practices;
- Assisting contractor and EC in all matters related to public contacts including public consultation pertaining to environmental and community health & safety issues;
- Assisting EC to carry out environmental monitoring;
- Organizing training to the EE of contractor and field staff; and
- Preparing and submitting monthly and quarterly environmental progress/compliance reports to the EC.

5.1.5 Responsibilities of Site Environmental Engineer of Construction Contractor

Site Environmental Engineer of Construction Contractor will carry out the implementation of the mitigation measures at construction site. Construction Contractor will be bound through contract documents to appoint the Site Environmental Engineer with relevant educational

background and experience. Responsibilities of EE of Contractor are as follows:

- Preparing sub plans including monitoring plan, traffic control/diversion plan, site rehabilitation plans etc. and will submit all the plans to the EE of SC.
- Implementation of EMP and to take effective measures against corrective actions plan;
- Preparing the compliance reports as per schedule and will submit it to the SC;
- Providing proper Personal Protective Equipment (PPEs) to the workers and trained them for their proper use; and
- Providing environmental and health & safety trainings to the workers /labor.

5.1.6 Non-Compliance of the EMP

The implementation of the proposed EMP involves inputs from various functionaries as discussed earlier. The contractor will be primarily responsible for ensuring implementation of the mitigation measures proposed in the EMP, which will be part of the contract documents. The provision of the environmental mitigation cost will be made in the total cost of project, for which contractor will be paid on the basis of monthly compliance reports. The contractor will not be allowed to proceed further until the mitigation measures as proposed in the EMP are taken and approved by Supervision Consultant

5.1.7 EMP Reporting and Review

The Environmental Engineer of SC will prepare monthly reports covering various aspects of the EMP implementation including compliance and effects monitoring, capacity building, and grievance redressal during project implementation. List of reports to be prepared during implementation and operation stages are presented in **Table 5.1**.

Table 5.1: Reporting during implementation and operation stages

Report	Contents	Prepared by	Distribution
Monthly Progress Report for EMP Compliance	Any Non-Compliances Observed on sites and actions required	EE of SC	Contractor, EC of PMU
Monthly Progress Report for EMP Compliance	Actions taken on site in response to EE, SC monthly report Project progress and works to be Undertaken in the coming three months Details of training delivered Details of accidents reported and actions taken	Contractor	EE of SC EC of PMU
Quarterly Progress Report for EMP Compliance	Quarterly review on implementation of EMP including compliance and monitoring, capacity building, and grievance redressal	EC of PMU	Project Director of PMU, ADB, Contractor
Biannual Progress Report for EMP Compliance	Biannual reporting for OHS, including work hours, number of lost-time accidents/incidents, serious injuries and fatalities,	EC of PMU	Project Director of PMU, ADB, Contractor

Report	Contents	Prepared by	Distribution
	amount of lost time, root cause investigations, etc. There should also be some incident reporting requirements, such as for major spills, fatalities, local unrest, etc.		
Annual Report for EMP Compliance	Results of effects monitoring Independent review of environmental and social performance on site Recommended actions required by all parties	EC of PMU	Project Director of PMU, ADB, Contractor

5.2 Environmental Technical Assistance and Training Plan

In order to raise the level of professional and managerial staff, there is a need to upgrade their knowledge in the related areas. The SC will play a key role in this respect and supervise the arrangements of trainings.

An environmental and social training and Technical Assistance (TA) program is to be carried out before the implementation of the project. Contractor’s environmental awareness and appropriate knowledge of environmental protection is critical to the successful implementation of the EMP because without appropriate environmental awareness, knowledge and skills required for the implementation of the mitigation measures, it would be difficult for the Contractor(s) workforce to implement effective environmental protection measures. A suitable training program is proposed to train the Contractor(s) staff who will be involved in the Construction Phase and the professional staff from the client involved at the operational stage of the project.

The PMU, LG & CDD will engage TA consultant to manage the environmental training program. The objective of the TA will be, to help in establishment of appropriate systems, and to train senior staff and Environmental Expert responsible for managing environment, operations, and planning, who can then impart training at a broader level within and outside the LG & CDD. The TA consultant will organize training courses for client and contractor staff to train them in specialized areas such as air and noise pollution monitoring; develop environment operation manuals in consultation with the EPA Punjab. The details of this training program are presented in Table 5.2.

Table 5.2: Personnel Training Program

Provided by	Contents	Trainees/Events	Duration
TA Consultants/ organizations specializing in environmental management and monitoring	Short seminars and courses on Environmental laws and regulations daily monitoring and supervision	Three seminar for LG & CDD and Contractor staff	2 days each
TA Consultants/ organizations specializing in social management and monitoring	Short seminars and courses on: Social awareness	One seminar for project staff dealing with environmental/ social matters	2 days
TA Consultants/ organizations specializing in Occupational, health and safety issues	Short lectures relating to Occupational Safety and Health	Two seminars for contractor's staff	1 day

6 SECTION 6: ESTIMATED COST OF EMP

The cost required to effectively implement the mitigation measures is important for the sustainability of the Project both in the construction and operational phases.

6.1 Cost of Environmental Monitoring

Environmental Monitoring cost has been worked out during construction and during 1st year of operational phase. Table 6.1 provides detail of cost estimate for environmental monitoring.

Table 6.1: Cost Estimate for Environmental Monitoring During the Construction and Operational Phases

Components	Parameters	Frequency	Responsibility	Duration	Cost (Rs.)
Construction Phase (8 Months)					
Air Quality	CO, NO ₂ , SO ₂ , PM ₁₀	Quarterly	CC and EC	24 hours	136,200/ @ Rs. 45,400/ sample
Drinking Water Quality	Total Coliforms, Fecal E. Coli, Total Coliform Bacteria, pH, TDS, Total Hardness, Taste, Turbidity, CaCO ₃ , Aluminium, Arsenic, Barium, Cadmium, Chloride, Chromium, Copper, Cyanide, Fluoride, Lead, Manganese, Mercury, Nickel, Nitrate, Nitrite, Selenium, Residual Chlorine, Zinc, Phenolic Compound as Phenols	Quarterly	CC and EC	-	78,000/- @ Rs. 26,000/sample
Waste Water Quality	Temperature, pH, Colour, TSS, TDS, Alkalinity, BOD ₅ , COD, Grease and Oil, Phenolic Compounds, Chlorides, Fluorides, Cyanide, Anionic detergents, Sulphate, Sulphides, Ammonia, Calcium, Cadmium, Chromium, Lead, Mercury, Selenium, Nickel, Silver, Zinc, Arsenic, Barium, Iron, Manganese, Boron, Chlorine Total	Quarterly	CC and EC	-	66,000/- @ Rs. 22,000/sample
Noise Level	-	Quarterly	CC and EC	24 hours	15,000/- @ Rs. 5,000/point
Total					Rs.295,200/-

6.2 Cost of Health and Safety

Cost of Health and Safety is worked out as under Table 6.2 below.

Table 6.2: Health and Safety Cost

Sr. #.	Items	Description	Cost (Rs.)
1	Medical screening for workers	Rs. 3000 per employee and for 40 employees	120,000
2	Material Storage, handling and use	One (01) No. of tarpaulins of Rs. 30,000 each	30,000
3	Handling/ transportation of hazardous material	Rs. 15,000/month for a period of 8 months will be required for transportation of material	120,000
4	Handling of solid waste	Rs.12,000 per month (two trips per month) for a period of 8 months, which includes the cost of collection, transportation and disposal to the designated site	192,000
5	Cost of Personal Protective Equipment (PPE)*	For 40 employees for the provision of dust masks, safety shoes, gloves, first aid box, ear plugs	365,800
Total Cost			1,104,200/-

*Detail of PPE cost is given below in Table 6.3

Table 6.3: Break-up for PPEs Cost

Items	Quantity	Cost / Item (Rs.)	Total Cost (Rs.)
Dust masks	1400	50	70,000
Safety Shoes	80	1500	120,000
Gloves	640	250	160,000
First Aid Box	1	3000	3,000
Ear Plugs	320	40	12,800
Total			365,800/-
Time required for Construction = 8 months			
No. of labour required = 40			
Detail of Personal Protective Equipment PPE			
Dust mask	1 dust mask to be used in a week by each laborer		
Safety Shoes	1 safety shoe for six months for each laborer		
Gloves	1 pair of gloves for each laborer for a month		
First Aid Box	2 first aid box		
Ear Plug	1 set of ear plug to be used for 1 month for each laborer		

6.3 Cost of EMP

Cost of implementation of Environmental Management plan is estimated to be Rs. 3.323 million. Detail is given below in **Table 6.4**

Table 6.4: Environmental Management Cost

Sr. #.	Items	Description	Cost
1	Environmental Monitoring Cost	Refer Back up 1	295,200
2	Cost of Health and Safety	Refer Back up 2	827,800
3	Cost of environmental	LumpSum	200,000
4	Cost of Tree Plantation	LumpSum	200,000
5	Cost of Hiring EE for Supervision	LumpSum	1,800,000
Total Cost			3,323,000/-

Section 7 - General Conditions of Contract

Program Management Unit

*Punjab Intermediate Cities Improvement Investment Program (PICIIP)
Local Government & Community Development Department, Punjab,
Pakistan - 40, B-1, Gulberg III, Lahore, Pakistan*

[Name of Employer]

*NCB-Works/PICIIP-15; Upgradation of Punjab Local Government Academy
(PLGA) campus at Lala Musa*

[Name of Contract]

Table of Clauses

A. General	7-Error! Bookmark not defined.
1. Definitions	7-4
2. Interpretation	7-6
3. Language and Law	7-7
4. Contract Agreement	7-7
5. Assignment	7-7
6. Care and Supply of Documents	7-7
7. Confidential Details.....	7-7
8. Compliance with Laws	7-8
9. Joint and Several Liability	7-8
10. Project Manager's Decisions	7-9
11. Delegation	7-9
12. Communications.....	7-9
13. Subcontracting	7-9
14. Other Contractors.....	7-9
15. Personnel and Equipment	7-9
16. Employer's and Contractor's Risks	7-10
17. Employer's Risks	7-10
18. Contractor's Risks	7-10
19. Insurance	7-10
20. Site Investigation Reports.....	7-11
21. Contractor to Construct the Works.....	7-11
22. The Works to Be Completed by the Intended Completion Date	7-11
23. Designs by Contractor and Approval by the Project Manager.....	7-11
24. Safety.....	7-11
25. Discoveries.....	7-12
26. Possession of the Site	7-12
27. Access to the Site.....	7-12
28. Instructions, Inspections, and Audits	7-12
29. Appointment of the Adjudicator.....	7-12
30. Procedure for Disputes.....	7-13
B. Staff and Labor	7-13
31. Forced Labor	7-13
32. Child Labor	7-13
33. Workers' Organizations	7-13
34. Nondiscrimination and Equal Opportunity.....	7-13
C. Time Control	7-Error! Bookmark not defined.
35. Program	7-14
36. Extension of the Intended Completion Date.....	7-14
37. Acceleration.....	7-15
38. Delays Ordered by the Project Manager.....	7-15
39. Management Meetings	7-15
40. Early Warning.....	7-15

D. Quality Control	7-Error! Bookmark not defined.
41. Identifying Defects	7-16
42. Tests	7-16
43. Correction of Defects	7-16
44. Uncorrected Defects	7-16
E. Cost Control	7-Error! Bookmark not defined.
45. Contract Price	7-16
46. Changes in the Contract Price	7-16
47. Variations	7-17
48. Cash Flow Forecasts	7-17
49. Payment Certificates	7-17
50. Payments	7-18
51. Compensation Events	7-18
52. Tax	7-19
53. Currencies	7-20
54. Price Adjustment	7-20
55. Retention	7-20
56. Liquidated Damages	7-20
57. Bonus	7-21
58. Advance Payment	7-21
59. Securities	7-21
60. Dayworks	7-21
61. Cost of Repairs	7-22
F. Force Majeure	7-21
62. Definition of Force Majeure	7-21
63. Notice of Force Majeure	7-22
64. Duty to Minimize Delay	7-22
65. Consequences of Force Majeure	7-22
66. Force Majeure Affecting Subcontractor	7-23
67. Optional Termination, Payment, and Release	7-23
68. Release from Performance	7-23
G. Finishing the Contract	7-24
69. Completion	7-24
70. Taking Over	7-24
71. Final Account	7-24
72. Operating and Maintenance Manuals	7-25
73. Termination	7-25
74. Fraud and Corruption	7-26
75. Payment upon Termination	7-27
76. Property	7-27
77. Release from Performance	7-28
78. Suspension of ADB Loan or Credit	7-28
79. Eligibility	7-28

General Conditions of Contract

A. General	
1. Definitions	<p>1.1 Boldface type is used to identify defined terms.</p> <p>(a) The Accepted Contract Amount means the amount accepted in the Letter of Acceptance for the execution and completion of the Works and the remedying of any defects.</p> <p>(b) The Activity Schedule is a schedule of the activities comprising the construction, installation, testing, and commissioning of the Works in a lump sum contract. It includes a lump sum price for each activity, which is used for valuations and for assessing the effects of Variations and Compensation Events.</p> <p>(c) The Adjudicator is the person appointed jointly by the Employer and the Contractor to resolve disputes in the first instance, as provided for in GCC 29.1 [Appointment of Adjudicator] hereunder.</p> <p>(d) Bank means the financing institutions named in the Particular Conditions of Contract (PCC).</p> <p>(e) Bill of Quantities means the priced and completed Bill of Quantities forming part of the Bid.</p> <p>(f) Compensation Events are those defined in GCC 51.1 [Compensation Events] hereunder.</p> <p>(g) The Completion Date is the date of completion of the Works as certified by the Project Manager, in accordance with GCC 69.1 [Completion].</p> <p>(h) The Contract is the Contract between the Employer and the Contractor to execute, complete, and maintain the Works. It consists of the documents listed in GCC 2.3 below.</p> <p>(i) The Contractor is the party whose Bid to carry out the Works has been accepted by the Employer.</p> <p>(j) The Contractor's Bid is the completed bidding document submitted by the Contractor to the Employer.</p> <p>(k) The Contract Price is the Accepted Contract Amount stated in the Letter of Acceptance and thereafter as adjusted in accordance with the Contract.</p> <p>(l) Days are calendar days; months are calendar months.</p> <p>(m) Dayworks are varied work inputs subject to payment on a time basis for the Contractor's employees and Equipment, in addition to payments for associated Materials and Plant.</p> <p>(n) A Defect is any part of the Works not completed in accordance with the Contract.</p> <p>(o) The Defects Liability Certificate is the certificate issued by the Project Manager upon correction of defects by the</p>

	<p>Contractor.</p> <p>(p) The Defects Liability Period is the period calculated from the Completion Date where the Contractor remains responsible for remedying defects.</p> <p>(q) Drawings include calculations and other information provided or approved by the Project Manager for the execution of the Contract.</p> <p>(r) The Employer is the party who employs the Contractor to carry out the Works, as specified in the PCC.</p> <p>(s) Equipment is the Contractor's machinery and vehicles brought temporarily to the Site to construct the Works.</p> <p>(t) Force Majeure means an exceptional event or circumstance; which is beyond a Party's control; which such Party could not reasonably have provided against before entering into the Contract; which, having arisen, such Party could not reasonably have avoided or overcome; and, which is not substantially attributable to the other Party.</p> <p>(u) In writing or written means hand-written, type-written, printed or electronically made, and resulting in a permanent record.</p> <p>(v) The Initial Contract Price is the Contract Price listed in the Employer's Letter of Acceptance.</p> <p>(w) The Intended Completion Date is the date on which it is intended that the Contractor shall complete the Works. The Intended Completion Date is specified in the PCC. The Intended Completion Date may be revised only by the Project Manager by issuing an extension of time or an acceleration order.</p> <p>(x) Letter of Acceptance means the formal acceptance by the Employer of the Bid and denotes the formation of the Contract at the date of acceptance.</p> <p>(y) Materials are all supplies, including consumables, used by the Contractor for incorporation in the Works.</p> <p>(z) Party means the Employer or the Contractor, as the context requires.</p> <p>(aa) PCC means Particular Conditions of Contract.</p> <p>(bb) Plant is any integral part of the Works that shall have a mechanical, electrical, chemical, or biological function.</p> <p>(cc) The Project Manager is the person named in the PCC (or any other competent person appointed by the Employer and notified to the Contractor, to act in replacement of the Project Manager) who is responsible for supervising the execution of the Works and administering the Contract.</p> <p>(dd) Retention Money means the aggregate of all monies retained by the Employer pursuant to GCC 55.1 [Retention].</p> <p>(ee) Schedules means the document(s) entitled schedules, completed by the Contractor and submitted with the Letter of</p>
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	<p>Tender, as included in the Contract. Such document may include the Bill of Quantities, data, lists, and schedules of rates and/or prices.</p> <p>(ff) The Site is the area defined as such in the PCC.</p> <p>(gg) Site Investigation Reports are those that were included in the bidding documents and are factual and interpretative reports about the surface and subsurface conditions at the Site.</p> <p>(hh) Specification means the Specification of the Works included in the Contract and any modification or addition made or approved by the Project Manager.</p> <p>(ii) The Start Date is given in the PCC. It is the latest date when the Contractor shall commence execution of the Works. It does not necessarily coincide with any of the Site Possession Dates.</p> <p>(jj) A Subcontractor is a person or corporate body who has a Contract with the Contractor to carry out a part of the work in the Contract, which includes work on the Site.</p> <p>(kk) Temporary Works are works designed, constructed, installed, and removed by the Contractor that are needed for construction or installation of the Works.</p> <p>(ll) A Variation is an instruction given by the Project Manager which varies the Works.</p> <p>(mm) The Works are what the Contract requires the Contractor to construct, install, and turn over to the Employer, as defined in the PCC.</p>
<p>2. Interpretation</p>	<p>2.1 In interpreting these GCC, singular also means plural, male also means female or neuter, and the other way around. Headings have no significance. Words have their normal meaning under the language of the Contract unless specifically defined. The Project Manager shall provide instructions clarifying queries about these GCC.</p>
	<p>2.2 If sectional completion is specified in the PCC, references in the GCC to the Works, the Completion Date, and the Intended Completion Date apply to any Section of the Works (other than references to the Completion Date and Intended Completion Date for the whole of the Works).</p>
	<p>2.3 The documents forming the Contract shall be interpreted in the following order of priority:</p> <ul style="list-style-type: none"> (a) Contract Agreement, (b) Letter of Acceptance, (c) Letter of Bid, (d) Particular Conditions of Contract, (e) the List of Eligible Countries that was specified in Section 5 of the bidding document,

	<p>(f) General Conditions of Contract,</p> <p>(g) Specifications,</p> <p>(h) Drawings,</p> <p>(i) Completed Activity Schedules or Bill of Quantities, and</p> <p>(j) any other document listed in the PCC as forming part of the Contract.</p>
3. Language and Law	<p>3.1 The language of the Contract and the law governing the Contract are stated in the PCC.</p> <p>3.2 Throughout the execution of the Contract, the Contractor shall comply with the import of goods and services prohibitions in the Employer's country when</p> <p>(a) by an act of compliance with a decision of the United Nations Security Council taken under Chapter VII of the Charter of the United Nations, the Borrower's Country prohibits any import of goods from, or any payments to, a particular country, person, or entity. Where the borrower's country prohibits payments to a particular firm or for particular goods by such an act of compliance, that firm may be excluded.</p>
4. Contract Agreement	<p>4.1 The Parties shall enter into a Contract Agreement within 28 days after the Contractor receives the Letter of Acceptance, unless the Particular Conditions establish otherwise. The Contract Agreement shall be based upon the attached Contract forms in Section 8. The costs of stamp duties and similar charges (if any) imposed by law in connection with entry into the Contract Agreement shall be borne by the Employer.</p>
5. Assignment	<p>5.1 Neither Party shall assign the whole or any part of the Contract or any benefit or interest in or under the Contract. However, either Party</p> <p>(a) may assign the whole or any part with the prior agreement of the other Party, at the sole discretion of such other Party; and</p> <p>(b) may, as security in favor of a bank or financial institution, assign its right to any moneys due, or to become due, under the Contract.</p>
6. Care and Supply of Documents	<p>6.1 The Specification and Drawings shall be in the custody and care of the Employer. Unless otherwise stated in the Contract, two copies of the Contract and of each subsequent Drawing shall be supplied to the Contractor, who may make or request further copies at the cost of the Contractor.</p> <p>6.2 Each of the Contractor's Documents shall be in the custody and care of the Contractor, unless and until taken over by the Employer. Unless otherwise stated in the Contract, the Contractor shall supply to the Engineer six copies of each of the Contractor's Documents.</p> <p>6.3 The Contractor shall keep, on the Site, a copy of the Contract, publications named in the Specification, the Contractor's Documents (if any), the Drawings and Variations and other communications given under the Contract. The Employer's Personnel shall have the right of</p>

	<p>access to all these documents at all reasonable times.</p> <p>6.4 If a Party becomes aware of an error or defect in a document which was prepared for use in executing the Works, the Party shall promptly give notice to the other Party of such error or defect.</p>
7. Confidential Details	<p>7.1 The Contractor's and the Employer's Personnel shall disclose all such confidential and other information as may be reasonably required in order to verify the Contractor's compliance with the Contract and allow its proper implementation.</p> <p>7.2 Each of them shall treat the details of the Contract as private and confidential, except to the extent necessary to carry out their respective obligations under the Contract or to comply with applicable Laws. Each of them shall not publish or disclose any particulars of the Works prepared by the other Party without the previous agreement of the other Party. However, the Contractor shall be permitted to disclose any publicly available information, or information otherwise required to establish his qualifications to compete for other projects.</p> <p>7.3 Notwithstanding the above, the Contractor may furnish to its Subcontractor(s) such documents, data and other information it receives from the Employer to the extent required for the Subcontractor(s) to perform its work under the Contract, in which event the Contractor shall obtain from such Subcontractor(s) an undertaking of confidentiality similar to that imposed on the Contractor under this Clause.</p>
8. Compliance with Laws	<p>8.1 The Contractor shall, in performing the Contract, comply with applicable Laws.</p> <p>8.2 Unless otherwise stated in the Particular Conditions,</p> <p>(a) the Employer shall acquire and pay for all permits, approvals, and/or licenses from all local, state, or national government authorities or public service undertakings in the [Employer's Country or country where the Site is located] which (i) such authorities or undertakings require the Employer to obtain in the Employer's name, and (ii) are necessary for the execution of the Contract, including those required for the performance by both the Contractor and the Employer of their respective obligations under the Contract;</p> <p>(b) the Contractor shall acquire and pay for all permits, approvals, and/or licenses from all local, state, or national government authorities or public service undertakings in the [Employer's Country or country where the Site is located] which such authorities or undertakings require the Contractor to obtain in its name and which are necessary for the performance of the Contract, including, without limitation, visas for the Contractor's and Subcontractor's personnel and entry permits for all imported Contractor's Equipment. The Contractor shall acquire all other permits, approvals, and/or licenses that are not the responsibility of the Employer under Subclause 8.2(a) hereof and that are necessary for the</p>

	<p>performance of the Contract. The Contractor shall indemnify and hold harmless the Employer from and against any and all liabilities, damages, claims, fines, penalties, and expenses of whatever nature arising or resulting from the violation of such laws by the Employer or its personnel, including the Subcontractors and their personnel, but without prejudice to Subclause 8.1 hereof.</p>
9. Joint and Several Liability	<p>9.1 If the Contractor is a joint venture of two or more persons, all such persons shall be jointly and severally liable to the Employer for the fulfillment of the provisions of the Contract, and shall designate one of such persons to act as a leader with authority to bind the joint venture. The composition or the constitution of the joint venture shall not be altered without the prior consent of the Employer.</p>
10. Project Manager's Decisions	<p>10.1 Except where otherwise specifically stated, the Project Manager shall decide contractual matters between the Employer and the Contractor in the role representing the Employer.</p>
11. Delegation	<p>11.1 The Project Manager may delegate any of his duties and responsibilities to other people, except to the Adjudicator, after notifying the Contractor, and may cancel any delegation after notifying the Contractor.</p>
12. Communications	<p>12.1 Communications between parties that are referred to in the Conditions shall be effective only when in writing. A notice shall be effective only when it is delivered.</p>
13. Subcontracting	<p>13.1 The Contractor may subcontract with the approval of the Project Manager, but may not assign the Contract without the approval of the Employer in writing. Subcontracting shall not alter the Contractor's obligations.</p>
14. Other Contractors	<p>14.1 The Contractor shall cooperate and share the Site with other contractors, public authorities, utilities, and the Employer between the dates given in the Schedule of Other Contractors, as referred to in the PCC. The Contractor shall also provide facilities and services for them as described in the Schedule. The Employer may modify the Schedule of Other Contractors, and shall notify the Contractor of any such modification.</p>
15. Personnel and Equipment	<p>15.1 The Contractor shall employ the key personnel and use the equipment identified in its Bid to carry out the functions stated in the Schedule or other personnel and equipment approved by the Project Manager. The Project Manager shall approve any proposed replacement of key personnel and equipment only if their relevant qualifications or characteristics are substantially equal to or better than those proposed in the Bid.</p> <p>15.2 If the Project Manager asks the Contractor to remove a person who is a member of the Contractor's staff or work force, stating the reasons, the Contractor shall ensure that the person leaves the Site within 7 days and has no further connection with the work in the Contract.</p> <p>15.3 If the Employer, Project Manager, or Contractor determines, that any</p>

	employee of the Contractor be determined to have engaged in corrupt, fraudulent, collusive, coercive, or other prohibited practices during the execution of the Works, then that employee shall be removed in accordance with Clause 15.2 above.
16. Employer's and Contractor's Risks	16.1 The Employer carries the risks which this Contract states are Employer's risks, and the Contractor carries the risks which this Contract states are Contractor's risks.
17. Employer's Risks	<p>17.1 From the Start Date until the Defects Liability Certificate has been issued, the following are Employer's risks:</p> <p>(a) The risk of personal injury, death, or loss of or damage to property (excluding the Works, Plant, Materials, and Equipment), which are due to</p> <p>(i) use or occupation of the Site by the Works or for the purpose of the Works, which is the unavoidable result of the Works, or</p> <p>(ii) negligence, breach of statutory duty, or interference with any legal right by the Employer or by any person employed by or contracted to him except the Contractor.</p> <p>(b) The risk of damage to the Works, Plant, Materials, and Equipment to the extent that it is due to a fault of the Employer or in the Employer's design, or due to war or radioactive contamination directly affecting the country where the Works are to be executed.</p>
	<p>17.2 From the Completion Date until the Defects Liability Certificate has been issued, the risk of loss of or damage to the Works, Plant, and Materials is an Employer's risk except loss or damage due to</p> <p>(a) a Defect which existed on the Completion Date,</p> <p>(b) an event occurring before the Completion Date, which was not itself an Employer's risk, or</p> <p>(c) the activities of the Contractor on the Site after the Completion Date.</p>
18. Contractor's Risks	18.1 From the Starting Date until the Defects Liability Certificate has been issued, the risks of personal injury, death, and loss of or damage to property (including, without limitation, the Works, Plant, Materials, and Equipment) which are not Employer's risks, are Contractor's risks.
19. Insurance	<p>19.1 The Contractor shall provide, in the joint names of the Employer and the Contractor, insurance cover from the Start Date to the end of the Defects Liability Period, in the amounts and deductibles stated in the PCC for the following events, which are due to the Contractor's risks:</p> <p>(a) loss of or damage to the Works, Plant, and Materials;</p> <p>(b) loss of or damage to Equipment;</p> <p>(c) loss of or damage to property (except the Works, Plant, Materials, and Equipment) in connection with the Contract; and</p> <p>(d) personal injury or death.</p>

	19.2 Policies and certificates for insurance shall be delivered by the Contractor to the Project Manager for the Project Manager's approval before the Start Date. All such insurance shall provide for compensation to be payable in the types and proportions of currencies required to rectify the loss or damage incurred.
	19.3 If the Contractor does not provide any of the policies and certificates required, the Employer may effect the insurance, which the Contractor should have provided and recover the premiums the Employer has paid from payments otherwise due to the Contractor or, if no payment is due, the payment of the premiums shall be a debt due.
	19.4 Alterations to the terms of an insurance shall not be made without the approval of the Project Manager.
	19.5 Both parties shall comply with any conditions of the insurance policies.
20. Site Investigation Reports	20.1 The Contractor, in preparing the Bid, shall rely on any Site Investigation Reports referred to in the PCC , supplemented by any information available to the Contractor.
21. Contractor to Construct the Works	21.1 The Contractor shall construct and install the Works in accordance with the Specifications and Drawings.
22. The Works to Be Completed by the Intended Completion Date	22.1 The Contractor may commence execution of the Works on the Start Date and shall carry out the Works in accordance with the Program submitted by the Contractor, as updated with the approval of the Project Manager, and complete them by the Intended Completion Date.
23. Designs by Contractor and Approval by the Project Manager	23.1 The Contractor shall carry out design to the extent specified in the PCC . The Contractor shall promptly submit to the Employer all designs prepared by him. Within 14 days of receipt, the Employer shall notify any comments. The Contractor shall not construct any element of the permanent work designed by him within 14 days after the design has been submitted to the Employer or where the design for that element has been rejected. Design that has been rejected shall be promptly amended and resubmitted. The Contractor shall resubmit all designs commented on, taking these comments into account as necessary.
	23.2 The Contractor shall submit Specifications and Drawings showing the proposed Temporary Works to the Project Manager, who is to approve them if they comply with the Specifications and Drawings.
	23.3 The Contractor shall be responsible for design of Temporary Works.
	23.4 The Project Manager's approval shall not alter the Contractor's responsibility for design of the Temporary Works.

	23.5 The Contractor shall obtain approval of third parties to the design of the Temporary Works, where required.
	23.6 All Drawings prepared by the Contractor for the execution of the temporary or permanent Works, are subject to prior approval by the Project Manager before this use.
24. Safety	24.1 The Contractor shall be responsible for the safety of all activities on the Site.
25. Discoveries	25.1 Anything of historical or other interest or of significant value unexpectedly discovered on the Site shall be the property of the Employer. The Contractor shall notify the Project Manager of such discoveries and carry out the Project Manager's instructions for dealing with them.
26. Possession of the Site	26.1 The Employer shall give possession of all parts of the Site to the Contractor. If possession of a part is not given by the date stated in the PCC , the Employer shall be deemed to have delayed the start of the relevant activities, and this shall be a Compensation Event.
27. Access to the Site	27.1 The Contractor shall allow the Project Manager and any person authorized by the Project Manager access to the Site and to any place where work in connection with the Contract is being carried out or is intended to be carried out.
28. Instructions, Inspections, and Audits	28.1 The Contractor shall carry out all instructions of the Project Manager, which comply with the applicable laws where the Site is located. 28.2 The Contractor shall keep, and shall make all reasonable efforts to cause its Subcontractors and sub consultants to keep accurate and systematic accounts and records in respect of the Works in such form and details as will clearly identify relevant time changes and costs.
	28.3 The Contractor shall permit ADB to inspect the Contractor's accounts, records, and other documents relating to the submission of bids and contract performance and to have them audited by auditors appointed by ADB. The Contractor shall maintain all documents and records related to the Contract for a period of three (3) years after completion of the Works. The Contractor shall provide any documents necessary for the investigation of allegations of fraud, collusion, coercion, or corruption and require its employees or agents with knowledge of the Contract to respond to questions from ADB.
29. Appointment of the Adjudicator	29.1 The Adjudicator shall be appointed jointly by the Employer and the Contractor, at the time of the Employer's issuance of the Letter of Acceptance. If, in the Letter of Acceptance, the Employer does not agree on the appointment of the Adjudicator, the Employer will request the Appointing Authority designated in the PCC , to appoint the Adjudicator within 14 days of receipt of such request.
	29.2 Should the Adjudicator resign or die, or should the Employer and the Contractor agree that the Adjudicator is not functioning in accordance with the provisions of the Contract; a new Adjudicator shall be jointly appointed by the Employer and the Contractor. In case of

	disagreement between the Employer and the Contractor, within 30 days, the Adjudicator shall be designated by the Appointing Authority at the request of either party, within 14 days of receipt of such request.
30. Procedure for Disputes	30.1 If the Contractor believes that a decision taken by the Project Manager was either outside the authority given to the Project Manager by the Contract or that the decision was wrongly taken, the decision shall be referred to the Adjudicator within 14 days of the notification of the Project Manager's decision.
	30.2 The Adjudicator shall give a decision in writing within 28 days of receipt of a notification of a dispute.
	30.3 The Adjudicator shall be paid by the hour at the rate specified in the PCC , together with reimbursable expenses of the types specified in the PCC , and the cost shall be divided equally between the Employer and the Contractor, whatever decision is reached by the Adjudicator. Either party may refer a decision of the Adjudicator to an Arbitrator within 28 days of the Adjudicator's written decision. If neither party refers the dispute to arbitration within the above 28 days, the Adjudicator's decision shall be final and binding.
	30.4 The arbitration shall be conducted in accordance with the arbitration procedures published by the institution named and in the place specified in the PCC .
B. Staff and Labor	
31. Forced Labor	31.1 The Contractor shall not employ forced labor, which consists of any work or service, not voluntarily performed, that is exacted from an individual under threat of force or penalty. This covers any kind of involuntary or compulsory labor, such as indentured labor, bonded labor, or similar labor-contracting arrangements.
32. Child Labor	32.1 The Contractor shall not employ children in a manner that is economically exploitative, or is likely to be hazardous, or to interfere with, the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development. Where national laws have provisions for employment of minors, the Contractor shall follow those laws applicable to the Contractor. Children below the age of 18 years shall not be employed in dangerous work.
33. Workers' Organizations	33.1 In countries where national law recognizes workers' rights to form and to join workers' organizations of their choosing without interference and to bargain collectively, the Contractor shall comply with national law. Where national law substantially restricts workers' organizations, the Contractor shall enable alternative means for the Contractor's Personnel to express their grievances and protect their rights regarding working conditions and terms of employment. In either case described above, and where national law is silent, the Contractor shall not discourage the Contractor's Personnel from forming or joining workers' organizations of their choosing or from bargaining

	collectively, and shall not discriminate or retaliate against the Contractor's Personnel who participate, or seek to participate, in such organizations and bargain collectively. The Contractor shall engage with such workers representatives. Worker organizations are expected to fairly represent the workers in the workforce.
34. Nondiscrimination and Equal Opportunity	34.1 The Contractor shall not make employment decisions on the basis of personal characteristics unrelated to inherent job requirements. The Contractor shall base the employment relationship on the principle of equal opportunity and fair treatment, and shall not discriminate with respect to aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, promotion, termination of employment or retirement, and discipline. In countries where national law provides for non-discrimination in employment, the Contractor shall comply with national law. When national laws are silent on nondiscrimination in employment, the Contractor shall meet this Sub clause's requirements. Special measures of protection or assistance to remedy past discrimination or selection for a particular job based on the inherent requirements of the job shall not be deemed discrimination.
C. Time Control	
35. Program	35.1 Within the time stated in the PCC , after the date of the Letter of Acceptance, the Contractor shall submit to the Project Manager for approval a Program showing the general methods, arrangements, order, and timing for all the activities in the Works. In the case of a lump sum contract, the activities in the Program shall be consistent with those in the Activity Schedule.
	35.2 An update of the Program shall be a program showing the actual progress achieved on each activity and the effect of the progress achieved on the timing of the remaining work, including any changes to the sequence of the activities.
	35.3 The Contractor shall submit to the Project Manager for approval an updated Program at intervals no longer than the period stated in the PCC . If the Contractor does not submit an updated Program within this period, the Project Manager may withhold the amount stated in the PCC from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue Program has been submitted. In the case of a lump sum contract, the Contractor shall provide an updated Activity Schedule within 14 days of being instructed to by the Project Manager.
	35.4 The Project Manager's approval of the Program shall not alter the Contractor's obligations. The Contractor may revise the Program and submit it to the Project Manager again at any time. A revised Program shall show the effect of Variations and Compensation Events.
36. Extension of the Intended Completion	36.1 The Project Manager shall extend the Intended Completion Date if a Compensation Event occurs or a Variation is issued which makes it impossible for Completion to be achieved by the Intended Completion

Date	Date without the Contractor taking steps to accelerate the remaining work, which would cause the Contractor to incur additional cost.
	36.2 The Project Manager shall decide whether and by how much to extend the Intended Completion Date within 21 days of the Contractor asking the Project Manager for a decision upon the effect of a Compensation Event or Variation and submitting full supporting information. If the Contractor has failed to give early warning of a delay or has failed to cooperate in dealing with a delay, the delay by this failure shall not be considered in assessing the new Intended Completion Date.
37. Acceleration	37.1 When the Employer wants the Contractor to finish before the Intended Completion Date, the Project Manager shall obtain priced proposals for achieving the necessary acceleration from the Contractor. If the Employer accepts these proposals, the Intended Completion Date shall be adjusted accordingly and confirmed by both the Employer and the Contractor.
	37.2 If the Contractor's priced proposals for an acceleration are accepted by the Employer, they are incorporated in the Contract Price and treated as a Variation.
38. Delays Ordered by the Project Manager	38.1 The Project Manager may instruct the Contractor to delay the start or progress of any activity within the Works.
39. Management Meetings	39.1 Either the Project Manager or the Contractor may require the other to attend a management meeting. The business of a management meeting shall be to review the plans for remaining work and to deal with matters raised in accordance with the early warning procedure.
	39.2 The Project Manager shall record the business of management meetings and provide copies of the record to those attending the meeting and to the Employer. The responsibility of the parties for actions to be taken shall be decided by the Project Manager either at the management meeting or after the management meeting and stated in writing to all who attended the meeting.
40. Early Warning	40.1 The Contractor shall warn the Project Manager at the earliest opportunity of specific likely future events or circumstances that may adversely affect the quality of the work, increase the Contract Price, or delay the execution of the Works. The Project Manager may require the Contractor to provide an estimate of the expected effect of the future event or circumstance on the Contract Price and Completion Date. The estimate shall be provided by the Contractor as soon as reasonably possible.
	40.2 The Contractor shall cooperate with the Project Manager in making and considering proposals for how the effect of such an event or circumstance can be avoided or reduced by anyone involved in the work and in carrying out any resulting instruction of the Project Manager.

D. Quality Control	
41. Identifying Defects	41.1 The Project Manager shall check the Contractor's work and notify the Contractor of any Defects that are found. Such checking shall not affect the Contractor's responsibilities. The Project Manager may instruct the Contractor to search for a Defect and to uncover and test any work that the Project Manager considers may have a Defect.
42. Tests	42.1 If the Project Manager instructs the Contractor to carry out a test not specified in the Specification to check whether any work has a Defect and the test shows that it does, the Contractor shall pay for the test and any samples. If there is no Defect, the test shall be a Compensation Event.
43. Correction of Defects	43.1 The Project Manager shall give notice to the Contractor of any Defects before the end of the Defects Liability Period, which begins at Completion, and is defined in the PCC . The Defects Liability Period shall be extended for as long as Defects remain to be corrected.
	43.2 Every time notice of a Defect is given, the Contractor shall correct the notified Defect within the length of time specified by the Project Manager's notice.
44. Uncorrected Defects	44.1 If the Contractor has not corrected a Defect within the time specified in the Project Manager's notice, the Project Manager shall assess the cost of having the Defect corrected, and the Contractor shall pay this amount.
E. Cost Control	
45. Contract Price	45.1 In the case of an admeasurement contract, the Bill of Quantities shall contain priced items for the Works to be performed by the Contractor. The Bill of Quantities is used to calculate the Contract Price. The Contractor will be paid for the quantity of the work accomplished at the rate in the Bill of Quantities for each item.
	45.2 In the case of a lump sum contract, the Activity Schedule shall contain the priced activities for the Works to be performed by the Contractor. The Activity Schedule is used to monitor and control the performance of activities on which basis the Contractor will be paid. If payment for Materials on Site shall be made separately, the Contractor shall show delivery of Materials to the Site separately on the Activity Schedule.
46. Changes in the Contract Price	46.1 In the case of an admeasurement contract: <ul style="list-style-type: none"> (a) If the final quantity of the work done differs from the quantity in the Bill of Quantities for the particular item by more than 25%, provided the change exceeds 1% of the Initial Contract Price, the Project Manager shall adjust the rate to allow for the change. (b) The Project Manager shall not adjust rates from changes in quantities if thereby the Initial Contract Price is exceeded by more than 15%, except with the prior approval of the Employer.

	(c) If requested by the Project Manager, the Contractor shall provide the Project Manager with a detailed cost breakdown of any rate in the Bill of Quantities.
	46.2 In the case of a lump sum contract, the Activity Schedule shall be amended by the Contractor to accommodate changes of Program or method of working made at the Contractor's own discretion. Prices in the Activity Schedule shall not be altered when the Contractor makes such changes to the Activity Schedule.
47. Variations	47.1 All Variations shall be included in updated Programs, and, in the case of a lump sum contract, also in the Activity Schedule, produced by the Contractor.
	47.2 The Contractor shall provide the Project Manager with a quotation for carrying out the Variation when requested to do so by the Project Manager. The Project Manager shall assess the quotation, which shall be given within seven (7) days of the request or within any longer period stated by the Project Manager and before the Variation is ordered.
	47.3 If the Contractor's quotation is unreasonable, the Project Manager may order the Variation and make a change to the Contract Price, which shall be based on the Project Manager's own forecast of the effects of the Variation on the Contractor's costs.
	47.4 If the Project Manager decides that the urgency of varying the work would prevent a quotation being given and considered without delaying the work, no quotation shall be given and the Variation shall be treated as a Compensation Event.
	47.5 The Contractor shall not be entitled to additional payment for costs that could have been avoided by giving early warning.
	47.6 In the case of an admeasurement contract, if the work in the Variation corresponds to an item description in the Bill of Quantities and if, in the opinion of the Project Manager, the quantity of work above the limit stated in GCC 46.1 [Changes in the Contract Price] or the timing of its execution do not cause the cost per unit of quantity to change, the rate in the Bill of Quantities shall be used to calculate the value of the Variation. If the cost per unit of quantity changes, or if the nature or timing of the work in the Variation does not correspond with items in the Bill of Quantities, the quotation by the Contractor shall be in the form of new rates for the relevant items of work.
48. Cash Flow Forecasts	48.1 When the Program, or, in the case of a lump sum contract, the Activity Schedule, is updated, the Contractor shall provide the Project Manager with an updated cash flow forecast. The cash flow forecast shall include different currencies, as defined in the Contract, converted as necessary using the Contract exchange rates.
49. Payment Certificates	49.1 The Contractor shall submit to the Project Manager monthly statements of the estimated value of the work executed less the cumulative amount certified previously.

	49.2 The Project Manager shall check the Contractor's monthly statement and certify the amount to be paid to the Contractor.
	49.3 The value of work executed shall be determined by the Project Manager.
	49.4 The value of work executed shall comprise, <ul style="list-style-type: none"> (a) in the case of an admeasurement contract, the value of the quantities of work in the Bill of Quantities that have been completed; or (b) in the case of a lump sum contract, the value of work executed shall comprise the value of completed activities in the Activity Schedule.
	49.5 The value of work executed shall include the valuation of Variations and Compensation Events.
	49.6 The Project Manager may exclude any item certified in a previous certificate or reduce the proportion of any item previously certified in any certificate in the light of later information.
50. Payments	50.1 Payments shall be adjusted for deductions for advance payments and retention. The Employer shall pay the Contractor the amounts certified by the Project Manager within 28 days of the date of each certificate. If the Employer makes a late payment, the Contractor shall be paid interest on the late payment in the next payment. Interest shall be calculated from the date by which the payment should have been made up to the date when the late payment is made at the prevailing rate of interest for commercial borrowing for each of the currencies in which payments are made.
	50.2 If an amount certified is increased in a later certificate or as a result of an award by the Adjudicator or an Arbitrator, the Contractor shall be paid interest upon the delayed payment as set out in this clause. Interest shall be calculated from the date upon which the increased amount would have been certified in the absence of dispute.
	50.3 Unless otherwise stated, all payments and deductions shall be paid or charged in the proportions of currencies comprising the Contract Price.
	50.4 Items of the Works for which no rate or price has been entered in shall not be paid for by the Employer and shall be deemed covered by other rates and prices in the Contract.
51. Compensation Events	51.1 The following shall be Compensation Events: <ul style="list-style-type: none"> (a) The Employer does not give access to a part of the Site by the Site Possession Date pursuant to GCC 26.1 [Possession of the Site]. (b) The Employer modifies the Schedule of Other Contractors in a way that affects the work of the Contractor under the Contract. (c) The Project Manager orders a delay or does not issue

	<p>Drawings, Specifications, or instructions required for execution of the Works on time.</p> <p>(d) The Project Manager instructs the Contractor to uncover or to carry out additional tests upon work, which is then found to have no Defects.</p> <p>(e) The Project Manager unreasonably does not approve a subcontract to be let.</p> <p>(f) Ground conditions are substantially more adverse than could reasonably have been assumed before issuance of the Letter of Acceptance from the information issued to Bidders (including the Site Investigation Reports), from information available publicly and from a visual inspection of the Site.</p> <p>(g) The Project Manager gives an instruction for dealing with an unforeseen condition, caused by the Employer, or additional work required for safety or other reasons.</p> <p>(h) Other contractors, public authorities, utilities, or the Employer does not work within the dates and other constraints stated in the Contract, and they cause delay or extra cost to the Contractor.</p> <p>(i) The advance payment is delayed.</p> <p>(j) The effects on the Contractor of any of the Employer's Risks.</p> <p>(k) The Project Manager unreasonably delays issuing a Certificate of Completion.</p>
	<p>51.2 If a Compensation Event would cause additional cost or would prevent the work being completed before the Intended Completion Date, the Contract Price shall be increased and/or the Intended Completion Date shall be extended. The Project Manager shall decide whether and by how much the Contract Price shall be increased and whether and by how much the Intended Completion Date shall be extended.</p>
	<p>51.3 As soon as information demonstrating the effect of each Compensation Event upon the Contractor's forecast cost has been provided by the Contractor, it shall be assessed by the Project Manager, and the Contract Price shall be adjusted accordingly. If the Contractor's forecast is deemed unreasonable, the Project Manager shall adjust the Contract Price based on the Project Manager's own forecast. The Project Manager shall assume that the Contractor shall react competently and promptly to the event.</p>
	<p>51.4 The Contractor shall not be entitled to compensation to the extent that the Employer's interests are adversely affected by the Contractor's not having given early warning or not having cooperated with the Project Manager.</p>
<p>52. Tax</p>	<p>52.1 The Project Manager shall adjust the Contract Price if taxes, duties, and other levies are changed between the date 28 days before the submission of bids for the Contract and the date of the last Completion certificate. The adjustment shall be the change in the amount of tax payable by the Contractor, provided such changes are</p>

	not already reflected in the Contract Price or are a result of GCC 54.1 [Price Adjustment].
53. Currencies	53.1 Where payments are made in currencies other than the currency of the Employer's country specified in the PCC , the exchange rates used for calculating the amounts to be paid shall be the exchange rates stated in the Contractor's Bid.
54. Price Adjustment	<p>54.1 Prices shall be adjusted for fluctuations in the cost of inputs only if provided for in the PCC. If so provided, the amounts certified in each payment certificate, before deducting for Advance Payment, shall be adjusted by applying the respective price adjustment factor to the payment amounts due in each currency. A separate formula of the type indicated below applies to each Contract currency:</p> $P_c = A_c + B_c \text{ Imc/loc}$ <p>where:</p> <p>P_c is the adjustment factor for the portion of the Contract Price payable in a specific currency "c."</p> <p>A_c and B_c are coefficients¹ specified in the PCC, representing the nonadjustable and adjustable portions, respectively, of the Contract Price payable in that specific currency "c;" and</p> <p>Imc is a consolidated index prevailing at the end of the month being invoiced and loc is the same consolidated index prevailing 28 days before Bid opening for inputs payable; both in the specific currency "c."</p>
	54.2 If the value of the index is changed after it has been used in a calculation, the calculation shall be corrected and an adjustment made in the next payment certificate. The index value shall be deemed to take account of all changes in cost due to fluctuations in costs.
55. Retention	55.1 The Employer shall retain from each payment due to the Contractor the proportion stated in the PCC until Completion of the whole of the Works.
	55.2 Upon the issue of a Certificate of Completion of the Works by the Project Manager, in accordance with GCC 69.1 [Completion], half the total amount retained shall be repaid to the Contractor and half when the Defects Liability Period has passed and the Project Manager has certified that all Defects notified by the Project Manager to the Contractor before the end of this period have been corrected. The Contractor may substitute retention money with an "on demand" bank guarantee.
56. Liquidated Damages	56.1 The Contractor shall pay liquidated damages to the Employer at the rate per day stated in the PCC for each day that the Completion Date is later than the Intended Completion Date. The total amount of

¹ The sum of the two coefficients A_c and B_c should be 1 (one) in the formula for each currency. Normally, both coefficients shall be the same in the formulas for all currencies, since coefficient A, for the nonadjustable portion of the payments, is a very approximate figure (usually 0.10 - 0.20) to take account of fixed cost elements or other nonadjustable components. The sum of the adjustments for each currency is added to the Contract Price.

	liquidated damages shall not exceed the amount defined in the PCC . The Employer may deduct liquidated damages from payments due to the Contractor. Payment of liquidated damages shall not affect the Contractor's liabilities.
	56.2 If the Intended Completion Date is extended after liquidated damages have been paid, the Project Manager shall correct any overpayment of liquidated damages by the Contractor by adjusting the next payment certificate. The Contractor shall be paid interest on the overpayment, calculated from the date of payment to the date of repayment, at the rates specified in GCC 50.1 [Payments].
57. Bonus	57.1 The Contractor shall be paid a Bonus calculated at the rate per calendar day stated in the PCC for each day (less any days for which the Contractor is paid for acceleration) that the Completion is earlier than the Intended Completion Date. The Project Manager shall certify that the Works are complete, although they may not be due to be complete.
58. Advance Payment	58.1 The Employer shall make advance payment to the Contractor of the amounts stated in the PCC by the date stated in the PCC , against provision by the Contractor of an unconditional bank guarantee in a form and by a bank acceptable to the Employer in amounts and currencies equal to the advance payment. The guarantee shall remain effective until the advance payment has been repaid, but the amount of the guarantee shall be progressively reduced by the amounts repaid by the Contractor. Interest shall not be charged on the advance payment.
	58.2 The Contractor is to use the advance payment only to pay for Equipment, Plant, Materials, and mobilization expenses required specifically for execution of the Contract. The Contractor shall demonstrate that advance payment has been used in this way by supplying copies of invoices or other documents to the Project Manager.
	58.3 The advance payment shall be repaid by deducting proportionate amounts from payments otherwise due to the Contractor, following the schedule of completed percentages of the Works on a payment basis. No account shall be taken of the advance payment or its repayment in assessing valuations of work done, Variations, price adjustments, Compensation Events, Bonuses, or Liquidated Damages.
59. Securities	59.1 The Performance Security shall be provided to the Employer no later than the date specified in the Letter of Acceptance and shall be issued in an amount specified in the PCC , by a bank acceptable to the Employer, and denominated in the types and proportions of the currencies in which the Contract Price is payable. The Performance Security shall be valid until a date 28 days from the date of issue of the Certificate of Completion in the case of a bank guarantee.
60. Dayworks	60.1 If applicable, the Dayworks rates in the Contractor's Bid shall be used for small additional amounts of work only when the Project Manager has given written instructions in advance for additional work to be paid

	for in that way.
	60.2 All work to be paid for as Dayworks shall be recorded by the Contractor on forms approved by the Project Manager. Each completed form shall be verified and signed by the Project Manager within 2 days of the work being done.
	60.3 The Contractor shall be paid for Dayworks subject to obtaining signed Dayworks forms.
61. Cost of Repairs	61.1 Loss or damage to the Works or Materials to be incorporated in the Works between the Start Date and the end of the Defects Correction periods shall be remedied by the Contractor at the Contractor's cost if the loss or damage arises from the Contractor's acts or omissions.
F. Force Majeure	
62. Definition of Force Majeure	62.1 In this Clause, "Force Majeure" means an exceptional event or circumstance, <ul style="list-style-type: none"> (a) which is beyond a Party's control; (b) which such Party could not reasonably have provided against before entering into the Contract; (c) which, having arisen, such Party could not reasonably have avoided or overcome; and (d) which is not substantially attributable to the other Party.
	62.2 Force Majeure may include, but is not limited to, exceptional events or circumstances of the kind listed below, so long as conditions (a) to (d) above are satisfied: <ul style="list-style-type: none"> (a) war, hostilities (whether war be declared or not), invasion, act of foreign enemies; (b) rebellion, terrorism, sabotage by persons other than the Contractor's Personnel, revolution, insurrection, military or usurped power, or civil war; (c) riot, commotion, disorder, strike or lockout by persons other than the Contractor's Personnel; (d) munitions of war, explosive materials, ionizing radiation or contamination by radio-activity, except as may be attributable to the Contractor's use of such munitions, explosives, radiation or radio-activity; and (e) natural catastrophes such as earthquake, hurricane, typhoon, or volcanic activity.
63. Notice of Force Majeure	63.1 If a Party is or will be prevented from performing its substantial obligations under the Contract by Force Majeure, then it shall give notice to the other Party of the event or circumstances constituting the Force Majeure and shall specify the obligations, the performance of which is or will be prevented. The notice shall be given within 14 days after the Party became aware, or should have become aware, of the relevant event or circumstance constituting Force Majeure.

	63.2 The Party shall, having given notice, be excused performance of its obligations for so long as such Force Majeure prevents it from performing them.
	63.3 Notwithstanding any other provision of this Clause, Force Majeure shall not apply to obligations of either Party to make payments to the other Party under the Contract.
64. Duty to Minimize Delay	64.1 Each Party shall at all times use all reasonable endeavours to minimize any delay in the performance of the Contract as a result of Force Majeure.
	64.2 A Party shall give notice to the other Party when it ceases to be affected by the Force Majeure.
65. Consequences of Force Majeure	65.1 If the Contractor is prevented from performing its substantial obligations under the Contract by Force Majeure of which notice has been given under GCC Subclause 63 [Notice of Force Majeure], and suffers delay and/or incurs Cost by reason of such Force Majeure, the Contractor shall be entitled subject to GCC Subclause 30.1 [Procedure for Disputes] to <ul style="list-style-type: none"> (a) an extension of time for any such delay, if completion is or will be delayed, under GCC Subclause 36 [Extension of the Intended Completion Date]; and (b) if the event or circumstance is of the kind described in subparagraphs (a) to (d) of GCC Subclause 62.2 [Definition of Force Majeure] and, in the case of subparagraphs (b) to (d), occurs in the Country, payment of any such Cost, including the costs of rectifying or replacing the Works and/or Goods damaged or destroyed by Force Majeure, to the extent they are not indemnified through the insurance policy referred to in GCC Subclause 19 [Insurance].
	65.2 After receiving this notice, the Project Manager shall proceed in accordance with GCC Subclause 10 [Project Manager's Decisions] to agree or determine these matters.
66. Force Majeure Affecting Subcontractor	66.1 If any Subcontractor is entitled under any contract or agreement relating to the Works to relief from force majeure on terms additional to or broader than those specified in this Clause, such additional or broader Force Majeure events or circumstances shall not excuse the Contractor's nonperformance or entitle him to relief under this Clause.
67. Optional Termination, Payment and Release	67.1 If the execution of substantially all the Works in progress is prevented for a continuous period of 84 days by reason of Force Majeure of which notice has been given under GCC Subclause 63 [Notice of Force Majeure], or for multiple periods which total more than 140 days due to the same notified Force Majeure, then either Party may give to the other Party a notice of termination of the Contract. In this event, the termination shall take effect 7 days after the notice is given, and the Contractor shall proceed in accordance with GCC Subclause 73.5 [Termination].

	<p>67.2 Upon such termination, the Project Manager shall determine the value of the work done and issue a Payment Certificate, which shall include</p> <ul style="list-style-type: none"> (a) the amounts payable for any work carried out for which a price is stated in the Contract; (b) the Cost of Plant and Materials ordered for the Works which have been delivered to the Contractor, or of which the Contractor is liable to accept delivery: this Plant and Materials shall become the property of (and be at the risk of) the Employer when paid for by the Employer, and the Contractor shall place the same at the Employer's disposal; (c) other Costs or liabilities which in the circumstances were reasonably and necessarily incurred by the Contractor in the expectation of completing the Works; (d) the Cost of removal of Temporary Works and Contractor's Equipment from the Site and the return of these items to the Contractor's works in his country (or to any other destination at no greater cost); and (e) the Cost of repatriation of the Contractor's staff and labor employed wholly in connection with the Works at the date of termination.
<p>68. Release from Performance</p>	<p>68.1 Notwithstanding any other provision of this Clause, if any event or circumstance outside the control of the Parties (including, but not limited to, Force Majeure) arises, which makes it impossible or unlawful for either or both Parties to fulfill its or their contractual obligations or which, under the law governing the Contract, entitles the Parties to be released from further performance of the Contract, then upon notice by either Party to the other Party of such event or circumstance,</p> <ul style="list-style-type: none"> (a) the Parties shall be discharged from further performance, without prejudice to the rights of either Party in respect of any previous breach of the Contract; and (b) the sum payable by the Employer to the Contractor shall be the same as would have been payable under GCC Subclause 67 [Optional Termination, Payment and Release] if the Contract had been terminated under GCC Subclause 67.
<p>G. Finishing the Contract</p>	
<p>69. Completion</p>	<p>69.1 The Contractor shall request the Project Manager to issue a certificate of Completion of the Works, and the Project Manager shall do so upon deciding that the work is completed.</p>
<p>70. Taking Over</p>	<p>70.1 The Employer shall take over the Site and the Works within 7 days of the Project Manager's issuing a certificate of Completion.</p>
<p>71. Final Account</p>	<p>71.1 The Contractor shall supply the Project Manager with a detailed account of the total amount that the Contractor considers payable under the Contract before the end of the Defects Liability Period. The Project Manager shall issue a Defects Liability Certificate and certify any final payment that is due to the Contractor within 56 days of</p>

	<p>receiving the Contractor's account if it is correct and complete. If it is not, the Project Manager shall issue within 56 days a schedule that states the scope of the corrections or additions that are necessary. If the Final Account is still unsatisfactory after it has been resubmitted, the Project Manager shall decide on the amount payable to the Contractor and issue a payment certificate.</p>
72. Operating and Maintenance Manuals	<p>72.1 If "as built" Drawings and/or operating and maintenance manuals are required, the Contractor shall supply them by the dates stated in the PCC.</p>
	<p>72.2 If the Contractor does not supply the Drawings and/or manuals by the dates stated in the PCC pursuant to GCC 72.1, or they do not receive the Project Manager's approval, the Project Manager shall withhold the amount stated in the PCC from payments due to the Contractor.</p>
73. Termination	<p>73.1 The Employer or the Contractor may terminate the Contract if the other party causes a fundamental breach of the Contract.</p>
	<p>73.2 Fundamental breaches of Contract shall include, but shall not be limited to, the following:</p> <ul style="list-style-type: none"> (a) the Contractor stops work for 28 days when no stoppage of work is shown on the current Program and the stoppage has not been authorized by the Project Manager; (b) the Project Manager instructs the Contractor to delay the progress of the Works, and the instruction is not withdrawn within 28 days; (c) the Employer or the Contractor is made bankrupt or goes into liquidation other than for a reconstruction or amalgamation; (d) a payment certified by the Project Manager is not paid by the Employer to the Contractor within 84 days of the date of the Project Manager's certificate; (e) the Project Manager gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Contractor fails to correct it within a reasonable period of time determined by the Project Manager; (f) the Project Manager gives two consecutive Notices to update the Program and accelerate the works to ensure compliance with GCC Subclause 22.1 [The Works to be Completed by the Intended Completion Date] and the Contractor fails to update the Program and demonstrate acceleration of the works within a reasonable period of time determined by the Project Manager; (g) the Contractor does not maintain a Security, which is required; (h) the Contractor has delayed the completion of the Works by the number of days for which the maximum amount of liquidated damages can be paid, as defined in the PCC; and (i) if the Contractor, in the judgment of the Employer has engaged in corrupt or fraudulent practices in competing for or in executing the Contract, pursuant to GCC 74.1 [Fraud and

	Corruption].
	73.3 When either party to the Contract gives notice of a breach of Contract to the Project Manager for a cause other than those listed under GCC 73.2 above, the Project Manager shall decide whether the breach is fundamental or not.
	73.4 Notwithstanding the above, the Employer may terminate the Contract for convenience.
	73.5 If the Contract is terminated, the Contractor shall stop work immediately, make the Site safe and secure, and leave the Site as soon as reasonably possible.
74. Fraud and Corruption	<p>74.1 ADB's Anticorruption Policy requires Borrowers (including beneficiaries of ADB-financed activity), as well as Contractors, Subcontractors, Manufacturers, and Consultants under ADB-financed contracts, observe the highest standard of ethics during the procurement and execution of such contracts. In pursuance of this policy, the ADB</p> <p>(a) defines, for the purposes of this provision, the terms set forth below as follows:</p> <p>(i) "corrupt practice" means the offering, giving, receiving, or soliciting, directly or indirectly, anything of value to influence improperly the actions of another party;</p> <p>(ii) "fraudulent practice" means any act or omission, including a misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation;</p> <p>(iii) "coercive practice" means impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party;</p> <p>(iv) "collusive practice" means an arrangement between two or more parties designed to achieve an improper purpose, including influencing improperly the actions of another party;</p> <p>(v) "obstructive practice" means (a) deliberately destroying, falsifying, altering, or concealing of evidence material to an ADB investigation; (b) making false statements to investigators in order to materially impede an ADB investigation; (c) failing to comply with requests to provide information, documents, or records in connection with an Office of Anticorruption and Integrity (OAI) investigation; (d) threatening, harassing, or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation, or (e) materially impeding ADB's contractual rights of audit or access to information; and</p> <p>(vi) "integrity violation" is any act which violates ADB's Anticorruption Policy, including (i) to (v) above and the following: abuse, conflict of interest, violations of ADB</p>

	<p>sanctions, retaliation against whistleblowers or witnesses, and other violations of ADB's Anticorruption Policy, including failure to adhere to the highest ethical standard.</p> <p>(b) will reject a proposal for award if it determines that the Bidder recommended for award has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations in competing for the Contract;</p> <p>(c) will cancel the portion of the financing allocated to a contract if it determines at any time that representatives of the borrower or of a beneficiary of ADB-financing engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations during the procurement or the execution of that contract, without the borrower having taken timely and appropriate action satisfactory to ADB to remedy the situation; and</p> <p>(d) will impose remedial actions on a firm or an individual, at any time, in accordance with ADB's Anticorruption Policy and Integrity Principles and Guidelines (both as amended from time to time), including declaring ineligible, either indefinitely or for a stated period of time, to participate² in ADB-financed, -administered, or -supported activities or to benefit from an ADB-financed, -administered, or -supported contract, financially or otherwise, if it at any time determines that the firm or individual has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations.</p>
<p>75. Payment upon Termination</p>	<p>75.1 If the Contract is terminated because of a fundamental breach of Contract by the Contractor, the Project Manager shall issue a certificate for the value of the work done and Materials ordered less advance payments received up to the date of the issue of the certificate and less the percentage to apply to the value of the work not completed, as indicated in the PCC. Additional Liquidated Damages shall not apply. If the total amount due to the Employer exceeds any payment due to the Contractor, the difference shall be a debt payable to the Employer.</p>
	<p>75.2 If the Contract is terminated for the Employer's convenience or because of a fundamental breach of Contract by the Employer, the Project Manager shall issue a certificate for the value of the work done, Materials ordered, the reasonable cost of removal of Equipment, repatriation of the Contractor's personnel employed solely on the Works, and the Contractor's costs of protecting and securing the Works, and less advance payments received up to the date of the certificate.</p>
<p>76. Property</p>	<p>76.1 All Materials on the Site, Plant, Equipment, Temporary Works, and Works shall be deemed to be the property of the Employer if the</p>

² Whether as a Contractor, Nominated Subcontractor, Consultant, Manufacturer or Supplier, or Service Provider; or in any other capacity (different names are used depending on the particular Bidding Document). A Nominated Subcontractor is one which either has been (i) included by the Bidder in its prequalification application or bid because it brings specific and critical experience and know-how that are accounted for in the evaluation of the Bidder's prequalification application or the bid; or (ii) appointed by the Employer.

	Contract is terminated because of the Contractor's default.
77. Release from Performance	77.1 If the Contract is frustrated by the outbreak of war or by any other event entirely outside the control of either the Employer or the Contractor, the Project Manager shall certify that the Contract has been frustrated. The Contractor shall make the Site safe and stop work as quickly as possible after receiving this certificate and shall be paid for all work carried out before receiving it and for any work carried out afterward to which a commitment was made.
78. Suspension of ADB Loan or Credit	78.1 In the event that ADB suspends the Loan or Credit to the Employer, from which part of the payments to the Contractor are being made, <ul style="list-style-type: none"> (a) the Employer is obligated to notify the Contractor, with copy to the Project Manager, of such suspension within 7 days of having received ADB's suspension notice. (b) if the Contractor has not received sums due it within the 28 days for payment provided for in GCC 50.1 [Payments], the Contractor may immediately issue a 14-day termination notice.
79. Eligibility	79.1 The Contractor shall have the nationality of an eligible country as specified in Section 5 [Eligible Countries] of the bidding document. The Contractor shall be deemed to have the nationality of a country if the Contractor is a citizen or is constituted, incorporated, or registered, and operates in conformity with the provisions of the laws of that country. This criterion shall also apply to the determination of the nationality of proposed subcontractors or suppliers for any part of the Contract including related services.
	79.2 The materials, equipment, and services to be supplied under the Contract shall have their origin in eligible source countries as specified in Section 5 [Eligible Countries] of the bidding document and all expenditures under the Contract will be limited to such materials, equipment, and services. At the Employer's request, the Contractor may be required to provide evidence of the origin of materials, equipment, and services.
	79.3 For purposes of GCC 79.2, "origin" means the place where the materials and equipment are mined, grown, produced, or manufactured, and from which the services are provided. Materials and equipment are produced when, through manufacturing, processing, or substantial or major assembling of components, a commercially recognized product results that differs substantially in its basic characteristics or in purpose or utility from its components.

Section 8 - Particular Conditions of Contract

The following Particular Conditions of Contract shall supplement the GCC. Whenever there is a conflict, the provisions herein shall prevail over those in the GCC.

Particular Conditions of Contract

A. General	
GCC 1.1 (d)	The financing institutions is Asian Development Bank
GCC 1.1 (r)	The Employer is Local Government & Community Development Department, Government of Punjab Authorized Representative: Program Management Unit, (PMU), Punjab Intermediate Cities Improvement Investment Program (PICIIP), Local Government & Community Development Department, Punjab, Pakistan
GCC 1.1 (w)	The Intended Completion Date for the whole of the Works shall be: Five Hundred Forty-Seven (547) days
GCC 1.1 (cc)	The Project Manager is the Team Leader/Chief Resident Engineer (CRE) nominated by the Project Urban Mobility Design & Supervision (UMDS) Consultant. Authorized Representative: Resident Engineer
GCC 1.1 (ff)	The Site is located in Lala Musa Campus.
GCC 1.1 (ii)	The Start Date shall be Twenty-One (21) days from the signing of the Contract
GCC 1.1 (mm)	The Works consist of: ➤ NCB-Works/PICIIP-15; Upgradation of Punjab Local Government Academy (PLGA) campus at Lala Musa Which include execution of all the items identified in the Drawings, Specifications, BOQ and Contract documents
GCC 2.2	Sectional Completions are: Not Applicable
GCC 2.3 (j)	The following documents also form part of the Contract: a. Site Specific Environmental Management Plan (SSEMP) b. Site Specific Health and Safety Management Plan (SSHSMP) c. Details of Personnel d. Details of Equipment e. Method statement and Implementation Schedule (including mobilization and construction schedule) f. COVID-19 Specific Site Health and Safety Management Plan
GCC 3.1	The language of the contract is English. The law that applies to the Contract is the law of the Islamic Republic of Pakistan
GCC 10	Add a second paragraph: <i>"The Project Manager shall provide within 5 working days the following information, as prepared by the Project Manager and/or received from the Contractor, to the</i>

	<p><i>Employer's Authorized Representative without limitation:</i></p> <ul style="list-style-type: none"> <i>i. Proposal for Extension of the Intended Completion Date prepared under Clause 36;</i> <i>ii. Early Warning received from Contractor under Clause 40;</i> <i>iii. Changes in the Contract Price determined by the Project Manager under Clause 46;</i> <i>iv. Variations Requested by the Project Manager, quotations received from the Contractor and determined by the Project Manger under Clause 47;</i> <i>v. Compensation Event determined by the Project Manager under Clause 51;</i> <i>vi. Request for issuing the Completion certificate requested by the Contractor under Clause 69"</i>
GCC 11.1	The Project Manager may delegate any of his/her duties and responsibilities subject to prior approval of the Employer.
GCC 14.1	Schedule of other contractors: Not Applicable
GCC 19.1	<p>The minimum insurance amounts and deductibles shall be:</p> <ul style="list-style-type: none"> (a) for loss or damage to the Works, Plant and Materials: 110% of the contract price (b) for loss or damage to Equipment: Full Replacement Value (c) for loss or damage to property (except the Works, Plant, Materials, and Equipment) in connection with Contract: 100% of the loss occurred (d) for personal injury or death: <ul style="list-style-type: none"> (i) of the Contractor's employees: PKR 500,000/- in case of the injury for each occurrence and PKR 2,000,000/- in case of death for each occurrence. (Occurrences unlimited) (ii) of other people: same as above (iii) The maximum deductible amount shall be "PKR Five (5) Million" against event under Para (a) herein above whereas "Nil" against events under Para (b), (c) and (d). The insurance will be from the companies rated "A" or higher by Pakistan Credit Rating Agency Limited.
GCC 20.1	Site Investigation Reports are: Nil
GCC 22.1	<p>Please add the following at the end Sub-Clause 22.1</p> <p><i>"The Contractor shall adequately record the condition of roads, adjoining land and other infrastructure prior to the start of transporting materials, goods and equipment, and construction."</i></p>
GCC 23.1	The following shall be designed by the Contractor: Not Applicable
GCC 24.1	<p><i>Following shall replace text under Sub-Clause 24.1:</i></p> <p><i>"The Contractor shall at all times take all reasonable precautions to maintain the health and safety of the Contractor's Personnel and to provide a safe work environment to both female and male workers.</i></p> <p><i>The Contractor shall: (a) comply with applicable core labor standards and labor laws, and incorporate applicable workforce occupational safety norms; (b) comply</i></p>

	<p><i>with the applicable provisions of the Gender Action Plan, including equal pay to men and women for the same type of work and enabling working conditions for female workers; (c) to the extent possible, maximize employment of local poor and disadvantaged persons for project construction purposes, provided that the requirement for job and efficiency are adequately met; and (d) provide safe working conditions.</i></p> <p><i>The Contractor shall disseminate information (in local languages) on the risks of sexually-transmitted diseases, including HIV/AIDs, in health and safety program for all construction works at campsites. Compliance to the foregoing will be strictly monitored by the Employer.</i></p> <p><i>In particular, the Contractor is responsible for providing site workers with safe and healthy working conditions and establish an operating system to prevent accidents, injuries, and disease.</i></p>
GCC 24.2	<p><i>Please add the following as Sub-Clause 24.2:</i></p> <p><i>"The Contractor is responsible for establishment of preventive and emergency preparedness and response measures to avoid, and where avoidance is not possible, to minimize, adverse impacts and risks of the construction site work to the health and safety of local communities.</i></p> <p><i>Within 14 days of the Start Date the Contractor shall submit a detailed Site-Specific Health and Safety Management Plan (SSHSMP) for the Project Manager's no objection showing how he/she intends to comply with the local Health and Safety laws and regulations and other specific requirements prescribed in the Contract, taking into account the Supplementary Information in Section 6- Employer's Requirements. Work shall not commence on the Site until the confirmation of no objection of the SSHSMP has been obtained from the Project Manager and is being implemented. Such confirmation of no objection by the Project Manager shall not relieve the Contractor of any of his/her obligations or responsibilities under the Contract.</i></p> <p><i>Where unanticipated health and safety hazards or risks become apparent during the Contract, the Contractor is required to update the SSHSMP to outline the potential impacts to site works and associated mitigation measures for the Project Manager's no objection.</i></p> <p><i>The Contractor shall comply with the approved SSHSMP and any corrective or preventative actions set out in safeguards monitoring reports that the Employer will prepare from time to time to monitor the implementation of the project EMP through the SSHSMP.</i></p> <p><i>In particular, the Contractor is required to provide all personnel on site including Employer's Personnel and visitors with personal protective equipment, including protection for feet (safety boots), head, eyes, ears (safety helmets) and hands, etc. in accordance with the Contractor's SSHSMP. The Contractor should ensure that his Subcontractors comply with the SSHSMP and provide all such necessary equipment to their personnel.</i></p> <p><i>The Contractor shall bear the costs to ensure that such measures, requirements and actions are carried out.</i></p> <p><i>The Contractor shall submit semi-annual reports on the compliance of such measures to the Employer.</i></p> <p><i>In the event of a significant injury involving medical treatment or hospitalization and</i></p>

	<i>fatal accident the Contractor shall notify the Project Manager immediately by verbal communication and submit a formal report as soon as practicable after its occurrence. For all accidents, whether fatal or not, the Contractor shall also notify the appropriate local authorities in accordance with the Laws of the Country."</i>
GCC 26.1	The Site Possession Date(s) shall be: within Fourteen (14) days from signing of the Contract. The Contractor shall sign and handover the site possession certificate to the Employer within Five (5) days of information by the Employer that site is ready to be taken over.
GCC 27.2	Please add the following as Sub-Clause 27.2: <i>"The Contractor shall comply with (i) the measures and requirements relevant to the Contractor which are set forth in the Resettlement Plan ("RP"), to the extent it concerns impacts on affected people during construction; and (ii) any corrective or preventive actions set out in safeguards monitoring reports that the Employer will prepare from time to time to monitor implementation of the resettlement plan.</i> <i>The Contractor shall allocate a budget for compliance with these measures, requirements and actions."</i>
GCC 29.1	Appointing Authority for the Adjudicator: Pakistan Engineering Council, Islamabad
GCC 30.3	The Adjudicator shall be paid by the hour at the rate of: PKR 2,000 (two thousand) The reimbursable expenses are: Actual transportation expenses incurred. Transportation expenses should be by economy class travel whether by air or land. Adjudicator shall be entitled to a per diem of PKR Ten thousand (10,000) per day.
GCC 30.4	Institution whose arbitration procedures shall be used: Arbitration shall be carried out in accordance with the rules and provision of Arbitration Act 1940 of Islamic Republic of Pakistan . The place of arbitration shall be "Lahore, Punjab, Islamic Republic of Pakistan".
GCC 32.1	Please add the following at the end of Sub-Clause 32.1: <i>"Child' means a child below the statutory minimum age of 14 under applicable national, provincial or law of Pakistan."</i>
GCC 34.2	Following new sub clause is added as Sub-Clause 34.2: The Contractor shall (i) comply with Pakistan's (a) labour laws and regulations applicable to the Contractors Personnel, including male and female staff, consultants, contractors, and agents; and (b) incorporate workplace occupational safety norms; and (ii) allow freedom of association and effectively recognize the right to collective bargaining. Employment opportunities shall be offered to women, as skilled or unskilled workers. The Contractor shall offer incentives to attract women as unskilled workers under cash-for work program to the extent possible. These incentives could include widely announcing employment opportunities and recruitment notices through the most appropriate communication means to target local women. Equal pay for equal work and basic facilities (separate toilets, clean water) are provided for women."

	<p>The Contractor shall ensure that its employees and Subcontractors observe the highest ethical standards and refrain from any form of bullying, discrimination, misconduct and harassment, including sexual harassment and shall, at all times, behave in a manner that creates an environment free of unethical behavior, bullying, misconduct and harassment, including sexual harassment. The Contractor shall take appropriate action against any employees or Subcontractors, including suspension or termination of employment or sub-contract, if any form of unethical or inappropriate behavior is identified.</p> <p>The Contractor shall conduct training programs for its employees and Subcontractors to raise awareness on and prevent any form of bullying, discrimination, misconduct and harassment including sexual harassment, and to promote a respectful work environment. The Contractor shall keep an up-to-date record of its employees and Subcontractors who have attended and completed such training programs and provide such records to the Employer or the Project Manager at their first written request.</p> <p>.</p>
C. Time Control	
GCC 35.1	<p>The Contractor shall submit for approval a Program for the Works within Twenty-Eight (28) days from the date of the Letter of Acceptance. The program shall be submitted in the form of MS Project or other similar software (3 Nos. hard and soft copies) by allocating the equipment and other resources, moreover, the critical activities shall be identified. The program shall include information on equipment for the Contract consistent with its proposal regarding work methods, scheduling, and material sourcing in sufficient detail as advised and approved by the Project Manager. The Contractor shall include as part of its program submitted, a detail forecasted cash flow in a format acceptable to the Project Manager.</p>
GCC 35.3	<p>The period between Program updates is Fourteen (14) days. If the progress of works is slow, or an acceleration of work is required, or unforeseeable circumstances warrant/require an increase in progress then the Project Manager may also instruct the Contractor to submit the update within a period of Seven (7) days.</p> <p>The amount to be withheld for late submission of an updated Program is PKR Five Hundred Thousand (500,000).</p> <p>Following is added:</p>
D. Quality Control	
GCC 40.1	<p>Following text is added;</p> <p><i>"In addition to the foregoing, the Contractor shall provide the Project Manager with a written notice of any unanticipated environmental or resettlement risks or impacts on both women and men that arise during construction, implementation or operation of the Permanent Works, which were not considered in the Initial Environmental Examination, the Environmental Management Plan or the Resettlement Plan"</i></p>
GCC 43.1	<p>The Defects Liability Period from the Completion Date is: Three Hundred and Sixty Five (365) days</p>

E. Cost Control	
SCC 49.7	<p>Please add following as the new Sub-Clause 49.7:</p> <p>"</p> <p>(a) <i>The Contractor shall be entitled to receive from the Employer an amount for Materials as "Secured Advance" against an indemnity bond acceptable to the Employer (Form provided in Section 9) of such sum as the Project Manager may consider proper in respect of the Materials (listed in the Schedules for payment and) delivered to the Site but not yet incorporated in the Permanent Works provided that:</i></p> <ul style="list-style-type: none"> <i>i. The Materials are in accordance with the Specifications for the Works;</i> <i>ii. Such Materials have been delivered to the Site and are properly stored and protected against loss or damage or deterioration to the satisfaction of the Project Manager but at the risk and cost of the Contractor;</i> <i>iii. The Contractor's records of the requirements, orders, receipts and use of Materials are kept in a form approved by the Project Manager, and such records shall be available for inspection by the Project Manager;</i> <i>iv. The Contractor shall submit with his monthly statement the estimated value of the Materials on Site together with such documents as may be required by the Project Manager for the purpose of valuation of Materials and providing evidence of ownership and payment therefore;</i> <i>v. Ownership of such Materials shall be deemed to vest in the Employer and these Materials shall not be removed from the Site or otherwise disposed off without written permission of the Employer; and</i> <i>vi. The sum payable for such Materials on Site shall not exceed 80% of the (i) landed cost of imported Materials, or (ii) ex-factory / ex-warehouse price of locally manufactured or produced Materials, or (iii) market price of other Materials, also keeping in view value of the Materials under the Contract taking into account the unit rates of the corresponding items of payment in the Bills of Quantity.</i> <p>(b) <i>The "Secured Advance" paid to the Contractor under the above provisions shall be recovered through deductions from the monthly payments on actual consumption basis.</i></p>
GCC 53.1	The currency of the Employer's country is: Pakistani Rupees (PKR).
GCC 54.1	<p>The Contract is subject to price adjustment in accordance with GCC Clause 54, and the following information regarding coefficients shall apply.</p> <p>The coefficients and indexes for adjustment of prices in local currencies shall be as specified in the Table of Adjustment Data submitted together with the Letter of Bid.</p>
GCC 55.1	The proportion of payments retained is: Five Percent (5%).
GCC 56.1	<p>The liquidated damages for the whole of the Works are 0.1% per day of the Final Contract Price.</p> <p>The maximum amount of liquidated damages for the whole of the Works is Ten Percent (10%) of the final Contract Price.</p>
GCC 57.1	The Bonus for the whole of the Works is Not Applicable.

GCC 58.1	<p>The Advance Payments shall be Fifteen Percent (15%) of the Accepted Contract amount and shall be paid to the Contractor no later than Twenty-Eight (28) days from the date the corresponding bank guarantee delivered by the Contractor and has been verified by the Employer from the issuing bank.</p> <p>The bifurcation of Fifteen Percent (15%) advance payment is as follows; 10% After Signing of Contract and remaining 5% could be paid after confirmation of Mobilization of Contractors resources, Machinery, Human Resource at sites by the Project Manager.</p>
GCC 58.3	<p>Repayment of the Advance Payments shall be: Twenty Percent (20%) from each payment certificate.</p>
GCC 59.1	<p>The Performance Security amount is Ten Percent (10%) of the accepted contract amount. In case of Joint Venture, the performance security must be in the name of Joint Venture.</p> <p>The Performance Security shall be issued either (a) By a reputable bank, which may include scheduled banks, located in the Country, or (b) by a reputable foreign bank, selected by the Contractor and acceptable to the Employer. If the bank issuing the Performance Security furnished by the Contractor is outside the Country, the issuer shall have a correspondent bank in the Country to make it enforceable in the Country. The Performance Security shall be in the form annexed to the Bidding Document.</p>
G. Finishing the Contract	
GCC 69.2	<p>Please add the following as Sub-Clause 69.2:</p> <p><i>"Upon the completion of construction, the Contractor shall fully reinstate pathways, other local infrastructure to at least their pre-project condition as recorded by the Contractor in consonance with its obligation in Clause 22."</i></p>
GCC 71.1	<p>Add the following at the end of this sub-clause:</p> <p>On expiry of the Defects Liability Period, the Employer / Employer's representative shall constitute a committee comprising of Project Manager / Project Manager's representative, Employer / Employer's representative and the Contractor / Contractor's representative. The committee shall conduct a detailed inspection of the Works to ascertain the completion of any outstanding Work stated in Completion Certificate and remedying of defects to ascertain to the Project Manager for issuance of Defects Liability Certificate or otherwise.</p>
GCC 72.1	<p>The date by which operating and maintenance manuals are required is Twenty Eight (28) days after issuance of the Completion Certificate.</p> <p>The date by which "as built" drawings are required is within Twenty Eight (28) days after issuance of the Completion Certificate.</p>
GCC 72.2	<p>The amount to be withheld for failing to produce "as built" drawings by the date required in GCC 72.1 is PKR Five Hundred Thousand (500,000).</p>
GCC 73.2 (h)	<p>The maximum number of days is: One Hundred (100) days</p>
GCC 75.1	<p>The percentage to apply to the value of the work not completed, representing the Employer's additional cost for completing the Works, is Fifteen Percent (15%) of the final Contract Price.</p>

PCC 80	<p>Please add the following as new sub-paragraph 80:</p> <p><i>"The Contractor shall provide the Employer with quarterly reports of its activities, including each of its obligations in Sub-Clauses 22, 24, 27,34, 69 and 81.</i></p>
PCC 81	<p>Please add the following as new Sub-Clause 81:</p> <p><i>"Protection of the Environment:</i></p> <p><i>The Contractor shall comply with all applicable national, provincial, and local environmental laws and regulations.</i></p> <p><i>The Contractor shall also comply with all reasonable requests of the national and local authorities responsible for enforcing environmental controls. Within 14 days of the Start Date the Contractor shall submit a detailed Site Specific Environmental Management Plan (SSEMP) for the Project Manager's no objection showing how he/she intends to comply with environmental laws and regulations and other specific requirements prescribed in the Contract, addressing all the monitoring and mitigation measures set forth in the Environmental Impact Assessment ("EIA") or Initial Environmental Examination ("IEE") and the Environmental Management Plan ("EMP") of the project attached in Section 6- Employer's Requirements. Work shall not commence on the Site until the no objection of SSEMP has been obtained from the Project Manager and is being implemented. Such acceptance by the Project Manager shall not relieve the Contractor of any of his obligations or responsibilities under the Contract.</i></p> <p><i>The Contractor shall (a) establish an operational system for managing environmental impacts, (b) comply with the approved SSEMP and any corrective or preventative actions set out in safeguards monitoring reports that the Employer will prepare from time to time to monitor the implementation of the project EMP through the SSEMP, (c) allocate the budget required to ensure that such measures, requirements and actions are carried out, (d) submit semi-annual reports on the compliance of such measures to the Employer.</i></p> <p><i>Where unanticipated environmental risks or impacts become apparent during the Contract, the Contractor is required to update the SSEMP to outline the potential impacts to site works and associated mitigation measures for the Project Manager's approval"</i></p>
PCC 82	<p>Please add following as the new Sub-Clause 82:</p> <p><i>"Labor Laws:</i></p> <p><i>The Contractor, its Personnel, and subcontractors shall comply with the following at all times during the period of the Contract (together, the Labor Requirements):</i></p> <p><i>(a) all the relevant Laws in force, in Pakistan, which are applicable to the Contractor and its Personnel, including but not limited to, Laws applying to their employment, health, safety, welfare, immigration and emigration, and shall allow them the exercise of all their legal rights, and Laws concerning the prevention of sexual harassment, abuse, assault and sexual exploitation of, or by, the Contractor's Personnel at or in the vicinity of the Site, or any accommodation, amenities and facilities provided under the Contract;</i></p> <p><i>(b) (i) the Standard Operating Procedures as may be issued by the Employer (SOPs) to the Contractor with respect to the conditions of the place of employment, health and safety measures to be taken to protect the health, safety and welfare of the Contractor's Personnel; and (ii) the core labor standards which prohibits the use child labor, discrimination of workers in respect of employment and occupation, the</i></p>

	<p><i>use of forced or compulsory labor, and allows the freedom of association and effectively recognizes the right to collective bargaining (CLS); and</i></p> <p><i>(c) the requirements on health and safety set out in Clause 24.</i></p> <p><i>If the Contractor or any of its Personnel or sub-contractors becomes aware of any breach, or suspected breach, of the Labor Requirements by the Contractor or any of its Personnel or sub-contractors (the Labor Requirements Non-Compliance), it shall immediately report it to the Employer's Representative in writing, giving details of the nature of the breach and the time-frame within which such Labor Requirements Non-Compliance will be rectified. If the Employer becomes aware of any Labor Requirements Non-Compliance, the Employer's Representative (or any other person nominated by the Employer) shall deliver a written notice to the Contractor's Representative (Employer's Notice of Non-Compliance), giving details of the nature of the breach and the time-frame within which such breach must be rectified by the Contractor. The notice shall also require the Contractor to explain in writing its response to the alleged finding of a Labor Requirements Non-Compliance. The Contractor shall be given 7 calendar days to submit its written response to the Employer's Notice of Breach of Labor Requirements. If the Contractor fails to rectify the Labor Requirements Non-Compliance within the prescribed period, and if the Employer determines that the breach is of such materiality and gravity that in the opinion of the Employer (acting reasonably), it merits a stoppage of Works (as specified in the Schedule), the Employer shall be entitled to declare a stoppage of Works for a period of time to be determined by the Employer. The Contractor shall not be entitled to an extension of time for, or payment or reimbursement for any costs incurred in, rectifying the Labor Requirements Non-Compliance. The Contractor shall be solely responsible and liable for all consequences and liabilities arising from such stoppage of Works and the Labor Requirements Non-Compliance. Any action taken by the Employer pursuant to an Employer's Notice of Non-Compliance shall be without prejudice to the Employer's rights under the Contract, including without limitation the Employer's rights to terminate the Contract under GCC 73."</i></p>
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Section 9 - Contract Forms

This section contains forms which, once completed, will form part of the Contract. The forms for Performance Security and Advance Payment Security, when required, shall only be completed by the successful Bidder after contract award.

Table of Forms

Notification of Award	9-2
Contract Agreement	9-3
Performance Security	9-5
Advance Payment Security	9-6
Indemnity Bond for Secured Advance	9-7

Notification of Award

---- on letterhead paper of the employer ----

Letter of Acceptance

..... date.....

To: Name and address of the contractor

Subject: Notification of Award Contract No.

This is to notify you that your Bid dated date for execution of the name of the contract and identification number, as given in the Bid Data Sheet for the Accepted Contract Amount of the equivalent of amount in words and figures and name of currency, as corrected and modified in accordance with the Instructions to Bidders is hereby accepted by our Agency.

You are requested to furnish the Performance Security within 28 days in accordance with the Conditions of Contract, using for that purpose the Performance Security Form included in Section 9 (Contract Forms) of the Bidding Document.

[Choose one of the following statements:]

We accept that [insert the name of adjudicator proposed by the bidder] be appointed as the Adjudicator.

[or]

We do not accept that [insert the name of the adjudicator proposed by the bidder] be appointed as the Adjudicator, and by sending a copy of this Letter of Acceptance to [insert name of the appointing authority], the Appointing Authority, we are hereby requesting such Authority to appoint the Adjudicator in accordance with GCC 29.1.

Authorized Signature:

Name and Title of Signatory:

Name of Agency:

Attachment: Contract Agreement

Contract Agreement

THIS AGREEMENT made the day of, between name of the employer. (hereinafter "the Employer"), of the one part, and name of the contractor. (hereinafter "the Contractor"), of the other part:

WHEREAS the Employer desires that the Works known as name of the contract. should be executed by the Contractor, and has accepted a Bid by the Contractor for the execution and completion of these Works and the remedying of any defects therein,

The Employer and the Contractor agree as follows:

1. In this Agreement, words and expressions shall have the same meanings as are respectively assigned to them in the Contract documents referred to.
2. The following documents shall be deemed to form and be read and construed as part of this Agreement. This Agreement shall prevail over all other Contract documents.
 - (a) the Contract Agreement,
 - (b) the Letter of Acceptance,
 - (c) the Letters of Technical Bid and Price Bid,
 - (d) the Particular Conditions of Contract,
 - (e) the List of Eligible Countries that was specified in Section 5 of the bidding document,
 - (f) the General Conditions of Contract,
 - (g) the Specifications,
 - (h) the Drawings,
 - (i) the Bill of Quantities, and
 - (j) any other documents shall be added here.¹
3. In consideration of the payments to be made by the Employer to the Contractor as indicated in this Agreement, the Contractor hereby covenants with the Employer to execute the Works and to remedy defects therein in conformity 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 and the remedying of defects therein, 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 in accordance with the laws of name of the borrowing country. on the day, month and year indicated above.

¹ Tables of Adjustment Data may be added if the contract provides for price adjustment (see GCC 54.1).

Signed by
for and on behalf of the Employer

Signed by
for and on behalf the Contractor

in the presence of:

in the presence of:

Witness, Name, Signature, Address, Date

Witness, Name, Signature, Address, Date

Performance Security

Bank's name, and address of issuing branch or office¹

Beneficiary: *Name and address of the employer*

Date:

Performance Guarantee No.:

We have been informed that *name of the contractor* (hereinafter called "the Contractor") has entered into Contract No. *reference number of the contract* dated with you, for the execution of *name of contract and brief description of works* (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, a performance guarantee is required.

At the request of the Contractor, we *name of the bank* hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of *name of the currency and amount in words* ² (..... *amount in figures*) such sum being payable in the types and proportions of currencies in which the Contract Price is payable, upon receipt by us of your first demand in writing accompanied by a written statement stating that the Contractor is in breach of its obligation(s) under the Contract, without your needing to prove or to show grounds for your demand or the sum specified therein.

This guarantee shall expire, no later than the Day of ³, and any demand for payment under it must be received by us at this office on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees, ICC Publication No. 458, except that subparagraph (ii) of Sub-article 20(a) is hereby excluded. ⁴

.....
Signature(s) and seal of bank (where appropriate)

If the institution issuing the performance security is located outside the country of the employer, it shall have a correspondent financial institution located in the country of the employer to make it enforceable.

¹ All italicized text is for guidance on how to prepare this demand guarantee and shall be deleted from the final document.

² The guarantor shall insert an amount representing the percentage of the contract price specified in the contract and denominated either in the currency(ies) of the contract or a freely convertible currency acceptable to the employer. If the bank issuing the performance security is located outside the country of the employer, it shall have a correspondent financial institution located in the country of the employer.

³ Insert the date 28 days after the expected completion date. The employer should note that in the event of an extension of the time for completion of the contract, the employer would need to request an extension of this guarantee from the guarantor. Such request must be in writing and must be made prior to the expiration date established in the guarantee. In preparing this guarantee, the employer might consider adding the following text to the form, at the end of the penultimate paragraph: "The Guarantor agrees to a one-time extension of this guarantee for a period not to exceed [6 months][1 year], in response to the Employer's written request for such extension, such request to be presented to the Guarantor before the expiry of the guarantee."

⁴ Or the same or similar to this clause specified in the Uniform Rules for Demand Guarantees, ICC Publication No. 758 where applicable.

Advance Payment Security

Bank's name, and address of issuing branch or office¹

Beneficiary: *Name and address of the employer*

Date:

Advance Payment Guarantee No.:

We have been informed that *name of the contractor*. (hereinafter called "the Contractor") has entered into Contract No. *reference number of the contract*. dated with you, for the execution of *name of contract and brief description of works*. (hereinafter called "the Contract").

Furthermore, we understand that, according to the Conditions of the Contract, an advance payment in the sum *name of the currency and amount in words*². (..... *amount in figures*.) is to be made against an advance payment guarantee.

At the request of the Contractor, we *name of the bank*. hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of *name of the currency and amount in words*³. (..... *amount in figures*.) upon receipt by us of your first demand in writing accompanied by a written statement stating that the Contractor is in breach of its obligation under the Contract because the Contractor used the advance payment for purposes other than the costs of mobilization in respect of the Works.

It is a condition for any claim and payment under this guarantee to be made that the advance payment referred to above must have been received by the Contractor on its account number *contractor's account number*. at *name and address of the bank*.

The maximum amount of this guarantee shall be progressively reduced by the amount of the advance payment repaid by the Contractor as indicated in copies of interim statements or payment certificates which shall be presented to us. This guarantee shall expire, at the latest, upon our receipt of a copy of the interim payment certificate indicating that eighty percent (80%) of the Contract Price has been certified for payment, or on the ... day of⁴, whichever is earlier. Consequently, any demand for payment under this guarantee must be received by us at this office on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees, ICC Publication No. 458 (or ICC Publication No. 758 as applicable).

.....
Signature(s) and seal of bank (where appropriate)

- Note to Bidder -

If the institution issuing the advance payment security is located outside the country of the employer, it shall have a correspondent financial institution located in the country of the employer to make it enforceable.

- ¹ All italicized text is for guidance on how to prepare this demand guarantee and shall be deleted from the final document.
- ² The guarantor shall insert an amount representing the amount of the advance payment denominated either in the currency(ies) of the advance payment as specified in the Contract, or in a freely convertible currency acceptable to the employer.
- ³ Footnote 2.
- ⁴ Insert the expected expiration date of the time for completion. The employer should note that in the event of an extension of the time for completion of the contract, the employer would need to request an extension of this guarantee from the guarantor. Such request must be in writing and must be made prior to the expiration date established in the guarantee. In preparing this guarantee, the employer might consider adding the following text to the form, at the end of the penultimate paragraph: "The Guarantor agrees to a one-time extension of this guarantee for a period not to exceed [6 months][1 year], in response to the Employer's written request for such extension, such request to be presented to the Guarantor before the expiry of the guarantee."

**INDEMNITY BOND
FOR SECURED ADVANCE
AGAINST MATERIALS BROUGHT AT SITE
(ON PAK RUPESS 500 JUDICIAL STAMP PAPER)**

This Deed of Indemnity is issued by M/s. _____
_____ (Name of the Contractor) in favor of Local Government &
Community Development Department, Government of Punjab (hereinafter referred to as the Employer).

Whereas the Employer has paid the Secured Advance against the cost of Materials through any Bank or like agency by any other method by virtue of the terms of the Contract existing between the Parties. The details of the Materials and their price for which Secured Advance is sought for the period _____ till consumption of the Materials is as under:

1. _____ at Rs. _____ per _____ = Rs.
2. _____ at Rs. _____ per _____ = Rs.

THEREFORE, THIS DEED OF INDEMNITY WITNESSETH AS FOLLOWS:

I/We _____ of M/s _____ do hereby indemnify the Employer for all losses due to thefts, arson, pilferage, loss due to flood and inundation, shortage, deterioration and depreciation etc. through any act of Man or God or slump in the Market of any or all the Materials financed or paid by the Employer on our request for financing payment against Materials.

I/We _____ shall indemnify the Employer against any or all claims and damages arising out of or resulting to the said Materials.

I/We _____ further declare that we will faithfully abide by the above declaration and solemnly affirm that we will not remove, sell, pilferage any of the Materials against which the Employer has paid us such a Secured Advance and will not pledge the same with any Bank, Finance Corporation, Firm, Company, Individual or the like agency or create any change whereon in any from what so ever, except incorporating in the Permanent Works under the Contract.

I/We _____ do hereby also declare that in the event of my/our infringement of the declaration made above the Employer will be entitled to forfeit all such Materials and also proceed against me/us according to the relevant clause pertaining to breach of Contract and further invoke the power or seek any remedies secured of any kind under the Contract signed with us or otherwise available under the Law.

Place _____ Dated _____

Contractor _____ (Signature)
Name and CNIC/Passport (copy attached) number