PROJECT MANAGEMENT UNIT (PMU),
Sindh Integrated Health & Population Program (SIHPP)
Health Department,
Government of Sindh

BIDDING DOCUMENTS

VOLUME - I
BIDDING DOCUMENTS

Issued to M/s: _____

Date: _____

Issued By: _____

REHABILITATION AND UPGRADATION OF 15 THQs DAMAGED DURING FLOOD, AT VARIOUS DISTRICT OF SINDH

15 Nos of Taluka Headquarter Hospitals (THQs) at Hyderabad, Mirpurkhas, Larkana, Shaheed Benazirabad & Sukkur Divisions

OCT 2025

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Procurement Document

Bidding Document: Request for Bids –Works (Single Stage Single -Envelope Bidding Process)

PART 1 – BIDDING PROCEDURES

Section I - Instructions to Bidders (ITB)

This Section provides relevant information to help Bidders prepare their Bids. It is based on Single (1) envelope bidding process. Information is also provided on the submission, opening, and evaluation of Bids and on the award of Contracts. **Section I contains provisions that are to be used without modification.**

Section II - Bid Data Sheet (BDS)

This Section includes provisions that are specific to each procurement and that supplement Section I, Instructions to Bidders.

Section III - Evaluation and Qualification Criteria

This Section specifies the criteria to determine the Most Advantageous Bid.

Section IV - Bidding Forms

This Section includes the forms for the Bid submission, Bill of Quantities or Activity Schedules to be completed by the Bidder and submitted as part of its Bid.

Section V - Eligible Countries

This Section contains information regarding eligible countries.

Section VI - Fraud and Corruption

This section includes the Fraud and Corruption provisions which apply to this Bidding process.

PART 2 – WORKS' REQUIREMENTS

Section VII - Works' Requirements

This Section contains the Specification, the Drawings, and supplementary information that describe the Works to be procured. The Works' Requirements also include the environmental and social (ES) requirements.

PART 3 – CONDITIONS OF CONTRACT AND CONTRACT FORMS

Section VIII - General Conditions of Contract

This Section contains the general clauses to be applied in all contracts. **The text of the clauses in this Section shall not be modified.**

Section IX - Particular Conditions of Contract

This Section consists of the Particular Conditions of Contract which contains provisions specific to each contract. The contents of this Section modify or supplement the General Conditions of Contract and shall be prepared by the Employer.

Section X - Contract Forms

This Section contains the Letter of Acceptance, Contract Agreement and other relevant forms.

Specific Procurement Notice
Request for Bids
(One-Envelope Bidding Process)

Employer: Project Management Unit, Sindh Integrated Health & Population Program (SIHPP), Health Department, Government of Sindh
Project: Sindh Integrated Health and Population Program (SIHPP)
Contract title: Rehabilitation and Upgradation of 15 Nos Taluka Headquarter Hospitals (THQs) at Hyderabad, Mirpur has, Larkana, Shaheed Benazir Abad & Sukkur Divisions
Country: Pakistan
Loan No. /Credit No. / Grant No.: IDA-72370
RFB No: PK-SIHPP----------CW-RFB
Issued on: 24th October 2025

1. The *Government of Pakistan has received financing* from the World Bank toward the cost of the Sindh Integrated Health and Population Program (SIHPP) and intends to apply part of the proceeds toward payments under the contracts for Rehabilitation and Upgradation of 15 Taluqa Headquarter Hospitals (THQs) Damaged During Flood, at various Districts of Sindh
2. The *Project Management Unit, Sindh Integrated Health & Population Program (SIHPP), Health Department, Government of Sindh* now invites sealed Bids from eligible Bidders for Rehabilitation and Upgradation of 15 Taluqa Headquarter Hospitals (THQs) Damaged During Flood, at various Districts of Sindh
3. In addition to Activity No. PK-SIHPP-_____-CW-RFB, Rehabilitation and Upgradation of 15 THQs at Hyderabad, Larkana, Mirpurkhas and Shaheed Benazirabad & Sukkur Divisions , PK-SIHPP-_____-CW-RFB, Rehabilitation and Upgradation of 10 Rural Healthcare Centers (RHCs) at Hyderabad, Mirpurkhas, Shaheed Benazirabad, Larkana & Sukkur Divisions and Activity No. PK-SIHPP-_____-CW-RFB, Rehabilitation and Upgradation of 39 Government dispensaries fully Damaged During Flood, at Karachi, Hyderabad, Mirpurkhas Larkana, Sukkur & Shaheed Benazirabad Division of Sindh, there are two packages, tendered out in parallel. Bidders have the option to Bid for any one or more packages. However, if a bidder is found Most Advantageous on more than one package, the bidder shall meet the aggregate qualification criteria (cashflow, annual turnover, value of specific experience, key activity production rates, personnel and equipment) to be awarded the packages under consideration. The award will be made based on best economic award option to the Employer.

4. Bidding will be conducted through national competitive procurement using Request for Bids (RFB) as specified in the World Bank's "Procurement Regulations for IPF Borrowers *September 2023* ("Procurement Regulations"), and is open to all eligible Bidders as defined in the Procurement Regulations.

5. Bids will be evaluated in accordance with the evaluation process set out in the bidding documents.

6. Interested eligible Bidders may obtain further information from *The Project Management Unit Sindh Integrated Health & Population Program(SIHPP)* **pd@sihpp.gos.pk or ce1@sihpp.gos.pk** and inspect the bidding document during office hours *9:00 AM to 5:00 PM* at the address given below *Office #201, plot No 180-C, Al Murtaza Commercial Lane* 2, Phase VIII, DHA Karachi (Sindh) Pakistan .

7. The bidding document in English may be purchased by interested eligible Bidders upon the submission of a written application to the address below and upon payment of a nonrefundable fee of **PKR 10,000**. The method of payment will be a pay-order / banker's cheque in favor of "**Sindh Human Capital Investment 1000 Days**". The document may either be collected from the office of the undersigned or downloaded from the website.

8. Bids must be delivered to the address below on or before ***1500 HRS on 26th November 2025***. Electronic bidding *will not* be permitted. Late Bids will be rejected. The outer Bid envelopes marked "ORIGINAL BID", and the inner envelopes marked "TECHNICAL & FINANCIAL PART" will be publicly opened in the presence of the Bidders' designated representatives and anyone who chooses to attend, at the address below on ***1500 HRS on 26th November 2025.***

9. All Bids must be accompanied by a "Bid Security" of **PKR 40,000,000** in a form of Bank Guarantee, CDR, PayOrder or Banker's Cheque issued by a Scheduled Bank of Pakistan in favor of "**Sindh Human Capital Investment 1000 Days**".

10. Interested bidders must have, among other requirements, (i) an average annual turnover of **USD 11 Million**, (ii) an available cash flow of **USD 2 Million**., and (iii) A minimum number of similar contracts specified below that have been satisfactorily and substantially completed as a prime contractor, joint venture member, management contractor or sub-contractor between **1st January 2015 and bid** submission deadline:
    - One (1) contract of USD 6 Million in building works. Or Two (2) contracts, each with a value of USD 3 Million each in building works.

11. Attention is drawn to the Procurement Regulations requiring the Borrower to disclose information on the successful bidder's beneficial ownership, as part of the Contract Award Notice, using the Beneficial Ownership Disclosure Form as included in the bidding document.

12. The address(es) referred to above is (are):

Shafqat Soomro
Program Director
Sindh Integrated Health & Population Program (SIHPP
Office # 201, Plot No. 180-C,
Al-Murtaza Commercial Lane 2, Phase VIII, DHA Karachi (Sindh) Pakistan
Tel: (+92-21) 33406147, 33406145, 33406360
pd@sihpp.gos.pk or ce1@sihpp.gos.pk

Request for Bids

(One-Envelope Bidding Process)

Procurement of:

REHABILITATION AND UPGRADATION OF 15 THQs DAMAGED DURING FLOOD, AT VARIOUS DISTRICT OF SINDH

SINDH INTEGRATED HEALTH & POPULATION PROGRAM (SIHPP)

Rehabilitation and Upgradation of 15 Nos Taluka Headquarter Hospitals (THQs) at Hyderabad, Mirpurkhas, Larkana, Shaheed Benazirabad & Sukkur Divisions

Employer: *Project Management Unit, Sindh Integrated Health & Population Program (SIHPP), Health Department, Government of Sindh*

Project: *Sindh Integrated Health and Population Program (SIHPP)*

Contract title: Rehabilitation and Upgradation of 15 Nos Taluka Headquarter Hospitals (THQs) at Hyderabad, Mirpurkhas, Larkana, Shaheed Benazirabad & Sukkur Divisions

Country: *Pakistan*

Loan No. /Credit No. / Grant No.: *IDA-72370*

RFB No: *PK-SIHPP-_____-CW-RFB*

Issued on: 24th October 2025

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Civil Work: REHABILITATION AND UPGRADATION OF 15 THQs DAMAGED DURING FLOOD, AT VARIOUS DISTRICT OF SINDH

S.No	Division	District	Health Facility Name
1	HYD	Badin	Taluka Hospital Tando Bago
2	HYD	Badin	Taluka Hospital Golarchi
3	HYD	Jamshoro	Taluka Hospital Manjhand
4	HYD	Sujawal	Taluka Hospital Hospital Mirpur Bathoro
5	HYD	Tando Mohd Khan	Taluka Hospital Tando Ghulam Haider
6	MPK	Mirpurkhas	Taluka Hospital Kot Ghulam Mohammad
7	MPK	Mirpurkhas	Taluka Hospital Digri
8	LRK	Kashmore	Taluka Hospital Kashmore
9	SBA	Naushahro Feroz	Taluka Hospital Moro
10	SBA	Naushahro Feroz	Taluka Hospital Kandiaro
11	SBA	Shaheed Benazirabad	Taluka Hospital Sakrand
12	SBA	Shaheed Benazirabad	Taluka Hospital Kazi Ahmed
13	SUK	Ghotki	Taluka Hospital Ghotki
14	SUK	Khairpur	Taluka Hospital Kotdeji
15	SUK	Sukkur	Taluka Hospital Rohri

Procurement Document

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PART 1 – Bidding Procedures

Section I - Instructions to Bidders

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Section I - Instructions to Bidders

A. General

1. Scope of Bid

1.1 In connection with the Specific Procurement Notice – Request for Bids (RFB), specified in the **Bid Data Sheet (BDS)**, the Employer, as **specified in the BDS**, issues this bidding document for the provision of Works as specified in Section VII, Works' Requirements. The name, identification, and (contracts) of this RFB are **specified in the BDS.**

1.2 Throughout this bidding document:

(a) the term **"in writing"** means communicated in written form (e.g., by mail, e-mail, fax, including if **specified in the BDS**, distributed or received through electronic-procurement system used by the Employer) with proof of receipt;

(b) if the context so requires, **"singular"** means **"plural'** and vice versa;

(c) **"Day"** means calendar day, unless otherwise specified as a **"Business Day."** A Business Day is any day that is a working day of the Borrower. It excludes the Borrower's official public holidays;

(d) **"ES"** means environmental and social (including Sexual Exploitation and Abuse (SEA), and Sexual Harassment (SH));

(e) **"Sexual Exploitation and Abuse" "(SEA)"** means the following:

"Sexual Exploitation" is defined as any actual or attempted abuse of position of vulnerability, differential power or trust, for sexual purposes, including, but not limited to, profiting monetarily, socially or politically from the sexual exploitation of another;

"Sexual Abuse" is defined as the actual or threatened physical intrusion of a sexual nature, whether by force or under unequal or coercive conditions;

(f) **"Sexual Harassment" "(SH)"** is defined as unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature by the Contractor's Personnel with other Contractor's or Employer's Personnel;

(g) **"Contractor's Personnel"** is as defined in Sub- Clause 1 (ii) of the General Conditions of Contract; and

(h) **"Employer's personnel"** is as defined in GCC Sub-Clause 1 (nn) of the General Conditions of Contract.

A non-exhaustive list of (i) behaviors which constitute SEA and (ii) behaviors which constitute SH is attached to the Code of Conduct form in Section IV.

2. Source of Funds

2.1 The Borrower or Recipient (hereinafter called "Borrower") **specified in the BDS** has received or has applied for financing (hereinafter called "funds") from the International Bank for Reconstruction and Development or the International Development Association (hereinafter called "the Bank") in an amount **specified in the BDS**, toward 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 are issued.

2.2 Payment by the Bank will be made only at the request of the Borrower and upon approval by the Bank, and will be subject, in all respects, to the terms and conditions of the Loan (or other financing) Agreement. The Loan (or other financing) Agreement prohibits a withdrawal from the Loan account for the purpose of any payment to persons or entities, or for any import of goods, equipment, plant, or materials, if such payment or import is prohibited by a decision of the United Nations Security Council taken under Chapter VII of the Charter of the United Nations. No party other than the Borrower shall derive any rights from the Loan (or other financing) Agreement or have any claim to the proceeds of the Loan (or other financing).

3. Fraud and Corruption

3.1 The Bank requires compliance with the Bank's Anti-Corruption Guidelines and its prevailing sanctions policies and procedures as set forth in the WBG's Sanctions Framework, as set forth in Section VI.

3.2 In further pursuance of this policy, Bidders shall permit and shall cause their agents (where declared or not), subcontractors, sub consultants, service providers, suppliers, and personnel, to permit the Bank to inspect all accounts, records and other documents relating to any initial selection process, prequalification process, bid submission, proposal submission, and contract performance (in the case of award), and to have them audited by auditors appointed by the Bank.

4. Eligible Bidders

4.1 A Bidder may be a firm that is a private entity, or a state-owned enterprise or institution —subject to ITB 4.6—or any combination of them in the form of a joint venture (JV), under an existing agreement, or with the intent to enter into such an agreement supported by a letter of intent. In the case of a joint venture, all members shall be jointly and severally liable for the execution of the entire Contract in accordance with the Contract terms. The JV shall nominate a Representative who shall have the authority to conduct all business for and on behalf of any and all the members of the JV during the Bidding process and, in the event the JV is awarded the Contract, during contract execution. Unless **specified in the BDS**, there is no limit on the number of members in a JV.

4.2 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 have a conflict of interest for the purpose of this Bidding process, if the Bidder:

(a) directly or indirectly controls, is controlled by or is under common control with another Bidder; or

(b) receives or has received any direct or indirect subsidy from another Bidder; or

(c) has the same legal representative as another Bidder; or

(d) has a relationship with another Bidder, directly or through common third parties, that puts it in a position to influence the Bid of another Bidder, or influence the decisions of the Employer regarding this Bidding process; or

(e) or any of its affiliates participated as a consultant in the preparation of the design or technical specifications of the works that are the subject of the Bid; or

(f) or any of its affiliates has been hired (or is proposed to be hired) by the Employer or Borrower as Project Manager for the Contract implementation;

(g) would be providing goods, works, or non-consulting services resulting from or directly related to consulting services for the preparation or implementation of the project **specified in the BDS** 2.1 that it provided or were provided by any affiliate that directly or indirectly controls, is controlled by, or is under common control with that firm; or

(h) has a close business or family relationship with a professional staff of the Borrower (or of the project

implementing agency, or of a recipient of a part of the loan) who: (i) are directly or indirectly involved in the preparation of the bidding document or specifications of the contract, and/or the Bid evaluation process of such contract; or (ii) would be involved in the implementation or supervision of such contract unless the conflict stemming from such relationship has been resolved in a manner acceptable to the Bank throughout the procurement process and execution of the contract.

4.3 A firm that is a Bidder (either individually or as a JV member) shall not participate in more than one Bid, except for permitted alternative Bids. This includes participation as a subcontractor in other Bids. Such participation shall result in the disqualification of all Bids in which the firm is involved. A firm that is not a Bidder or a JV member may participate as a subcontractor in more than one Bid.

4.4 A Bidder may have the nationality of any country, subject to the restrictions pursuant to ITB 4.8. A Bidder shall be deemed to have the nationality of a country if the Bidder is constituted, incorporated or registered in and operates in conformity with the provisions of the laws of that country, as evidenced by its articles of incorporation (or equivalent documents of constitution or association) and its registration documents, as the case may be. This criterion also shall apply to the determination of the nationality of proposed subcontractors or subconsultants for any part of the Contract including related Services.

4.5 A Bidder that has been sanctioned by the Bank, pursuant to the Bank's Anti-Corruption Guidelines, in accordance with its prevailing sanctions policies and procedures as set forth in the WBG's Sanctions Framework as described in Section VI paragraph 2.2 d. shall be ineligible to be prequalified for, initially selected for, bid for, propose for, or be awarded a Bank-financed contract or benefit from a Bank-financed contract, financially or otherwise, during such period of time as the Bank shall have determined. The list of debarred firms and individuals is available at the electronic address specified in the BDS.

4.6 Bidders that are state-owned enterprises or institutions in the Employer's Country may be eligible to compete and be awarded a Contract(s) only if they can establish, in a manner acceptable to the Bank, that they (i) are legally and financially

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autonomous (ii) operate under commercial law, and (iii) are not under supervision of the Employer.

4.7 A Bidder shall not be under suspension from Bidding by the Employer as the result of the operation of a Bid–Securing or Proposal-Securing Declaration.

4.8 Firms and individuals may be ineligible if so indicated in Section V and (a) as a matter of law or official regulations, the Borrower's country prohibits commercial relations with that country, provided that the Bank is satisfied that such exclusion does not preclude effective competition for the supply of goods or the contracting of works or services required; or (b) 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 any country, person, or entity in that country. When the Works are implemented across jurisdictional boundaries (and more than one country is a Borrower, and is involved in the procurement), then exclusion of a firm or individual on the basis of ITB 4.8 (a) above by any country may be applied to that procurement across other countries involved, if the Bank and the Borrowers involved in the procurement agree.

4.9 A Bidder shall provide such documentary evidence of eligibility satisfactory to the Employer, as the Employer shall reasonably request.

4.10 A firm that is under a sanction of debarment by the Borrower from being awarded a contract is eligible to participate in this procurement, unless the Bank, at the Borrower's request, is satisfied that the debarment;

(a) relates to fraud or corruption; and

(b) Followed a judicial or administrative proceeding that afforded the firm adequate due process.

5. Eligible Materials, Equipment and Services

5.1 The materials, equipment and services to be supplied under the Contract and financed by the Bank may have their origin in any country subject to the restrictions specified in Section V, Eligible Countries, and all expenditures under the Contract will not contravene such restrictions. At the Employer's request, Bidders may be required to provide evidence of the origin of materials, equipment and services.

B. Contents of Bidding Document

6. Sections of Bidding Document

6.1 The bidding document consist of Parts 1, 2, and 3, which include all the sections specified below, and which should be read in conjunction with any Addenda issued in accordance with ITB 8.

PART 1 Bidding Procedures

- Section I - Instructions to Bidders (ITB)
- Section II - Bid Data Sheet (BDS)
- Section III - Evaluation and Qualification Criteria
- Section IV - Bidding Forms
- Section V - Eligible Countries
- Section VI - Fraud and Corruption

PART 2 Works' Requirements

- Section VII – Works' Requirements

PART 3 Conditions of Contract and Contract Forms

- Section VIII - General Conditions of Contract
- Section IX - Particular Conditions of Contract
- Section X - Contract Forms

6.2 The Specific Procurement Notice - Request for Bids (RFB) issued by the Employer is not part of this bidding document.

6.3 Unless obtained directly from the Employer, the Employer is not responsible for the completeness of the bidding document, responses to requests for clarification, the minutes of the pre-Bid meeting (if any), or Addenda to the bidding document in accordance with ITB 8. In case of any contradiction, documents obtained directly from the Employer shall prevail.

6.4 The Bidder is expected to examine all instructions, forms, terms, and specifications in the bidding document and to furnish with its Bid all information and documentation as is required by the bidding document.

7. Clarification of Bidding Document, Site

7.1 A Bidder requiring any clarification of the bidding document shall contact the Employer in writing at the Employer's address **specified in the BDS** or raise its inquiries during the pre-Bid meeting if provided for in accordance with ITB 7.4. The

Visit, Pre-Bid Meeting

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 **specified 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. If so **specified in the BDS**, the Employer shall also promptly publish its response at the web page **identified in the BDS**. Should the clarification result in changes to the essential elements of the bidding document, the Employer shall amend the bidding document following the procedure under ITB 8 and ITB 22.2.

7.2 The Bidder is advised to visit and examine the Site of works and its surroundings and obtain for itself on its own 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.

7.3 The Bidder and any of its personnel or agents will be granted permission by the Employer to enter upon 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.

7.4 If so **specified in the BDS**, the Bidder's designated representative is invited to attend a pre-Bid meeting and/or a Site of works visit. 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 one week before the meeting.

7.6 Minutes of the pre-Bid meeting, if applicable, including the text of the questions asked by Bidders, 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. If so **specified in the BDS,** the Employer shall also promptly publish the Minutes of the pre-Bid meeting at the web page **identified in the BDS**. 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. 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. The Employer shall also promptly publish the addendum on the Employer's web page in accordance with ITB 7.1.

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 Parts, namely the Technical Part and the Financial Part. These two Parts shall be submitted simultaneously in two separate sealed envelopes (two-envelope Bidding process). One envelope shall contain only information relating to the Technical Part and the other, only information relating to the Financial Part. These two envelopes shall be enclosed in a separate sealed outer envelope marked "ORIGINAL BID".

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11.2 The **Technical Part** shall contain the following:

(a) **Letter of Bid – Technical Part,** prepared in accordance with ITB 12;

(b) **Bid Security** or **Bid-Securing Declaration**, in accordance with ITB 19.1;

(c) **Alternative Bid - Technical Part**: if permissible in accordance with ITB 13, the Technical Part of any Alternative Bid;

(d) **Authorization**: written confirmation authorizing the signatory of the Bid to commit the Bidder, in accordance with ITB 20.3;

(e) **Bidder's Eligibility:** documentary evidence in accordance with ITB 17.1 establishing the Bidder's eligibility to Bid;

(f) **Qualifications:** documentary evidence in accordance with ITB 17.2 establishing the Bidder's qualifications to perform the Contract if its Bid is accepted;

(g) **Conformity**: a technical proposal in accordance with ITB 16; and

(h) Any other document **required in the BDS**.

11.3 The **Financial Part** shall contain the following:

(a) **Letter of Bid – Financial Part:** prepared in accordance with ITB 12 and ITB 14;

(b) **Bill of Quantities or Activity Schedule** completed in accordance with ITB 12 and ITB 14 as specified **in the BDS;**

(c) **Alternative Bid - Financial Part:** if permissible in accordance with ITB 13, the Financial Part of any Alternative Bid; and

(d) Any other document required **in the BDS.**

11.4 The Technical Part shall not include any information related to the Bid price. Where material financial information related to the Bid price is contained in the Technical Part the Bid shall be declared non-responsive.

11.5 In addition to the requirements under ITB 11.2, Bids submitted by a JV shall include a copy of the Joint Venture Agreement entered into by all members. Alternatively, a letter of intent to execute a Joint Venture Agreement in the event of a successful Bid shall be signed by all members and submitted with the Bid, together with a copy of the proposed Agreement.

11.6 The Bidder shall furnish in the Letter of Bid – Financial Part information on commissions and gratuities, if any, paid or to be paid to agents or any other party relating to this Bid.

12. Letters of Bid and Schedules

12.1 The Letter of Bid – Technical Part, Letter of Bid – Financial Part and Priced Activity Schedules or Bill of Quantities shall be prepared using the relevant forms furnished in Section IV, Bidding Forms. The forms must be completed without any alterations to the text, and no substitutes shall be accepted except as provided under ITB 20.3. All blank spaces shall be filled in with the information requested.

13. Alternative Bids

13.1 Unless otherwise **specified in the BDS**, alternative Bids shall not be considered.

13.2 When alternative times for completion are explicitly invited, a statement to that effect will be **included in the BDS**, and the method of evaluating different alternative times for completion will be described in Section III, Evaluation and Qualification Criteria.

13.3 Except as provided under 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 Bidder with the Most Advantageous Bid conforming to the basic technical requirements shall be considered by the Employer.

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 VII, Works' Requirements. The method for their evaluation will be stipulated in Section III, Evaluation and Qualification Criteria.

14. Bid Prices and Discounts

14.1 The prices and discounts quoted by the Bidder in the Letter of Bid – Financial Part and in the Priced Activity Schedule or Bill of Quantities 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 IV, 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 Bid – Financial Part, in accordance with ITB 12.1, shall be the total price of the Bid, excluding any discounts offered.

14.4 The Bidder shall quote any discounts and indicate the methodology for their application in the Letter of Bid - Financial Part, in accordance with ITB 12.1.

14.5 Unless otherwise **provided in the BDS,** and the Conditions of Contract, th**e** 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 indices and weightings for the price adjustment formulae in the Schedule of Adjustment Data in Section IV-Bidding Forms and the Employer may require the Bidder to justify its proposed indices and weightings.

14.6 If so specified in ITB 1.1, Bids are invited (contracts) Bidders wishing to offer discounts 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. Discounts shall be submitted in accordance with ITB 14.4, provided the Bids for (contracts) are opened at the same time. **However, discounts on condition of award of more than one contract will not be used for Bid evaluation purpose.**

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[1] and the total Bid price submitted by the Bidder.

15. Currencies of Bid and Payment

15.1 The currency(ies) of the Bid and the currency(ies) of payments shall be the same and shall be as **specified in the BDS.**

[1] In lump-sum contracts, delete "rates and prices and the."

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 unit rates and prices and shown in the Schedule of Adjustment Data are reasonable[2], 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 in the Technical Part of the Bid including a statement of work methods, equipment, personnel, schedule and any other information as stipulated in Section IV, Bidding Forms, in sufficient detail to demonstrate the adequacy of the Bidders' proposal to meet the work's requirements and the completion time.

17. Documents Establishing the Eligibility and Qualifications of the Bidder

17.1 To establish Bidder's eligibility in accordance with ITB 4, Bidders shall complete the Letter of Bid, – Technical Part, included in Section IV, Bidding Forms.

17.2 In accordance with Section III, Evaluation and Qualification Criteria, to establish its qualifications to perform the Contract, the Bidder shall provide the information requested in the corresponding information sheets included in Section IV, Bidding Forms.

17.3 If a margin of preference applies as specified in accordance with ITB 38.1, domestic Bidders, individually or in joint ventures, applying for eligibility for domestic preference shall supply all information required to satisfy the criteria for eligibility specified in accordance with ITB 38.1.

18. Period of Validity of Bids

18.1 Bids shall remain valid until the date specified **in the BDS** or any extended date if amended by the Employer in accordance with ITB 8. A Bid that is not valid until the date specified **in the BDS,** or any extended date if amended by the Employer in accordance with ITB 8, shall be rejected by the Employer as nonresponsive.

18.2 In exceptional circumstances, prior to the date of expiry of the Bid validity, 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 for twenty-eight (28) days beyond the extended date for Bid validity. A Bidder may refuse the request without forfeiting its Bid

[2] For lump-sum contracts, delete "unit rates and prices and shown in the Schedule of Adjustment Data are reasonable" and replace with "Lump-sum."

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Security. A Bidder granting the request shall not be required or permitted to modify its Bid, except as provided in ITB 18.3.

18.3 If the award is delayed by a period exceeding fifty-six (56) days beyond the date of expiry of the Bid validity specified in accordance with ITB 18.1, the Contract price shall be determined as follows:

(a) in **the** case of fixed price contracts, the Contract price shall be the Bid price adjusted by the factor **specified in the BDS;**

(b) in the case of adjustable price contracts, no adjustment shall be made; or

(c) in any case, Bid evaluation shall be based on the Bid price without taking into consideration the applicable correction from those indicated above.

19. Bid Security

19.1 The Bidder shall furnish as part of its Technical Part of its Bid, either a Bid-Securing Declaration or a Bid Security as **specified in the BDS**, in original form and, in the case of a Bid security, in the amount and currency **specified in the BDS**.

19.2 A Bid-Securing Declaration shall use the form included in Section IV, Bidding Forms.

19.3 If a Bid Security is specified pursuant to ITB 19.1, the Bid Security shall be a demand guarantee, and in any of the following forms at the Bidder's option:

(a) an unconditional guarantee issued by a bank or non-bank financial institution (such as an insurance, bonding or surety company);

(b) an irrevocable letter of credit;

(c) a cashier's or certified check; or

(d) another security **specified in the BDS,**

From a reputable source, and an eligible country. If an unconditional guarantee is issued by a non-bank financial institution located outside the Employer's Country, the issuing non-bank financial institution shall have a correspondent financial institution located in the Employer's Country to make it enforceable unless the Employer has agreed in writing, prior to Bid submission, that a correspondent financial institution is not required. In the case of a bank guarantee, the Bid Security shall be submitted either using the Bid Security Form included in Section IV, Bidding Forms, or in another substantially

similar format approved by the Employer prior to Bid submission. The Bid Security shall be valid for twenty-eight (28) days beyond the original date of expiry of the Bid validity, or beyond any extended date if requested under ITB 18.2.

19.4 If a Bid Security or Bid-Securing Declaration is specified pursuant to ITB 19.1, any Bid not accompanied by a substantially responsive Bid Security or Bid-Securing Declaration shall be rejected by the Employer as non-responsive.

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 signing the Contract and furnishing the Performance Security and if required in the BDS, the Environmental and Social (ES) Performance Security pursuant to ITB 50.

19.6 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 and if required in the BDS, the Environmental and Social (ES) Performance Security.

19.7 The Bid Security may be forfeited:

(a) if a Bidder withdraws its Bid prior to the expiry date of the Bid validity specified by the Bidder on the Letter of Bid – Technical Part and repeated in the Letter of Bid – Financial Part or any extension thereto provided by the Bidder; or

(b) if the successful Bidder fails to:

(i) Sign the Contract in accordance with ITB 49; or

(ii) Furnish a Performance Security and if required in the BDS, the Environmental and Social (ES) Performance Security in accordance with ITB 50.

19.8 The Bid Security or the Bid-Securing Declaration of a JV shall be in the name of the JV that submits the Bid. If the JV has not been constituted into a legally enforceable JV, at the time of Bidding, the Bid Security or the Bid-Securing Declaration shall be in the names of all future members as named in the letter of intent mentioned in ITB 4.1 and ITB 11.5.

19.9 If a Bid Security is not required in the BDS, pursuant to ITB 19.1, and:

(a) if a Bidder withdraws its Bid prior to the expiry date of the Bid validity specified by the Bidder on the Letters of Bid or any extended date provided by the Bidder; or

(b) if the successful Bidder fails to:

(i) sign the Contract in accordance with ITB 49; or

(ii) furnish a Performance Security and if required in the BDS, the Environmental, and Social (ES) Performance Security in accordance with ITB 50;

the Borrower may, if provided for **in the BDS**, declare the Bidder ineligible to be awarded a contract by the Employer for a period of time as **stated in the BDS**.

20. Format and Signing of Bid

20.1 The Bidder shall prepare the Bid, in accordance with this Instruction, ITB 11 and ITB 21.

20.2 Bidders shall mark as "CONFIDENTIAL" information in their Bids which is confidential to their business. This may include proprietary information, trade secrets or commercial or financially sensitive information.

20.3 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 must be typed or printed below the signature. All pages of the Bid where entries or amendments have been made shall be signed or initialed by the person signing the Bid.

20.4 In case the Bidder is a JV, the Bid shall be signed by an authorized representative of the JV on behalf of the JV, and so as to be legally binding on all the members as evidenced by a power of attorney signed by their legally authorized representatives.

20.5 Any interlineations, erasures, or overwriting shall be valid only if they are signed or initialed by the person signing the Bid.

D. Submission of Bids

21. Sealing and Marking of Bids

21.1 The Bidder shall deliver the Bid in two separate, sealed envelopes (the Technical Part and the Financial Part.) These two envelopes shall be enclosed in a separate sealed outer envelope marked "ORIGINAL BID".

21.2 In addition, the Bidder shall submit copies of the Bid in the number **specified in the BDS**. Copies of the Technical Part shall be placed in a separate sealed envelope marked "COPIES: TECHNICAL PART". Copies of the Financial Part shall be placed in a separate sealed envelope marked "COPIES: FINANCIAL PART". The Bidder shall place both of these envelopes in a separate, sealed outer envelope marked "BID COPIES". In the event of any discrepancy between the original and the copies, the original shall prevail. If alternative Bids are permitted in accordance with ITB 13, the alternative Bids shall be submitted as follows: the original of the alternative Bid Technical Part shall be placed in a sealed envelope marked "ALTERNATIVE BID – TECHNICAL PART" and the Financial Part shall be placed in a sealed envelope marked "ALTERNATIVE BID – FINANCIAL PART" and these two separate sealed envelopes then enclosed within a sealed outer envelope marked "ALTERNATIVE BID – ORIGINAL", the copies of the alternative Bid will be placed in separate sealed envelopes marked "ALTERNATIVE BID – COPIES OF TECHNICAL PART", and "ALTERNATIVE BID – COPIES OF FINANCIAL PART" and enclosed in a separate sealed outer envelope marked "ALTERNATIVE BID - COPIES"

21.3 The envelopes marked "ORIGINAL BID" and "BID COPIES" (and, if appropriate, a third envelope marked "ALTERNATIVE BID") shall be enclosed in a separate sealed outer envelope for submission to the Employer.

21.4 All inner and outer envelopes, shall:

(a) bear the name and address of the Bidder;

(b) be addressed to the Employer in accordance with ITB 22.1;

(c) bear the specific identification of this Bidding process indicated in ITB 1.1; and

(d) bear a warning not to open before the time and date for Bid opening.

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.

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 **specified in the BDS**. When so **specified in the BDS**, Bidders shall have the option of submitting their Bids electronically. Bidders submitting Bids

electronically shall follow the electronic Bid submission procedures **specified 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

24.1 A Bidder may withdraw, substitute, or modify its Bid 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 20.3, (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:

(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 date of expiry of the Bid validity specified by the Bidder on the Letter of Bid or any extended date thereof.

E. Public Opening of Technical Parts of Bids

25. Public Opening of Technical Parts of Bids

25.1 Except in the cases specified in ITB 23 and ITB 24.2, the Employer shall publicly open and read out all Bids received by the deadline, at the date, time and place **specified in the BDS**, in the presence of Bidders` designated representatives and anyone who chooses to attend. All Bidders, or their

representatives and any interested party may attend a public opening. Any specific electronic Bid opening procedures required if electronic bidding is permitted in accordance with ITB 22.1, shall be as **specified in the BDS**.

25.2 First, the written notice of withdrawal in the 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.

25.3 Next, envelopes marked "Substitution" shall be opened and read out and exchanged with the corresponding Bid being substituted, and the substituted Bid shall not be opened, but returned to the Bidder. No Bid substitution shall be permitted unless the corresponding substitution notice contains a valid authorization to request the substitution and is read out at Bid opening.

25.4 Next, envelopes marked "MODIFICATION" shall be opened and read out with the corresponding Bid. No Bid modification shall be permitted unless the corresponding modification notice contains a valid authorization to request the modification and is read out at Bid opening.

25.5 Next, all other envelopes marked "TECHNICAL PART" shall be opened one at a time. All envelopes marked "SECOND ENVELOPE: FINANCIAL PART" shall remain sealed and kept by the Employer in safe custody until they are opened at a later public opening, following the evaluation of the Technical Part parts of the Bids. On opening the envelopes marked "TECHNICAL PART" the Employer shall read out: the name of the Bidder, the presence or the absence of a Bid Security, or Bid-Securing Declaration, if required, and whether there is a modification; and Alternative Bid - Technical Part; and any other details as the Employer may consider appropriate.

25.6 Only Technical Parts of Bids and Alternative Bid - Technical Parts that are read out at Bid opening shall be considered further for evaluation. The Letter of Bid- Technical Part and the separate sealed envelope marked "SECOND ENVELOPE: FINANCIAL PART" are to be initialed by representatives of the Employer attending Bid opening in the manner **specified in the BDS**.

25.7 At the Bid opening the Employer shall neither discuss the merits of any Bid nor reject any Bid (except for late Bids, in accordance with ITB 23.1).

25.8 The Employer shall prepare a record of the Technical Parts of Bid opening that shall include, as a minimum:

(a) the name of the Bidder and whether there is a withdrawal, substitution, or modification;

(b) the receipt of envelopes marked "SECOND ENVELOPE: FINANCIAL PART";

(c) the presence or absence of a Bid Security or Bid-Securing Declaration if one was required; and

(d) if applicable, any Alternative Bid – Technical Part.

25.9 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.

F. Evaluation of Bids – General Provisions

26. Confidentiality

26.1 Information relating to the evaluation of the Technical Part shall not be disclosed to Bidders or any other persons not officially concerned with the Bidding process until the notification of evaluation of the Technical Part in accordance with ITB 34. Information relating to the evaluation of Financial Part, the evaluation of combined Technical Part and Financial Part, and recommendation of contract award, shall not be disclosed to Bidders or any other persons not officially concerned with the RFB process until the Notification of Intention to Award the Contract is transmitted to all Bidders in accordance with ITB 45.

26.2 Any effort 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.

26.3 Notwithstanding ITB 26.2, from the time of Bid opening to the time of Contract award, if a Bidder wishes to contact the Employer on any matter related to the Bidding process, it shall do so in writing.

27. Clarification of Bids

27.1 To assist in the examination, evaluation, and comparison of the Bids, and qualification of the Bidders, the Employer may, at its

discretion, ask any Bidder for a clarification of its Bid given a reasonable time for a response. 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, including any voluntary increase or decrease in the prices or substance of the Bid shall be sought, offered, or permitted, except to confirm the correction of arithmetic errors discovered by the Employer in the evaluation of the Bids, in accordance with ITB 36.

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. Nonmaterial Nonconformities

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

29.2 Provided that a Bid is substantially responsive, the Employer may request that the Bidder submit the necessary information or documentation, within a reasonable period of time, to rectify nonmaterial nonconformities in the Bid related to documentation requirements. Requesting information or documentation on such nonconformities shall not be related to any aspect of the price of the Bid. Failure of the Bidder to comply with the request may result in the rejection of its Bid.

G. Evaluation of Technical Parts of Bids

30. Determination of Responsiveness of Technical Part

30.1 The Employer's determination of the Technical Part's responsiveness shall be based on the contents of the Bid, as specified in ITB 11.

30.2 Preliminary examination of the Technical Part shall be carried out to identify bids that are incomplete, invalid or substantially nonresponsive to the requirements of the Bidding documents. A substantially responsive 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 If the Technical Partis 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. Eligibility and Qualifications of the Bidder

31.1 The Employer shall determine to its satisfaction whether the eligible Bidders that have submitted substantially responsive Bid - Technical Parts meet the qualifying criteria specified in Section III, Evaluation and Qualification Criteria.

31.2 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. The determination shall not take into consideration the qualifications of other firms such as the Bidder's subsidiaries, parent entities, affiliates, subcontractors (other than Specialized Subcontractors if permitted in the bidding document), or any other firm different from the Bidder.

31.3 Prior to Contract award, the Employer will verify that the successful Bidder (including each member of a JV) is not disqualified by the Bank due to noncompliance with contractual SEA/SH prevention and response obligations. The Employer will conduct the same verification for each subcontractor proposed by the successful Bidder. If any proposed subcontractor does not meet the requirement, the Employer will require the Bidder to propose a replacement subcontractor.

31.4 Only substantially responsive bids submitted by eligible and qualified bidders shall proceed to the detailed technical evaluation specified in ITB 32.

32. Detailed Evaluation of Technical Part

32.1 The Employer's evaluation of Technical Part will be carried out as specified in Section III, Evaluation and Qualification Criteria.

32.2 The scores and weightings to be given to Rated Criteria (including technical and non-price factors and sub factors) are specified **in the BDS**.

33. Subcontractors

33.1 Unless otherwise stated **in the BDS**, the Employer does not intend to execute any specific elements of the Works by subcontractors selected in advance by the Employer.

33.2 The subcontractor's qualifications shall not be used by the Bidder to qualify for the Works unless their specialized parts of the Works were previously designated by the Employer **in the BDS** as can be met by subcontractors referred to hereafter as 'Specialized Subcontractors', in which case, the qualifications of the Specialized Subcontractors proposed by the Bidder may be added to the qualifications.

33.3 Bidders may propose subcontracting up to the percentage of total value of contracts or the volume of works as **specified in the BDS.** Subcontractors proposed by the Bidder shall be fully qualified for their parts of the Works.

H. Notification of Evaluation of Technical Parts and Public Opening of Financial Parts of Bids

34. Notification of Evaluation of Technical Parts and Public Opening of Financial Parts

34.1 Following the completion of the evaluation of the Technical Parts of the Bids, the Employer shall notify in writing those Bidders whose Bids were considered non-responsive to the bidding document or failed to meet the Qualification requirements, advising them of the following information:

(a) the grounds on which their Technical Part of Bid failed to meet the requirements of the bidding document;

(b) their envelopes marked "SECOND ENVELOPE: FINANCIAL PART" will be returned to them unopened after the completion of the selection process and the signing of the Contract; and

(c) notify them of the date, time and location of the public opening of the envelopes marked "SECOND ENVELOPE: FINANCIAL PART".

34.2 The Employer shall, simultaneously, notify in writing those Bidders whose Technical Part have been evaluated as substantially responsive to the bidding document and met all Qualifying Criteria, advising them of the following information:

(a) their Bid has been evaluated as substantially responsive to the bidding document and met the qualification requirements;

(b) their envelope marked "SECOND ENVELOPE: FINANCIAL PART" will be opened at the public opening of the Financial Parts; and

(c) notify them of the date, time and location of the second public opening of the envelopes marked "SECOND ENVELOPE: FINANCIAL PART".

34.3 The opening date shall be not less than ten (10) Business Days from the date of notification of the results of the technical evaluation, specified in ITB 34.1 and 34.2. However, if the Employer receives a complaint on the results of the technical evaluation within the ten (10) Business Days, the opening date shall be subject to ITB 52.1. The Financial Part of the Bid shall be opened publicly in the presence of Bidders' designated representatives and anyone who chooses to attend.

34.4 At this public opening the Financial Parts will be opened by the Employer in the presence of Bidders, or their designated representatives and anyone else who chooses to attend. Bidders who met the Qualification Criteria and whose bids were evaluated as substantially responsive will have their envelopes marked "SECOND ENVELOPE: FINANCIAL PART" opened at the second public opening. Each of these envelopes marked "SECOND ENVELOPE: FINANCIAL PART" shall be inspected to confirm that they have remained sealed and unopened. These envelopes shall then be opened by the Employer. The Employer shall read out the names of each Bidder, the technical scores and the total Bid prices, (contract) if applicable, including any discounts and Alternative Bid - Financial Part, and any other details as the Employer may consider appropriate.

34.5 Only envelopes of Financial Part of Bids, Financial Parts of Alternative Bids and discounts that are opened and read out at

Bid opening shall be considered further for evaluation. The Letter of Bid – Financial Part and the Priced Activity Schedules are to be initialed by a representative of the Employer attending the Bid opening in the manner **specified in the BDS**.

34.6 The Employer shall neither discuss the merits of any Bid nor reject any envelopes marked "SECOND ENVELOPE: FINANCIAL PART".

34.7 The Employer shall prepare a record of the Financial Part of the Bid opening that shall include, as a minimum:

(a) the name of the Bidder whose Financial Part was opened;

(b) the Bid price, per (contract) if applicable, including any discounts; and

(c) if applicable, any Alternative Bid – Financial Part.

34.8 The Bidders whose envelopes marked "SECOND ENVELOPE: FINANCIAL PART" have been opened or their 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.

I. Evaluation of Financial Parts of Bids

35. Evaluation of Financial Parts

35.1 To evaluate the Financial Part, the Employer shall consider the following:

(a) the Bid price, excluding Provisional Sums and the provision, if any, for contingencies in the Summary Bill of Quantities[3] for admeasurement contracts, but including Daywork[4] items, where priced competitively;

(b) price adjustment for correction of arithmetic errors in accordance with ITB 36.1;

(c) price adjustment due to discounts offered in accordance with ITB 14.4;

[3] In lump-sum contracts, delete "Bill of Quantities" and replace with "Activity Schedule."

[4] Daywork is work carried out following instructions of the Project Manager and paid for on the basis of time spent by workers, and the use of materials and the Contractor's equipment, at the rates quoted in the Bid. For Daywork to be priced competitively for Bid evaluation purposes, the Employer must list tentative quantities for individual items to be costed against Daywork (e.g., a specific number of tractor driver staff-days, or a specific tonnage of Portland cement), to be multiplied by the Bidders' quoted rates and included in the total Bid price.

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(d) converting the amount resulting from applying (a) to (c) above, if relevant, to a single currency in accordance with ITB 37;

(e) price adjustment due to quantifiable nonmaterial nonconformities in accordance with ITB 35.4; and

(f) the additional evaluation factors are specified in Section III, Evaluation and Qualification Criteria.

35.2 If price adjustment is allowed in accordance with ITB 14.5, 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.

35.3 If this bidding document allows Bidders to quote separate prices for different l (contracts), each lot will be evaluated separately to determine the Most Advantageous Bid using the methodology specified in in Section III, Evaluation and Qualification Criteria. **Discounts that are conditional on the award of more than one lotor slice shall not be considered for Bid evaluation.**

35.4 Provided that a Bid is substantially responsive, the Employer shall rectify quantifiable nonmaterial nonconformities related to the Bid Price. To this effect, the Bid Price shall be adjusted, for comparison purposes only, to reflect the price of a missing or non-conforming item or component by adding the average price of the item or component quoted by substantially responsive Bidders. If the price of the item or component cannot be derived from the price of other substantially responsive Bidders, the Employer shall use its best estimate.

36. Correction of Arithmetic Errors

36.1 In evaluating the Financial Part of each Bid, the Employer shall correct arithmetical errors on the following basis:

(a) only for admeasurement 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 subtraction of subtotals, the subtotals shall prevail and the total shall be corrected; and

(c) 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) and (b) above.

36.2 Bidders shall be requested to accept correction of arithmetical errors. Failure to accept the correction in accordance with ITB 36.1, shall result in the rejection of the Bid.

37. Conversion to Single Currency

37.1 For evaluation and comparison purposes, the currency(ies) of the Bids shall be converted in a single currency as **specified in the BDS.**

38. Margin of Preference

38.1 Unless otherwise **specified in the BDS,** a margin of preference for domestic Bidders[5] shall not apply.

39. Comparison of Financial Parts

39.1 The Employer shall compare the evaluated costs of all responsive and qualified Bids to determine the Bid that has the lowest evaluated cost.

40. Abnormally Low Bids

40.1 An Abnormally Low Bid is one where the Bid price, in combination with other constituent elements of the Bid, appears unreasonably low to the extent that the Bid price raises material concerns as to the capability of the Bidder to perform the Contract for the offered Bid price.

40.2 In the event of identification of a potentially Abnormally Low Bid, the Employer shall seek written clarifications from the Bidder, including detailed price analyses of its Bid price in correlation to the subject matter of the contract, scope, proposed methodology, schedule, allocation of risks and responsibilities and any other requirements of the bidding document.

[5] An individual firm is considered a domestic bidder for purposes of the margin of preference if it is registered in the country of the Employer, has more than 50 percent ownership by nationals of the country of the Employer, and if it does not subcontract more than 10 percent of the contract price, excluding provisional sums, to foreign contractors. JVs are considered as domestic bidders and eligible for domestic preference only if the individual member firms are registered in the country of the Employer or have more than 50 percent ownership by nationals of the country of the Employer, and the JV shall be registered in the country of the Borrower. The JV shall not subcontract more than 10 percent of the contract price, excluding provisional sums, to foreign firms. JVs between foreign and national firms will not be eligible for domestic preference.

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40.3 After evaluation of the price analyses, in the event that the Employer determines that the Bidder has failed to demonstrate its capability to deliver the contract for the offered tender price, the Employer shall reject the Bid.

41. Unbalanced or Front Loaded Bids

41.1 If the Bid for an admeasurement contract, which results in the lowest evaluated cost, in the Employer's opinion, seriously unbalanced or front loaded the Employer may require the Bidder to provide written clarifications. Clarifications may include detailed price analyses to demonstrate the consistency of the Bid prices with the scope of works, proposed methodology, schedule and any other requirements of the bidding document.

41.2 After the evaluation of the information and detailed price analyses presented by the Bidder, the Employer may as appropriate:

(a) accept the Bid; or

(b) require that the amount of the performance security be increased at the expense of the Bidder to a level not exceeding 20% of the Contract price; or

(c) reject the Bid.

J. Evaluation of Combined Technical and Financial Parts, Most Advantageous Bid and Notification of Intention to Award

42. Evaluation of combined Technical and Financial Parts, Most Advantageous Bid

42.1 The Employer's evaluation of responsive Bids will take into account technical factors, in addition to cost factors in accordance with Section III Evaluation and Qualification Criteria. The weight to be assigned for the Technical factors and cost is specified **in the BDS**. The Employer will rank the Bids based on the evaluated Bid score (B).

42.2 Having compared the evaluated costs of Bids, the Employer shall determine the Most Advantageous Bid. The Most Advantageous Bid is the Bid of the Bidder that meets the Qualification Criteria and whose Bid has been determined to be substantially responsive to the Bidding document and is the Bid with the highest combined technical and financial score.

43. Employer's Right to Accept Any Bid, and to Reject Any or All Bids

43.1 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.

44. Standstill Period

44.1 The Contract shall not be awarded earlier than the expiry of the Standstill Period. The Standstill Period shall be ten (10) Business Days unless extended in accordance with ITB 48. The Standstill Period commences the day after the date the Employer has transmitted to each Bidder the Notification of Intention to Award the Contract. Where only one Bid is submitted, or if this contract is in response to an emergency situation recognized by the Bank, the Standstill Period shall not apply.

45. Notification of Intention to Award

45.1 The Employer shall send to each Bidder (that has not already been notified that it has been unsuccessful) the Notification of Intention to Award the Contract to the successful Bidder. The Notification of Intention to Award shall contain, at a minimum, the following information:

(a) the name and address of the Bidder submitting the successful Bid;

(b) the Contract price of the successful Bid;

(c) the total combined score of the successful bid;

(d) the names of all Bidders who submitted Bids, and their Bid prices as readout, and as evaluated and technical scores;

(e) a statement of the reason(s) the Bid (of the unsuccessful Bidder to whom the notification is addressed) was unsuccessful;

(f) the expiry date of the Standstill Period; and

(g) Instructions on how to request a debriefing and/or submit a complaint during the standstill period.

K. Award of Contract

46. Award Criteria

46.1 Subject to ITB 43, the Employer shall award the Contract to the successful Bidder. This is the Bidder whose Bid has been determined to be the Most Advantageous Bid as specified in ITB 42.

47. Notification of Award

47.1 Prior to the expiration of the Bid validity and upon expiry of the Standstill Period, specified in ITB 44.1 or any extension thereof, and, upon satisfactorily addressing any complaint that has been filed within the Standstill Period, the Employer shall notify the successful Bidder, in writing, that its Bid has been accepted. The notification of award (hereinafter and in the Conditions of Contract and Contract Forms called the "Letter

of Acceptance") shall specify the sum that the Employer will pay the Contractor in consideration of the execution of the contract (hereinafter, and in the Conditions of Contract and Contract Forms, called "the Contract Price").

47.2 Within ten (10) Business Days after the date of transmission of the Letter of Acceptance, the Employer shall publish the Contract Award Notice which shall contain, at a minimum, the following information:

(a) name and address of the Employer;

(b) name and reference number of the contract being awarded, and the selection method used;

(c) names of all Bidders that submitted Bids, and their Bid prices as read out at Bid opening, and as evaluated;

(d) names of all Bidders whose Bids were rejected either as nonresponsive or as not meeting qualification criteria, or were not evaluated, with the reasons therefor;

(e) the name of the successful Bidder, the final total contract price, the contract duration and a summary of its scope; and

(f) Successful Bidder's Beneficial Ownership Disclosure Form.

47.3 The Contract Award Notice shall be published on the Employer's website with free access if available, or in at least one newspaper of national circulation in the Employer's country, or in the official gazette.

47.4 Until a formal Contract is prepared and executed, the Letter of Acceptance shall constitute a binding Contract.

48. Debriefing by the Employer

48.1 On receipt of the Employer's Notification of Intention to Award referred to in ITB 45.1, an unsuccessful Bidder has three (3) Business Days to make a written request to the Employer for a debriefing. The Employer shall provide a debriefing to all unsuccessful Bidders whose request is received within this deadline.

48.2 Where a request for debriefing is received within the deadline, the Employer shall provide a debriefing within five (5) Business Days, unless the Employer decides, for justifiable reasons, to provide the debriefing outside this timeframe. In that case, the standstill period shall automatically be extended until five (5) Business Days after such debriefing is provided. If more than one debriefing is so delayed, the standstill period shall not end earlier than five (5) Business Days after the last

debriefing takes place. The Employer shall promptly inform, by the quickest means available, all Bidders of the extended standstill period

48.3 Where a request for debriefing is received by the Employer later than the three (3)-Business Day deadline, the Employer should provide the debriefing as soon as practicable, and normally no later than fifteen (15) Business Days from the date of publication of Public Notice of Award of contract. Requests for debriefing received outside the three (3)-day deadline shall not lead to extension of the standstill period.

48.4 Debriefings of unsuccessful Bidders may be done in writing or verbally. The Bidder shall bear their own costs of attending such a debriefing meeting.

49. Signing of Contract

49.1 The Employer shall send to the successful Bidder the Letter of Acceptance including the Contract Agreement, and a request to submit the Beneficial Ownership Disclosure Form providing additional information on its beneficial ownership. The Beneficial Ownership Disclosure Form shall be submitted within eight (8) Business Days of receiving this request.

49.2 The successful Bidder shall sign, date and return to the Employer, the Contract Agreement within twenty-eight (28) days of its receipt.

50. Performance Security

50.1 Within twenty-eight (28) days of the receipt of the Letter of Acceptance from the Employer, the successful Bidder shall furnish the Performance Security and, if required in the BDS, the Environmental and Social (ES) Performance Security in accordance with the General Conditions of Contract, subject to ITB 41.2 (b), using for that purpose the Performance Security and ES Performance Security Forms included in Section X, Contract Forms, or another form acceptable to the Employer. If the Performance Security furnished by the successful Bidder is in the form of a bond, it shall be issued by a bonding or insurance company that has been determined by the successful Bidder to be acceptable to the Employer. A foreign institution providing a bond shall have a correspondent financial institution located in the Employer's Country, unless the Employer has agreed in writing that a correspondent financial institution is not required.

50.2 Failure of the successful Bidder to submit the above-mentioned Performance Security and, if required in the BDS, the Environmental and Social (ES) Performance Security, or to

sign the Contract Agreement shall constitute sufficient grounds for the annulment of the award and forfeiture of the Bid Security. In that event the Employer may award the Contract to the Bidder offering the next Most Advantageous Bid.

51. Adjudicator

51.1 The Employer proposes the person named **in the BDS** to be appointed as Adjudicator under the Contract, at the hourly fee **specified in the BDS**, plus reimbursable expenses. If the Bidder disagrees with this proposal, the Bidder should so state in his Bid. 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 Particular Conditions of Contract (PCC) pursuant to Clause 23.1 of the General Conditions of Contract (GCC), to appoint the Adjudicator.

52. Procurement Related Complaint

52.1 The procedures for making a Procurement-related Complaint are as specified in the BDS.

Section II - Bid Data Sheet (BDS)

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

A. General	
ITB 1.1	The reference number of the Request for Bids (RFB) is: PK-SIHPP-_____-CW-RFB The Employer is***: Project Management Unit, Sindh Integrated Health & Population Program (SIHPP), Health Department , Government of Sindh , Karachi Pakistan*** The name of the RFB is: Rehabilitation and Upgradation of 15 Taluqa Headquarter Hospitals (THQs) Damaged During Flood, at various Districts of Sindh The number and identification of (contracts) comprising this RFB is: Rehabilitation and Upgradation of 15 THQs Damaged During Flood, at various Districts of Sindh **Rehabilitation and Upgradation of 15 Nos Taluka Headquarter Hospitals (THQs) at Hyderabad, Mirpurkhas, Larkana, Shaheed Benazirabad & Sukkur Divisions**
ITB 1.2(a)	*Not Applicable*
ITB 2.1	The Borrower is: ***Islamic Republic of Pakistan (Government of Sindh)*** Loan or Financing Agreement amount: ***250 Million US$*** The name of the Project is: ***Integrated Health & Population Program***
ITB 4.1	Maximum number of members in the JV shall be: ***Three(03)***
ITB 4.5	A list of debarred firms and individuals is available on the Bank's external website: http://www.worldbank.org/debarr.
B. Contents of Bidding Document	
ITB 7.1	For **Clarification of Bid purposes** only, the Employer's address is: Attention: *Program Director, Sindh Integrated Health& Population Program (SIHPP)*

	Address: *Office#201, Plot no.180-C, Al- Murtaza Commercial Lane 2, Phase VIII, DHA* Floor/ Room number*:2ND Floor* City: *Karachi (Sindh), Pakistan* ZIP Code: 75500 Country: Pakistan Telephone: **(+92-21) 33406147, 33406145, 33406360** Facsimile number: Electronic mail address: **pd@sihpp.gos.pk or ce1@sihpp.gos.pk**
ITB 7.1	Requests for clarification should be received by the Employer no later than: ***10 days prior to the date of Bid Opening*** Web page: Sindh Integrated Health and Population Program https://sihpp.gos.pk/
ITB 7.4	A Pre-Bid meeting ***"shall"*** take place at the following date, time and place: Program Director- Sindh Integrated Health & Population Program (SIHPP) Date: 17th November 2025 Time: 11:30 PM Place: Office# 201, Plot No 180-C, Al Murtaza Commercial Lane 2, Phase VIII, DHA, Karachi (Sindh) A site visit conducted by the Employer ***shall not be*** organized
ITB 7.6	Web page: Sindh Integrated Health and Population Program, https://sihpp.gos.pk/
C. Preparation of Bids	
ITB 10.1	The language of the Bid is: ***English*** All correspondence exchange shall be in ***English*** language. Language for translation of supporting documents and printed literature is ***English***
ITB 11.2 (h)	The Bidder shall submit the following additional documents in the Technical Part of its Bid: **Code of Conduct for Contractor's Personnel (ES)**

	The Bidder shall submit its Code of Conduct that will apply to Contractor's Personnel (as defined in Sub- Clause 1 (ii) of the General Conditions of Contract), to ensure compliance with the Contractor's Environmental and Social (ES) obligations under the Contract. The Bidder shall use for this purpose the Code of Conduct form provided in Section IV. No substantial modifications shall be made to this form, except that the Bidder may introduce additional requirements, including as necessary to take into account specific Contract issues/risks. **Management Strategies and Implementation Plans (MSIP) to manage the (ES) risks** The Bidder shall submit Management Strategies and Implementation Plans (MSIPs) to manage the risks identified in the ESMP document attached with the bidding documents including but not limited to the following key Environmental and Social (ES) risks: • *Adherence to all HSE protocols while demolition of existing structures where applicable and safe disposal of debris including work hours and controlling noise pollution etc.* • Respectful Work Environment Plan (Social) [and Sexual Exploitation, and Abuse (SEA) prevention and response action Plan]*;* • Engagement of local population in the activities to ensure a harmonious work atmosphere. • Labour management plan especially for labor coming from afar having different social and cultural background compared to the local population. • All other risks identified in the ESMP document.
ITB 11.3 (b)	The following schedules shall be submitted with the Bid: [Financial part] ***Letter of Priced Bid, the duly filled up Bill of Quantities***
ITB 11.3 (d)	The Bidder shall submit the following additional documents in its Bid: [Financial Part ***Not applicable.***
ITB 13.1	Alternative Bids ***shall not be*** considered.
ITB 13.2	Alternative times for completion ***shall not be*** permitted.
ITB 13.4	Alternative technical solutions ***shall not be*** permitted for the following parts of the Works
ITB 14.5	The prices quoted by the Bidder ***shall not be*** subject to adjustment during the performance of the Contract.

ITB 15.1	The price shall be quoted by the Bidder in: ***PKR***
ITB 18.1	*The Bid shall be valid until* ***1St March, 2026***
ITB 18.3 (a)	NOT APPLICABLE
ITB 19.1	All Bids must be accompanied by a "Bid Security" of **PKR 40,000,000** in a form of Bank Guarantee, CDR, PayOrder or Banker's Cheque issued by a Scheduled Bank of Pakistan in favor of "**Sindh Human Capital Investment 1000 Days**". A Bid Security shall be required A Bid-Securing Declaration *"**shall not be**"* required.
ITB 19.3 (d)	Other types of acceptable securities: ***CDR/ Bankers Check/ Pay order***
ITB 19.9	***N/A***
ITB 20.3	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: a) notarized, or b)attested by an appropriate authority in the Bidder's home country, specifying the representative's authority to sign the bid on behalf of the Bidder. If the bidder is an intended or existing joint venture, such organization should be signed by all the parties and specify the representative's authority to sign the bid on behalf of the intended or existing joint venture. 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 the event of a contract award, in accordance with ITB 11.2(d).
D. Submission of Bids	
ITB 21.2	In addition to the original of the Bid, the number of copies is: ***0ne (01)***

	Additionally, the Bidder shall submit a soft copy of complete Bid in USB containing i) a scanned copy of the complete original bid in PDF Format in technical part, and ii) filled Price Schedules in MS Excel Format in financial part. **These should be enclosed in the respective sealed envelopes containing the Original technical and financial part of the Bid**. In case of discrepancy between the original bid and soft copy, the original bid shall prevail. The submission of soft copy shall not constitute an electronic bid submission, and failure to submit the soft copy with the original bid shall not lead to rejection.
ITB 22.1	For **Bid submission purposes** only, the Employer's address is Attention: ***Program Director-Sindh Integrated Health & Population Program, Government of Sindh*** Street Address: *Office#201, Plot No-180 C, Al -Murtaza Commercial Lane 2, Phase VIII, DHA* Floor/ Room number:*2nd Floor* City: Karachi (Sindh) ZIP/Postal Code: 75500 Country: Pakistan The deadline for Bid submission is: Date: : **26th November, 2025** Time: 1500 HRS Bidders ***shall not*** have the option of submitting their Bids electronically.
E. Public Opening of Technical Parts of Bids	
ITB 25.1	The Bid opening shall take place at: Street Address: *Office#201, Plot No-180 C, Al -Murtaza Commercial Lane 2, Phase VIII, DHA* Floor/ Room number: *2nd Floor* City: *Karachi (Sindh)* Country: *Pakistan* Date**26th November 2025** Time: 1500 HRS

ITB 25.1	***Electronic Bids are not permitted***
ITB 25.6	The Letter of Bid – Technical Part and the sealed envelope marked "SECOND ENVELOPE: FINANCIAL PART" shall be initialed by **three (03)** representatives of the Employer conducting Bid opening. *The Employer shall notify a bid evaluation committee comprising of minimum three representatives of the Employer and two co-opted members of the Consultants or any third-party. The letter of technical bid submission and the sealed envelope of priced bid shall be initialed by all members of the bid evaluation committee and as a minimum at least by the three members representing the Employer.*
G. Evaluation of Technical Parts of Bids	
ITB 32.1	The weighting to be given for Rated Criteria (i[illegible]g technical and non-price factors) is: ***30%*** The technical factors (and sub-facto[illegible] which for purposes of this document carry the same meani[illegible] Criteria, and the corresponding weight out of 100% are: NOT APPLICABLE

Technical Factor	weight in percentage (insert weight in %)
1. Extent the technical proposal exceeds the requirements of the Design/Specification. The bidders shall be evaluated equally for the clarity of thought in understanding the assignment, innovativeness, proposed sustainable practices, risk mitigation [illegible] resource planning.	**10%**
2. Method Statement for construct[illegible]es. The statement must cover co[illegible]vely the bidder's strategy to identify a[illegible] mitigate the potential risks that may occur during the construction stage and execution of this project in general. The statement shall not be generic in nature. The bidder must specifically mention how it is going to manage such a big geographic spread and supply chain of construction materials therein.	**20%**
3. Site Organization, team composition, qualifications and experience of Contractor's personnel. The proposed team shall be as	

NOT APPLICABLE

	defined under Section III, sub-section 5. 5% marks each for Project Manager, Civil Engineer/, Material Engineer, E&M Engineer, Environment Specialist & Soci specialist .	**30%**
	4. Work Program should not be gen re. Must commensurate with scope. Bidders may identify s concurrent activities to ensure expeditious completion of THQs.	**11%**
	5. Management strategies and implementation plans (MSIPs) for ES.. The statement must cover comprehensively the bidder's strategy to identify and mitigate the potential risks that may occur during the execution of this project as identified under the ESMP document. The statement shall not be generic in nature. The bidder must propose specific safeguards that he intends to undertake for mitigating the local issues such as local population engagement, adhering to social norms / customs and gender issues.	**15%**
	1. Key Equipment. The equipment shall be as der Section III, sub-sectio tegories carry equal marks. Each iciency shall result in deduction of 2 mark. Excavator Dumpers Plate Compactor Concrete Mixer Power Driven Water Tankers Tractor Trolley Generator 10KVA	**14%**
ITB 33.1	At this time the Employer ***does not intend to*** execute certain specific parts of the Works by subcontractors selected in advance.	
ITB 33.2	The parts of the Works for which the Employer permits Bidders to propose Specialized Subcontractors are designated as follows: a. Solar PV Panels Work b. RO Plant / Filtration Plant	

NOT APPLICABLE

NOT APPLICABLE

	For the above-designated parts of the Works that may require Specialized Subcontractors, the relevant qualifications of the proposed Specialized Subcontractors will be added to the qualifications of the Bidder for the purpose of evaluation.
ITB 33.3	Contractor's proposed subcontracting: Maximum percentage of subcontracting permitted is up to 20% of total contract amount. Bidders planning to subcontract more than 20% of total volume of work shall specify, in the Letter of Bid, the activity (ies) or parts of the Works to be subcontracted along with complete details of the subcontractors and their qualification and experience.
H. Notification of Evaluation of Technical Parts and Public Opening of Financial Parts	
ITB 34.5	The Letter of Bid – Financial Part and Schedules shall be initialed by three (03) representatives of the Employer conducting Bid opening. *The Employer shall notify a bid opening committee comprising of minimum three representatives of the Employer and two co-opted members of the Consultants or any third-party. The letter of priced bid submission shall be initialed by all members of the bid opening committee and as a minimum at least by the three members representing the Employer.*
I. Evaluation of Financial Parts of Bids	
ITB 37.1	**N/A** The bidders must quote in **PKR**
ITB 38.1	***N/A***
J. Evaluation of Combined Technical and Financial Parts and Most Advantageous Bid	
ITB 42.1	The weight to be given for cost is: **70%**
K. Award of Contract	
ITB 50.1 and 50.2	The successful Bidder shall be required to submit an Environmental and Social (ES) Performance Security

ITB 51 **Adjudicator**	The Adjudicator proposed by the Employer is: **- Engr. Mian Faizullah Khattak** **The hourly fee for this proposed Adjudicator shall be: PKR 20,000__** **The biographical data of the proposed Adjudicator is as follows:** _____ **Engr. Mian Faizullah Khattak is a respected Civil Engineer and ADR practioner in Pakistan with experience of over 20 years. He is a fellow of the Chartered Institute of Arbitrators and has served as counsel, arbitrator and dispute board member on many forums.**
ITB 52.1	The procedures for making a Procurement-related Complaint are detailed in the "Procurement Regulations for IPF Borrowers (Annex III)." If a Bidder wishes to make a Procurement-related Complaint, the Bidder shall submit its complaint following these procedures, In Writing (by the quickest means available, such as by email or fax), to: **For the attention**: *Mr, Rehan Iqbal Baloch* **Title/position**: *Secretary Health* **Employer**: *Health Department Government of Sindh, Sixth Floor Sindh Secretariat Saddar, Karachi* **Email address***: ribaloch@gmail.com* A copy of the complaint can be sent for the Bank's information and monitoring to: **pprocurementcomplaints@worldbank.org** In summary, a Procurement-related Complaint may challenge any of the following: **1.** the terms of the Bidding Documents; **2.** the Employer's decision to exclude a Bidder from the procurement process prior to the award of contract; and **3.** the Employer's decision to award the contract.

Section III - Evaluation and Qualification Criteria

This section contains all the criteria that the Employer shall use to evaluate Bids and qualify Bidders. No other factors, methods or criteria shall be used other than those specified in this bidding document. The Bidder shall provide all the information requested in the forms included in Section IV, Bidding Forms.

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

- For construction turnover or financial data required for each year - Exchange rate prevailing on the last day of the respective calendar year (in which the amount for that year is to be converted) was originally established. Published rates of the State Bank of Pakistan shall be applicable.

- Value of single contract - Exchange rate prevailing on the date of the completion certificate. Published rates of the State Bank of Pakistan shall be applicable.

Exchange rates shall be taken from the publicly available source identified in the ITB 37.1. Any error in determining the exchange rates in the Bid may be corrected by the Employer.

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Section III - Evaluation and Qualification Criteria

1. Technical Part

1.1 Evaluation of Technical Proposal

(a) Technical Responsiveness

Bidders have to meet the minimum technical proposals requirements provided in the bidding documents on a pass/fail criterion prior to being considered for technical evaluation by applying the scored technical factors/subfactors in accordance with BDS ITB 32.1. This will include an assessment of the Bidder's extent the technical proposal exceeds the requirements of the Design/Specification, methodology, work plan, management strategies and implementation plans (MSIPs) for ES, technical capacity to mobilize key equipment and personnel for the contract consistent with its Bid regarding work methods, scheduling, and material sourcing in sufficient detail and fully in accordance with the requirements stipulated in "Technical Bid-Section IV" and "Section VII (Works Requirements)".

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

(b) Rated Criteria

(b)(1) Criteria

The Rated Criteria (including technical and non-price factors, and [illegible]) to be evaluated and the scores to be given to each factor and sub fa[illegible]cified in the BDS ITB 32.2.

(b2) Technical Proposal Scoring Methodology

NOT APPLICABLE

Score (of the total score fo[illegible] the factor/[illegible] a[illegible]	D[illegible]	Remarks
0	Required feature is absent; no relevant information to demonstrate how the requirement is met	

1	Required features present with deficiencies such as insufficient information that lacks clarity	
2	Sufficient information to [illegible] how the requirement [illegible]	
3	Sufficient infor[illegible] demonstrate that the [illegible]ent will be margin[illegible]ed	
4	Su[illegible] information that [illegible]ntly exceeds the [illegible]irement/proposal contributes to significant value addition	

NOT APPLICABLE

The s[illegible] each sub- factor (i) within a factor (j) will be combined with the scores of sub- factors in the same factor as a weighted sum to form the Factor Technical Score using the following formula:

$$S_j \equiv \sum_{i=1}^{k} t_{ji} * w_{ji}$$

where:

t_{ji} = the technical score for sub- factor "i" in factor "j",

w_{ji} = the weight of sub- factor "i" in factor "j",

k = the number of scored sub-factors in factor

$$\sum_{i}^{k} w$$

NOT APPLICABLE

The Factor Technical Scores [illegible]mbined in a weighted sum to form the total Technical Prop[illegible]using the following formula:

$$T \equiv \sum_{j=1}^{n} S_j * W_j$$

whe[illegible]

S_j= the Factor Technical Score of factor "j",

W_j = the weight of factor "j" as specified **in the BDS,**

n = the number of Factors, and

$$\sum_{j=1}^{n} W_j = 1$$

1.2 Alternative Technical Solutions for specified parts of Works

N/A

1.3 Specialized Subcontractors

If permitted under ITB 33, only the specific experience of Subcontractors for specialized works permitted by the Employer will be considered. The general experience and financial resources of the Specialized Subcontractors shall not be added to those of the Bidder for purposes of qualification of the Bidder.

The experience to be met by the specialized sub-contractor shall be in line with the requirements laid out under Section 4.2(b) for it to be considered.
However,

1.4 Qualification Criteria

Pursuant to ITB 31.1, the Employer shall assess each Bid against the following Qualification Criteria. Requirements not included in the text below shall not be used in the evaluation of the Bidder's qualifications.

Eligibility and Qualification Criteria			Compliance Requirements				Documentation
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All members Combined	Each member	At least one member	
1. Eligibility							
1.1	Nationality	Nationality in accordance with ITB 4.4	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Forms ELI – 1.1 and 1.2, with attachments
1.2	Conflict of Interest	No conflicts of interest in accordance with ITB 4.2	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Letter of Bid
1.3	Bank Eligibility	Not having been declared ineligible by the Bank, as described in ITB 4.5.	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Letter of Bid
1.4	State-owned enterprise or institution of the Borrower country	Meets conditions of ITB 4.6	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Forms ELI – 1.1 and 1.2, with attachments
1.5	United Nations resolution or Borrower's country law	Not having been excluded as a result of prohibition in the Borrower's country laws or official regulations against commercial relations with the Bidder's country, or by an act of compliance with UN Security Council resolution, both in accordance with ITB 4.8 and Section V.	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Forms ELI – 1.1 and 1.2, with attachments

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Eligibility and Qualification Criteria			Compliance Requirements				Documentation
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All members Combined	Each member	At least one member	
2. Historical Contract Non-Performance							
2.1	History of Non-Performing Contracts	Non-performance of a contract[1] did not occur as a result of contractor default since 1st January 2019.	Must meet requirement[1 and 2]	Must meet requirements	Must meet requirement[2]	N/A	Form CON-2
2.2	Suspension Based on Execution of Bid/Proposal Securing Declaration by the Employer	Not under suspension based on execution of a Bid/Proposal Securing Declaration pursuant to ITB 4.7 and ITB 19.9.	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Letter of Bid
2.3	Pending Litigation	Bidder's financial position and prospective long term profitability sound according to criteria established in 3.1 below and assuming that all pending litigation will be resolved against the Bidder	Must meet requirement	N/A	Must meet requirement	N/A	Form CON – 2
2.4	Litigation History	No consistent history of court/arbitral award decisions against the Bidder[3] since 1st January 2020	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Form CON – 2

[1] Nonperformance, as decided by the Employer, shall include all contracts where (a) nonperformance was not challenged by the contractor, including through referral to the dispute resolution mechanism under the respective contract, and (b) contracts that were so challenged but fully settled against the contractor. Nonperformance shall not include contracts where Employers decision was overruled by the dispute resolution mechanism. Nonperformance must be based on all information on fully settled disputes or litigation, i.e., dispute or litigation that has been resolved in accordance with the dispute resolution mechanism under the respective contract and where all appeal instances available to the Bidder have been exhausted.

[2] This requirement also applies to contracts executed by the Bidder as JV member.

[3] The Bidder shall provide accurate information on the letter of Bid about any litigation or arbitration resulting from contracts completed or ongoing under its execution over the last five years. A consistent history of court/arbitral awards against the Bidder or any member of a joint venture may result in disqualifying the Bidder.

Eligibility and Qualification Criteria			Compliance Requirements				Documentation
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All members Combined	Each member	At least one member	
2.5	**Declaration: Environmental and Social (ES) past performance**	Declare any civil work contracts that have been suspended or terminated and/or performance security called by an employer for reasons of breach of environmental or social (including Sexual Exploitation and Abuse)) contractual obligations in the past five years.[4]	Must make the declaration. Where there are Specialized Sub-contractor/s, the Specialized Sub-contractor/s must also make the declaration.	N/A	Each must make the declaration. Where there are Specialized Sub-contractor/s, the Specialized Sub-contractor/s must also make the declaration.	N/A	Form CON-3 ES Performance Declaration
2.6	**Bank's SEA and/or SH Disqualification**	At the time of Contract Award, not subject to disqualification by the Bank for non-compliance with SEA/ SH obligations	Must meet requirement (including each subcontractor proposed by the Bidder)	N/A	Must meet requirement (including each subcontractor proposed by the Bidder)	N/A	Letter of Bid, Form CON-4
		If the Bidder had been subject to disqualification by the Bank for non-compliance with SEA/ SH obligations, the Bidder shall either (i) provide evidence of an arbitral award on the disqualification made in its favour; or (ii) demonstrate that it has adequate capacity and commitment to comply with SEA/SH prevention and response obligations; or (iii) provide evidence that it has	Must meet requirement (including each subcontractor proposed by the Bidder)	N/A	Must meet requirement (including each subcontractor proposed by the Bidder)	N/A	Letter of Bid, Form CON-4

[4] The Employer may use this information to seek further information or clarifications in carrying out its due diligence.

Eligibility and Qualification Criteria			Compliance Requirements				Documentation
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All members Combined	Each member	At least one member	
		already demonstrated such capacity and commitment on another Bank financed works contract.					
3. Financial Situation and Performance							
3.1	Financial Capabilities	(i) The Bidder shall demonstrate that it has access to, or has available, liquid assets, unencumbered real assets, lines of credit, and other financial means (independent of any contractual advance payment) sufficient to meet the construction cash flow requirements estimated as: **USD 2 Million**	Must meet requirement	Must meet Requirement	At least 25%	At least 40%	Form FIN – 3.1, with attachments
		(ii) The Bidders shall also demonstrate, to the satisfaction of the Employer, that it has adequate sources of finance to meet the cash flow requirements on works currently in progress and for future contract commitments.	Must meet requirement	Must meet requirement	N/A	N/A	
		(iii) The audited balance sheets or, if not required by the laws of the Bidder's Country, other financial statements acceptable	Must meet requirement	N/A	Must meet requirement	N/A	

Eligibility and Qualification Criteria			Compliance Requirements				Documentation
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All members Combined	Each member	At least one member	
		to the Employer, for the last five years shall be submitted and must demonstrate the current soundness of the Bidder's financial position and indicate its prospective long-term profitability.					
3.2	Average Annual Construction Turnover	Minimum average annual construction turnover calculated as total certified payments received for contracts in progress and/or completed within the last Five (05) years, divided by Five (05) years **USD 11 Million**	Must meet requirement	Must meet requirement	Must meet 25%, of the requirement	Must meet 40 %, of the requirement	Form FIN – 3.2
4. Experience							
4.1 (a)	General Construction Experience	Experience under construction contracts in the role of prime contractor, JV member, sub-contractor, or management contractor for at least the last 10 years, starting 1st January 2015	Must meet requirement	N/A	Must meet requirement	N/A	Form EXP – 4.1

Eligibility and Qualification Criteria			Compliance Requirements				Documentation
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All members Combined	Each member	At least one member	
4.2 (a)	Specific Construction & Contract Management Experience	A minimum number of similar contracts specified below that have been satisfactorily and substantially[5] completed as a prime contractor, joint venture member[6], management contractor or sub-contractor6 between 1st January 2015 and bid submission deadline: **One (1) contract of USD 6 Million in building works.** **Or** **Two (2) contracts each with a value of USD 3 Million each in building works.**	Must meet requirements	Must meet requirement[7]	N/A	N/A	Form EXP 4.2(a)

[5] Substantial completion shall be based on 80% or more works completed under the contract.

[6] For contracts under which the Bidder participated as a joint venture member or sub-contractor, only the Bidder's share, by value, shall be considered to meet this requirement.

[7] In the case of JV, the value of contracts completed by its members shall not be aggregated to determine whether the requirement of the minimum value of a single contract has been met. Instead, each contract performed by each member shall satisfy the minimum value of a single contract as required for single entity. In determining whether the JV meets the requirement of total number of contracts, only the number of contracts completed by all members each of value equal or more than the minimum value required shall be aggregated.

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Eligibility and Qualification Criteria			Compliance Requirements				Documentation
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All members Combined	Each member	At least one member	
4.2 (b)		For the above and any other contracts [substantially completed and under implementation] as prime contractor, joint venture member, or sub-contractor between 1st January *2015* Application submission deadline, a minimum construction experience in the following key activities successfully completed in any one contract[8]: **i. Reinforcement Total 100 ton/year** **ii. Concrete Total 132,000 CFT/year** **iii. Masonry Total 170,000 CFT/year** **iv. Installation of 600 KW solar system / year** **v. Installation of 15,000 LPH RO/UF Plants / year**	Must meet requirements Item iv Solar systems and item v RO plant can be met through specialized sub-contractors, in accordance *accordance with ITB 33.2]*	Must meet requirements *[Item iv Solar systems and item v RO plant can be met through specialized sub-contractors, in accordance with ITB 33.2]*	N/A	N/A	Form EXP – 4.2 (b)
4.2 (c)	Specific Experience in managing ES aspects	For contracts [substantially completed and under implementation] as prime contractor, joint venture member, or Subcontractor between 1st January 2015 and bid submission deadline,	Must meet requirements	Must meet requirements	N/A	N/A	Form EXP – 4.2 (c)

[8] Volume, number or rate of production of any key activity can be demonstrated in one or more contracts combined if executed during same time period.

Eligibility and Qualification Criteria			Compliance Requirements				Documentation
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All members Combined	Each member	At least one member	
		experience in managing ES risks and impacts in the following aspects: Managing ES Risks Managing HSE Risks					

5. Key Personnel

The Bidder must demonstrate that it will have suitably qualified (and in adequate numbers) Key Personnel, as described in the Specification.

The Bidder shall provide details of the Key Personnel and such other Key Personnel that the Bidder considers appropriate to perform the Contract, together with their academic qualifications and work experience. The Bidder shall complete the relevant Forms in Section IV, Bidding Forms.

Item No.	Position/specialization	Relevant academic qualifications	Minimum years of relevant work experience
1.	Project Manager	Master in Civil Engineering, BE or B.Sc. Civil Engineer.	15
2.	Civil Engineer (Construction Management) /Planning Engineering	Master in Civil Engr, BE or B.Sc. Civil, PMP Preferred	10
3.	Site Engineers (15) Nos	BE or BSC Civil Engineer	4
4.	Material Engineer (2 Nos)	M.Sc. Geology or B.Sc. Civil Engineer	10
5.	E&M Engineer	BE or B.Sc. Electrical/Mechanical Engineer	3
6.	Environment Specialist (05 Nos)	B.S/ B.E Environmental Science/ Environmental Engineer/ MA Sociology /Rural Development	05
7.	Social Specialist (2 Nos)	MA Sociology /Rural Development	05
8.	Health & Safety specialist (2 Nos)	B.S/ B.E Environmental Science/ Environmental Engineer/ Mechanical Engg/Civil Enggg	02
9.	Environmental/Social/ Health & Safety Officer (11) each on every district	Masters/Bachelor Environment/Sociology	03
10.	Building Surveyor (3) Nos	DAE/Qualified Surveyor	05
11.	Lab Technicians (2) Nos	DAE/Qualified Lab Technicians	05
12.	Quantity Surveyor (2) Nos	DAE/Qualified Surveyor	10

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6. Equipment

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

No.	Equipment Type and Characteristics	Minimum Number required
1	*Excavator*	05
2	*Dumpers*	10
3	*Plate Compactor*	06
4	*Concrete Mixer Power Driven*	06
5	*Water Tankers*	04
6	*Surveying Equipment set*	06
7	*Utility Installation Equipment*	06
8	*Tractor Trolley*	06
9	*Concrete lifting Machine*	06
10	*Laboratory equipment as per approval of client.*	06
11	*Generator 10KVA*	06

The Bidder shall provide further details of proposed items of equipment using Form EQU in Section IV, Bidding Forms.

2. Financial Part

2.1 Margin of Preference

N/A

2.2 Alternative Completion Time

N/A

2.3 Alternative Technical Solutions for specified parts of the Works

N/A

3. Combined Evaluation

The Employer will evaluate and compare the Bids that have been determined to be substantially responsive.

An Evaluated Bid Score (B) will be calculated for each responsive Bid using the following formula, which permits a comprehensive assessment of the evaluated cost and the technical merits of each Bid:

$$B \equiv \frac{Clow}{C} * X * 100 + \frac{T}{Thigh} * (1 - X$$

NOT APPLICABLE

where

C = Evaluated Bid Cost

C_{low} = the lowest of all E... d Costs among responsive Bids

T = the total Tec... e awarded to the Bid

T_{high} = the T... core achieved by the Bid that was scored best among ... ve Bids

X = ... t for Cost as **specified in the BDS**

The Bid with the best evaluated Bid Score (B) among responsive Bids shall be the Most Advantageous Bid provided the Bidder is qualified to perform the Contract.

4. Multiple Contracts

If a Bidder, with a Bid that is substantially responsive and with the highest evaluated score for individual lots, is not qualified for the combination of the lots, then the award will be made based on the highest total score for the combination of lots for which the Bidders are qualified.

Cross discounts for award of multiple lots will not be considered.

However, In addition to Activity No. PK-SIHPP-_____-CW-RFB, Rehabilitation and Upgradation of 15 THQs at Hyderabad, Larkana, Mirpurkhas and Shaheed Benazirabad & Sukkur Divisions , PK-SIHPP-_____-CW-RFB, Rehabilitation and Upgradation of 10 Rural Healthcare Centers (RHCs) at Hyderabad, Mirpurkhas, Shaheed Benazirabad, Larkana & Sukkur Divisions and Activity No. PK-SIHPP-_____-CW-RFB, Rehabilitation and Upgradation of 39 Government dispensaries fully Damaged During Flood, at Karachi, Hyderabad, Mirpurkhas Larkana, Sukkur & Shaheed Benazirabad Division of Sindh, there are two packages, tendered out in parallel. Bidders have the option to Bid for any one or more packages. However, if a bidder is found Most Advantageous on more than one package, the bidder shall meet the aggregate qualification criteria (cashflow, annual turnover, value of specific experience, key activity production rates, personnel and equipment) to be awarded the packages under consideration. The award will be made based on best economic award option to the Employer

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Letter of Bid - Technical Part

INSTRUCTIONS TO BIDDERS: DELETE THIS BOX ONCE YOU HAVE COMPLETED THE DOCUMENT

The Bidder must prepare this Letter of Bid on stationery with its letterhead clearly showing the Bidder's complete name and business address.

Note: All italicized text is to help Bidders in preparing this form.

Date of this Bid submission: [*insert date (as day, month and year) of Bid submission*]
Request for Bid No.: [*insert identification*]
Alternative No.: [*insert identification No if this is a Bid for an alternative*]

To: **[*insert complete name of Employer*]**

We, the undersigned, hereby submit our Bid, in two parts, namely:

(a) the Technical Part, and

(b) the Financial Part

In submitting our Bid, we make the following declarations:

(a) **No reservations:** We have examined and have no reservations to the bidding document, including Addenda issued in accordance with Instructions to Bidders (ITB 8);

(b) **Eligibility**: We meet the eligibility requirements and have no conflict of interest in accordance with ITB 4;

(c) **Bid-Securing Declaration:** We have not been suspended nor declared ineligible by the Employer based on execution of a Bid-Securing Declaration or Proposal-Securing Declaration in the Employer's country in accordance with ITB 4.7;

(d) **Exploitation and Abuse (SEA) and/or Sexual Harassment (SH):** [*select the appropriate option from (i) to (v) below and delete the others*].

We *[where JV, insert:* "including any of our JV members"*]*, and any of our subcontractors:

i. [have not been subject to disqualification by the Bank for non-compliance with SEA/ SH obligations.]

ii. [are subject to disqualification by the Bank for non-compliance with SEA/ SH obligations.]

iii. [had been subject to disqualification by the Bank for non-compliance with SEA/ SH obligations. An arbitral award on the disqualification case has been made in our favor.]

iv. [had been subject to disqualification by the Bank for non-compliance with SEA/ SH obligations for a period of two years. We have subsequently provided and demonstrated that we have adequate capacity and commitment to comply with SEA and SH prevention and response obligations.]

v. [had been subject to disqualification by the Bank for non-compliance with SEA/ SH obligations for a period of two years. We have attached documents demonstrating that we have adequate capacity and commitment to comply with SEA and SH prevention and response obligations.]

(e) **Conformity**: We offer to execute in conformity with the bidding document the following Works: [*insert a brief description of the Works*]_____

_____;

(f) **Bid Validity**: Our Bid shall be valid until *[insert day, month and year in accordance with ITB 18.1]*, and it shall remain binding upon us and may be accepted at any time on or before this date;

(g) **Performance Security:** If our Bid is accepted, we commit to obtain a Performance Security [*and an Environmental and Social (ES) Performance Security, **Delete if not applicable***] in accordance with the bidding document;

(h) **One Bid Per Bidder:** We are not submitting any other Bid(s) as an individual Bidder or as a subcontractor, and we are not participating in any other Bid(s) as a Joint Venture member, and meet the requirements of ITB 4.3, other than alternative Bids submitted in accordance with ITB 13;

(i) **Suspension and Debarment**: We, along with any of our subcontractors, suppliers, consultants, manufacturers, or service providers for any part of the contract, are not subject to, and not controlled by any entity or individual that is subject to, a temporary suspension or a debarment imposed by the World Bank Group or a debarment imposed by the World Bank Group in accordance with the Agreement for Mutual Enforcement of Debarment Decisions between the World Bank and other development banks. Further, we are not ineligible under the Employer's country laws or official regulations or pursuant to a decision of the United Nations Security Council;

(j) **State-owned enterprise or institution:** [*select the appropriate option and delete the other*] [*We are not a state-owned enterprise or institution*] / [*We are a state-owned enterprise or institution but meet the requirements of ITB 4.6*];

(k) **Binding Contract**: We understand that this Bid, together with your written acceptance thereof included in your Letter of Acceptance, shall constitute a binding contract between us, until a formal contract is prepared and executed;

(l) **Not Bound to Accept:** We understand that you are not bound to accept the lowest evaluated cost Bid, the Most Advantageous Bid or any other Bid that you may receive;

(m) **Fraud and Corruption:** We hereby certify that we have taken steps to ensure that no person acting for us or on our behalf engages in any type of Fraud and Corruption;

(n) **Adjudicator:** We accept the appointment of *[insert name proposed in Bid Data Sheet]* as the Adjudicator.

[or]

We do not accept the appointment of *[insert name proposed in Bid Data Sheet]* as the Adjudicator and propose instead that *[insert name]* be appointed as Adjudicator, whose daily fees and biographical data are attached.

Name of the Bidder: *[*insert complete name of the Bidder*]

Name of the person duly authorized to sign the Bid on behalf of the Bidder: ** [*insert complete name of person duly authorized to sign the Bid*]

Title of the person signing the Bid: [*insert complete title of the person signing the Bid*]

Signature of the person named above: [*insert signature of person whose name and capacity are shown above*]

Date signed [*insert date of signing*] **day of** [*insert month*], [*insert year*]

Date signed _____ day of _____,

_____

*: In the case of the Bid submitted by joint venture specify the name of the Joint Venture as Bidder
**: Person signing the Bid shall have the power of attorney given by the Bidder to be attached with the Bid

Appendix A to Technical Part: Technical Proposal

(Forms to be completed wherever it is necessary and applicable)

Extent the technical proposal exceeds the requirements of the Design/Specification
(provide here)

Site Organization

[insert Site Organization information]

Method Statement

[insert Method Statement]

[If the contract is assessed to present potential supply chain risk, the method statement must include method statement to manage supply chain risks.]

Mobilization Schedule

[insert Mobilization Schedule]

Construction Schedule

[insert Construction Schedule]

Environmental and Social, Health Management Strategies and Implementation Plans (ES-MSIP)

The Bidder shall submit comprehensive and concise Environmental and Social Management Strategies and Implementation Plans (ES-MSIP) as required by ITB 11.2 (h) of the Bid Data Sheet. These strategies and plans shall describe in detail the actions, materials, equipment, management processes etc. that will be implemented by the Contractor, and its subcontractors.

In developing these strategies and plans, the Bidder shall have regard to the ES provisions of the contract including those as may be more fully described in the Works' Requirements in Section VII.

Sustainable Procurement Proposal

Not Applicable

Code of Conduct for Contractor's Personnel (ES) Form

***Note to the Employer**:*

***The following minimum requirements shall not be modified**. The Employer may add additional requirements to address identified issues, informed by relevant environmental and social assessment.*

The types of issues identified could include risks associated with: labor influx, spread of communicable diseases, and Sexual Exploitation and Abuse (SEA), Sexual Harassment (SH) etc.

Delete this Box prior to issuance of the bidding documents.

Note to the Bidder:

The minimum content of the Code of Conduct form as set out by the Employer shall not be substantially modified. However, the Bidder may add requirements as appropriate, including to take into account Contract-specific issues/risks.

The Bidder shall initial and submit the Code of Conduct form as part of its bid.

CODE OF CONDUCT FOR CONTRACTOR'S PERSONNEL

We are the Contractor, [*enter name of Contractor*]. We have signed a contract with [*enter name of Employer*] for [*enter description of the Works*]. These Works will be carried out at [*enter the Site and other locations where the Works will be carried out*]. Our contract requires us to implement measures to address environmental and social risks related to the Works, including the risks of sexual exploitation, sexual abuse and sexual harassment.

This Code of Conduct is part of our measures to deal with environmental and social risks related to the Works. It applies to all our staff, laborers and other employees at the Works Site or other places where the Works are being carried out. It also applies to the personnel of each subcontractor and any other personnel assisting us in the execution of the Works. All such persons are referred to as "**Contractor's Personnel"** and are subject to this Code of Conduct.

This Code of Conduct identifies the behavior that we require from all Contractor's Personnel.

Our workplace is an environment where unsafe, offensive, abusive or violent behavior will not be tolerated and where all persons should feel comfortable raising issues or concerns without fear of retaliation.

REQUIRED CONDUCT

Contractor's Personnel shall:

1. carry out his/her duties competently and diligently;
2. comply with this Code of Conduct and all applicable laws, regulations and other requirements, including requirements to protect the health, safety and well-being of other Contractor's Personnel and any other person;
3. maintain a safe working environment including by:
    a. ensuring that workplaces, machinery, equipment and processes under each person's control are safe and without risk to health;
    b. wearing required personal protective equipment;
    c. using appropriate measures relating to chemical, physical and biological substances and agents; and
    d. following applicable emergency operating procedures.
4. report work situations that he/she believes are not safe or healthy and remove himself/herself from a work situation which he/she reasonably believes presents an imminent and serious danger to his/her life or health;
5. treat other people with respect, and not discriminate against specific groups such as women, people with disabilities, migrant workers or children;
6. not engage in Sexual Harassment, which means unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature with other Contractor's or Employer's Personnel;
7. not engage in Sexual Exploitation, which means any actual or attempted abuse of position of vulnerability, differential power or trust, for sexual purposes, including, but not limited to, profiting monetarily, socially or politically from the sexual exploitation of another;
8. not engage in Sexual Abuse, which means the actual or threatened physical intrusion of a sexual nature, whether by force or under unequal or coercive conditions;
9. not engage in any form of sexual activity with individuals under the age of 18, except in case of pre-existing marriage;
10. complete relevant training courses that will be provided related to the environmental and social aspects of the Contract, including on health and safety matters, and Sexual Exploitation, and Abuse (SEA) and Sexual Harassment (SH);
11. report violations of this Code of Conduct; and
12. not retaliate against any person who reports violations of this Code of Conduct, whether to us or the Employer, or who makes use of the grievance mechanism for Contractor's Personnel or the project's Grievance Redress Mechanism.

RAISING CONCERNS

If any person observes behavior that he/she believes may represent a violation of this Code of Conduct, or that otherwise concerns him/her, he/she should raise the issue promptly. This can be done in either of the following ways:

1. Contact [*enter name of the Contractor's Social Expert with relevant experience in handling gender-based violence, or if such person is not required under the Contract, another individual designated by the Contractor to handle these matters*] in writing at this address [ ] or by telephone at [ ] or in person at [ ]; or
2. Call [ ] to reach the Contractor's hotline *(if any)* and leave a message.

The person's identity will be kept confidential, unless reporting of allegations is mandated by the country law. Anonymous complaints or allegations may also be submitted and will be given all due and appropriate consideration. We take seriously all reports of possible misconduct and will investigate and take appropriate action. We will provide warm referrals to service providers that may help support the person who experienced the alleged incident, as appropriate.
There will be no retaliation against any person who raises a concern in good faith about any behavior prohibited by this Code of Conduct. Such retaliation would be a violation of this Code of Conduct.

CONSEQUENCES OF VIOLATING THE CODE OF CONDUCT

Any violation of this Code of Conduct by Contractor's Personnel may result in serious consequences, up to and including termination and possible referral to legal authorities.

FOR CONTRACTOR'S PERSONNEL:

I have received a copy of this Code of Conduct written in a language that I comprehend. I understand that if I have any questions about this Code of Conduct, I can contact [*enter name of Contractor's contact person with relevant experience*] requesting an explanation.

Name of Contractor's Personnel: [insert name]

Signature: _____

Date: (day month year): _____

Countersignature of authorized representative of the Contractor:

Signature: _____

Date: (day month year): _____

ATTACHMENT 1: Behaviors constituting Sexual Exploitation and Abuse (SEA) and behaviors constituting Sexual Harassment (SH)

ATTACHMENT 1 TO THE CODE OF CONDUCT FORM

BEHAVIORS CONSTITUTING SEXUAL EXPLOITATION AND ABUSE (SEA) AND BEHAVIORS CONSTITUTING SEXUAL HARASSMENT (SH)

The following non-exhaustive list is intended to illustrate types of prohibited behaviors:

(1) **Examples of sexual exploitation and abuse** include, but are not limited to:

- A Contractor's Personnel tells a member of the community that he/she can get them jobs related to the work site (e.g., cooking and cleaning) in exchange for sex.
- A Contractor's Personnel that is connecting electricity input to households says that he can connect women headed households to the grid in exchange for sex.
- A Contractor's Personnel rapes, or otherwise sexually assaults a member of the community.
- A Contractor's Personnel denies a person access to the Site unless he/she performs a sexual favor.
- A Contractor's Personnel tells a person applying for employment under the Contract that he/she will only hire him/her if he/she has sex with him/her.

(2) **Examples of sexual harassment in a work context**

- Contractor's Personnel comment on the appearance of another Contractor's Personnel (either positive or negative) and sexual desirability.
- When a Contractor's Personnel complains about comments made by another Contractor's Personnel on his/her appearance, the other Contractor's Personnel comment that he/she is "asking for it" because of how he/she dresses.
- Unwelcome touching of a Contractor's or Employer's Personnel by another Contractor's Personnel.
- A Contractor's Personnel tells another Contractor's Personnel that he/she will get him/her a salary raise, or promotion if he/she sends him/her naked photographs of himself/herself.

Others

Appendix B to Technical Part: Equipment

The Bidder shall provide adequate information to demonstrate clearly that it has the capability to meet the requirements for the key equipment listed in Section III, Evaluation and Qualification Criteria. 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 (a) ☐ Owned ☐ Rented ☐ Leased ☐ 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	

Appendix C to Technical Part: Key Personnel

Form PER -1: Key Personnel Schedule

Bidders should provide the names and details of the suitably qualified Key Personnel to perform the Contract. The data on their experience should be supplied using the Form PER-2 below for each candidate.

Key Personnel

1.	**Title of position:**	
	Name of candidate:	
	Duration of appointment:	[*insert the whole period (start and end dates) for which this position will be engaged*]
	Time commitment: for this position:	[*insert the number of days/week/months/ that has been scheduled for this position*]
	Expected time schedule for this position:	[*insert the expected time schedule for this position (e.g., attach high level Gantt chart*]
2.	**Title of position:** *[Environmental Specialist]*	
	Name of candidate:	
	Duration of appointment:	[*insert the whole period (start and end dates) for which this position will be engaged*]
	Time commitment: for this position:	[*insert the number of days/week/months/ that has been scheduled for this position*]
	Expected time schedule for this position:	[*insert the expected time schedule for this position (e.g., attach high level Gantt chart*]
3.	**Title of position:** *[Health and Safety Specialist]*	
	Name of candidate:	
	Duration of appointment:	[*insert the whole period (start and end dates) for which this position will be engaged*]
	Time commitment: for this position:	[*insert the number of days/week/months/ that has been scheduled for this position*]
	Expected time schedule for this position:	[*insert the expected time schedule for this position (e.g., attach high level Gantt chart*]
4.	**Title of position:** *[Social Specialist]*	
	Name of candidate:	
	Duration of appointment:	[*insert the whole period (start and end dates) for which this position will be engaged*]

	Time commitment: for this position:	[*insert the number of days/week/months/ that has been scheduled for this position*]
	Expected time schedule for this position:	[*insert the expected time schedule for this position (e.g., attach high level Gantt chart*]
5.	**Title of position: Sexual Exploitation, Abuse and Harassment Expert** *[Where a Project SEA risks are assessed to be substantial or high, Key Personnel shall include an expert with relevant experience in addressing sexual exploitation, sexual abuse and sexual harassment cases]*	
	Name of candidate	
	Duration of appointment:	[*insert the whole period (start and end dates) for which this position will be engaged*]
	Time commitment: for this position:	[*insert the number of days/week/months/ that has been scheduled for this position*]
	Expected time schedule for this position:	[*insert the expected time schedule for this position (e.g., attach high level Gantt chart*]
6.	**Title of position: Cyber security Expert/s** ***[Include as required]***	
	Name of candidate	
	Duration of appointment:	[*insert the whole period (start and end dates) for which this position will be engaged*]
	Time commitment: for this position:	[*insert the number of days/week/months/ that has been scheduled for this position*]
	Expected time schedule for this position:	[*insert the expected time schedule for this position (e.g., attach high level Gantt chart*]

Form PER-2: Resume and Declaration
Key Personnel

Name of Bidder

Position [*#1*]: [*title of position from Form PER-1*]		
Personnel information	**Name:**	**Date of birth:**
	Address:	**E-mail:**
	Professional qualifications:	
	Academic qualifications:	
	Language proficiency:*[language and levels of speaking, reading and writing skills]*	
details		
	Address of employer:	
	Telephone:	**Contact (manager / personnel officer):**
	Fax:	
	Job title:	**Years with present employer:**

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

Project	**Role**	**Duration of involvement**	**Relevant experience**
[main project details]	*[role and responsibilities on the project]*	*[time in role]*	*[describe the experience relevant to this position]*

Declaration

I, the undersigned Key Personnel, certify that to the best of my knowledge and belief, the information contained in this Form PER-2 correctly describes myself, my qualifications and my experience.

I confirm that I am available as certified in the following table and throughout the expected time schedule for this position as provided in the Bid:

Commitment	**Details**
Commitment to duration of contract:	*[insert period (start and end dates) for which this Key Personnel is available to work on this contract]*
Time commitment:	*[insert the number of days/week/months/ that this Key Personnel will be engaged]*

I understand that any misrepresentation or omission in this Form may:

(a) be taken into consideration during Bid evaluation;

(b) result in my disqualification from participating in the Bid;

(c) result in my dismissal from the contract.

Name of Key Personnel: [*insert name*]

Signature: _____

Date: (day month year): _____

Countersignature of authorized representative of the Bidder:

Signature: _____

Date: (day month year): _____

Appendix D to Technical Part: Bidder's Qualification

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

Official Use Only

Form ELI -1.1
Bidder Information Form

Date: _____
RFB No. and title: _____
Page _____ of _____ pages

Bidder's name
In case of Joint Venture (JV), name of each member:
Bidder's actual or intended country of registration: *[indicate country of Constitution]*
Bidder's actual or intended year of incorporation:
Bidder's legal address [in country of registration]:
Bidder's authorized representative information Name: _____ Address: _____ Telephone/Fax numbers: _____ E-mail address: _____
1. Attached are copies of original documents of ☐ Articles of Incorporation (or equivalent documents of constitution or association), and/or documents of registration of the legal entity named above, in accordance with ITB 4.4. ☐ In case of JV, letter of intent to form JV or JV agreement, in accordance with ITB 4.1. ☐ In case of state-owned enterprise or institution, in accordance with ITB 4.6 documents establishing: • Legal and financial autonomy • Operation under commercial law • Establishing that the Bidder is not under the supervision of the Employer 2. Included are the organizational chart, a list of Board of Directors, and the beneficial ownership. The successful Bidder shall provide additional information on beneficial ownership, using the Beneficial Ownership Disclosure Form.

Form ELI -1.2
Bidder's JV Information Form

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

Date: _____
RFB No. and title: _____
Page _____ of _____ pages

Bidder's JV name:
JV member's name:
JV member's country of registration:
JV member's year of constitution:
JV member's legal address in country of constitution:
JV member's authorized representative information Name: _____ Address: _____ Telephone/Fax numbers: _____ E-mail address: _____
1. Attached are copies of original documents of ☐ Articles of Incorporation (or equivalent documents of constitution or association), and/or registration documents of the legal entity named above, in accordance with ITB 4.4. ☐ In case of a state-owned enterprise or institution, documents establishing legal and financial autonomy, operation in accordance with commercial law, and that they are not under the supervision of the Employer, in accordance with ITB 4.6. 2. Included are the organizational chart, a list of Board of Directors, and the beneficial ownership. The successful Bidder shall provide additional information on beneficial ownership for each JV member using the Beneficial Ownership Disclosure Form.

Form CON – 2
Historical Contract Non-Performance, Pending Litigation and Litigation History

Bidder's Name: _____
Date: _____
JV Member's Name_____
RFB No. and title: _____
Page _____of _____pages

Non-Performed Contracts in accordance with Section III, Evaluation and Qualification Criteria			
☐ Contract non-performance did not occur since 1st January *[insert year]* ☐ Contract(s) not performed since 1st January *[insert year]*			
Year	**Non-performed portion of contract**	**Contract Identification**	**Total Contract Amount (current value, currency, exchange rate and US$ equivalent)**
[insert year]	*[insert amount and percentage]*	Contract Identification: *[indicate complete contract name/ number, and any other identification]* Name of Employer: *[insert full name]* Address of Employer: *[insert street/city/country]* Reason(s) for nonperformance: *[indicate main reason(s)]*	*[insert amount]*
Pending Litigation, in accordance with Section III, Evaluation and Qualification Criteria			
☐ No pending litigation ☐ Pending litigation.			

Year of dispute	Amount in dispute (currency)	Contract Identification	Total Contract Amount (currency), USD Equivalent (exchange rate)
		Contract Identification: _____ Name of Employer: _____ Address of Employer: _____ Matter in dispute: _____ Party who initiated the dispute: ____ Status of dispute: _____	
		Contract Identification: Name of Employer: Address of Employer: Matter in dispute: Party who initiated the dispute: Status of dispute:	

Litigation History in accordance with Section III, Evaluation and Qualification Criteria

☐ No Litigation History
☐ Litigation History

Year of award	Outcome as percentage of Net Worth	Contract Identification	Total Contract Amount (currency), USD Equivalent (exchange rate)
[insert year]	*[insert percentage]*	Contract Identification: [indicate complete contract name, number, and any other identification] Name of Employer: *[insert full name]* Address of Employer: *[insert street/city/country]* Matter in dispute: *[indicate main issues in dispute]* Party who initiated the dispute: *[indicate "Employer" or "Contractor"]* Reason(s) for Litigation and award decision *[indicate main reason(s)]*	*[insert amount]*

Form CON – 3:
Environmental and Social (ES) Performance Declaration

[The following table shall be filled in for the Bidder, each member of a Joint Venture and each Specialized Subcontractor]

Bidder's Name: *[insert full name]*
Date: *[insert day, month, year]*
Joint Venture Member's or Specialized Subcontractor's Name: *[insert full name]*
RFB No. and title: *[insert RFB number and title]*
Page *[insert page number]* of *[insert total number]* pages

Environmental and Social, Performance Declaration
in accordance with Section III, Evaluation and Qualification Criteria

☐ **No suspension or termination of contract**: An employer has not suspended or terminated a contract and/or called the performance security for a contract for reasons related to Environmental, or Social (ES) performance since the date specified in Section III, Evaluation and Qualification Criteria, Sub-Factor 2.5.

☐ **Declaration of suspension or termination of contract**: The following contract(s) has/have been suspended or terminated and/or Performance Security called by an employer(s) for reasons related to Environmental or Social (ES) performance since the date specified in Section III, Evaluation and Qualification Criteria, Sub-Factor 2.5. Details are described below:

Year	Suspended or terminated portion of contract	Contract Identification	Total Contract Amount (current value, currency, exchange rate and US$ equivalent)
[insert year]	*[insert amount and percentage]*	Contract Identification: *[indicate complete contract name/ number, and any other identification]* Name of Employer: *[insert full name]* Address of Employer: *[insert street/city/country]* Reason(s) for suspension or termination: *[indicate main reason(s) e.g., for gender-based violence; sexual exploitation or sexual abuse breaches]*	*[insert amount]*
[insert year]	*[insert amount and percentage]*	Contract Identification: *[indicate complete contract name/ number, and any other identification]* Name of Employer: *[insert full name]* Address of Employer: *[insert street/city/country]*	*[insert amount]*

		Reason(s) for suspension or termination: *[indicate main reason(s)]*	
…	…	*[list all applicable contracts]*	…
Performance Security called by an employer(s) for reasons related to ES performance			
Year	Contract Identification		Total Contract Amount (current value, currency, exchange rate and US$ equivalent)
[insert year]	Contract Identification: *[indicate complete contract name/ number, and any other identification]* Name of Employer: *[insert full name]* Address of Employer: *[insert street/city/country]* Reason(s) for calling of performance security: *[indicate main reason(s) e.g., for gender-based violence; sexual exploitation, or sexual abuse breaches]*		*[insert amount]*

ANNEX II - Forced Labor Performance Declaration[1]

[The following table shall be filled in by the Bidder, each member of a Joint Venture, each Subcontractor/ supplier/ manufacturer providing solar panels and/or solar panel components proposed by the Bidder]

Bidder's Name: *[insert full name]*
Date: *[insert day, month, year]*
Joint Venture Member's or Subcontractor's/supplier's/manufacturer's Name: *[insert full name]*
RFB No. and title: *[insert RFB number and title]*
Page *[insert page number]* of *[insert total number]* pages

Forced Labor Performance Declaration
in accordance with Section III, Evaluation and Qualification Criteria

We:

☐ (a) have not been suspended or terminated, and/or other contractual remedies applied including calling of performance security by an employer, for reasons of breach of forced labor obligations in the past five years. *[if (a) is declared, state N/A for (b) below]*

☐ (b) have been suspended or terminated, and/or other contractual remedies applied including calling of performance security by an employer, for reasons of breach of forced labor obligations in the past five years. Details are provided below:

Year	Contract identification	Name of Employer	Reasons for suspension or, termination, and/or other contractual remedies applied including calling performance security
-	-	-	-

☐ (c) [*If (b) above is applicable, attach evidence demonstrating that adequate capacity and commitment to comply with Forced Labor obligations.]*

We declare that all the information and statements made in this Form are true, and we accept that any misrepresentation contained in this Form may lead to our disqualification by the Employer and/or sanctions by the Bank.

Name of the Bidder/ JV member/ Subcontractor/ supplier/ manufacturer
_____

Name of the person duly authorized to sign on behalf of the Bidder/ JV member/ Subcontractor/ supplier/manufacturer
_____

Title of the person signing on behalf of the Bidder/ JV member/ Subcontractor/ supplier/ manufacturer
_____

Signature of the person named above
_____

Date signed _____ day of _____,
_____

Countersignature of authorized representative of the Bidder (for forms submitted by a JV member, Subcontractor/ supplier/ manufacturer):

[1] Annex II uses terms such as "RFB" and "bidder". The terms should be adjusted depending on the applicable procurement process terms such as "RFP" "proposer" and "applicant".

Signature:
_____

Date signed _____ day of _____,
_____

ANNEX III - Forced Labor Declaration[1]

Date: _____ RFB No.: _____

Alternative No.: _____

Contract Title: _____-

_____

To:

We, the undersigned, declare that, if awarded the Contract, we, including our Subcontractors and suppliers/ manufacturers, are required to comply with the contractual Forced Labor obligations. In this regard, we:

(a) accept that there will be no Forced Labor among the staff, employees, workers and any other persons employed or engaged by us;
(b) accept that staff, employees, workers and any other persons employed or engaged, will be hired under employment conditions that meet the contractual obligations set out in the Contract;
(c) will include in our contracts with Subcontractors/ suppliers/ manufacturers of *[solar panels] [solar panel components]* obligations to prevent Forced Labor among the staff, employees, workers and any other person employed or engaged by the Subcontractor/ supplier/ manufacturer;
(d) will include in our contracts with Subcontractors/ suppliers/ manufacturers of *[solar panels] [solar panel components]*, that the Subcontractors/ suppliers/ manufacturers include an obligation to prevent Forced Labor in all contracts that they execute with their suppliers/ manufacturers of [solar panel][solar panel components];
(e) will monitor our Subcontractors/ suppliers/ manufacturers of *[solar panels][solar panel components]* on implementation of obligations to prevent Forced Labor among the staff, employees, workers and any other person employed or engaged by them;
(f) will require our Subcontractors to monitor their suppliers/ manufacturers of *[solar panels][solar panel components]* on implementation of obligations to prevent Forced Labor among the staff, employees, workers and any other person employed or engaged by them;
(g) will require our Subcontractors/ suppliers/ manufacturers to immediately notify us of any incidents of Forced Labor;
(h) will immediately notify the Employer any incident of Forced labor on the site, or premises of Subcontractors/ suppliers/ manufacturers of *[solar panels] [solar panel components]*;
(i) will include in periodic progress reports submitted in accordance with the contract sufficient details on our, including our Subcontractors/ suppliers/ manufacturers , compliance with Forced Labor obligations; and we
(j) confirm that the Subcontractors/ suppliers/ manufacturers for *[solar panels][solar panel components]* for this contract are (or likely to be):

[Provide each firm's name, address, primary contact, e-mail address, and the link to the firm's website]

[1] Annex III uses terms such as "bid" and "bidder". The terms should be adjusted depending on the applicable procurement process terms such as "proposal" "proposer"

OR

confirm that you have not yet finalized the Subcontractors/ suppliers/ manufacturers of solar panels/components, but when known the firm/s name(s), address(es), primary contact(s), e-mail address(es) and web site link(s) will be provided to the Employer, prior to signing the contract, with documentation demonstrating compliance with forced labor obligations to the Employer for approval].

THEN

If (c) above is applicable, attach evidence of how these contract obligations are/will be made.

If (d) above is applicable, attach evidence of how these contract obligations are/will be made.

If (e) above is applicable, please attach evidence of how this monitoring/due diligence is/will be undertaken (such as your inspection protocols, use of inspection agents, frequency of inspections, examples of previous factory/labor inspection reports etc.).

If (f) above is applicable, please attach evidence of how this monitoring/due diligence is/will be undertaken by Subcontractors (such as their inspection protocols, use of inspection agents, frequency of inspections, examples of previous factory/labor inspection reports etc.).

We declare all the information and statements made in this Form are true, and we accept that any misrepresentation contained in this Form may lead to our disqualification by the Employer and/or sanctions by the Bank.

Name of the Bidder*_____

Name of the person duly authorized to sign the Bid on behalf of the Bidder**_____

Title of the person signing the Bid_____

Signature of the person named above_____

Date signed _____ day of _____, _____

*: In the case of the Bid submitted by joint venture specify the name of the Joint Venture as Bidder

**: Person signing the Bid shall have the power of attorney given by the Bidder attached to the Bid

[Note: In case of a Joint Venture, the Forced Labor Declaration must be in the name of all members to the Joint Venture that submits the Bid.]

Form CON – 4
Sexual Exploitation and Abuse (SEA) and/or Sexual Harassment Performance Declaration

[The following table shall be filled in by the Bidder, each member of a Joint Venture and each subcontractor proposed by the Bidder]

Bidder's Name: *[insert full name]*
Date: *[insert day, month, year]*
Joint Venture Member's or Subcontractor's Name: *[insert full name]*
RFB No. and title: *[insert RFB number and title]*
Page *[insert page number]* of *[insert total number]* pages

SEA and/or SH Declaration **in accordance with Section III, Evaluation and Qualification Criteria**
We: ☐ (a) have not been subject to disqualification by the Bank for non-compliance with SEA/ SH obligations ☐ (b) are subject to disqualification by the Bank for non-compliance with SEA/ SH obligations ☐ (c) had been subject to disqualification by the Bank for non-compliance with SEA/ SH obligations. An arbitral award on the disqualification case has been made in our favor. ☐ (d) had been subject to disqualification by the Bank for non-compliance with SEA/ SH obligations for a period of two years. We have subsequently demonstrated that we have adequate capacity and commitment to comply with SEA/ SH obligations. ☐ (e) had been subject to disqualification by the Bank for non-compliance with SEA/ SH obligations for a period of two years. We have attached evidence demonstrating that we have adequate capacity and commitment to comply with SEA/ SH obligations.
[If (c) above is applicable, attach evidence of an arbitral award reversing the findings on the issues underlying the disqualification.]
[If (d) or (e) above are applicable, provide the following information:]
Period of disqualification: From: _____ To: _____
If previously provided on another Bank financed works contract, details of evidence that demonstrated adequate capacity and commitment to comply with SEA/ SH obligations (**as per (d) above)** Name of Employer: _____ Name of Project: _____ Contract description: _____ Brief summary of evidence provided: _____ _____ Contact Information: (Tel, email, name of contact person): _____

_____
As an alternative to the evidence under (d), other evidence demonstrating adequate capacity and commitment to comply with SEA/ SH obligations (**as per (e) above)** *[attach details as appropriate].*

Form FIN – 3.1
Financial Situation and Performance

Bidder's Name: _____
Date: _____
JV Member's Name_____
RFB No. and title: _____
Page _____of _____pages

1. Financial data

Type of Financial information in (currency)	**Historic information for previous** _____*years,* _____ **(amount in currency, currency, exchange rate*, USD equivalent)**				
	Year 1	Year 2	Year 3	Year4	Year 5
Statement of Financial Position (Information from Balance Sheet)					
Total Assets (TA)					
Total Liabilities (TL)					
Total Equity/Net Worth (NW)					
Current Assets (CA)					
Current Liabilities (CL)					
Working Capital (WC)					
Information from Income Statement					
Total Revenue (TR)					
Profits Before Taxes (PBT)					
Cash Flow Information					
Cash Flow from Operating Activities					

*Refer to ITB 37.1 for the exchange rate

2. Sources of Finance

Specify sources of finance to meet the cash flow requirements on works currently in progress and for future contract commitments.

No.	Source of finance	Amount (US$ equivalent)
1		
2		
3		

2. Financial documents

The Bidder and its parties shall provide copies of financial statements for _____years pursuant Section III, Evaluation and Qualifications Criteria, Sub-factor 3.1. The financial statements shall:

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

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

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

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

☐ Attached are copies of financial statements[2] for the _____years required above; and complying with the requirements

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

Form FIN – 3.2
Average Annual Construction Turnover

Bidder's Name: _____
Date: _____
JV Member's Name_____
RFB No. and title: _____
Page _____of _____pages

	Annual turnover data (construction only)		
Year	**Amount** **Currency**	**Exchange rate**	**USD equivalent**
[indicate year]	*[insert amount and indicate currency]*		
Average Annual Construction Turnover *			

* See Section III, Evaluation and Qualification Criteria, Sub-Factor 3.2.

Form FIN – 3.3
Financial Resources

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

Financial Resources		
No.	**Source of financing**	**Amount (US$ equivalent)**
1		
2		
3		

Form FIN – 3.4
Current Contract Commitments / Works in Progress

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

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

Form EXP - 4.1
General Construction Experience

Bidder's Name: _____
Date: _____
JV Member's Name_____
RFB No. and title: _____
Page _____of _____pages

Starting Year	Ending Year	Contract Identification	Role of Bidder
		Contract name: _____ Brief Description of the Works performed by the Bidder: _____ Amount of contract: _____ Name of Employer: _____ Address: _____	
		Contract name: _____ Brief Description of the Works performed by the Bidder: _____ Amount of contract: _____ Name of Employer: _____ Address: _____	
		Contract name: _____ Brief Description of the Works performed by the Bidder: _____ Amount of contract: _____ Name of Employer: _____ Address: _____	

Form EXP - 4.2(a)
Specific Construction and Contract Management Experience

Bidder's Name: _____
Date: _____
JV Member's Name_____
RFB No. and title: _____
Page _____of _____pages

Similar Contract No.	**Information**			
Contract Identification				
Award date				
Completion date				
Role in Contract	Prime Contractor ☐	Member in JV ☐	Management Contractor ☐	Sub-contractor ☐
Total Contract Amount			US$	
If member in a JV or sub-contractor, specify participation in total Contract amount				
Employer's Name:				
Address: Telephone/fax number E-mail:				

Form EXP - 4.2(a) (cont.)
Specific Construction and Contract Management Experience (cont.)

Similar Contract No.	Information
Description of the similarity in accordance with Sub-Factor 4.2(a) of Section III:	
1. Amount	
2. Physical size of required works items	
3. Complexity	
4. Methods/Technology	
5. Construction rate for key activities	
6. Other Characteristics	

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Form EXP - 4.2(b)
Construction Experience in Key Activities

Bidder's Name: _____
Date: _____
Bidder's JV Member Name: _____
Sub-contractor's Name[3] (as per ITB 34.2 and 34.3): _____
RFB No. and title: _____

Page _____ of _____ pages

All Sub-contractors for key activities must complete the information in this form as per ITB 33.2 and 33.3 and Section III, Qualification Criteria and Requirements, Sub-Factor 4.2.

1. Key Activity No One: _____

	Information			
Contract Identification				
Award date				
Completion date				
Role in Contract	Prime Contractor ☐	Member in JV ☐	Management Contractor ☐	Sub-contractor ☐
Total Contract Amount			US$	
Quantity (Volume, number or rate of production, as applicable) performed under the contract per year or part of the year	Total quantity in the contract (i)	Percentage participation (ii)		Actual Quantity Performed (i) x (ii)
Year 1				
Year 2				
Year 3				
Year 4				
Employer's Name:				

[3] If applicable

	Information
Address: Telephone/fax number E-mail:	

2. Activity No. Two

3. ……

	Information
Description of the key activities in accordance with Sub-Factor 4.2(b) of Section III:	

Form EXP - 4.2(c)
Specific Experience in Managing ES aspects and any additional sustainable procurement aspects

[The following table shall be filled in for contracts performed by the Bidder, and each member of a Joint Venture]

Bidder's Name: _____
Date: _____
Bidder's JV Member Name: _____
RFB No. and title: _____
Page _____ of _____ pages

1. Key Requirement no 1 in accordance with 4.2 (c): _____

Contract Identification				
Award date				
Completion date				
Role in Contract	Prime Contractor ☐	Member in JV ☐	Management Contractor ☐	Subcontractor ☐
Total Contract Amount			US$	
Details of relevant experience				

2. Key Requirement no 2 in accordance with 4.2 (c): _____
3. Key Requirement no 3 in accordance with 4.2 (c): _____

Appendix E to Technical Part: Bid Security

Form of Demand Guarantee

Beneficiary: _____

Request for Bids No: _____

Date: _____

BID GUARANTEE No.: _____

Guarantor: _____

We have been informed that _____ (hereinafter called "the Applicant") has submitted or will submit to the Beneficiary its Bid (hereinafter called "the Bid") for the execution of _____ under Request for Bids No. _____ ("the RFB").

Furthermore, we understand that, according to the Beneficiary's conditions, bids must be supported by a bid guarantee.

At the request of the Applicant, we, as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of _____ (_____) upon receipt by us of the Beneficiary's complying demand, supported by the Beneficiary's statement, whether in the demand itself or a separate signed document accompanying or identifying the demand, stating that either the Applicant:

(a) has withdrawn its Bid prior to the Bid validity expiry date set forth in the Applicant's Letter of Bid, or any extended date provided by the Applicant; or

(b) having been notified of the acceptance of its Bid by the Beneficiary prior to the expiry date of the Bid validity or any extension thereto provided by the Applicant, (i) has failed to execute the contract agreement, or (ii) has failed to furnish the performance security, and, if required, the Environmental and Social (ES) Performance Security, in accordance with the Instructions to Bidders ("ITB") of the Beneficiary's bidding document.

This guarantee will expire: (a) if the Applicant is the successful Bidder, upon our receipt of copies of the contract agreement signed by the Applicant and the Performance Security and, if required, the Environmental and Social (ES) Performance Security, issued to the Beneficiary in relation to such contract agreement; or (b) if the Applicant is not the successful Bidder, upon the earlier of (i) our receipt of a copy of the Beneficiary's notification to the Applicant of the results of the Bidding process; or (ii) twenty-eight days after the expiry date of the Bid validity.

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

This guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication No. 758.

_____

[Signature]

Form of Bid Security – Bid Bond

Not Applicable

[The Surety shall fill in this Bid Bond Form in accordance with the instructions indicated.]

BOND NO. _____

BY THIS BOND *[name of Bidder]* as Principal (hereinafter called "the Principal"), and *[name, legal title, and address of surety],* authorized to transact business in *[name of country of Employer],* as Surety (hereinafter called "the Surety"), are held and firmly bound unto *[name of Employer]* as Obligee (hereinafter called "the Employer") in the sum of *[amount of Bond]*[4] *[amount in words]*, for the payment of which sum, well and truly to be made, we, the said Principal and Surety, bind ourselves, our successors and assigns, jointly and severally, firmly by these presents.

WHEREAS the Principal has submitted a written Bid to the Employer dated the ___ day of _____, 20__, for the execution of *[name of Contract]* (hereinafter called the "Bid").

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that if the Principal:

(a) has withdrawn its Bid prior to the Bid validity expiry date set forth in the Principal's Letter of Bid, or any extension thereto provided by the Principal; or

(b) having been notified of the acceptance of its Bid by the Employer prior to the expiry date of the Bid validity or any extension thereto provided by the Principal: (i) failed to execute the contract agreement; or (ii) has failed to furnish the Performance Security, and, if required, the Environmental and Social (ES) Performance Security, if required, in accordance with the Instructions to Bidders ("ITB") of the Employer's bidding document.

then the Surety undertakes to immediately pay to the Employer up to the above amount upon receipt of the Employer's first written demand, without the Employer having to substantiate its demand, provided that in its demand the Employer shall state that the demand arises from the occurrence of any of the above events, specifying which event(s) has occurred.

The Surety hereby agrees that its obligation will remain in full force and effect up to and including the date 28 days after the date of expiration of the Bid validity set forth in the Principal's Letter of Bid or any extension thereto provided by the Principal.

IN TESTIMONY WHEREOF, the Principal and the Surety have caused these presents to be executed in their respective names this ____ day of _____ 20__.

[4] The amount of the Bond shall be denominated in the currency of the Employer's country or the equivalent amount in a freely convertible currency.

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Principal: _____ Surety: _____

Corporate Seal (where appropriate)

_____ _____

(Signature) *(Signature)*

(Printed name and title) *(Printed name and title)*

Form of Bid-Securing Declaration
(Not Applicable)

Date: _____
RFB No.: _____
Alternative No.: _____

To:

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 or submitting proposals in any contract with the Employer for the period of time specified in Section II – Bid Data Sheet if we are in breach of our obligation(s) under the Bid conditions, because we:

(a) have withdrawn our Bid prior to the expiry date of the Bid validity specified in the Letter of Bid or any extended date provided by us; or

(b) having been notified of the acceptance of our Bid by the Employer prior to the expiry date of the Bid validity in the Letter of Bid or any extended date provided by us, (i) fail or refuse to execute the Contract, if required, or (ii) fail or refuse to furnish the Performance Security, and, if required, the Environmental and Social (ES) Performance Security, in accordance with the ITB.

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) twenty-eight days after the expiry date of the Bid validity.

Name of the Bidder*_____

Name of the person duly authorized to sign the Bid on behalf of the Bidder**_____

Title of the person signing the Bid_____

Signature of the person named above_____

Date signed _____ day of _____, _____

*: In the case of the Bid submitted by joint venture specify the name of the Joint Venture as Bidder

**: Person signing the Bid shall have the power of attorney given by the Bidder attached to the Bid

[Note: In case of a Joint Venture, the Bid-Securing Declaration must be in the name of all members to the Joint Venture that submits the Bid.]

Financial Bid

(Forms to be completed wherever it is necessary and applicable)

Letter of Bid - Financial Part

INSTRUCTIONS TO BIDDERS: DELETE THIS BOX ONCE YOU HAVE COMPLETED THE DOCUMENT

The Bidder must prepare this Letter of Bid on stationery with its letterhead clearly showing the Bidder's complete name and business address.

Note: All italicized text in black font is to help Bidders in preparing this form.

Date of this Bid submission: [*insert date (as day, month and year) of Bid submission*]
Request for Bid No.: [*insert identification*]
Alternative No.: [*insert identification No if this is a Bid for an alternative*]

To: **[*insert complete name of Employer*]**

We, the undersigned, hereby submit the second part of our Bid, the Bid Price and Bill of Quantities. This accompanies the Letter of Technical Part.

In submitting our Bid, we make the following additional declarations:

(a) **Bid Validity**: Our Bid shall be valid until *[insert day, month and year in accordance with ITB 18.1]*, and it shall remain binding upon us and may be accepted at any time on or before this date;

(b) **Total Price**: The total price of our Bid, excluding any discounts offered in item (f) below is: [Insert one of the options below as appropriate]

Total price is: [*insert the total price of the Bid in words and figures, indicating the various amounts and the respective currencies*];

(c) **Discounts:** The discounts offered and the methodology for their application are:

(i) The discounts offered are: [*Specify in detail each discount offered*]

(ii) The exact method of calculations to determine the net price after application of discounts is shown below: [*Specify in detail the method that shall be used to apply the discounts*];

(d) **Commissions,** gratuities **and fees:** We have paid, or will pay the following commissions, gratuities, or fees with respect to the Bidding process or execution of the Contract: [*insert complete name of each Recipient, its full address, the reason for which each commission or gratuity was paid and the amount and currency of each such commission or gratuity*].

Name of Recipient	Address	Reason	Amount

(If none has been paid or is to be paid, indicate "none.")

Name of the Bidder:*[*insert complete name of the Bidder*]

Name of the person duly authorized to sign the Bid on behalf of the Bidder: ** [*insert complete name of person duly authorized to sign the Bid*]

Title of the person signing the Bid: [*insert complete title of the person signing the Bid*]

Signature of the person named above: [*insert signature of person whose name and capacity are shown above*]

Date signed [*insert date of signing*] **day of** [*insert month*], [*insert year*]

*: In the case of the Bid submitted by a Joint Venture specify the name of the Joint Venture as Bidder.

**: Person signing the Bid shall have the power of attorney given by the Bidder. The power of attorney shall be attached with the Bid Schedules

Appendix A to Financial Part: Schedules
Bill of Quantities

Bill of Quantities attached as Volume III of Bidding Documents

Schedule(s) of Adjustment Data

Not Applicable

Table A - Local Currency

Index Code	Index Description	Source of Index	Base Value and Date	Bidder's Local Currency Amount	Bidder's Proposed Weighting
			Total		**1**

[Whereas "A" is a fixed percentage; B, C, D and E specifies a range of values and the Bidder is required to specify a value within the range such that the total weighting = 1.00]

Section V - Eligible Countries

Eligibility for the Provision of Goods, Works and Non-consulting Services in Bank-Financed Procurement

In reference to ITB 4.8 and ITB 5.1, for the information of the Bidders, at the present time firms, goods and services from the following countries are excluded from this Bidding process:

Under ITB 4.8 (a) and ITB 5.1: *None*

Under ITB 4.8 (b) and ITB 5.1: *None*

Section VI - Fraud and Corruption

(Section VI shall not be modified)

1. Purpose

1.1 The Bank's Anti-Corruption Guidelines and this annex apply with respect to procurement under Bank Investment Project Financing operations.

2. Requirements

2.1 The Bank requires that Borrowers (including beneficiaries of Bank financing); bidders, (applicants/proposers), consultants, contractors and suppliers; any sub-contractors, sub-consultants, service providers or suppliers; any agents (whether declared or not); and any of their personnel, observe the highest standard of ethics during the procurement process, selection and contract execution of Bank-financed contracts, and refrain from Fraud and Corruption.

2.2 To this end, the Bank:

a. Defines, for the purposes of this provision, the terms set forth below as follows:

i. "corrupt practice" is the offering, giving, receiving, or soliciting, directly or indirectly, of anything of value to influence improperly the actions of another party;

ii. "fraudulent practice" is any act or omission, including misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain financial or other benefit or to avoid an obligation;

iii. "collusive practice" is an arrangement between two or more parties designed to achieve an improper purpose, including to influence improperly the actions of another party;

iv. "coercive practice" is 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;

v. "obstructive practice" is:

(a) deliberately destroying, falsifying, altering, or concealing of evidence material to the investigation or making false statements to investigators in order to materially impede a Bank investigation into allegations of a corrupt, fraudulent, coercive, or collusive practice; and/or threatening, harassing, or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation; or

(b) Acts intended to materially impede the exercise of the Bank's inspection and audit rights provided for under paragraph 2.2 e. below.

b. Rejects a proposal for award if the Bank determines that the firm or individual recommended for award, any of its personnel, or its agents, or its sub-consultants, sub-

contractors, service providers, suppliers and/ or their employees, has, directly or indirectly, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices in competing for the contract in question;

c. In addition to the legal remedies set out in the relevant Legal Agreement, may take other appropriate actions, including declaring misprocurement, if the Bank determines at any time that representatives of the Borrower or of a recipient of any part of the proceeds of the loan engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices during the procurement process, selection and/or execution of the contract in question, without the Borrower having taken timely and appropriate action satisfactory to the Bank to address such practices when they occur, including by failing to inform the Bank in a timely manner at the time they knew of the practices;

d. Pursuant to the Bank's Anti- Corruption Guidelines and in accordance with the Bank's prevailing sanctions policies and procedures, may sanction a firm or individual, either indefinitely or for a stated period of time, including by publicly declaring such firm or individual ineligible (i) to be awarded or otherwise benefit from a Bank-financed contract, financially or in any other manner;[1] (ii) to be a nominated2 sub-contractor, consultant, manufacturer or supplier, or service provider of an otherwise eligible firm being awarded a Bank-financed contract; and (iii) to receive the proceeds of any loan made by the Bank or otherwise to participate further in the preparation or implementation of any Bank-financed project;

e. Requires that a clause be included in bidding/request for proposals documents and in contracts financed by a Bank loan, requiring (i) bidders (applicants/proposers), consultants, contractors, and suppliers, and their sub-contractors, sub-consultants, service providers, suppliers, agents, personnel, permit the Bank to inspect[3] all accounts, records and other documents relating to the procurement process, selection and/or contract execution,, and to have them audited by auditors appointed by the Bank.

---

1 For the avoidance of doubt, a sanctioned party's ineligibility to be awarded a contract shall include, without limitation, (i) applying for pre-qualification, expressing interest in a consultancy, and bidding, either directly or as a nominated sub-contractor, nominated consultant, nominated manufacturer or supplier, or nominated service provider, in respect of such contract, and (ii) entering into an addendum or amendment introducing a material modification to any existing contract.

2 A nominated sub-contractor, nominated consultant, nominated manufacturer or supplier, or nominated service provider (different names are used depending on the particular bidding document) is one which has been: (i) included by the bidder in its pre-qualification application or bid because it brings specific and critical experience and know-how that allow the bidder to meet the qualification requirements for the particular bid; or (ii) appointed by the Borrower.

3 Inspections in this context usually are investigative (i.e., forensic) in nature. They involve fact-finding activities undertaken by the Bank or persons appointed by the Bank to address specific matters related to investigations/audits, such as evaluating the veracity of an allegation of possible Fraud and Corruption, through the appropriate mechanisms. Such activity includes but is not limited to: accessing and examining a firm's or individual's financial records and information, and making copies thereof as relevant; accessing and examining any other documents, data and information (whether in hard copy or electronic format) deemed relevant for the investigation/audit, and making copies thereof as relevant; interviewing staff and other relevant individuals; performing physical inspections and site visits; and obtaining third party verification of information.

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PART 2 – Works' Requirements

Section VII - Works' Requirements

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Specifications

Attached Volume II of the Bidding Documents

The scope of work includes site clearing, layout, excavation, lean concrete, RCC steel fabrication, fair-face shuttering, and backfilling with imported earth for footings and underflooring. It also encompasses the provision of 3000 psi reinforced cement concrete for RCC footings, short columns, plinth beams, superstructure columns, ground floor beams and slabs. Additional tasks are brick masonry, plastering, painting, subflooring, and the installation of tiles and marble flooring.

Rough electrical work covers conduit and piping, wiring, electrical fittings, and fixtures. Plumbing works include water supply and sanitation using UPVC and PPRC pipes as well as plumbing fixtures and fittings. The scope further covers façade
works, wall cladding, roof screeding with waterproofing, doors and windows, planters, and external development such as approach roads, tree planting, plantation pits, and earth filling (imported).

Scope also includes the supply and installation of Solar system, and Solor powered RO plant, detail specifications available in the BOQs & drawings, scope also includes Environment and social, health and safety compliance.

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Environmental and Social (ES) Requirements

See the attached annexure -1 ESMPs (Volume V to the bidding documents) and ensure to deliver a Site-Specific Mitigation Plan covering all the risks pointed out under the document comprehensively.

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Key Personnel

Already covered under Section III (5)

Drawings

Attached as Volume IV of the Bidding Documents

Supplementary Information

Not Applicable

PART 3 – Conditions of Contract and Contract Forms

Section VIII - General Conditions of Contract

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General Conditions of Contract

A. General

1. Definitions

1.1 Boldface type is used to identify defined terms.

(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.

(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.

(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 23.

(d) **Bank** means the financing institution **named in the PCC**.

(e) **Bill of Quantities** means the priced and completed Bill of Quantities forming part of the Bid.

(f) **Compensation Events** are those defined in GCC Clause 42 hereunder.

(g) The **Completion Date** is the date of completion of the Works as certified by the Project Manager, in accordance with GCC Sub-Clause 57.1.

(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 Sub-Clause 2.3 below.

(i) The **Contractor** is the party whose Bid to carry out the Works has been accepted by the Employer.

(j) The **Contractor's Bid** is the completed bidding document submitted by the Contractor to the Employer.

(k) The **Contract Price** is the Accepted Contract Amount stated in the Letter of Acceptance and thereafter as adjusted in accordance with the Contract.

(l) **Days** are calendar days; months are calendar months.

(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.

(n) A **Defect** is any part of the Works not completed in accordance with the Contract.

(o) The **Defects Liability Certificate** is the certificate issued by Project Manager upon correction of defects by the Contractor.

(p) The **Defects Liability Period** is the period **named in the PCC** pursuant to GCC Sub-Clause 38.1 and calculated from the Completion Date.

(q) **Drawings** means the drawings of the Works, as included in the Contract, and any additional and modified drawings issued by (or on behalf of) the Employer in accordance with the Contract, include calculations and other information provided or approved by the Project Manager for the execution of the Contract.

(r) The **Employer** is the party who employs the Contractor to carry out the Works, **as specified in the PCC**.

(s) **Equipment** is the Contractor's machinery and vehicles brought temporarily to the Site to construct the Works.

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

(u) The **Initial Contract Price** is the Contract Price listed in the Employer's Letter of Acceptance.

(v) 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.

(w) **Materials** are all supplies, including consumables, used by the Contractor for incorporation in the Works.

(x) **Plant** is any integral part of the Works that shall have a mechanical, electrical, chemical, or biological function.

(y) 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.

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(z) **PCC** means Particular Conditions of Contract.

(aa) The **Site** is the area defined as such in the PCC.

(bb) **Site Investigation Reports** are those that were included in the bidding document and are factual and interpretative reports about the surface and subsurface conditions at the Site.

(cc) **Specification** means the Specification of the Works included in the Contract and any modification or addition made or approved by the Project Manager.

(dd) 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.

(ee) 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.

(ff) **Temporary Works** are works designed, constructed, installed, and removed by the Contractor that are needed for construction or installation of the Works.

(gg) A **Variation** is an instruction given by the Project Manager which varies the Works.

(hh) The **Works** are what the Contract requires the Contractor to construct, install, and turn over to the Employer, as defined in the PCC.

(ii) "**Contractor's Personnel**" refers to all personnel whom the Contractor utilizes on the Site or other places where the Works are carried out, including the staff, labor and other employees of each Subcontractor.

(jj) **"Key Personnel"** means the positions (if any) of the Contractor's personnel that are stated in the Specification.

(kk) **"ES"** means Environmental and Social (including Sexual Exploitation and Abuse (SEA), and Sexual Harassment (SH)).

(ll) **"Sexual Exploitation and Abuse" "(SEA)"** means the following:

Sexual Exploitation is defined as any actual or attempted abuse of position of vulnerability, differential power or trust, for sexual purposes, including, but not limited to,

profiting monetarily, socially or politically from the sexual exploitation of another;

Sexual Abuse is defined as the actual or threatened physical intrusion of a sexual nature, whether by force or under unequal or coercive conditions.

(mm) **"Sexual Harassment" "(SH)"** is defined as unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature by the Contractor's Personnel with other Contractor's or Employer's Personnel; and

(nn) "**Employer's Personnel"** refers to the Project Manager and all other staff, labor and other employees (if any) of the Project Manager and of the Employer engaged in fulfilling the Employer's obligations under the Contract; and any other personnel identified as Employer's Personnel, by a notice from the Employer or the Project Manager to the Contractor.

2. Interpretation

2.1 In interpreting these GCC, words indicating one gender include all genders. Words indicating the singular also include the plural and words indicating the plural also include the singular. 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.

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).

2.3 The documents forming the Contract shall be interpreted in the following order of priority:

(a) Agreement,

(b) Letter of Acceptance,

(c) Contractor's Bid,

(d) Particular Conditions of Contract,

(e) General Conditions of Contract, including Appendices,

(f) Specification,

(g) Drawings,

(h) Bill of Quantities,[1] and

(i) any other document **listed in the PCC** as forming part of the Contract.

3. Language and Law

3.1 The language of the Contract and the law governing the Contract are **stated in the PCC**.

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

(a) as a matter of law or official regulations, the Borrower's country prohibits commercial relations with that country; or

(b) 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 that country or any payments to any country, person, or entity in that country.

4. Project Manager's Decisions

4.1 Except where otherwise specifically stated, the Project Manager shall decide contractual matters between the Employer and the Contractor in the role representing the Employer.

5. Delegation

5.1 Unless otherwise **specified in the PCC,** the Project Manager may delegate any of his duties and responsibilities to other people, except to the Adjudicator, after notifying the Contractor, and may revoke any delegation after notifying the Contractor.

6. Communications

6.1 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.

7. Subcontracting

7.1 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. The Contractor shall require that its Subcontractors execute the Works in accordance with the Contract, including complying with the relevant ES requirements and the obligations set out in Sub-Clause 28.1.

7.2 Submision by the Contractor for approval of the Project Manager, addition of any Subcontractor not named in the Contract, shall also include the Subcontractor's declaration in accordance with Appendix C- Sexual exploitation and Abuse (SEA) and/or Sexual Harassment (SH) Performance Declaration.

[1] In lump-sum contracts, delete "Bill of Quantities" and replace with "Activity Schedule."

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8. Other Contractors

8.1 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.

8.2 The Contractor shall also, as stated in the Specification or as instructed by the Project Manager, cooperate with and allow appropriate opportunities for the Employer's or any other personnel, notified to the Contractor by the Employer or Project Manager, to conduct any environmental and social assessment.

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9. Personnel and Equipment

9.1 The Contractor shall employ the Key Personnel and use the Equipment identified in its Bid, to carry out the Works 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.

9.2 The Project Manager may require the Contractor to remove (or cause to be removed) any person employed on the Site or Works, including the Key Personnel (if any), who:

(a) persists in any misconduct or lack of care;

(b) carries out duties incompetently or negligently;

(c) fails to comply with any provision of the Contract;

(d) persists in any conduct which is prejudicial to safety, health, or the protection of the environment;

(e) based on reasonable evidence, is determined to have engaged in Fraud and Corruption during the execution of the Works;

(f) has been recruited from the Employer's Personnel;

(g) undertakes behavior which breaches the Code of Conduct for Contractor's Personnel (ES).

If appropriate, the Contractor shall then promptly appoint (or cause to be appointed) a suitable replacement with equivalent skills and experience.

Notwithstanding any requirement from the Project Manager to remove or cause to remove any person, the Contractor shall take immediate action as appropriate in response to any violation of (a) through (g) above. Such immediate action shall include removing (or causing to be removed) from the Site or other places where the Works are being carried out, any Contractor's Personnel who engages in (a), (b), (c), (d), (e) or (g) above or has been recruited as stated in (f) above.

9.3 The Contractor shall take all necessary safety measures to avoid the occurrence of incidents and injuries to any third party associated with the use of, if any, Equipment on public roads or other public infrastructure. The Contractor shall monitor road safety incidents and accidents to identify negative safety issues and establish and implement necessary measures to resolve them.

9.4 Labor

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9.4.1 *Engagement of Staff and Labor.* The Contractor shall provide and employ on the Site for the execution of the Works such skilled, semi-skilled and unskilled labor as is necessary for the proper and timely execution of the Contract. The Contractor is encouraged, to the extent practicable and reasonable, to employ staff and labor with appropriate qualifications and experience from sources within the Country.

Unless otherwise provided in the Contract, the Contractor shall be responsible for the recruitment, transportation, accommodation and welfare facilities in accordance with GCC Sub-Clause 9.4.6, of the Contractor's Personnel, and for all payments in connection therewith.

The Contractor shall provide the Contractor's Personnel information and documentation that are clear and understandable regarding their terms and conditions of employment. The information and documentation shall set out their rights under relevant labor laws applicable to the Contractor's Personnel (which will include any applicable collective agreements), including their rights related to hours of work, wages, overtime, compensation and benefits, as well as those arising from any requirements in the Specification. The Contractor's Personnel shall be informed when any material changes to their terms or conditions of employment occur.

9.4.2 *Conditions of Labor.* The Contractor shall inform the Contractor's Personnel about:

(a) any deduction to their payment and the conditions of such deductions in accordance with the applicable laws or as stated in the Specification; and

(b) their liability to pay personal income taxes in the Country in respect of such of their salaries, wages, allowances and any benefits as are subject to tax under the laws of the Country for the time being in force.

The Contractor shall perform such duties in regard to such deductions thereof as may be imposed on him by such laws.

Where required by applicable laws or as stated in the Specification, the Contractor shall provide the Contractor's Personnel written notice of termination of employment and details of severance payments in a timely manner. The Contractor shall have paid the Contractor's Personnel (either directly or where appropriate for their benefit) all due wages and entitlements including, as applicable, social security benefits and pension contributions, on or before the end of their engagement/ employment.

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9.4.3 The Contractor may bring into the Country any foreign personnel who are necessary for the execution of the Works to the extent allowed by the applicable Laws. The Contractor shall ensure that these personnel are provided with the required residence visas and work permits. The Employer will, if requested by the Contractor, use its best endeavors in a timely and expeditious manner to assist the Contractor in obtaining any local, state, national, or government permission required for bringing in the Contractor's personnel.

9.4.4 The Contractor shall at its own expense provide the means of repatriation to and the Contractor's Personnel employed on the Contract at the Site to their various home countries. It shall also provide suitable temporary maintenance of all such persons from the cessation of their employment on the Contract to the date programmed for their departure. In the event that the Contractor defaults in providing such means of transportation and temporary maintenance, the Employer may provide the same to such personnel and recover the cost of doing so from the Contractor.

9.4.5 *Disorderly conduct.* The Contractor shall at all times during the progress of the Contract use its best endeavors to prevent any unlawful, riotous or disorderly conduct or behavior by or amongst the Contractor's Personnel.

9.4.6 *Facilities for Staff and Labor.* Except as otherwise stated in the Specification, the Contractor shall provide and maintain all necessary accommodation and welfare facilities for the Contractor's Personnel. If stated in the Specification, the Contractor shall give access to or provide services that accommodate the physical, social and cultural needs of the Contractor's Personnel. The Contractor shall also provide similar facilities for the Employer's Personnel if stated in the Specification.

9.4.7 The Contractor shall, in all dealings with the Contractor's Personnel, pay due regard to all recognized festivals, official holidays, religious or other customs and all local laws and regulations pertaining to the employment of labor. The Contractor shall provide the Contractor's Personnel annual holiday and sick, maternity and family leave, as required by applicable laws or as stated in the Specification.

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

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

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

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

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

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

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

No persons shall be employed or engaged who have been subject to trafficking. Trafficking in persons is defined as the recruitment, transportation, transfer, harboring or receipt of persons by means of the threat or use of force or other forms of coercion, abduction, fraud, deception, abuse of power, or of a position of vulnerability, or of the giving or receiving of payments or benefits to achieve the consent of a person having control over another person, for the purposes of exploitation.

9.4.15 *Child Labor*. The Contractor, including its Subcontractors, shall not employ or engage a child under the age of 14 unless the national law specifies a higher age (the minimum age).

The Contractor, including its Subcontractors, shall not employ or engage a child between the minimum age and the age of 18 in a manner that 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.

The Contractor including its Subcontractors, shall only employ or engage children between the minimum age and the age of 18 after an appropriate risk assessment has been conducted by the Contractor with the Project Manager's approval. The Contractor shall be subject to regular monitoring by the Project Manager that includes monitoring of health, working conditions and hours of work.

Work considered hazardous for children is work that, by its nature or the circumstances in which it is carried out, is likely to jeopardize the health, safety, or morals of children. Such work activities prohibited for children include work:

(a) with exposure to physical, psychological or sexual abuse;

(b) underground, underwater, working at heights or in confined spaces;

(c) with dangerous machinery, equipment or tools, or involving handling or

(d) transport of heavy loads;

(e) in unhealthy environments exposing children to hazardous substances, agents, or processes, or to temperatures, noise or vibration damaging to health; or

(f) under difficult conditions such as work for long hours, during the night or in confinement on the premises of the employer.

9.4.16 *Employment Records of Workers.* The Contractor shall keep complete and accurate records of the employment of labor at the Site. The records shall include the names, ages, genders, hours worked, and wages paid to all workers. These records shall be summarized on a monthly basis and submitted to the project Manager.

9.4.17 *Workers' Organizations*. In countries where the relevant labor laws recognize workers' rights to form and to join workers' organizations of their choosing and to bargain collectively without interference, the Contractor shall comply with such laws. In such circumstances, the role of legally established workers' organizations and legitimate workers' representatives will be respected, and they will be provided with information needed for meaningful negotiation in a timely manner. Where the relevant labor laws substantially restrict 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. The Contractor shall not seek to influence or control these alternative means. The Contractor shall not

discriminate or retaliate against the Contractor's Personnel who participate, or seek to participate, in such organizations and collective bargaining or alternative mechanisms. Workers' organizations are expected to fairly represent the workers in the workforce.

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

Special measures of protection or assistance to remedy past discrimination or selection for a particular job based on the inherent requirements of the job shall not be deemed discrimination. The Contractor shall provide protection and assistance as necessary to ensure non-discrimination and equal opportunity, including for specific groups such as women, people with disabilities, migrant workers and children (of working age in accordance with GCC Sub-Clause 9.4.15).

9.4.19 *Contractor's Personnel Grievance Mechanism.* The Contractor shall have a grievance mechanism for Contractor's Personnel, and where relevant the workers' organizations stated in GCC Sub-Clause 9.4.17, to raise workplace concerns. The grievance mechanism shall be proportionate to the nature, scale, risks and impacts of the Contract. The mechanism shall address concerns promptly, using an understandable and transparent process that provides timely feedback to those concerned in a language they understand, without any retribution, and shall operate in an independent and objective manner.

The Contractor's Personnel shall be informed of the grievance mechanism at the time of engagement for the Contract, and the measures put in place to protect them against any reprisal for its use. Measures will be put in place to make the grievance mechanism easily accessible to all Contractor's Personnel.

The grievance mechanism shall not impede access to other judicial or administrative remedies that might be available, or substitute for grievance mechanisms provided through collective agreements.

The grievance mechanism may utilize existing grievance mechanisms, providing that they are properly designed and implemented, address concerns promptly, and are readily accessible to Contractor's Personnel. Existing grievance mechanisms may be supplemented as needed with Contract-specific arrangements.

9.4.20 *Training of Contractor's Personnel.* The Contractor shall provide appropriate training to relevant Contractor's Personnel on ES aspects of the Contract, including appropriate sensitization on prohibition of SEA and SH, and health and safety training referred to in GCC Sub-Clause 18.2.

As stated in the Specification or as instructed by the Project Manager, the Contractor shall also allow appropriate opportunities for the relevant Contractor's Personnel to be trained on ES aspects of the Contract by the Employer's Personnel.

The Contractor shall provide training on SEA and SH, including its prevention, to any of its personnel who has a role to supervise other Contractor's Personnel.

10. Employer's and Contractor's Risks

10.1 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.

11. Employer's Risks

11.1 From the Start Date until the Defects Liability Certificate has been issued, the following are Employer's risks:

(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

(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

(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.

(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.

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11.2 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

(a) a Defect which existed on the Completion Date,

(b) an event occurring before the Completion Date, which was not itself an Employer's risk, or

(c) the activities of the Contractor on the Site after the Completion Date.

12. Contractor's Risks

12.1 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.

13. Insurance

13.1 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:

(a) loss of or damage to the Works, Plant, and Materials;

(b) loss of or damage to Equipment;

(c) loss of or damage to property (except the Works, Plant, Materials, and Equipment) in connection with the Contract; and

(d) personal injury or death.

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.

13.2 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.

13.3 Alterations to the terms of an insurance shall not be made without the approval of the Project Manager.

13.4 Both parties shall comply with any conditions of the insurance policies.

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14. Site Data

14.1 The Contractor shall be deemed to have examined any Site Data **referred to in the PCC**, supplemented by any information available to the Contractor.

15. Contractor to Construct the Works

15.1 The Contractor shall construct and install the Works in accordance with the Specification and Drawings.

15.2 If the Contract specifies that the Contractor shall design any part of the permanent Works, the Contractor shall take into account the Employer's requirements which may include, if stated in the Specification:

(a) designing structural elements of the Works taking into account climate change considerations;

(b) applying the concept of universal access (the concept of universal access means unimpeded access for people of all ages and abilities in different situations and under various circumstances; and

(c) considering the incremental risks of the public's potential exposure to operational accidents or natural hazards, including extreme weather events.

15.3 The Contractor shall not post and shall ensure that its Subcontractors/suppliers/manufacturers and Contractors' Personnel shall not post, any signage on the Site, or in any other place where the Works will be carried out, except such signage as is required under the Contract, including by the Laws of the Country, or has been approved by the Employer. For the purposes of this sub-clause, signage shall include, inter alia, flags, billboards, advertising materials and any other similar item separately posted on the Site.

16. The Works to Be Completed by the Intended Completion Date

16.1 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.

16.2 The Contractor shall not carry out mobilization to the Site unless the Project Manager gives approval, an approval that shall not be unreasonably delayed, to the measures the Contractor proposes to address environmental and social risks and impacts, which at a minimum shall include applying the Management Strategies and Implementation Plans (MSIPs) and Code of Conduct for Contractor's Personnel submitted as part of the Bid and agreed as part of the Contract.

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The Contractor shall submit to the Project Manager for its approval any additional MSIPs as are necessary to manage the ES risks and impacts of ongoing Works. These MSIPs collectively comprise the Contractor's Environmental and Social Management Plan (C-ESMP). The Contractor shall review the C-ESMP, periodically (but not less than every six (6) months), and update it as required to ensure that it contains measures appropriate to the Works. The updated C-ESMP shall be submitted to the Project Manager for its approval.

17. Approval by the Project Manager

17.1 The Contractor shall submit Specification and Drawings showing the proposed Temporary Works to the Project Manager, for his approval.

17.2 The Contractor shall be responsible for design of Temporary Works.

17.3 The Project Manager's approval shall not alter the Contractor's responsibility for design of the Temporary Works.

17.4 The Contractor shall obtain approval of third parties to the design of the Temporary Works, where required.

17.5 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.

18. Health, Safety and Protection of the Environment

18.1 The Contractor shall be responsible for the safety of all activities on the Site.

18.2 The Contractor shall:

(a) comply with all applicable health and safety regulations and Laws;

(b) comply with all applicable health and safety obligations specified in the Contract;

(c) take care for the health and safety of all persons entitled to be on the Site and other places, if any, where the Works are being executed;

(d) keep the Site and Works clear of unnecessary obstruction so as to avoid danger to these persons;

(e) provide fencing, lighting, safe access, guarding and watching of the Works until the issue of the Contract Completion Certificate;

(f) provide any Temporary Works (including roadways, footways, guards and fences) which may be necessary, because of the execution of the Works, for the use and

protection of the public and of owners and occupiers of adjacent land;

(g) provide health and safety training of Contractor's Personnel as appropriate and maintain training records;

(h) actively engage the Contractor's Personnel in promoting understanding, and methods for, implementation of health and safety requirements, as well as in providing information to Contractor's Personnel, training on occupational safety and health, and provision of personal protective equipment without expense to the Contractor's Personnel;

(i) put in place workplace processes for Contractor's Personnel to report work situations that they believe are not safe or healthy, and to remove themselves from a work situation which they have reasonable justification to believe presents an imminent and serious danger to their life or health.

(j) Contractor's Personnel who remove themselves from such work situations shall not be required to return to work until necessary remedial action to correct the situation has been taken. Contractor's Personnel shall not be retaliated against or otherwise subject to reprisal or negative action for such reporting or removal;

(k) where the Employer's Personnel, any other contractors employed by the Employer, and/or personnel of any legally constituted public authorities and private utility companies are employed in carrying out, on or near the site, of any work not included in the Contract, collaborate in applying the health and safety requirements, without prejudice to the responsibility of the relevant entities for the health and safety of their own personnel; and

(l) establish and implement a system for regular (not less than six-monthly) review of health and safety performance and the working environment.

Subject to GCC Sub-Clause 16.2, the Contractor shall submit to the Project Manager for its approval a health and safety manual which has been specifically prepared for the Works, the Site and other places (if any) where the Contractor intends to execute the Works.

The health and safety manual shall be in addition to any other similar document required under applicable health and safety regulations and laws.

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The health and safety manual shall set out all the health and safety requirements under the Contract,

(a) which shall include at a minimum:

(i) the procedures to establish and maintain a safe working environment without risk to health at all workplaces, machinery, equipment and processes under the control of the Contractor, including control measures for chemical, physical and biological substances and agents;

(ii) details of the training to be provided, records to be kept;

(iii) the procedures for prevention, preparedness and response activities to be implemented in the case of an emergency event (i.e., an unanticipated incident, arising from both natural and man-made hazards, typically in the form of fire, explosions, leaks or spills, which may occur for a variety of different reasons including failure to implement operating procedures that are designed to prevent their occurrence, extreme weather or lack of early warning);

(iv) remedies for adverse impacts such as occupational injuries, deaths, disability and disease;

(v) the measures to be taken to avoid or minimize the potential for community exposure to water-borne, water-based, water-related, and vector-borne diseases,

(vi) the measures to be implemented to avoid or minimize the spread of communicable diseases (including transfer of Sexually Transmitted Diseases or Infections (STDs), such as HIV virus) and non-communicable diseases associated with the execution of the Works, taking into consideration differentiated exposure to and higher sensitivity of vulnerable groups. This includes taking measures to avoid or minimize the transmission of communicable diseases that may be associated with the influx of temporary or permanent Contract-related labor;

(vii) the policies and procedures on the management and quality of accommodation and welfare facilities if such accommodation and welfare facilities are provided by the Contractor in accordance with GCC Sub-Clause 9.4.6; and

(b) any other requirements stated in the Specification.

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18.3 Protection of the environment

The Contractor shall take all necessary measures to:

(a) protect the environment (both on and off the Site); and

(b) limit damage and nuisance to people and property resulting from pollution, noise and other results of the Contractor's operations and/ or activities.

The Contractor shall ensure that emissions, surface discharges, effluent and any other pollutants from the Contractor's activities shall exceed neither the values indicated in the Specification, nor those prescribed by applicable laws.

In the event of damage to the environment, property and/or nuisance to people, on or off Site as a result of the Contractor's operations, the Contractor shall agree with the Project Manager the appropriate actions and time scale to remedy, as practicable, the damaged environment to its former condition. The Contractor shall implement such remedies at its cost to the satisfaction of the Project Manager.

19. Archaeological and Geological Findings

19.1 All fossils, coins, articles of value or antiquity, structures, groups of structures, and other remains or items of geological, archaeological, paleontological, historical, architectural or religious interest found on the Site shall be placed under the care and custody of the Employer. The Contractor shall:

(a) take all reasonable precautions, including fencing-off the area or site of the finding, to avoid further disturbance and prevent Contractor's Personnel or other persons from removing or damaging any of these findings;

(b) train relevant Contractor's Personnel on appropriate actions to be taken in the event of such findings; and

(c) implement any other action consistent with the requirements of the Specification and relevant laws.

The Contractor shall, as soon as practicable after discovery of any such finding, notify the Project Manager of such discoveries and carry out the Project Manager's instructions for dealing with them.

20. Possession of the Site

20.1 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.

21. Access to the Site

21.1 The Contractor shall allow the Project Manager and any person authorized by the Project Manager (including the Bank staff or consultants acting on the Bank's behalf, stakeholders and third parties, such as independent experts, local communities, or non-governmental organizations), including to carry out environmental and social audit, as appropriate, 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.

22. Instructions, Inspections and Audits

22.1 The Contractor shall carry out all instructions of the Project Manager which comply with the applicable laws where the Site is located.

22.2 The Contractor shall keep and shall make all reasonable efforts to cause its Subcontractors and subconsultants 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.

22.3 Inspections &Audit by the Bank

Pursuant to paragraph 2.2 e. of Appendix A to the GCC- Fraud and Corruption, the Contractor shall permit and shall cause its agents (where declared or not), subcontractors, subconsultants, service providers, suppliers, and personnel, to permit, the Bank and/or persons appointed by the Bank to inspect the site and/or the accounts, records and other documents relating to the procurement process, selection and/or contract execution, and to have such accounts, records and other documents audited by auditors appointed by the Bank. The Contractor's and its Subcontractors' and subconsultants' attention is drawn to GCC Sub-Clause 25.1 (Fraud and Corruption) which provides, inter alia, that acts intended to materially impede the exercise of the Bank's inspection and audit rights constitute a prohibited practice subject to contract termination (as well as to a determination of ineligibility pursuant to the Bank's prevailing sanctions procedures).

23. Appointment of the Adjudicator

23.1 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.

23.2 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 **designated in the PCC** at the request of either party, within 14 days of receipt of such request.

24. Procedure for Disputes

24.1 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.

24.2 The Adjudicator shall give a decision in writing within 28 days of receipt of a notification of a dispute.

24.3 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.

24.4 The arbitration shall be conducted in accordance with the arbitration procedures published by the institution named and in the place **specified in the PCC.**

25. Fraud and Corruption

25.1 The Bank requires compliance with the Bank's Anti-Corruption Guidelines and its prevailing sanctions policies and procedures as set forth in the WBG's Sanctions Framework, as set forth in Appendix A to the GCC.

25.2 The Employer requires the Contractor to disclose any commissions or fees that may have been paid or are to be paid to agents or any other party with respect to the bidding process or execution of the Contract. The information disclosed must include at least the name and address of the agent or other party, the amount and currency, and the purpose of the commission, gratuity or fee.

26. Stakeholder Engagement

26.1 The Contractor shall provide relevant contract- related information, as the Employer and/or Project Manager may reasonably request to conduct Stakeholder engagements. "Stakeholder" refers to individuals or groups who:

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(i) are affected or likely to be affected by the Contract; and

(ii) may have an interest in the Contract.

The Contractor may also directly participate in Stakeholder engagements, as the Employer and/or Project Manager may reasonably request

27. Suppliers (other than Subcontractors)

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

No persons shall be employed or engaged who have been subject to trafficking. Trafficking in persons is defined as the recruitment, transportation, transfer, harbouring or receipt of persons by means of the threat or use of force or other forms of coercion, abduction, fraud, deception, abuse of power, or of a position of vulnerability, or of the giving or receiving of payments or benefits to achieve the consent of a person having control over another person, for the purposes of exploitation.

In this regard, the Contractor shall:

(a) include in contracts with Subcontractors/ suppliers/ manufacturers of *[solar panels] [solar panel components]*, obligations to prevent Forced Labor among the staff, employees, workers and any other person employed or engaged by the Subcontractor/ supplier/ manufacturer;
(b) include in contracts with Subcontractors/ suppliers/ manufacturers of *[solar panels] [solar panel components]*, that the Subcontractors/ suppliers/manufacturers include an obligation to prevent Forced Labor in all contracts that they execute with their suppliers/ manufacturers of *[solar panel][solar panel components]*;
(c) monitor Subcontractors/ suppliers/ manufacturers of *[solar panels][solar panel components]* on implementation of obligations to prevent Forced Labor among the staff, employees, workers and any other person employed or engaged by them;
(d) require Subcontractors to monitor their suppliers/manufacturers of *[solar panels][solar panel components]* on implementation of obligations to prevent Forced Labor among the staff, employees, workers and any other person employed or engaged by them;
(e) require its Subcontractors/ suppliers/ manufacturers to immediately notify the Contractor of any incidents of Forced Labor;
(f) immediately notify the Employer any incident of Forced labor on the site, or premises of Subcontractors/ suppliers/ manufacturers of *[solar panels] [solar panel components]*; and
(g) include in periodic progress reports submitted in accordance with the contract sufficient details on its, including its Subcontractors/ suppliers/ manufacturers, compliance with Forced Labor obligations.

27.2 *Child Labor:* The Contractor shall take measures to require its suppliers (other than Subcontractors) not to employ or engage child labor as described in GCC Sub-Clause 9.4.15. If child labor cases are identified, the Contractor shall take measures to require the suppliers to take appropriate steps to remedy them. Where the supplier does not remedy the situation, the Contractor shall within a reasonable period substitute the supplier with a supplier that is able to manage such risks.

27.3 *Serious Safety Issues:* The Contractor, including its Subcontractors, shall comply with all applicable safety obligations, including as stated in GCC Sub-Clause 18.2. The Contractor shall also take measures to require its suppliers (other than Subcontractors) to adopt procedures and mitigation measures adequate to address safety issues related to their personnel. If serious safety issues are identified, the Contractor shall take measures to require the suppliers to take appropriate steps to remedy them. Where the supplier does not remedy the situation, the Contractor shall within a reasonable period substitute the supplier with a supplier that is able to manage such risks.

27.4 *Obtaining natural resource materials in relation to supplier:* The Contractor shall obtain natural resource *materials* from suppliers that can demonstrate, through compliance with the applicable verification and/ or certification requirements, that obtaining such materials is not contributing to the risk of significant conversion or significant degradation of natural or critical habitats such as unsustainably harvested wood products, gravel or sand extraction from riverbeds or beaches.

If a supplier cannot continue to demonstrate that obtaining such materials is not contributing to the risk of significant conversion or significant degradation of natural or critical habitats, the Contractor shall within a reasonable period substitute the supplier with a supplier that is able to demonstrate that they are not significantly adversely impacting the habitats.

28. Code of Conduct

28.1 The Contractor shall have a Code of Conduct for the Contractor's Personnel.

The Contractor shall take all necessary measures to ensure that each Contractor's Personnel is made aware of the Code of Conduct including specific behaviors that are prohibited and understands the consequences of engaging in such prohibited behaviors.

These measures include providing instructions and documentation that can be understood by the Contractor's

Personnel and seeking to obtain that person's signature acknowledging receipt of such instructions and/or documentation, as appropriate.

The Contractor shall also ensure that the Code of Conduct is visibly displayed in multiple locations on the Site and any other place where the Works will be carried out, as well as in areas outside the Site accessible to the local community and project affected people. The posted Code of Conduct shall be provided in languages comprehensible to Contractor's Personnel, Employer's Personnel and the local community.

The Contractor's Management Strategy and Implementation Plans shall include appropriate processes for the Contractor to verify compliance with these obligations.

29. Security of the Site

29.1 The Contractor shall be responsible for the security of the Site, and:

(a) for keeping unauthorized persons off the Site;

(b) authorized persons shall be limited to the Contractor's Personnel, the Employer's Personnel, and to any other personnel identified as authorized personnel (including the Employer's other contractors on the Site), by a notice from the Employer or the Project Manager to the Contractor.

Subject to GCC Sub-Clause 16.2, the Contractor shall submit for the Project Manager's No-objection a security management plan that sets out the security arrangements for the Site

The Contractor shall (i) conduct appropriate background checks on any personnel retained to provide security; (ii) train the security personnel adequately (or determine that they are properly trained) in the use of force (and where applicable, firearms), and appropriate conduct towards Contractor's Personnel, Employer's Personnel and affected communities; and (iii) require the security personnel to act within the applicable Laws and any requirements set out in the Specification.

The Contractor shall not permit any use of force by security personnel in providing security except when used for preventive and defensive purposes in proportion to the nature and extent of the threat.

In making security arrangements, the Contractor shall also comply with any additional requirements stated in the Specification.

B. Time Control

30. Program and Progress Reports

30.1 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. 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.

30.2 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.

30.3 The Contractor shall monitor progress of the Works and submit to the Project manager progress report and any updated Program showing the actual progress achieved and the effect of the progress achieved on the timing of the remaining Works, including any changes to the sequence of the activities, 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 lump-sum Contract, the Contractor shall provide an updated Activity Schedule within 14 days of being instructed to by the Project Manager.

30.4 Unless otherwise stated in the Specification, each progress report shall include the Environmental and Social (ES) metrics set out in Appendix B. If **stated in the PCC**, progress report shall include status of compliance to cyber security risks management, and any foreseeable cyber security risk and mitigation.

30.5 In addition to the progress reports, the Contractor shall inform the Project Manager immediately of any allegation, incident or accident in the Site, which has or is likely to have a significant adverse effect on the environment, the affected communities, the public, Employer's Personnel, Project Manager's personnel or Contractor's Personnel. This includes, but is not limited to, any incident or accident causing fatality or serious injury; significant adverse effects or damage to private property; any cyber security incidents **as specified in the PCC**; or any allegation of SEA and/or SH. In case of SEA and/or SH, while maintaining confidentiality as appropriate, the type of allegation (sexual

exploitation, sexual abuse or sexual harassment), gender and age of the person who experienced the alleged incident should be included in the information.

The Contractor, upon becoming aware of the allegation, incident or accident, shall also immediately inform the Project Manager of any such incident or accident on the Subcontractors' or suppliers' premises relating to the Works which has or is likely to have a significant adverse effect on the environment, the affected communities, the public, Employer's Personnel, or Contractor's, its Subcontractors' and suppliers' personnel. The notification shall provide sufficient detail regarding such incidents or accidents. The Contractor shall provide full details of such incidents or accidents to the Project Manager within the timeframe agreed with the Project Manager.

The Contractor shall require its Subcontractors and suppliers (other than Subcontractors) to immediately notify the Contractor of any incidents or accidents referred to in this Subclause.

31. Extension of the Intended Completion Date

31.1 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 without the Contractor taking steps to accelerate the remaining work, which would cause the Contractor to incur additional cost.

31.2 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.

32. Acceleration

32.1 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.

32.2 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.

33. Delays Ordered by the

33.1 The Project Manager may instruct the Contractor to delay the start or progress of any activity within the Works.

Project Manager

34. Management Meetings

34.1 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.

34.2 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.

35. Early Warning

35.1 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.

35.2 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.

C. Quality Control

36. Identifying Defects

36.1 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.

37. Tests

37.1 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.

38. Correction of Defects

38.1 The Project Manager shall give notice to the Contractor of any Defects before the end of the Defects Liability Period, which

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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.

38.2 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.

39. Uncorrected Defects

39.1 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.

D. Cost Control

40. Contract Price[2]

40.1 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.

41. Changes in the Contract Price[3]

41.1 If the final quantity of the work done differs from the quantity in the Bill of Quantities for the particular item by more than 25 percent, provided the change exceeds 1 percent of the Initial Contract Price, the Project Manager shall adjust the rate to allow for the change. The Project Manager shall not adjust rates from changes in quantities if thereby the Initial Contract Price is exceeded by more than 15 percent, except with the prior approval of the Employer.

41.2 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.

42. Variations

42.1 All Variations shall be included in updated Programs[4] produced by the Contractor.

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[2] In lump-sum contracts, replace GCC Sub-Clauses 40.1 as follows:
40.1 The Contractor shall provide updated Activity Schedules within 14 days of being instructed to by the Project Manager. 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.

[3] In lump-sum contracts, replace entire GCC Clause 41 with new GCC Sub-Clause 41.1, as follows:
41.1 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.

[4] In lump-sum contracts, add "and Activity Schedules" after "Programs."

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42.2 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 Contractor shall also provide information of any ES risks and impacts of the Variation, and any additional documents **specified in the PCC**. 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.

42.3 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.

42.4 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.

42.5 The Contractor shall not be entitled to additional payment for costs that could have been avoided by giving early warning.

42.6 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 Sub-Clause 41.1 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. [5]

42.7 Value Engineering: The Contractor may prepare, at its own cost, a value engineering proposal at any time during the performance of the contract. The value engineering proposal shall, at a minimum, include the following;

(a) the proposed change(s), and a description of the difference to the existing contract requirements;

(b) a full cost/benefit analysis of the proposed change(s) including a description and estimate of costs (including life cycle cost) the Employer may incur in implementing the value engineering proposal;

(c) a description of any effect(s) of the change on performance/functionality; and

[5] In lump-sum contracts, delete this paragraph.

(d) a description of the proposed work to be performed, a program for its execution and sufficient ES information to enable an evaluation of ES risks and impacts.

The Employer may accept the value engineering proposal if the proposal demonstrates benefits that:

(a) accelerates the contract completion period; or

(b) reduces the Contract Price or the life cycle costs to the Employer; or

(c) improves the quality, efficiency, safety or sustainability of the Facilities; or

(d) yields any other benefits to the Employer,

without compromising the functionality of the Works.

If the value engineering proposal is approved by the Employer and results in:

(a) a reduction of the Contract Price; the amount to be paid to the Contractor shall be the **percentage specified in the PCC** of the reduction in the Contract Price; or

(b) an increase in the Contract Price; but results in a reduction in life cycle costs due to any benefit described in (a) to (d) above, the amount to be paid to the Contractor shall be the full increase in the Contract Price.

43. Cash Flow Forecasts

43.1 When the Program,[6] 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.

44. Payment Certificates

44.1 The Contractor shall submit to the Project Manager monthly statements of the estimated value of the work executed less the cumulative amount certified previously.

44.2 The Project Manager shall check the Contractor's monthly statement and certify the amount to be paid to the Contractor.

44.3 The value of work executed shall be determined by the Project Manager.

44.4 The value of work executed shall comprise the value of the quantities of work in the Bill of Quantities that have been completed.[7]

[6] In lump-sum contracts, add "or Activity Schedule" after "Program."

[7] In lump-sum contracts, replace this paragraph with the following: "The value of work executed shall comprise the value of completed activities in the Activity Schedule."

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44.5 The value of work executed shall include the valuation of Variations and Compensation Events.

44.6 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.

44.7 If the Contractor was, or is, failing to perform any ES obligations or work under the Contract, the value of this work or obligation, as determined by the Project Manager, may be withheld until the work or obligation has been performed, and/or the cost of rectification or replacement, as determined by the Project Manager, may be withheld until rectification or replacement has been completed. Failure to perform includes, but is not limited to the following:

(a) failure to comply with any ES obligations or work described in the Works' Requirements which may include working outside site boundaries, excessive dust, failure to keep public roads in a safe usable condition, damage to offsite vegetation, pollution of water courses from oils or sedimentation, contamination of land e.g., from oils, human waste, damage to archeology or cultural heritage features, air pollution as a result of unauthorized and/or inefficient combustion;

(b) failure to regularly review C-ESMP and/or update it in a timely manner to address emerging ES issues, or anticipated risks or impacts;

(c) failure to implement the C-ESMP e.g., failure to provide required training or sensitization;

(d) failing to have appropriate consents/permits prior to undertaking Works or related activities;

(e) failure to submit ES report/s (as described in Appendix B), or failure to submit such reports in a timely manner;

(f) failure to implement remediation as instructed by the Project Manager within the specified timeframe (e.g., remediation addressing non-compliance/s).

44.8 **As specified in the PCC**, if the Contractor fails to perform its cyber security obligations under the Contract, an assessed amount, as determined by the Project Manager, may be withheld until the obligation has been performed.

45. Payments

45.1 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.

45.2 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.

45.3 Unless otherwise stated, all payments and deductions shall be paid or charged in the proportions of currencies comprising the Contract Price.

45.4 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.

46. Compensation Events

46.1 The following shall be Compensation Events:

(a) The Employer does not give access to a part of the Site by the Site Possession Date pursuant to GCC Sub-Clause 20.1.

(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 Drawings, Specification, or instructions required for execution of the Works on time.

(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.

(e) The Project Manager unreasonably does not approve a subcontract to be let.

(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.

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(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.

(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.

(i) The advance payment is delayed.

(j) The effects on the Contractor of any of the Employer's Risks.

(k) The Project Manager unreasonably delays issuing a Certificate of Completion.

46.2 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.

46.3 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.

46.4 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.

47. Tax

47.1 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 not already reflected in the Contract Price or are a result of GCC Clause 49.

48. Currencies

48.1 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.

49. Price Adjustment

49.1 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 specified below applies to each Contract currency:

$$\mathbf{P_c = A_c + B_c\ Imc/Ioc}$$

where:

P_c is the adjustment factor for the portion of the Contract Price payable in a specific currency "c."

A_c and B_c are coefficients[8] **specified in the PCC,** representing the nonadjustable and adjustable portions, respectively, of the Contract Price payable in that specific currency "c;" and

Imc is the index prevailing at the end of the month being invoiced and Ioc is the index prevailing 28 days before Bid opening for inputs payable; both in the specific currency "c."

49.2 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.

50. Retention

50.1 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.

50.2 Upon the issue of a Certificate of Completion of the Works by the Project Manager, in accordance with GCC Sub-Clause 57.1, 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.

[8] 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 formulae for all currencies, since coefficient A, for the nonadjustable portion of the payments, is a very approximate figure (usually 0.15) to take account of fixed cost elements or other nonadjustable components. The sum of the adjustments for each currency are added to the Contract Price.

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51. Liquidated Damages

51.1 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 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.

51.2 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 Sub-Clause 45.1.

52. Bonus

52.1 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.

53. Advance Payment

53.1 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.

53.2 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.

53.3 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.

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54. Securities

54.1 The Performance Security, and if so **specified in the PCC** an environmental and social (ES) 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 or surety 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, and until one year from the date of issue of the Certificate of Completion in the case of a Performance Bond.

55. Dayworks

55.1 If applicable, the Dayworks rates in the Contractor's Bid shall be used only when the Project Manager has given written instructions in advance for additional work to be paid for in that way.

55.2 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 two days of the work being done.

55.3 The Contractor shall be paid for Dayworks subject to obtaining signed Dayworks forms.

56. Cost of Repairs

56.1 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.

E. Finishing the Contract

57. Completion

57.1 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 whole of the Works is completed.

58. Taking Over

58.1 The Employer shall take over the Site and the Works within seven days of the Project Manager's issuing a certificate of Completion.

59. Final Account

59.1 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 receiving the Contractor's account if it is correct and complete. If it is not, the Project Manager shall issue within 56

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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.

60. Operating and Maintenance Manuals

60.1 If "as built" Drawings and/or operating and maintenance manuals are required, the Contractor shall supply them by the dates **stated in the PCC.**

60.2 If the Contractor does not supply the Drawings and/or manuals by the dates **stated in the PCC** pursuant to GCC Sub-Clause 60.1**,** 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.

61. Termination

61.1 The Employer or the Contractor may terminate the Contract if the other party causes a fundamental breach of the Contract.

61.2 Fundamental breaches of Contract shall include, but shall not be limited to, the following:

(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 Contractor does not maintain a Security, which is required;

(g) 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**; or

(h) if the Contractor, in the judgment of the Employer has engaged in Fraud and Corruption, as defined in paragraph

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2.2 a of the Appendix A to the GCC, in competing for or in executing the Contract, then the Employer may, after giving fourteen (14) days written notice to the Contractor, terminate the Contract and expel him from the Site.

61.3 Notwithstanding the above, the Employer may terminate the Contract for convenience.

61.4 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.

61.5 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 Sub-Clause 61.2 above, the Project Manager shall decide whether the breach is fundamental or not.

62. Payment upon Termination

62.1 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 specified 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.

62.2 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.

63. Property

63.1 All Materials on the Site, Plant, Equipment, Temporary Works, and Works shall be deemed to be the property of the Employer if the Contract is terminated because of the Contractor's default.

64. Release from Performance

64.1 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 afterwards to which a commitment was made.

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65. Suspension of Bank Loan or Credit

65.1 In the event that the Bank suspends the Loan or Credit to the Employer, from which part of the payments to the Contractor are being made:

(a) The Employer is obligated to notify the Contractor of such suspension within 7 days of having received the Bank's suspension notice.

(b) If the Contractor has not received sums due to it within the 28 days for payment provided for in GCC Sub-Clause 45.1, the Contractor may immediately issue a 14-day termination notice.

66. Cyber Security

66.1 Pursuant to the PCC, the Contractor, including its Subcontractors/ suppliers/ manufacturers shall take all technical and organizational measures necessary to protect the information technology systems and data used in connection with the Contract. Without limiting the foregoing, the Contractor, including its Subcontractors/ suppliers/ manufacturers, shall use all reasonable efforts to establish, maintain, implement and comply with, reasonable information technology, information security, cyber security and data protection controls, policies and procedures, including oversight, access controls, encryption, technological and physical safeguards and business continuity/disaster recovery and security plans that are designed to protect against and prevent breach, destruction, loss, unauthorized distribution, use, access, disablement, misappropriation or modification, or other compromise or misuse of or relating to any information technology system or data used in connection with the Contract.

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APPENDIX A
TO GENERAL CONDITIONS

Fraud and Corruption

(Text in this Appendix shall not be modified)

1. Purpose

1.1 The Bank's Anti-Corruption Guidelines and this annex apply with respect to procurement under Bank Investment Project Financing operations.

2. Requirements

2.1 The Bank requires that Borrowers (including beneficiaries of Bank financing); bidders (applicants/proposers),consultants, contractors and suppliers; any sub-contractors, sub-consultants, service providers or suppliers; any agents (whether declared or not); and any of their personnel, observe the highest standard of ethics during the procurement process, selection and contract execution of Bank-financed contracts, and refrain from Fraud and Corruption.

2.2 To this end, the Bank:

a. Defines, for the purposes of this provision, the terms set forth below as follows:

i. "corrupt practice" is the offering, giving, receiving, or soliciting, directly or indirectly, of anything of value to influence improperly the actions of another party;

ii. "fraudulent practice" is any act or omission, including misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain financial or other benefit or to avoid an obligation;

iii. "collusive practice" is an arrangement between two or more parties designed to achieve an improper purpose, including to influence improperly the actions of another party;

iv. "coercive practice" is 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;

v. "obstructive practice" is:

(a) deliberately destroying, falsifying, altering, or concealing of evidence material to the investigation or making false statements to investigators in order to materially impede a Bank investigation into allegations of a corrupt, fraudulent, coercive, or collusive practice; and/or threatening, harassing, or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation; or

(b) acts intended to materially impede the exercise of the Bank's inspection and audit rights provided for under paragraph 2.2 e. below.

b. Rejects a proposal for award if the Bank determines that the firm or individual recommended for award, any of its personnel, or its agents, or its sub-consultants, sub-contractors, service providers, suppliers and/ or their employees, has, directly or indirectly, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices in competing for the contract in question;

c. In addition to the legal remedies set out in the relevant Legal Agreement, may take other appropriate actions, including declaring misprocurement, if the Bank determines at any time that representatives of the Borrower or of a recipient of any part of the proceeds of the loan engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices during the procurement process, selection and/or execution of the contract in question, without the Borrower having taken timely and appropriate action satisfactory to the Bank to address such practices when they occur, including by failing to inform the Bank in a timely manner at the time they knew of the practices;

d. Pursuant to the Bank's Anti- Corruption Guidelines and in accordance with the Bank's prevailing sanctions policies and procedures, may sanction a firm or individual, either indefinitely or for a stated period of time, including by publicly declaring such firm or individual ineligible (i) to be awarded or otherwise benefit from a Bank-financed contract, financially or in any other manner;1 (ii) to be a nominated2 sub-contractor, consultant, manufacturer or supplier, or service provider of an otherwise eligible firm being awarded a Bank-financed contract; and (iii) to receive the proceeds of any loan made by the Bank or otherwise to participate further in the preparation or implementation of any Bank-financed project;

e. Requires that a clause be included in bidding/request for proposals documents and in contracts financed by a Bank loan, requiring (i) bidders(applicants/proposers), consultants, contractors, and suppliers, and their sub-contractors, sub-consultants, service providers, suppliers, agents, personnel, permit the Bank to inspect[3] all accounts, records and other documents relating to the procurement process, selection and/or contract execution, and to have them audited by auditors appointed by the Bank.

---

1 For the avoidance of doubt, a sanctioned party's ineligibility to be awarded a contract shall include, without limitation, (i) applying for pre-qualification, expressing interest in a consultancy, and bidding, either directly or as a nominated sub-contractor, nominated consultant, nominated manufacturer or supplier, or nominated service provider, in respect of such contract, and (ii) entering into an addendum or amendment introducing a material modification to any existing contract.

2 A nominated sub-contractor, nominated consultant, nominated manufacturer or supplier, or nominated service provider (different names are used depending on the particular bidding document) is one which has been: (i) included by the bidder in its pre-qualification application or bid because it brings specific and critical experience and know-how that allow the bidder to meet the qualification requirements for the particular bid; or (ii) appointed by the Borrower.

3 Inspections in this context usually are investigative (i.e., forensic) in nature. They involve fact-finding activities undertaken by the Bank or persons appointed by the Bank to address specific matters related to investigations/audits, such as evaluating the veracity of an allegation of possible Fraud and Corruption, through the appropriate mechanisms. Such activity includes but is not limited to: accessing and examining a firm's or individual's financial records and information, and making copies thereof as relevant; accessing and examining any other documents, data and information (whether in hard copy or electronic format) deemed relevant for the investigation/audit, and making copies thereof as relevant; interviewing staff and other relevant individuals; performing physical inspections and site visits; and obtaining third party verification of information.

Official Use Only

APPENDIX B

Environmental and Social (ES) Metrics for Progress Reports

Metrics for regular reporting:

The project specific ESMP is included in Volume-V, the bidder shall comply all the E&S aspects as mentioned in ESMP.

a. *environmental incidents or non-compliances with contract requirements, including contamination, pollution or damage to ground or water supplies;*

b. *health and safety incidents, accidents, injuries that require treatment and all fatalities;*

c. *interactions with regulators: identify agency, dates, subjects, outcomes (report the negative if none);*

d. *status of all permits and agreements:*

   i. work permits: number required, number received, actions taken for those not received;

   ii. status of permits and consents:

   - List areas/facilities with permits required (quarries & plants), dates of application, dates issued (actions to follow up if not issued), dates submitted to resident engineer (or equivalent), status of area (waiting for permits, working, abandoned without reclamation, decommissioning plan being implemented, etc.);
   - list areas with landowner agreements required (borrow and spoil areas, camp sites), dates of agreements, dates submitted to resident engineer (or equivalent);
   - identify major activities undertaken in each area in the reporting period and highlights of environmental and social protection (land clearing, boundary marking, topsoil salvage, traffic management, decommissioning planning, decommissioning implementation);
   - for quarries: status of relocation and compensation (completed, or details of activities and current status in the reporting period).

e. *health and safety supervision:*

   i. safety officer: number days worked, number of full inspections & partial inspections, reports to construction/project management;

ii. number of workers, work hours, metric of PPE use (percentage of workers with full personal protection equipment (PPE), partial, etc.), worker violations observed (by type of violation, PPE or otherwise), warnings given, repeat warnings given, follow-up actions taken (if any);

f. worker accommodations:

i. number of expats housed in accommodations, number of locals;

ii. date of last inspection, and highlights of inspection including status of accommodations' compliance with national and local law and good practice, including sanitation, space, etc.;

iii. actions taken to recommend/require improved conditions, or to improve conditions.

g. Health services: provider of health services, information and/or training, location of clinic, number of non-safety disease or illness treatments and diagnoses (no names to be provided);

h. gender (for expats and locals separately): number of female workers, percentage of workforce, gender issues raised and dealt with (cross-reference grievances or other sections as needed);

i. training:

i. number of new workers, number receiving induction training, dates of induction training;

ii. number and dates of toolbox talks, number of workers receiving Occupational Health and Safety (OHS), environmental and social training;

iii. number and dates of communicable diseases (including STDs) sensitization and/or training, no. workers receiving training (in the reporting period and in the past); same questions for gender sensitization, flag person training.

iv. number and date of SEA and SH prevention sensitization and/or training events, including number of workers receiving training on Code of Conduct for Contractor's Personnel (in the reporting period and in the past), etc.

j. environmental and social supervision:

i. environmentalist: days worked, areas inspected and numbers of inspections of each (road section, work camp, accommodations, quarries, borrow areas, spoil areas, swamps, forest crossings, etc.), highlights of activities/findings (including violations of environmental and/or social best practices, actions taken), reports to environmental and/or social specialist/construction/site management;

ii. sociologist: days worked, number of partial and full site inspections (by area: road section, work camp, accommodations, quarries, borrow areas, spoil areas, clinic, HIV/AIDS center, community centers, etc.), highlights of activities (including violations of environmental and/or social requirements observed, actions taken), reports to environmental and/or social specialist/construction/site management; and

iii. community liaison person(s): days worked (hours community center open), number of people met, highlights of activities (issues raised, etc.), reports to environmental and/or social specialist /construction/site management.

k. *Grievances*: list new grievances (e.g., number of allegations of SEA and SH) received in the reporting period and number of unresolved past grievances by date received, complainant's age and sex, how received, to whom referred to for action, resolution and date (if completed), data resolution reported to complainant, any required follow-up (Cross-reference other sections as needed):

i. Worker grievances;

ii. Community grievances

l. *Traffic, road safety and vehicles/equipment:*

i. traffic and road safety incidents and accidents involving project vehicles & equipment: provide date, location, damage, cause, follow-up;

ii. traffic and road safety incidents and accidents involving non-project vehicles or property (also reported under immediate metrics): provide date, location, damage, cause, follow-up;

iii. overall condition of vehicles/equipment (subjective judgment by environmentalist); non-routine repairs and maintenance needed to improve safety and/or environmental performance (to control smoke, etc.).

m. *Environmental mitigations and issues (what has been done):*

i. dust: number of working bowsers, number of waterings/day, number of complaints, warnings given by environmentalist, actions taken to resolve; highlights of quarry dust control (covers, sprays, operational status); % of rock/ spoil lorries with covers, actions taken for uncovered vehicles;

ii. erosion control: controls implemented by location, status of water crossings, environmentalist inspections and results, actions taken to resolve issues, emergency repairs needed to control erosion/sedimentation;

iii. quarries, borrow areas, spoil areas, asphalt plants, batch plants: identify major activities undertaken in the reporting period at each, and highlights of environmental and social protection: land clearing, boundary marking, topsoil

salvage, traffic management, decommissioning planning, decommissioning implementation;

iv. blasting: number of blasts (and locations), status of implementation of blasting plan (including notices, evacuations, etc.), incidents of off-site damage or complaints (cross-reference other sections as needed);

v. spill clean-ups, if any: material spilled, location, amount, actions taken, material disposal (report all spills that result in water or soil contamination;

vi. waste management: types and quantities generated and managed, including amount taken offsite (and by whom) or reused/recycled/disposed on-site;

vii. details of tree plantings and other mitigations required undertaken in the reporting period;

viii. details of water and swamp protection mitigations required undertaken in the reporting period.

n. compliance:

i. compliance status for conditions of all relevant consents/permits, for the Work, including quarries, etc.): statement of compliance or listing of issues and actions taken (or to be taken) to reach compliance;

ii. compliance status of C-ESMP/ESIP requirements: statement of compliance or listing of issues and actions taken (or to be taken) to reach compliance;

iii. compliance status of SEA and SH prevention and response action plan: statement of compliance or listing of issues and actions taken (or to be taken) to reach compliance;

iv. compliance status of Health and Safety Management Plan re: statement of compliance or listing of issues and actions taken (or to be taken) to reach compliance;

v. other unresolved issues from previous reporting periods related to environmental and social: continued violations, continued failure of equipment, continued lack of vehicle covers, spills not dealt with, continued compensation or blasting issues, etc. Cross-reference other sections as needed.

APPENDIX C
Sexual Exploitation and Abuse (SEA) and/or Sexual Harassment (SH) Performance Declaration for Subcontractors

[The following table shall be filled in by each subcontractor proposed by the Contractor, that was not named in the Contract]

Subcontractor's Name: *[insert full name]*
Date: *[insert day, month, year]*
Contract reference *[insert contract reference]*
Page *[insert page number]* of *[insert total number]* pages

SEA and/or SH Declaration
We: ☐ (a) have not been subject to disqualification by the Bank for non-compliance with SEA/ SH obligations. ☐ (b) are subject to disqualification by the Bank for non-compliance with SEA/ SH obligations. ☐ (c) had been subject to disqualification by the Bank for non-compliance with SEA/ SH obligations. An arbitral award on the disqualification case has been made in our favor. ☐ (d) had been subject to disqualification by the Bank for non-compliance with SEA/ SH obligations for a period of two years. We have subsequently demonstrated that we have adequate capacity and commitment to comply with SEA /SH obligations. ☐ (e) had been subject to disqualification by the Bank for non-compliance with SEA/ SH obligations for a period of two years. We have attached specific evidence demonstrating that we have adequate capacity and commitment to comply with SEA and SH obligations.
[If (c) above is applicable, attach evidence of an arbitral award reversing the findings on the issues underlying the disqualification.]
[If (d) or (e) above are applicable, provide the following information:]
Period of disqualification: From: _____ To: _____
If previously provided on another Bank financed works contract, details of evidence that demonstrated adequate capacity and commitment to comply with SEA/SH obligations (**as per (d) above)** Name of Employer: _____ Name of Project: _____

Contract description: _____ Brief summary of evidence provided: _____ _____ Contact Information: (Tel, email, name of contact person): _____ _____
As an alternative to the evidence under (d), other evidence demonstrating adequate capacity and commitment to comply with SEA/SH obligations (**as per (e) above))** *[attach details as appropriate].* _____ _____

Name of the Subcontractor_____

Name of the person duly authorized to sign on behalf of the Subcontractor_____

Title of the person signing on behalf of the Subcontractor_____

Signature of the person named above_____

Date signed _____ day of _____, _____

Countersignature of authorized representative of the Contractor:

Signature: _____

Section IX - Particular Conditions of Contract

A. General	
GCC 1.1 (d)	The financing institution is: The World Bank
GCC 1.1 (r)	The Employer is Shafqat Soomro, Program Director Project Management Unit Sindh Integrated Health & Population Program (SIHPP) Health Department Government of Sindh Karachi, Pakistan
GCC 1.1 (v)	**The Intended Completion Date for the whole of the Works shall be 300 days (three hundred Days) .**
GCC 1.1 (y)	The Project Manager is *Dr. Rafey A Siddiqui, Team Leader, EDSQA Consultants or any other person notified by the Employer to the Contractor during the currency of the Contract.*
GCC 1.1 (aa)	Site Locations are attached in Annexure 2
GCC 1.1 (dd)	The Start Date shall be *the date mentioned under the letter of commencement*
GCC 1.1 (hh)	The Works consist of Rehabilitation and Upgradation of 15 Taluqa Headquarter Hospitals (THQs) Damaged During Flood, at various Districts of Sindh **REHAB OF 15 THQs DAMAGED DURING FLOOD, AT VARIOUS DISTRICT OF SINDH**
GCC 2.2	Sectional Completions are: ***Each individual THQ is taken as a section and maybe issued a separate completion with subsequent take-over by the Employer as deemed fit by the Project Manager in consultation with the Employer.***
GCC 2.3(i)	The following documents also form part of the Contract: (i) the ESHS Management Strategies and Implementation Plans; and (ii) Code of Conduct (ESHS). (iii) ESMP

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 5.1	The Project manager *may* delegate any of his duties and responsibilities to the Resident Engineer.
GCC 8.1	Schedule of other contractors: Not Applicable
GCC 13.1	The minimum insurance amounts and deductibles shall be: (a) for loss or damage to the Works, Plant and Materials *115% of the contract price*. (b) For loss or damage to Equipment is the replacement cost of the equipment (c) for loss or damage to property (except the Works, Plant, Materials, and Equipment) in connection with Contract *as per law of Pakistan* (d) for personal injury or death: (i) of the Contractor's employees as per prevailing law of Pakistan (ii) of other people 1,000,000/-
GCC 14.1	Not Applicable
GCC 20.1	The Site Possession Date(s) shall be immediately after signing of Contract and shall be a condition precedent to issuance of Letter of Commencement
GCC 23.1 & GCC 23.2	Appointing Authority for the Adjudicator: *Registrar of Pakistan Engineering Council*
GCC 24.3	Hourly rate and types of reimbursable expenses to be paid to the Adjudicator: *PKR, 20,000 per Hour plus logistical costs.*
GCC 24.4	Arbitration will take place in accordance with the Arbitration Act 1940 under the law of Islamic Republic of Pakistan The place of arbitration shall be: *Karachi, Pakistan*
B. Time Control	
GCC 30.1	The Contractor shall submit for approval a Program for the Works within *14* days from the date of the Letter of Acceptance.
GCC 30.3	The period between Program updates is *30 days*.

	The amount to be withheld for late submission of an updated Program is *1% of the 1st 1PC* The period for submission of progress reports is *30* days
GCC 30.4	*N/A*
GCC 30.5	*N/A*
C. Quality Control	
GCC 38.1	The Defects Notification Period is: *180* days. The Defects Notification Period (DNP) can start concurrently with sectional completion of each THQ, however, DLC (Defects Liability Certificate) shall be issued upon completion of the latest DNP.
D. Cost Control	
GCC 42.2	*The Contractor shall provide a lead time for any imported items*
GCC 42.7	Not Applicable.
GCC 44.8	*There are no Particular Conditions of Contract applicable to GCC Sub-Clause 44.8*
GCC 48.1	The currency of the Employer's Country is: *Pakistani Rupee (PKR)*
GCC 49.1	Not Applicable
GCC 50.1	The proportion of payments retained is: *5%*
GCC 51.1	The liquidated damages for the whole of the Works are *0.1% of the final Contract Price* per day. The maximum number of liquidated damages for the whole of the Works is *10%* of the final Contract Price.
GCC 52.1	The Clause is deleted in its entirety and shall not be applicable to this Contract.
GCC 53.1	The Advance Payments shall be: *upto 20% of the Contract Price stated in the Letter of Acceptance* and shall be paid to the Contractor no later than *14 days from the issuance of the letter of commencement* subject to the receipt of an unconditional bank guarantee of the full amount and its formal verification by the issuing bank.
GCC 54.1	An Environmental, Social, Safety and Health (ESHS) Performance Security shall be provided to the Employer. GCC 54.1 is replaced with the following:

	The Performance Security and an Environmental, Social, Safety and Health (ESHS) 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 (for GCC 54.1). The Performance Security shall be issued 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 ESHS Performance Security shall be issued 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 and, if applicable, the ESHS Performance Security, shall be valid until a date 28 days from the date of issue of the Certificate of Completion. The Performance Security amount is specified below. (a) Performance Security – Bank Guarantee: in the amount(s) of 9***%* of the Accepted Contract Amount in PKR** of the Accepted Contract Amount in the form prescribed above. (b) Environmental, Social, Safety and Health (ESHS) Performance Security - Bank Guarantee: in the amount(s) of ***1%* percent of the Accepted Contract Amount** in PKR in the form prescribed above.
E. Finishing the Contract	
GCC 60.1	The date by which operating and maintenance manuals are required is *45 Days After the Issuance of the Completion Certificates* The date by which "as built" drawings are required is *45 days after issuance of the completion Certificates*
GCC 60.2	The amount to be withheld for failing to produce "as built" drawings and/or operating and maintenance manuals by the date required in GCC Sub-Clause 60.1 is *1% of contract amount*
GCC 61.2 (g)	The maximum number of days is: *100 Days*
GCC 62.1	The percentage to apply to the value of the work not completed, representing the Employer's additional cost for completing the Works, is *20%*.
GCC 66.1	Cyber Security *does not apply*

Section X - Contract Forms

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Notification of Intention to Award

[*This Notification of Intention to Award shall be sent to each Bidder that submitted a Bid, unless the Bidder has previously received notice of exclusion from the process at an interim stage of the procurement process*]

[*Send this Notification to the Bidder's Authorized Representative named in the Bidder Information Form*]

For the attention of Bidder's Authorized Representative

Name: *[insert Authorized Representative's name]*

Address: *[insert Authorized Representative's Address]*

Telephone/Fax numbers: *[insert Authorized Representative's telephone/fax numbers]*

Email Address: *[insert Authorized Representative's email address]*

[IMPORTANT: insert the date that this Notification is transmitted to Bidders. The Notification must be sent to all Bidders simultaneously. This means on the same date and as close to the same time as possible.]

DATE OF TRANSMISSION: This Notification is sent by: [*email/fax*] on [*date*] (local time)

Notification of Intention to Award

Employer: *[insert the name of the Employer]*
Project: *[insert name of project]*
Contract title: *[insert the name of the contract]*
Country: *[insert country where RFB is issued]*
Loan No. /Credit No. / Grant No.: *[insert reference number for loan/credit/grant]*
RFB No: *[insert RFB reference number from Procurement Plan]*

This Notification of Intention to Award (Notification) notifies you of our decision to award the above contract. The transmission of this Notification begins the Standstill Period. During the Standstill Period, you may:

a) request a debriefing in relation to the evaluation of your Bid, and/or

b) submit a Procurement-related Complaint in relation to the decision to award the contract.

1. The successful Bidder

Name:	[*insert name of successful Bidder*]
Address:	[*insert address of the successful Bidder*]
Contract price:	[*insert contract price of the successful Bidder*]

Total combined score:	*[insert the total combined score of the successful Bidder]*

2. Other Bidders *[INSTRUCTIONS: insert names of all Bidders that submitted a Bid, Bid prices as read out and evaluated, technical and combined scores.]*

Name of Bidder	Technical Score	Bid price	Evaluated Bid cost	Combined Score
[*insert name*]	*[insert Technical score]*	[*insert Bid price*]	[*insert evaluated cost*]	*[insert combined score]*
[*insert name*]	*[insert Technical score]*	[*insert Bid price*]	[*insert evaluated price*]	*[insert combined score]*
[*insert name*]	*[insert Technical score]*	[*insert Bid price*]	[*insert evaluated price*]	*[insert combined score]*
[*insert name*]	*[insert Technical score]*	[*insert Bid price*]	[*insert evaluated price*]	*[insert combined score]*
[*insert name*]	*[insert Technical score]*	[*insert Bid price*]	[*insert evaluated price*]	*[insert combined score]*

3. Reason/s why your Bid was unsuccessful*[Delete if the combined score already reveals the reason]*

[INSTRUCTIONS: State the reason/s why <u>this</u> Bidder's Bid was unsuccessful. Do NOT include: (a) a point by point comparison with another Bidder's Bid or (b) information that is marked confidential by the Bidder in its Bid.]

4. How to request a debriefing

DEADLINE: The deadline to request a debriefing expires at midnight on [*insert date*] (local time).

You may request a debriefing in relation to the results of the evaluation of your Bid. If you decide to request a debriefing your written request must be made within three (3) Business Days of receipt of this Notification of Intention to Award.

Provide the contract name, reference number, name of the Bidder, contact details; and address the request for debriefing as follows:

Attention: [*insert full name of person, if applicable*]

Title/position: [*insert title/position*]

Agency: [*insert name of Employer*]

Email address: [*insert email address*]

Fax number: [*insert fax number*] ***delete if not used***

If your request for a debriefing is received within the 3 Business Days deadline, we will provide the debriefing within five (5) Business Days of receipt of your request. If we are unable to provide the debriefing within this period, the Standstill Period shall be extended by five (5) Business Days after the date that the debriefing is provided. If this happens, we will notify you and confirm the date that the extended Standstill Period will end.

The debriefing may be in writing, by phone, video conference call or in person. We shall promptly advise you in writing how the debriefing will take place and confirm the date and time.

If the deadline to request a debriefing has expired, you may still request a debriefing. In this case, we will provide the debriefing as soon as practicable, and normally no later than fifteen (15) Business Days from the date of publication of the Contract Award Notice.

5. How to make a complaint

DEADLINE: The deadline for submitting a Procurement-related Complaint challenging the decision to award the contract expires on midnight, [*insert date*] (local time).

Provide the contract name, reference number, name of the Bidder, contact details; and address the Procurement-related Complaint as follows:

Attention: [*insert full name of person, if applicable*]

Title/position: [*insert title/position*]

Agency: [*insert name of Employer*]

Email address: [*insert email address*]

Fax number: [*insert fax number*] ***delete if not used***

At this point in the procurement process, you may submit a Procurement-related Complaint challenging the decision to award the contract. You do not need to have requested, or received, a debriefing before making this complaint. Your complaint must be submitted within the Standstill Period and received by us before the Standstill Period ends.

Further information:

For more information see the Procurement Regulations for IPF Borrowers (Procurement Regulations) (Annex III). You should read these provisions before preparing and submitting your complaint. In addition, the World Bank's Guidance "How to make a Procurement-related Complaint" provides a useful explanation of the process, as well as a sample letter of complaint.

In summary, there are four essential requirements:

1. You must be an 'interested party'. In this case, that means a Bidder who submitted a Bid in this procurement process and is the recipient of a Notification of Intention to Award.
2. The complaint can only challenge the decision to award the contract.
3. You must submit the complaint within the period stated above.
4. You must include, in your complaint, all of the information required by the Procurement Regulations (as described in Annex III).

6. Standstill Period

DEADLINE: The Standstill Period is due to end at midnight on [*insert date*] (local time).

The Standstill Period lasts ten (10) Business Days after the date of transmission of this Notification of Intention to Award.

The Standstill Period may be extended. This may happen where we are unable to provide a debriefing within the five (5) Business Day deadline. If this happens we will notify you of the extension.

If you have any questions regarding this Notification, please do not hesitate to contact us.

On behalf of the Employer:

Signature: _____

Name: _____

Title/position: _____

Telephone: _____

Email: _____

Beneficial Ownership Disclosure Form

INSTRUCTIONS TO BIDDERS: DELETE THIS BOX ONCE YOU HAVE COMPLETED THE FORM

This Beneficial Ownership Disclosure Form ("Form") is to be completed by the successful Bidder. In case of joint venture, the Bidder must submit a separate Form for each member. The beneficial ownership information to be submitted in this Form shall be current as of the date of its submission.

For the purposes of this Form, a Beneficial Owner of a Bidder is any natural person who ultimately owns or controls the Bidder by meeting one or more of the following conditions:

- *directly or indirectly holding 25% or more of the shares*
- *directly or indirectly holding 25% or more of the voting rights*
- *directly or indirectly having the right to appoint a majority of the board of directors or equivalent governing body of the Bidder*

RFB No.: [*insert number of RFB process*]
Request for Bid No.: [*insert identification*]

To: **[*insert complete name of Employer*]**

In response to your request in the Letter of Acceptance *dated [insert date of letter of Acceptance]* to furnish additional information on beneficial ownership: *[select one option as applicable and delete the options that are not applicable]*

(i) we hereby provide the following beneficial ownership information.

Details of beneficial ownership

Identity of Beneficial Owner	Directly or indirectly holding 25% or more of the shares (Yes / No)	Directly or indirectly holding 25 % or more of the Voting Rights (Yes / No)	Directly or indirectly having the right to appoint a majority of the board of the directors or an equivalent governing body of the Bidder (Yes / No)
[include full name (last, middle, first),			

nationality, country of residence]			

OR

(ii) *We declare that there is no Beneficial Owner meeting one or more of the following conditions:*

- directly or indirectly holding 25% or more of the shares
- directly or indirectly holding 25% or more of the voting rights
- directly or indirectly having the right to appoint a majority of the board of directors or equivalent governing body of the Bidder

OR

(iii) We declare that we are unable to identify any Beneficial Owner meeting one or more of the following conditions. [If this option is selected, the Bidder shall provide explanation on why it is unable to identify any Beneficial Owner]

- directly or indirectly holding 25% or more of the shares
- directly or indirectly holding 25% or more of the voting rights
- directly or indirectly having the right to appoint a majority of the board of directors or equivalent governing body of the Bidder]"

Name of the Bidder: *[*insert complete name of the Bidder*]_____

Name of the person duly authorized to sign the Bid on behalf of the Bidder: **[*insert complete name of person duly authorized to sign the Bid*]_____

Title of the person signing the Bid: [*insert complete title of the person signing the Bid*]_____

Signature of the person named above: [*insert signature of person whose name and capacity are shown above*]_____

Date signed [*insert date of signing*] **day of** [*insert month*], [*insert year*]_____

[*] In the case of the Bid submitted by a Joint Venture specify the name of the Joint Venture as Bidder. In the event that the Bidder is a joint venture, each reference to "Bidder" in the Beneficial Ownership Disclosure Form (including this Introduction thereto) shall be read to refer to the joint venture member.

[**] Person signing the Bid shall have the power of attorney given by the Bidder. The power of attorney shall be attached with the Bid Schedules.

Letter of Acceptance

[on letterhead paper of the Employer***]***

. . . . . ***[date]***. . . . . .

To: . . . . . ***[name and address of the Contractor]*** . . . . . .

Subject: . . . . . ***[Notification of Award Contract No]***. . . . . .

This is to notify you that your Bid dated . . . ***[insert date]*** . . . . for execution of the . . . . . ***.[insert name of the contract and identification number, as given in the PCC]*** . . . . . for the Accepted Contract Amount of . . . . . ***.[insert amount in numbers and words 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 (i) the Performance Security and an Environmental and Social (ES) Performance Security ***[Delete ES Performance Security if it is not required under the contract]*** within 28 days in accordance with the Conditions of Contract, using for that purpose the of the Performance Security Form and the ES Performance Security Form, ***[Delete reference to the ES Performance Security Form if it is not required under the contract]*** and (ii) the additional information on beneficial ownership in accordance with ITB 49.1, within eight (8) Business days using the Beneficial Ownership Disclosure Form, included in Section X - 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 ITB 51.1 and GCC Sub-Clause 23.1.

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 Letter of Acceptance

(b) the Letter of Bid

(c) the addenda Nos _____(if any)

(d) the Particular Conditions

(e) the General Conditions of Contract, including appendix;

(f) the Specification

(g) the Drawings

(h) Bill of Quantities; [1] and

(i) any other document listed in the PCC as forming part of the Contract, but not limited to;

i. the ES Management Strategies and Implementation Plans**;** and

ii. Code of Conduct for Contractor's Personnel (ES).

3. In consideration of the payments to be made by the Employer to the Contractor as specified 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.

[1] In lump sum contracts, delete "Bill of Quantities" and replace with "Activity Schedule."

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 specified above.

Signed by:	Signed by: .....
for and on behalf of the Employer	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
Option 1: Demand Guarantee

[Guarantor letterhead or SWIFT identifier code]

Beneficiary: *[insert name and Address of* Employer*]*

Date: *[Insert date of issue]*

PERFORMANCE GUARANTEE No.: *[Insert guarantee reference number]*

Guarantor: *[Insert name and address of place of issue, unless indicated in the letterhead]*

We have been informed that _ *[insert name of Contractor, which in the case of a joint venture shall be the name of the joint venture]* (hereinafter called "the Applicant") has entered into Contract No. *[insert reference number of the contract]* dated *[insert date]* with the Beneficiary, for the execution of _ *[insert 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 Applicant, we as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of *[insert amount in figures]* (_____) *[insert amount in words]*,[1] such sum being payable in the types and proportions of currencies in which the Contract Price is payable, upon receipt by us of the Beneficiary's complying demand supported by the Beneficiary's statement, whether in the demand itself or in a separate signed document accompanying or identifying the demand, stating that the Applicant is in breach of its obligation(s) under the Contract, without the Beneficiary 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 ……, 2… [2], and any demand for payment under it must be received by us at this office indicated above on or before that date.

---

[1] *The Guarantor shall insert an amount representing the percentage of the Accepted Contract Amount specified in the Letter of Acceptance, less provisional sums, if any, and denominated either in the currency(ies) of the Contract or a freely convertible currency acceptable to the Beneficiary.*

[2] *Insert the date twenty-eight days after the expected completion date as described in GCC Sub-Clause 57.1. The Employer should note that in the event of an extension of this date 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 [six months][one year], in response to the Beneficiary's written request for such extension, such request to be presented to the Guarantor before the expiry of the guarantee."*

This guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication No. 758, except that the supporting statement under Article 15(a) is hereby excluded.

_____

[signature(s)]

Note: All italicized text (including footnotes) is for use in preparing this form and shall be deleted from the final product.

Performance Security
Option 2: Performance Bond

(Not Applicable)

By this Bond *[insert name of Principal]* as Principal (hereinafter called "the Contractor") and *[insert name of Surety]* as Surety (hereinafter called "the Surety"), are held and firmly bound unto *[insert name of Employer]* as Obligee (hereinafter called "the Employer") in the amount of *[insert amount in words and figures]*, for the payment of which sum well and truly to be made in the types and proportions of currencies in which the Contract Price is payable, the Contractor and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS the Contractor has entered into a written Agreement with the Employer dated the _____ day of _____, 20 ____, for *[name of contract and brief description of Works]* in accordance with the documents, plans, specifications, and amendments thereto, which to the extent herein provided for, are by reference made part hereof and are hereinafter referred to as the Contract.

NOW, THEREFORE, the Condition of this Obligation is such that, if the Contractor shall promptly and faithfully perform the said Contract (including any amendments thereto), then this obligation shall be null and void; otherwise, it shall remain in full force and effect. Whenever the Contractor shall be, and declared by the Employer to be, in default under the Contract, the Employer having performed the Employer's obligations thereunder, the Surety may promptly remedy the default, or shall promptly:

(1) complete the Contract in accordance with its terms and conditions; or

(2) obtain a Bid or Bids from qualified Bidders for submission to the Employer for completing the Contract in accordance with its terms and conditions, and upon determination by the Employer and the Surety of the lowest responsive Bidder, arrange for a Contract between such Bidder and Employer and make available as work progresses (even though there should be a default or a succession of defaults under the Contract or Contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the Balance of the Contract Price; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "Balance of the Contract Price," as used in this paragraph, shall mean the total amount payable by Employer to Contractor under the Contract, less the amount properly paid by Employer to Contractor; or

(3) pay the Employer the amount required by Employer to complete the Contract in accordance with its terms and conditions up to a total not exceeding the amount of this Bond.

The Surety shall not be liable for a greater sum than the specified penalty of this Bond.

Any suit under this Bond must be instituted before the expiration of one year from the date of issue of the Certificate of Completion.

No right of action shall accrue on this Bond to or for the use of any person or corporation other than the Employer named herein or the heirs, executors, administrators, successors, and assigns of the Employer.

In testimony whereof, the Contractor has hereunto set his hand and affixed his seal, and the Surety has caused these presents to be sealed with his corporate seal duly attested by the signature of his legal representative, this _____ day of _____ 20 _____.

SIGNED ON _____ on behalf of _____

By _____ in the capacity of _____

In the presence of _____

SIGNED ON _____ on behalf of _____

By _____ in the capacity of _____

In the presence of _____

Environmental and Social (ES) Performance Security

ES Demand Guarantee

(Not Applicable0

[Guarantor letterhead or SWIFT identifier code]

Beneficiary: *[insert name and Address of* Employer*]*

Date: *[Insert date of issue]*

ES PERFORMANCE GUARANTEE No.: *[Insert guarantee reference number]*

Guarantor: *[Insert name and address of place of issue, unless indicated in the letterhead]*

We have been informed that _____ (hereinafter called "the Applicant") has entered into Contract No. _____ dated _____ with the Beneficiary, for the execution of _____ (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 Applicant, we as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of _____ ( ),[1] such sum being payable in the types and proportions of currencies in which the Contract Price is payable, upon receipt by us of the Beneficiary's complying demand supported by the Beneficiary's statement, whether in the demand itself or in a separate signed document accompanying or identifying the demand, stating that the Applicant is in breach of its Environmental and/or Social (ES) obligation(s) under the Contract, without the Beneficiary 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 ……, 2… [2], and any demand for payment under it must be received by us at this office indicated above on or before that date.

---

[1] *The Guarantor shall insert an amount representing the percentage of the Accepted Contract Amount specified in the Letter of Acceptance, less provisional sums, if any, and denominated either in the currency (ies) of the Contract or a freely convertible currency acceptable to the Beneficiary.*

[2] *Insert the date twenty-eight days after the expected completion date as described in GCC Sub-Clause 57.1. The Employer should note that in the event of an extension of this date 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 [six months] [one year], in response to the Beneficiary's written request for such extension, such request to be presented to the Guarantor before the expiry of the guarantee."*

This guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication No. 758, except that the supporting statement under Article 15(a) is hereby excluded.

_____

[signature(s)]

Note: All italicized text (including footnotes) is for use in preparing this form and shall be deleted from the final product.

Advance Payment Security

Demand Guarantee

[Guarantor letterhead or SWIFT identifier code]

Beneficiary: *[Insert name and Address of* Employer*]*

Date: *[Insert date of issue]*

ADVANCE PAYMENT GUARANTEE No.: *[Insert guarantee reference number]*

Guarantor: *[Insert name and address of place of issue, unless indicated in the letterhead]*

We have been informed that *[insert name of Contractor, which in the case of a joint venture shall be the name of the joint venture]* (hereinafter called "the Applicant") has entered into Contract No. *[insert reference number of the contract]* dated *[insert date]* with the Beneficiary, for the execution of *[insert 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 *[insert amount in figures]* () *[insert amount in words]* is to be made against an advance payment guarantee.

At the request of the Applicant, we as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of *[insert amount in figures]* (_____) *[insert amount in words]*[1] upon receipt by us of the Beneficiary's complying demand supported by the Beneficiary's statement, whether in the demand itself or in a separate signed document accompanying or identifying the demand, stating either that the Applicant:

(a) has used the advance payment for purposes other than the costs of mobilization in respect of the Works; or

(b) has failed to repay the advance payment in accordance with the Contract conditions, specifying the amount which the Applicant has failed to repay.

A demand under this guarantee may be presented as from the presentation to the Guarantor of a certificate from the Beneficiary's bank stating that the advance payment referred to above

[1] *The Guarantor shall insert an amount representing the amount of the advance payment and 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.*

has been credited to the Applicant on its account number *[insert number]* at *[insert name and address of Applicant's bank]*..

The maximum amount of this guarantee shall be progressively reduced by the amount of the advance payment repaid by the Applicant as specified 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 ninety (90) percent of the Accepted Contract Amount, less provisional sums, has been certified for payment, or on the *[insert day]* day of *[insert month]*, 2 *[insert year]*,[2] 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 (URDG) 2010 Revision, ICC Publication No. 758, except that the supporting statement under Article 15(a) is hereby excluded.

_____

[signature(s)]

Note: All italicized text (including footnotes) is for use in preparing this form and shall be deleted from the final product.

[2] *Insert the date twenty-eight days after the expected completion date as described in GCC Sub-Clause 57.1.. The Employer should note that in the event of an extension of the expected completion date, 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 [six months][one year], in response to the Beneficiary's written request for such extension, such request to be presented to the Guarantor before the expiry of the guarantee."*

Annexure 1 ESMP volume-V of bidding documents

Annexure-2 – Site Locations

FOR, 15 THQs

S.No	Division	District	Health Facility Name
1	HYD	Badin	Taluka Hospital Tando Bago
2	HYD	Badin	Taluka Hospital Golarchi
3	HYD	Jamshoro	Taluka Hospital Manjhand
4	HYD	Sujawal	Taluka Hospital Hospital Mirpur Bathoro
5	HYD	Tando Mohd Khan	Taluka Hospital Tando Ghulam Haider
6	MPK	Mirpurkhas	Taluka Hospital Kot Ghulam Mohammad
7	MPK	Mirpurkhas	Taluka Hospital Digri
8	LRK	Kashmore	Taluka Hospital Kashmore
9	SBA	Naushahro Feroz	Taluka Hospital Moro
10	SBA	Naushahro Feroz	Taluka Hospital Kandiaro
11	SBA	Shaheed Benazirabad	Taluka Hospital Sakrand
12	SBA	Shaheed Benazirabad	Taluka Hospital Kazi Ahmed
13	SUK	Ghotki	Taluka Hospital Ghotki
14	SUK	Khairpur	Taluka Hospital Kotdeji
15	SUK	Sukkur	Taluka Hospital Rohri

***Note: If any THQ is found to be duplicated with ADP or any other schemes of GoS during the execution stage, it will be excluded from the actual list*.**

PROJECT MANAGEMENT UNIT (PMU)
SINDH HUMAN CAPITAL INVESTMENT: 1000 DAYS INTEGRATED HEALTH & POPULATION PROGRAM

BIDDING DOCUMENTS

VOLUME - II
SPECIFICATIONS

Issued to M/s: _____
Date : _____
Issued By : _____

REHAB OF 15 THQs DAMAGED DURING FLOOD, AT VARIOUS DISTRICT OF SINDH

Rehabilitation of Taluka Headquarter Hospitals (THQs) at Hyderabad, Mirpurkhas, Larkana, Shaheed Benazirabad & Sukkur Divisions

OCT 2025

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VOLUME-II

SPECIFICATIONS - TECHNICAL PROVISIONS

All items to conform with latest Specifications (with their sub-sequent amendments) except where additional specifications are provided in this section and BOQ, with the following additional stipulations:

i) No payment for extra lead and lift will be made.

ii) Not with-standing any item of BOQ, **NO LEAD** or **LIFT** for supply of any material/ disposal of any item/ execution of any work would be given to the Contractor. The Contractor is supposed to investigates the source of all materials and ascertain their cost of cartage (including all incidental costs) which would be considered incorporated in the items rates.

iii) Sea water/ brackish water shall not be used in any construction activity including road construction.

iv) Any item (i) described in the Bill of Quantities or relevant Specifications but not shown on the Drawings, or (ii) shown on the Drawings but nor described in the Bill of Quantities or relevant Specifications, shall be of like effect as it has been shown and mentioned in both. Similarly, if any item which is neither shown on the drawing not mentioned in the Bill of Quantities or Specification but is a pre-condition to carryout any item of the contract, it shall be considered to be included in the contract price, distributed among the rates and prices entered for the related items of works. The decision of the Engineer / Project Manager shall be final and binding on the Contractor, unless before the deadline for submission of Bids, such discrepancies are clarified by the Design Consultant as a result of an inquiry from bidders or on the initiative of the Design Consultant/ Employer. The clarification in either case would be sent to all bidders as an Addendum. However it shall be clearly understood that no extra cost whatsoever shall be paid in case such discrepancies if any, exist in the Bid documents.

v) Not withstanding anything contained in the Contract Documents, Employer/ Engineer / Project Manager reserves the right to ask for justification/ rate analysis from the contractor of any rate which in the opinion of the Employer/ Engineer / Project Manager is abnormally high or low.

vi) Notwithstanding anything contained in the Contract, all structural concrete shall be through approved Concrete Mixer Machine and as per the specifications.

vii) The specifications for Solar System and RO Plant are not explicitly mentioned herein. The Contractor shall be required to submit and get approved a technical submittal, methodology and layout plan approved by the Engineer / Project Manager before execution.

SPECIFICATIONS - TECHNICAL PROVISIONS

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- **PACKAGED ENGINE GENERATOR**
- **MEDIUM VOLTAGE POWER FACTOR CORRECTION EQUIPMENT**
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- **LIGHTING**
- **CLOSED CIRCUIT TELEVISION SYSTEM (CCTV)**

CIVIL WORKS

REMOVAL OF EXISTING STRUCTURES

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 / Project Manager to be removed and (3) those structures or portions or structures which, in the opinion of the Engineer / Project Manager, it is necessary to remove in order to construct the new structures.

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 / Project Manager, 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. Underground 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.

3. DISPOSAL

All waste materials shall be disposed of, as directed by the Engineer / Project Manager, within 3000 ft. haul. All useable material, as determined by the Engineer / Project Manager shall be stacked in neat piles within the right of way.

4. MEASUREMENT & PAYMENT

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.

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

DISMANTLING EXISTING ROAD METALLING

1. DESCRIPTION

This item shall consist of scarification of existing road surface or breaking of existing road pavement structure to ensure bondage of new layer with the existing road pavement and to ensure drainage of water below the surface of freshly laid aggregate base. The surface on which the base material is to be constructed shall be approved and accepted by the Engineer / Project Manager prior to placing the crushed stone base aggregate.

2. CONSTRUCTION REQUIREMENT

The method of scarification of road surface of breaking of pavement structure shall be proposed by the contractor and approved by the Engineer / Project Manager, in accordance with the requirement under site conditions.

After the existing pavement structure has been broken off, the material shall be removed and stacked along with trench. The surface after dismantling of structure shall be compacted to the density as per the direction of the Engineer / Project Manager. The dismantled road surface is to be made good as per the existing road and as per the direction of the Engineer / Project Manager.

3. PAYMENT

The quantities shall be paid for at the unit price per Cft which includes the cost of breaking of road pavement structure, scarification of existing road pavement structure.

EXCAVATION

1. SCOPE

The work covered by this section of the specifications consists of furnishing all plant, labour, equipment, appliances and materials and performing all operations in connection with excavation, trenching and back-filling for sewer and water supply lines and all other 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 / Project Manager. The work shall be carried out in complete conformity with the specifications, set-forth hereunder.

2. SETTING OUT

Lines and levels will be set out by the Contractor who shall be responsible for maintaining all stakes and witness points set-up by the Engineer / Project Manager for the execution of work in strict accordance with them.

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 off at no extra cost in a manner satisfactory to the Engineer / Project Manager. All trees and shrubbery that are designated by the Engineer / Project Manager to remain shall be adequately protected and preserved in an approved manner.

4. EXCAVATION

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 backfilling 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 are not required for backfill shall be removed and disposed at a location approved by the Engineer / Project Manager. Grading shall be done as may be necessary to prevent surface water from flowing into 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 / Project Manager, excavation shall be open cut.

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

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

The quantity of excavation shall be the volume of materials removed from below the original surface of the ground to the limits of excavation specified or shown on the drawings.

Useful excavated material to be used in roadway embankment (as per NHA Specifications of road embankment). The material used for embankment is required to be dressed & compacted to specified degree of compaction at optimum moisture content. The rate of items deemed to include carriage, spreading, watering & compaction as per NHA specifications of Road Embankment. Item includes all cost whether backfilling due for trenches, road embankment and/or under floor (as per NHA specifications of Road Embankment).

4.2 Earth Excavation for Sewers

Unless otherwise directed or permitted by the Engineer / Project Manager not more than 500 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 / Project Manager or in such a position or to such dimensions and depths as shall allow for the proper construction of the relevant structure or construction or proper excavation of the relevant operation. For excavation the width of trench allowable for payment shall be the external diameter of pipes plus 12 inches on both sides, for pipes up to 15 inches diameter. For diameters exceeding 15 inches, the width of trenches shall be external diameter plus 18 inches on both sides. For depth exceeding 5 feet slope allowance of 1.5 inch per foot (in depth for each side of the trenches) shall be made in addition to the width specified to the full depth of trenches. The Contractor shall make allowance for the additional excavation required for making joints and, where necessary, for concrete bedding or surround in the price tendered for trench excavation. These shall not be separately measured or paid.

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 / Project Manager 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 Employer.

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 / Project Manager, up to corrected level, at his own expense.

Excavation for 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 / Project Manager, will be considered un-authorized and shall be refilled with compacted sand, gravel or concrete, as directed by the Engineer / Project Manager and at no additional cost to the Employer.

4.3 Earth Excavation for Water Supply Lines

For excavation the width of trench allowable for payment shall be the external diameter of pipes plus 18" for pipes up to 12" diameter. For depth exceeding 5 feet slope allowance of 1.5 inch per foot (in depth for each side of the trenches) shall be made in addition to the width specified to the full depth of trenches. The Contractor shall make allowance for the additional excavation required for making joints and, where necessary, for concrete bedding or surround in the price tendered for trench excavation. These shall not be separately measured or paid.

4.4 Excavations For Trenches / Drains

Unless otherwise directed or permitted by the Engineer / Project Manager 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 / Project Manager or in such a position or to such dimensions and depths as shall allow for the relevant operation.

Excavation shall be carried out to give ample space for making joints and, where necessary, for concrete bedding or surround. For trench width, the dimension (12 inches + 1.5 dia of pile (inch) will be followed, but in no case shall be less than 18". 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 / Project Manager 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 Owner.

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

Excavation for appurtenances shall be sufficient to leave atleast 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 / Project Manager will be considered un-authorised and shall be refilled with compacted sand, gravel or concrete, as directed by the Engineer / Project Manager and at no additional cost to the Employer.

4.5 Excavations for Reservoirs / Tanks and Foundations

The Contractor shall excavate tanks/ reservoirs and foundations to the lines and levels shown in the Drawings. As for as is practicable excavation shall be carried out in uniform layers over the full areas. The excavation shall be kept clear of water at all times. Bulk excavation may be carried out by machine or other approved methods to within 6 inches of the final surface. The final 6 inches of excavation shall be carefully carried out by hand. Embankment slopes shall be trimmed to the side slopes shown in the Drawings. For depth exceeding 5 feet slope allowance of 1.5 inch per foot (in depth for each side of the trenches) shall be made in addition to the width specified to the full depth of trenches.

4.6 For Pipelines

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

b). The quantity of excavation shall be the volume of materials removed from below the original surface of the ground to the limits of excavation specified or shown on the drawings. For soft and unstable soils, the Contractor shall provide all necessary site supports including timbering or sheet piling to support the sides of trenches. The cost of supply of all material, plant and labour that may be necessary for site clearance, excavation, over break, timbering, sheet piling, shoring, strutting, refilling, watering and ramming, etc., shall be included in the Contract Rates for excavation. In all cases, the quantity of excavation measured shall be the in- site volume of the undisturbed material with in allowable limits mentioned in the specification. In case sides or ends of any excavation collapse under self-weight or due to any other reason, the contractor shall at his own cost remove all disturbed material. Should sides or ends of any excavation give way, the contractor shall at his own cost remove all disturbed material. No additional payment due to side slopes of pipe trenches if carried out by Contractor shall be allowable.

c). Where the Contractor has excavated to depths in excess of the requirements, he shall refill and compact the excess excavation with 1:4:8 cement concrete upto the correct level at his own expense. Any excavation done in excess of specified width due to any reason, what so ever shall not be payable.

d). For excavation above ground water table, the width of the trench shall be equal to the external diameter of the pipe plus 18''dia. not exceeding 12'' dia. For sewers of internal diameter exceeding 12'' dia. The width of trench payable shall be equal to external diameter of pipe plus 30''dia. The depth shall be as per longitudinal section of sewers and shall include for sewer bedding, to give minimum 30''of the earth cushion over the pipe or to the depth of existing pipe where required to be connected.

e). For excavation below ground water table up to a depth of 10ft, the width of trench allowable for payment shall be the external diameter of pipes plus 24'' for pipes up to 12'' diameter. For diameters exceeding 12'', the width of trenches shall be external diameter plus 3ft.

f). For excavation below ground water table and depths exceeding 10ft, the width of trench allowable for payment shall be the external diameter of pipe plus 3'-6''.

g). Additional excavation will be necessary at all manholes, valve chambers and pipe joints to facilitate the making of joint. Additional excavation for construction of manholes, valve chambers and joint holes shall be of such dimensions, so as to give clear working space. The Contractor shall make allowance for the additional excavation required for the manholes and valve chambers in the price tendered for trench excavation. These shall not be separately measured or paid.

h). The length of the trench shall be measured along the centre line of the trench and the depth shall be measured vertically from original ground levels to the average bed level.

i). The maximum length of trench to be left open shall be the length between manholes or not more than 160ft of jointed pipe line, whichever is the lesser, and shall remain visible for the purpose of inspection and testing. In exceptional circumstances where the nature of the ground or locality renders it necessary to reduce this distance, the contractor shall inform the Engineer / Project Manager, immediately. In the case of pressure pipelines, partial backfilling shall be carried out before testing.

j). Where pipes are laid through rock or extra hard strata, the trench shall be excavated to depths below the barrel of the pipes specified in "Schedule for pipe bedding & surrounds". The space below the pipe barrel shall be refilled with specified granular bedding material.

4.7 Trial / Test Pits

The Contractor may be required to excavate trial pits and trial trenches upto about 10% of the total quantity of excavation specified in the contract at appropriate locations to determine the actual level of the existing water table, and position of existing conduits, water mains, gas mains, cable ducts and sewers etc. This excavation work shall be done carefully with due precaution, so as not to damage any existing services. The Contractor may be precluded from carrying out any permanent work until this information is obtained and may have to adopt his program in accordance with the information so obtained by the Contractor.

Trial test pits will be required to be dug before or during the execution of work at locations directed by the Engineer / Project Manager for determining the condition of soil, checking the location of utility services water levels etc. The size of individual trial pits may be kept 5ft x 5ft up to the required depth. The dimensions may be varied depending upon the site condition and as per instruction of the Engineer / Project Manager. The Contractor shall obtain prior permission from Engineer / Project Manager in writing before start of work on trial pits. No separate payment shall be made for trail pits required to be dug by the Contractor.

The cost incurred by the Contractor on the trial / test pits shall be deemed to be included by the Contractor in his rates for excavation.

4.8 Classification of Soils

Excavation shall include the removal of all materials in all kinds of soils or stratas of every name and nature. The sub- soil in the project area mostly comprises of clay with fine sand and silt and high sub-soil water level. A considerable amount of dewatering and supports for the sides of excavation will be essential including bore holes, well point system and side supports comprising of shuttering, bracing, strutting and sheet piling. However the Contractor shall make his own assessment after detailed study of the area and digging the required trial / test pits as required in this regard. No claim shall be allowed on account of any omission or error in such data trial / test pits.

If rock is encountered it shall be removed carefully and without excessive noise and vibration. Blasting shall not be allowable. The quantities of earthwork for each category of excavation i.e. soil, and rocks are provisional. The Engineer / Project Manager shall do the classification of soil during actual excavation. In case the Contractor meets rock during the excavation, the contractor shall request the Engineer / Project Manager in writing for a joint inspection for classification of soil. The Engineer / Project Manager shall visit the site during excavation and give his opinion in writing about classification of soil for the particular site or alignment.

The excavation payable shall be limited to the dimensions and elevations as indicated on the drawings. Foundations on made up ground shall be taken down to nascent soil as per direction and approval of the

Engineer / Project Manager. Excavation shall extend to a sufficient distance away from walls and footings to allow for placing and removal of forms, installation of services and for inspection. No payment shall be made for this extra excavation. The Contractor's rate for excavation shall be deemed to include for such extra excavation.

In the event of any excavation being carried out deeper than specified, the same shall be filled in by the Contractor at his own cost to the required level with lean concrete if beneath footing or with proper compacted local river sand if beneath slab.

4.9 Mechanical Diggers and Other Appliances

The Contractor shall not use mechanical excavation in gardens or plantation areas unless approval in writing has been obtained from Employer and tenants.

In addition to the above, if the Engineer / Project Manager shall reasonable consider it unsuitable that any excavator, mechanical digger or other machine or appliances employed, or proposed to be employed by the contractor should not be used or that any such machine or appliance as aforesaid is unsuitable for use on the works or on any part of the works, the Engineer / Project Manager may order the Contractor not to use and / or to immediately remove from the works such machine or appliance.

5. PRECAUTIONARY AND REMEDIAL MEASURES

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 authority concerned / Engineer / Project Manager 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 / Project Manager's Representative and any authority concerned and shall forthwith undertake remedial measures to the satisfaction of the Engineer / Project Manager or the appropriate authority.

5.2 Planking and Strutting

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

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

5.3 Removal of Water

The Contractor shall build all drains and do ditching, pumping and all other work necessary to keep the excavation clear of sewage, storm water and water from any source 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 / Project Manager and necessary precautions against flooding shall be taken. The contractor should submit the Methodology of dewatering for approval. It may also be noted that any approval of the methodology will not relieve the contractor from any of his responsibilities / obligations.

The Contractor shall be required to arrange well point equipment and / or adequate number of tube wells or both and pumping machinery for dewatering and lowering the existing water table for construction purposes in the areas where sub-soil water or any sewage and water from any other sources are encountered. The system shall be capable of working non-stop 24 hours a day for the entire duration of the work without break during excavation, and for laying of sewer, pipes and bedding, construction of manhole, construction of structures, testing of sewers/ pipes and backfilling. The system of dewatering proposed to be adopted shall be submitted

by the contractor with sufficient details along with the tender for approval of the Engineer / Project Manager. The Contractor is required to visit the site before submitting his tender and investigate the available mean of disposal of pumped water including laying of temporary pipeline for transmission of water during the period of excavation providing bedding, laying & jointing of sewer, pipes and construction of any structure up to ground level. The cost of all such works required for pumping and disposal of water from trenches/ pits shall be considered to be included in the BOQ rates for excavation.

5.4 Maintenance of Excavation

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

5.5 Surplus Materials

All surplus materials shall be disposed off at locations approved by the Engineer / Project Manager. 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 materials from falling on the street or pavement.

5.6 Cutting Pavement

In cutting or breaking street surfacing, the Contractor shall not use equipment which will damage the adjacent pavement. Existing paved surface shall be cut back beyond the edge of trenches to form neat square cuts. The road ballast and other materials shall be placed on one side and shall be preserved for re-installment 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 over unfilled excavations. All such bridges 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 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.

6. FILL, BACKFILLING AND RESTORING OF GROUND TO ORIGINAL CONDITION

6.1. General

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

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

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

After completion and final approval of the work of sewers and other construction as shown on drawings and prior to backfilling, forms shall be removed carefully and excavation shall be cleaned of stones and debris. Backfill shall be brought to a suitable elevation above ground to provide for anticipated settlement and shrinkage thereof.

Backfill shall not be placed against walls etc., prior to the water proofing treatment if provided and approved by the Engineer / Project Manager. Backfill shall be brought up evenly on each side of walls as far as practicable. Heavy equipment for spreading and compacting backfill shall not be operated closer to the wall than distance equal to the height of the backfill above the top of base slab footing. No back filling shall be done before the new structure has been cured for atleast two weeks.

6.2. Backfilling and Restoring of Ground to Original Condition

The back filling of the trench shall be allowed after the sewer pipe has been laid and jointed over the specified bed, inspected, checked, tested and approved by the Engineer / Project Manager. Backfilling of the trenches shall be carried out by filling to depth up to half pipe level. The filling shall then be thoroughly rammed more filling shall be carried out and rammed again until the consolidated filling reaches pipe top level. Only selected, dry materials free from stones or debris shall be used for backfilling, which shall be spread and rammed evenly across the trench. Thereafter, the trench shall be filled in layers not exceeding 150 mm in depth, each layer being properly rammed before the next layer is placed so that 95-100% compaction is obtained as per AASHTO Standard.

On completion of backfilling, the Contractor shall level all grounds disturbed by him in the course of the work, spread topsoil where necessary as directed by the Engineer / Project Manager.

6.3. 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 cost to the Employer. 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 85 or 90 as directed by the Engineer / Project Manager. No filling shall be made until the concrete foundations and footings etc., have been inspected and approved by the Engineer / Project Manager. 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.

6.4. Backfilling of Trenches

The trenches shall not be completely backfilled until all required pressure tests are performed and until the lines as installed conform to the requirements of specifications. Where in the opinion of the Engineer / Project Manager, 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 the item of 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.

6.5. Lower Portion of Trench

Backfill material shall be deposited in 6 inch maximum thickness layers and compacted with suitable hand tampers to ninety five percent 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 humps.

6.6. Remainder of Trench

The remainder of the trench shall be backfilled with material that is free from stones larger than 6 inch in any dimension. Backfill material shall be compacted to 90 percent of maximum density for cohesive soils and 95 percent of maximum density for others.

7. BORROW

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

8. 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 / Project Manager. Finished grading shall not be done until the installation of all utilities of appurtenances has been completed and tested. Prior to final acceptance, all damage due to settlement shall be repaired by an at the expense of the Contractor.

9. TESTING OF SOIL IN PLACE

The Engineer / Project Manager will make tests using the calibrated sand 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 / Project Manager and at no additional cost to the Employer.

10. REMOVAL OF EXCESS AND UNDESIRABLE MATERIALS

10.1. Excess and undesirable material from excavation not required for fill or backfill shall be disposed off, removed and / or deposited and leveled on the site where directed by the Engineer / Project Manager. Earth suitable and meant for backfill shall be stored at site in a manner not to interfere with the progress of construction works in progress.

10.2. The Contractor shall keep all excavated soil sprinkled with water during the excavation work so as to prevent any dust nuisance.

10.3. Surplus Excavation Debris etc.

All surplus soil arising out of the work shall be carried away to approved site, within a week, deposited and spread as directed by the Engineer / Project Manager.

The Contractor shall carry out the cutting of existing bituminous road as required for excavation for carrying out the work, to the full depth of hard crest of any existing thickness. The stone metal soling etc. shall be separately stacked along the side of excavation for possible reuse.

11. PROTECTION OF UTILITY SERVICES

11.1 Utility Lines

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 authority concerned / Engineer / Project Manager 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 / Project Manager's Representative and any authority concerned and shall forthwith undertake remedial measures to the satisfaction of the Engineer / Project Manager or the appropriate authority.

When any existing utility lines are encountered within the area of operations, the contractor shall take all necessary measures so that these are neither disturbed nor damaged. The Contractor shall be fully and solely responsible for any damage occurring due to non-providing of adequate measures for the protection of such services. The Contractor shall be required to obtain all necessary permissions from different departments / agencies in writing prior to start of work and maintain the affective liaison for trouble free progress of work(s). The contractor shall pay all fees, charges officially levied by such department / agencies while issuing required permission. The Contractor shall furnish originals of payment receipts alongwith his written request for allowing payments by the Engineer / Project Manager accordingly. In case of restoration to unavoidable damage to any utility service, line or by passing such line the procedure as detailed shall be followed in accordance with rules, regulation, specification or practice as preferred by the concerned department / agency.

11.2 Damage to Surface

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

11.3 Maintenance of Traffic

The Contractor shall keep the road crossings manned 24 hours per day. During night time, enough red lights shall be provided to warn 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.

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

11.4 Control of Traffic on Roads

The Contractor shall ensure that the flow of traffic over the existing roads and access to properties is maintained at all times during the contract. The flow of traffic is to take place at all time over a reasonable surface, which is to be segregated as far as possible from areas where work is in progress. The contractor shall provide flagmen and signaling equipment as may be necessary to control the traffic to the satisfaction of the Engineer / Project Manager and the appropriate controlling Authority. In the planning and execution of any temporary or permanent works, which may affect the traffic flow and / or access to properties, the contractor shall co-operate closely with the Engineer / Project Manager and the appropriate controlling Authority.

12. MEASUREMENT AND PAYMENT

12.1. Excavation and Backfilling

Measurement and payment for excavation and filling shall be made in accordance with the following provision:

a) Method of Measurement

The measurement shall be made of the earth acceptably excavated for trenches and structures within the lines and grades shown on the drawing or as directed by the Engineer / Project Manager.

b) Basis of Payment

i). Payment for earth excavations for trenches and structures will be made at unit price stated in Bid Schedule of this contract or in applicable Variation Orders.

ii). For the purpose of measurement, the depth of filling shall be taken as consolidated depth.

STRUCTURAL EXCAVATION AND BACKFILL

1. SCOPE

Structural excavation shall consists 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 / Project Manager, 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 / Project Manager. 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 / Project Manager.

2. MATERIAL REQUIREMENTS

2.1 Backfill

Backfill shall consist of granular material or other common materials as noted on the drawings or as approved by the Engineer / Project Manager.

3. CONSTRUCTION REQUIREMENTS

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 1. The price of structural excavation shall include backfilling, (except when granular backfill as specified in Clause 4.1 is ordered in writing by the Engineer / Project Manager), to these structures with material approved of by the Engineer / Project Manager, 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 / Project Manager 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 / Project Manager may require the contractor to excavate below the elevations shown on the drawings, depending upon where suitable foundation material is encountered.

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 / Project Manager 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.

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 / Project Manager. 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 / Project Manager. Material deposited within the stream area from foundation or other excavation shall be removed and the stream bed freed from obstruction thereby.

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 / Project Manager may order, in writing, such changes in dimensions or elevation of footings as may be necessary to secure a satisfactory foundation.

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 / Project Manager.

- 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.

3.6 Inspection

After each excavation is completed the Contractor shall notify the Engineer / Project Manager, and no masonry / concrete shall be placed until the Engineer / Project Manager has approved the depth of the excavation and the character of the foundation material.

4. BACKFILL MATERIALS

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 / Project Manager 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 / Project Manager.

Granular backfill material shall give the following grading requirements.

GRADING REQUIREMENT

MM	Inch	A	B
25.00	1"	100	100
19.00	¾"	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, course sand is utilized for granular fill it shall be ensured that the same is confined properly with approved material.

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 / Project Manager. 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 / Project Manager 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 / Project Manager.

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 / Project Manager 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.

5. MEASUREMENT AND PAYMENT

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 / Project Manager.

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, 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 above, computed and accepted by the Engineer / Project Manager.

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 above, computed by the average end-area method, compacted and accepted by the Engineer / Project Manager.

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 / Project Manager.

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.

COMPACTION OF NATURAL GROUND

1. DESCRIPTION

The natural ground or surface ready for construction purposes after stripping (if required) and/or excavation will be considered for natural ground compaction in this item only. The compaction of cleared / grubbed surface after Clearing and Grubbing is covered in "Clearing and Grubbing".

The compaction of natural ground shall be carried out through a written order by the Engineer / Project Manager.

2. CONSTRUCTION REQUIREMENTS

After striping of the topsoil or any layer of unsuitable material or after excavation, the ground up to a depth of 20 cms below the surface of exposed road bed (natural ground) shall be broken up by ploughing and scarifying to compact to a degree as defined below:

Depth **below sub grade level.**	**Percent of Maximum Dry Density as determined by AASHTO T -180.*** 0
to 30 cm	95
30 to 75cm	93
Over 75 cm	90
Below the foundation of structures	95

2.1 Compaction of original ground in areas of high water levels and salinity

Compaction of natural ground surface in such areas will be difficult if not impossible.

Accordingly, the locations/ areas shall be strengthened with stones of a minimum 30cm thick layer soling or as directed by the Engineer / Project Manager.

3. MEASUREMENT AND PAYMENT

3.1. Measurement

The measurement shall be made by multiplying the length and breadth of the area approved in writing by the Engineer / Project Manager to be paid under this item. The measurement of the item shall be as per the BOQ.

Any subsidence of levels of Natural Ground due to compaction under this item shall not be measured for payment; the Contractor is expected to take care of such factors while bidding.

3.2. Payment

The payment under this item shall be made at the contract unit price shown in BOQ of compaction of (natural) ground measured as above and shall be deemed to include cost of scarification, ploughing, watering, mixing, leveling, rolling, labour, equipment, tools, and incidentals necessary to complete this item.

FORMATION OF EMBANKMENT

1. DESCRIPTION

This work shall consist of formation of embankment, including preparation of area for placing and compaction of embankment material in layers and in holes, pits and other depressions within the roadway area in accordance with the specifications and in conformity with the lines, grades, thickness and typical cross-section shown on the plans or established by the Engineer / Project Manager.

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 or A-4 soil as specified in AASHTO M-145 as per approval of the Engineer / Project Manager.

b). CBR of the material shall not be less than Five (05) percent or as stated on the drawings and 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. The 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.

c). In case sandy material is used for embankment formation, it shall be properly confined at no extra payment with a material and to the extent as approved by the Engineer / Project Manager and sandy material shall not be used on slopes of embankment.

d). In areas subject to flood and prolonged inundation of the embankment, such as at bridge sites and other roadway areas or lengths, the material used in embankment, unless rock, shall be AASHTO Class (a) A-1, (b) A-3 and (c) A-2-4 soils. Other soils may be used only with the written consent of Engineer / Project Manager.

3. CONSTRUCTION REQUIREMENTS

3.1. Formation of Embankment with Borrow 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 / Project Manager. The layers of loose material other than rock shall be not more than 20 cm. thick, unless otherwise allowed by the Engineer / Project Manager after a trial section is prepared and approved.

The material placed in layers and that scarified to the designated depth for formation of embankment shall be compacted to the density specified below:

Depth in centimeters below subgrade level	**Percent of Maximum Dry Density as determined by AASHTO T-180.***
0 to 30	95
30 to 75	93
Over 75	90

* Method 'B' or 'D' whichever is applicable or corresponding Relative Density in case of sand fill.

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 ¾" /19 mm sieve), the in-place density thus obtained shall be adjusted to account for such oversize particles or as directed by the

Engineer / Project Manager. Subsequent layers shall not be placed and compacted unless the previous layer has been properly compacted and accepted by the Engineer / Project Manager.

Material for embankment at locations inaccessible to normal compacting equipment shall be placed in horizontal layers of loose material not more than 15 centimeters thick and compacted to the densities specified above by the use of mechanical tempers, or other appropriate equipment.

The compaction of the embankment shall be carried out at the designated moisture content consistent with the available compacting equipment.

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 optimum moisture may not, without written approval of the Engineer / Project Manager, be incorporated in the embankment until it has been sufficiently dried out. The drying up of wet material may be expedited by scarification, disking 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 / Project Manager. 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 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 / Project Manager, and the finished work shall be left in a neat and acceptable condition.

3.2. Formation of Embankment with Rock Material

Embankment formed of material consisting predominantly of rock fragment of such size that the material cannot be placed in layers of the thickness prescribed without crushing, pulverizing or further breaking down the pieces, such material may be placed in layers not exceeding in thickness than the approximate average size of the rocks except that no layer shall exceed eighty
(80) centimeters of loose measurement and compacted by a vibratory roller with the minimum mass as shown in the following table.

Mass per meter width of vibrating roller (Kg/M)	Depth of fill layer (mm)	Number of passes of the roller on each layer
2300-2900	400	5
2900-3600	500	5
3600-4300	600	5
4300-5000	700	5
>5000	800	5

The material shall be carefully placed in layers, so that all larger stones will be well distributed and voids completely filled with smaller stones, clean small spells, shale, earth, sand, gravel, to form a solid mass. After placing rock material, surface shall be covered with a layer of fine material having thickness less than twenty (20) centimeters. Such fine material shall be reserved from roadway excavation by the Contractor. Should such material be available but not reserved, Contractor will supply and place borrow material for forming smooth grade without extra payment.

Each layer shall be bladed or leveled with motor grader, bulldozer or similar equipment capable of shifting and forming the layer into a neat and orderly condition. No rock larger than eight (8) centimeters in any dimension shall be placed in the top fifteen (15) centimeters of embankment unless otherwise allowed by the Engineer / Project Manager.

Material for each layer should be consolidated with heavy weight vibratory roller until settlement as checked between two consecutive passes of roller is less than one (1) percent of the layer thickness. In evaluation of settlement, survey points should be established and rolling continued until difference of levels as checked after two consecutive passes is less than one (1) percent of

the total layer thickness. More over initial rolling of overlaid fine material shall be done without watering to ensure their intrusion in voids of rock layer beneath. Watering shall be done when voids are properly filled.

Embankments, which are formed of material that contain rock but also contain sufficient compactable material other than rock or other hard material to make rolling feasible, shall be placed and compacted in the manner prescribed above and to the point when settlement is within above mentioned requirement. Compaction test will be made whenever the Engineer / Project Manager determines they are feasible and necessary. Each layer must be approved by the Engineer / Project Manager before the next layer is placed.

When rock to be incorporated in fill is composed largely of weak or friable material, the rock shall be reduced to a maximum size not exceeding fifty (50) percent of the thickness of the layer being place.

3.3. Formation of Embankment on Steep Slopes

Where embankments are to be constructed on steep slope, hill sides or where new fill is to be placed and compacted against existing pavement or where embankment is to be built along one half the width at a time, the original slope of the hill side, of existing pavement or adjacent to half width of embankment shall be cut in steps of twenty (20) centimeters depth.

Benching shall be of sufficient width to permit operation of equipment possible during placing and compaction of material.

Cut material shall be incorporated with the new embankment material and compacted in horizontal layers. No extra payment will be allowed for such an operation.

3.4. Formation of Embankment on Existing Roads

Before fill is placed and compacted on an existing roadway, the existing embankment and/or pavement may be leveled by cutting, rooting or scarifying by approved mechanical means to a level to be determined by the Engineer / Project Manager. The earth, old asphalt or other material arising as a result of this operation will be declared either suitable or unsuitable, for use in the embankment or other items by the Engineer / Project Manager. If the material is declared suitable it will be measured under relative item and if it is declared unsuitable, it will be measured separately.

3.5. Formation of Embankment in Water Logged Areas

Where embankments are to be placed in water logged areas and which are inaccessible to heavy construction equipment, a special working platform shall be first established, consisting of a blanket of fill material placed on top of the soft layer. The material of the working table shall consist of normal or processed granular fill, obtained from borrow excavation. This material shall conform to the following specifications:

Percentage of Sieve Description	**Weight Passing Mesh Sieve. AASHTO T -27**
3 inch (75 mm)	100

The remaining grading shall be such as to avoid intrusion into the working platform material of subgrade or natural ground surface material. For this condition to be met it will be required that the ratio.

$$\frac{D_{15}\text{ (Working Platform Material)}}{D_{85}\text{ (Natural Ground Material)}} \text{ s less than 5.}$$

D_{85} and D_{15} mean the particle diameters corresponding to 85% and 15%, respectively, passing (by weight) in a grain size analysis. Construction of this working table shall proceed from one edge of the soft area by using the fill as a ramp for further material transport.

The thickness of the working table as prescribed above shall be approximately 0.5 meter unless directed otherwise by the Engineer / Project Manager, and the width shall be that of the embankment. The placement

and compaction of the working table shall be carried out by use of light equipment or as directed by the Engineer / Project Manager.

No density requirements are specified for the working platform, however, subsequent layers above shall be compacted to the specified densities.

No additional cost shall be made against this work, cost of this work is deemed to be included in formation of embankment.

3.6. General Requirements

To avoid interference with the construction of bridge abutments and wing walls, the Contractor shall at points determined by the Engineer / Project Manager, suspend work on embankments and/or in cuts forming the approaches to any such structure until such time as the construction of the later is sufficiently advanced to permit the completion of the approaches without the risk of interference or damage to the bridge 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 bridges, culverts or pipe drainage, 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. Contractor shall make special arrangements to ensure proper compaction in restricted spaces and around structures. No compensation shall be made to the Contractor for working in narrow or otherwise restricted areas.

When as a result of settlement, an embankment requires the addition of material up to 30 cm 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 being placed without extra payment to Contractor 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 / Project Manager 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.

During construction, the roadway shall be kept in shape and drained out at all times. When unsuitable material has been placed in the embankment by the Contractor, he shall remove it without extra payment.

4. MEASUREMENT AND PAYMENT

4.1. Measurement

The quantities to be paid for shall as per BOQ, calculated on theoretical designed lines and grades and the original ground levels as defined in item and as established using Average End Area Method compacted in place, accepted by the Engineer / Project Manager formed with material resulting from:

a). Formation of Embankment from Borrow Excavation

Measurement shall be made as under:-

Formation from Borrow	=	Total Embankment Quantity (Calculated with reference to original ground level by Average End Area Method) (Minus) Roadway Excavation Quantity (Minus) Structural Excavation Quantity

b). Formation from Structural Excavation

This quantity shall be the same as calculated for structural excavation irrespective of its haulage distance except that declared unsuitable by the Engineer / Project Manager, which shall not be placed in Embankment and shall be disposed-off as per the direction of Engineer / Project Manager.

c). Formation from Roadway Excavation

This quantity shall be the same as calculated for Roadway Excavation except that declared unsuitable by the Engineer / Project Manager which shall not be placed in embankment and shall be disposed off as directed by the Engineer / Project Manager. The contractor will be supposed to use only declared suitable material from Roadway Excavation irrespective of haulage distance. However if contractor, for his own convenience, uses the material from borrow, the payment will still be made under this item.

In the measurement of "Formation of Embankment on steep slopes" no allowance will be made for the benching or volume of material cut out from the hill side or from the first half width fill to accommodate the compacting equipment but will be calculated only on the net volume of fill placed against the original hill sides, the old embankment or the first half width fill.

4.2. Payment

a) Formation from Borrow Excavation

The quantity to be paid for shall as per BOQ, placed in embankment, measured as provided above for material from borrow excavation and such a payment will be deemed to include cost of excavation, payment of royalty, levies and taxes of Local, Provincial and Federal Government, cost of hauling including all lead and lift, spreading, watering, rolling, labour, equipment, tools and incidental necessary to complete this item.

b) Formation from Structural Excavation

The quantity to be paid for shall be as per BOQ, placed in embankment irrespective of the haulage distance and measured as provided above for suitable material from structural excavation and such payment will be deemed to include cost of excavation, hauling, dumping, spreading, watering, rolling, labour, equipment, tools and incidentals necessary to complete this item.

c) Formation from Roadway Excavation

The quantity to be paid for shall be as per BOQ, placed in embankment irrespective of the haulage distance and measured as provided above for suitable material from roadway excavation and such payment will be deemed to include cost of excavation, hauling, dumping, spreading, watering, rolling, labour, equipment, tools and incidental necessary to complete this item.

GRANULAR SUBBASE

1. DESCRIPTION

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 / Project Manager.

2. MATERIAL REQUIREMENTS

Granular subbase material shall consist of natural or processed aggregates such as gravel, sand or stone fragment and shall be clean and free from dirt, 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 subbase. The material shall comply to the following grading and quality requirements:

a). The subbase material shall have a gradation curve within the limits of grading given below:

Grading Requirements for Subbase Material			
Sieve Designation		Mass Percent Passing Grading	
Mm	**Inch**	**A**	**B**
60.0	(2-½)	100	--
50.0	(2)	90-100	100
25.0	(1)	50-80	55-85
9.5	(3/8)	--	40-70
4.75	No.4	35-70	30-60
2.0	No.10	--	20-50
0.425	No.40	--	10-30
0.075	No.200	2-8	5-15

The Coefficient of Uniformity D60/D10 shall be not less than 3, where D60 and D10 are the particle diameters corresponding to 60% and 10%, respectively, passing (by weight) in a grain size analysis, curve.

b). The Material shall have a CBR value of at least 50%, determined according to AASHTO T - 193. The CBR value shall be obtained at a density corresponding to Ninety eight (98) percent of the maximum dry density determined according to AASHTO T –180 Method-D.

c). The coarse aggregate material retained on sieve No.4 shall have a percentage of wear by the Los Angeles Abrasion (AASHTO T -96) of not more than 40%.

d). In order to avoid intrusion of silty and clayey material from the subgrade in the subbase, the ratio D15 (Subbase)/D85 (Subgrade) should be less than 5.

Where D85 and D15 are the particle diameters corresponding to eighty five (85) % and fifteen (15) %, respectively passing (by weight) in a grain size analysis curve.

e). The fraction passing the 0.075 mm (No.200) sieve shall not be greater than two third of the fraction passing the 0.425 mm (No. 40) sieve. The fraction passing the 0.425 mm sieve shall have a liquid limit of not greater than 25 and a plasticity index of 6 or less.

f). If over-size is encountered, screening of material at source shall invariably be done, no hand picking shall be allowed, however hand picking may be allowed by the Engineer / Project Manager, if over-size quantity is less than 5% of the total mass.

g). Sand equivalent for all classes shall be 25 min.

3. CONSTRUCTION REQUIREMENTS

3.1 Spreading

Granular subbase shall be spread on approved subgrade layer 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 roadbed or shoulders in a quantity which will provide the required compacted thickness without resorting to spotting, picking up or otherwise shifting the subbase material. In case any material is to be added to compensate for levels, the same shall be done after scarifying the existing material, to ensure proper bonding of additional material.

Where the required thickness is fifteen (15) cm or less, the aggregates may be spread and compacted as one layer, but in no case shall a layer be less than seven and one half (7.5) centimeters thick. Where the required thickness is more than 15 cm, the aggregates shall be spread and compacted in 2 or more layers of approximately equal thickness, but in any case the maximum compacted thickness of one layer shall not exceed 15 cm. 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 "Table for Allowable Tolerances" in these specifications. No hauling or placement of material will be permitted when, in the judgment of the Engineer / Project Manager, the weather or road conditions are such that the hauling operation will cause cutting or rutting of subgrade or contamination of sub base material.

3.2 Compaction Trials

Prior to commencement of granular subbase operation, contractor shall construct a trial length, not to exceed, five hundred (500) meters and not less than two hundred (200) meters with the approved subbase material as will be used during construction to determine the adequacy of the contractor's equipment, loose depth measurement necessary to result in the specified compacted layer depths, the field moisture content, and the relationship between the number of compaction passes and the resulting density of the material.

3.3 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 specified compaction.

The subbase material shall be compacted by means of approved vibrating rollers or steel wheel rollers (rubber type 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 free from ruts or ridges and having proper section and crown. Rolling shall continue until entire thickness of each layer is thoroughly and uniformly compacted to the specified density.

Any area inaccessible to rolling equipment shall be compacted by means of hand guided rollers, plate compactors or mechanical tampers, where the thickness in loose layer shall not be more than 10 cm.

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 succeeding layer of the pavement structure is constructed.

Immediately prior to the placing of first layer of base course the subbase layer (both under the travelled way and the shoulders) shall conform to the required level and shape. Prior to placing the succeeding layers of the material, the top surface of each layer shall be made sufficiently moist to ensure bond between the layers. The edges or edge slopes shall be bladed or otherwise dressed to conform to the lines and dimensions shown on the plans.

No material for construction of the base shall be placed until the subbase has been approved by the Engineer / Project Manager.

3.4 Compaction requirements

The relative compaction of each layer of the compacted subbase shall not be less than Ninety Eight (98) percent 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 19 mm sieve) as directed by the Engineer / Project Manager. Also for adjustment of any material retained on 4.75 mm sieve, AASHTO Method T -224 shall be used.

3.5 Moisture Content Determination

As It is customary in the project laboratories that small samples of materials are placed in ovens for moisture determination for proctor following precautions are necessary to ensure proper compaction results.

a). Same size of sample is placed in oven for moisture determination in case of laboratory density (modified proctor) and field density.

b). Moisture content for calculation of field density and proctor shall be observed on material passing 4.75 mm sieve.

3.6 Tolerance

The subbase shall be compacted to the desired level and cross slopes as shown on the drawings. The allowable tolerance shall be according to the "Table for Allowable Tolerances" in NHA specifications.

4. MEASUREMENT AND PAYMENT

4.1 Measurement

The quantity of subbase to be paid for shall be measured by the theoretical volume in place as shown on the drawings or as directed and approved for construction by the Engineer / Project Manager, placed and accepted in the completed granular subbase course. No allowance will be given for materials placed outside the theoretical limits as shown on the cross-sections.

4.2 Payment

The accepted quantities measured as provided above shall be for the Pay Item shown in the Bill of Quantities, which price and payment shall constitute full compensation for furnishing all materials, hauling, placing, watering, rolling, labour, equipment, tools and incidentals necessary to complete the item.

PLAIN & REINFORCED CONCRETE

1. SCOPE OF WORK

The work to be done under this section of the specifications shall consist of furnishing all plant, labour, equipment, appliances and materials and in performing all operations in connection with providing and placing plain and reinforced cement concrete, in position as shown on the drawings including furnishing formwork, batching, mixing, finishing and curing as per drawings or as directed by the Engineer / Project Manager.

2. CLASSES OF CONCRETE

The classes of concrete recognized in these specifications shall be designated: A, B, C, D1, D2, D3, Y and Lean concrete. The class of concrete to be used shall be as called for on the Drawings or as directed by the Engineer / Project Manager or specified in the special provisions. The following requirements shall govern unless otherwise shown on the Drawings.

Class A1 concrete shall be used everywhere, for non-reinforced and reinforced concrete structures, except as-noted below or directed by the Engineer / Project Manager. Concrete placed underwater shall be Class A2 with a minimum cement content of three hundred fifty (350) kg per cubic meter of concrete with a slump between ten (10) and fifteen (15) cm. Concrete placed for piles shall be Class A3 with a minimum content of four hundred (400) kg per cubic meter. Water retaining structures shall be Class A4 with a minimum content of four hundred (425) kg per cubic meter.

Class B Concretes shall be used only where specified.

Class C concretes shall be used for cribbing, or as otherwise directed by the Engineer / Project Manager or specified in the Special Provision or on the Drawing.

Class D1, D2 or D3, concrete shall be used for reinforced, pre-stressed and post-tensioned members (elements), as indicated on drawings.

Class Y concrete shall be used as a filler in steel grid bridge floors, in thin reinforced sections or as otherwise specified in the Special Provisions.

Lean concrete shall be used in thin layers underneath footings and when called for on the Drawings or directed by the Engineer / Project Manager. The concrete of the various classes shall satisfy the requirements shown in Table - 1.

Table - 1 ** - Requirements of concrete of various classes

CLASS	MIN. CEMENT VOLUME	MAX. COARSE AGGREGATE SIZE	28 DAY COMPRESSIVE STRENGTH (fc')	CONSISTENCY (RANGE IN SLUMP) VIBRATED	MAX. WATER CEMENT (w/c) RATIO
	kg/m3 (lbs/ft3)	mm (in)	kg/cm2 (psi)	mm (in)	
A1	300 kg/m3 (18.72 lb/ft3)	20 mm (0.8 inch)	210 kg/cm2 (3000 psi)	25-75 (1-3)	0.58
A2	350 kg/m3 (21.84 lb/ft3)	25 mm (1 inch)	245 kg/cm2 (3500 psi)	100-150 (4-6)	0.58
A3	400 kg/m3 (24.96 lb/ft3)	38 mm (1.5 inch)	280 kg/cm2 (4000 psi)	100-150 (4-6)	0.58
A4	425 kg/m3 (26.53 lb/ft3)	38 mm (1.5 inch)	316 kg/cm2 (4500 psi)	25-75 (1-3)	0.55
B	250 kg/m3 (15.6 lb/ft3)	51 mm (2 inch)	170 kg/cm2 (2500 psi)	25-75 (1-3)	0.65
C	275 kg/m3 (17.16 lb/ft3)	38 mm (1.5 inch)	210 kg/cm2 (3000 psi)	25-75 (1-3)	0.58
D1	450 kg/m3 (28.8 lb/ft3)	25 mm (1 inch)	350 kg/cm2 (5000 psi)	50-100 (2-4)	0.4
D2	50 kg/m3 (3.12 lb/ft3)	25 mm (1 inch)	425 kg/cm2 (6000 psi)	50-100 (2-4)	0.4
D3	550 kg/m3 (34.32 lb/ft3)	25 mm (1 inch)	500 kg/cm2 (7000 psi)	50-100 (2-4)	0.4
Y	400 kg/m3 (24.96 lb/ft3)	13 mm (0.5 inch)	210 kg/cm2 (3000 psi)	25-75 (1-3)	0.58
LEAN	175 kg/m3 (10.92 lb/ft3)	51 mm (2 inch)	100 kg/cm2 (1500 psi)	-	-

** Note:- For all concrete works the above mentioned table shall govern.

2.1. Types of Concrete Works

2.1.1 Underground Concrete

Concrete poured below Natural Surface Level with or without shuttering and shoring.

2.1.2 On-ground Concrete

Concrete poured by exiting formwork with necessary bracings on ground.

2.1.3 Elevated Concrete

Concrete poured by existing props, bracing and towers to support the formwork at higher levels.

3. EFFECT OF MATERIALS STRENGTH

The cement and aggregate used have significant influence on strength properties. The use of unsound aggregates will produce large variations in the strength of concrete. In general, however, a good aggregate will develop the full strength of the cementing matrix and therefore should cause little variation in the product. Strength is increases slightly with larger size coarse aggregates.

4. MATERIALS

4.1 Cement

i). The cement shall be fresh and of approved origin and manufacture, it shall be one of the following as may be specified by the Engineer / Project Manager.

a). Ordinary Portland Cement (OPC) shall comply with ASTM C150, Standard Specification for Portland Cement.

b). Rapid Hardening Hydraulic Cement (RHHC) shall comply with ASTM C1600, Standard Specification for Rapid Hardening Hydraulic Cement.

c). Sulphate-Resisting Portland Cement (SRPC) shall comply with ASTM C150, Standard Specification for Portland Cement.

ii). Mill Certificates shall accompany delivery of the material to the work.

iii). There shall be sufficient cement on site to ensure that each section of work is completed without interruption..

iv). Cement reclaimed from cleaning of bags or from leaky containers shall not be used.

v). The Contractor shall provide and erect (at his cost) in a suitable place dry, well ventilated, weather-proof and waterproof shed of sufficient capacity to store the cement.

vi). The cement shall be used as soon as possible after delivery and cement which has become stale or unsuitable through absorption of moisture from the atmosphere or otherwise shall be rejected and removed immediately from the site at the Contractor's expense. Any cement in containers damaged so as to allow the contents to spill or access of the atmosphere to the cement prior to opening at the time of concrete mixing shall be rejected and removed immediately from the site at the Contractor's expenses.

vii). Cement stored through a monsoon or for more than six months should not be used in reinforced concrete.

viii). Different brand or different types of cement from the same mill, or the same brand or type from differing mills shall not be mixed or used alternately in the same item of construction unless authorized by the Engineer / Project Manager, after preparing new mix designation.

4.2 Water

Water shall comply with ASTM C1602 - Standard Specification for Mixing Water Used in Production of Hydraulic Cement Concrete.

The water for curing, for washing aggregates and for mixing shall be fresh, clean, clear, potable and free from impurities & deleterious matter. Water containing less than 2000 parts per million (ppm) of total dissolved solids with following limits on contaminants, recommended to be used for concrete.

Contaminants	Conventional Reinforced Concrete	Pre-stressed Concrete	Non-reinforced Concrete
OIL	None	None	None
CHLORIDES, ppm	1,000	650	2,000
SULPHATES, ppm	1,000	800	1,500

In no case shall the water contain an amount of imparities that will cause arrange in the setting time of Portland cement of more than twenty five (25) percent nor a reduction in the compressive strength of mortar at fourteen (14) days of more than five (5) percent when compared to the result obtained with distilled water.

In addition to the above requirements, water for curing concrete shall not be contain any impurities in a sufficient amount to cause discoloration of the concrete or produce etching of the surface.

When required by the Engineer / Project Manager, the quality of the mixing water shall be processed by the standard method of test for quality of water to be used in concrete.

5. AGGREGATES

a) The quality and sources of all aggregates for concrete shall be approved by the Engineer / Project Manager before the materials are delivered to the site. Aggregates shall be obtained from a source known to produce aggregates satisfactory for concrete and shall be chemically inert, strong, hard, durable of limited porosity and free from adhering coatings, clay lumps, coal and coal residues, and organic or other impurities that may cause corrosion of the reinforcement or may impair the strength or durability of the concrete.

b) Wherever feasible the nominal maximum size of aggregate for cast-in-place reinforced concrete slabs and other thin members shall also be 20mm (¾"). If there are difficulties in placing such a concrete the maximum size may be restricted to 12mm (½") provided the requirements for strength are satisfied.

c) The nominal maximum size of the aggregate for precise concrete shall not be large than one- fifth of the narrowest dimension between sides of forms, one-third of the depth of slabs, nor three-fourths of the minimum clear distance between reinforcing bars or between bars and forms, whichever is least. In precast columns the nominal maximum size of the aggregate shall be limited as above but shall not be larger than two-thirds of the minimum clear distance between bars.

d) Storage

All aggregates shall be stored on properly constructed paving and bins or as directed by the Engineer / Project Manager. There shall be a physical partition between the stockpiles of coarse and fine aggregates. If required aggregates shall be washed and screened to the satisfaction of the Engineer / Project Manager.

e) Sieve Analysis

Sieve analysis of all the aggregates to be used in the works shall be carried out as and when required by the Engineer / Project Manager. All aggregates shall be subject to the approval of the Engineer / Project Manager.

f) Rejected Aggregates

Any aggregates not found to be of the specified standard shall be rejected by the Engineer / Project Manager and all such rejected material shall have to be removed from site without delay.

Concrete structures constructed with rejected aggregates shall be dismantled and rebuilt at the Contractor's expense.

5.1 Fine Aggregates

The Fine Aggregates shall comply with ASTMC-033 – Standard Specifications for Concrete Aggregates and AASHTO M-6.

Fine-Aggregate Grading Limits - (ASTM C 33/AASHTO M 6) Sieve

size	**Percent passing by mass**
9.5 mm (3⁄8 in.)	100
4.75 mm (No. 4, 3/16 in.)	95 to 100
2.36 mm (No. 8)	80 to 100
1.18 mm (No. 16)	50 to 85
600 µm (No. 30)	25 to 60
300 µm (No. 50)	5 to 30 (AASHTO 10 to 30)
150 µm (No. 100)	0 to 10 (AASHTO 2 to 10)

Other requirements of ASTM C 33 (AASTHO M 6) are:

1. The fine aggregate must not have more than 45% retained between any two consecutive standard sieves.

2. The fineness modulus must be not less than 2.3 nor more than 3.1, nor vary more than 0.2 from the typical value of the aggregate source. If this value is exceeded, the fine aggregate should be rejected unless suitable adjustments are made in proportions of fine and coarse aggregate.

5.2 Coarse Aggregate

The Coarse Aggregates shall comply with ASTMC-033 – Standard Specifications for Concrete Aggregates and AASHTO M-80.

The coarse aggregate grading requirements of ASTM C 33 (AASHTO M 80) permit a wide range in grading and a variety of grading sizes as shown in the Table below.

Table - Grading Requirements for Coarse Aggregates (ASTM C 33 and AASHTO M 80)

Size number	Nominal size, sieves with square openings	Amounts finer than each laboratory sieve, mass percent passing				
		100 mm (4 in.)	90 mm (3 ½ in.)	75 mm (3 in.)	63 mm (2 ½ in.)	50 mm (2 in.)
1	90 to 37.5mm (3½ to 1½ in.)	100	90 to 100	-	25 to 60	-
2	63 to 37.5mm (2½ to 1½ in.)	-	-	100	90 to 100	35 to 70
3	50 to 25.0mm (2 to 1 in.)	-	-	-	100	90 to 100
357	50 to 4.75mm (2 in. to No. 4)	-	-	-	100	90 to 100
4	37.5 to 19.0mm (1½ to ¾ in.)	-	-	-	-	100
467	37.5 to 4.75mm (1½ in. to No. 4)	-	-	-	-	100
5	25.0 to 12.5mm (1 to ½ in.)	-	-	-	-	-
56	25.0 to 9.5mm (1 to 3/8 in.)	-	-	-	-	-
57	25.0 to 4.75mm (1 in. to No. 4)	-	-	-	-	-
6	19.0 to 9.5mm (¾ to 3/8 in.)	-	-	-	-	-
67	19.0 to 4.75mm (¾ in. to No. 4)	-	-	-	-	-
7	12.5 to 4.75mm (½ in. to No. 4)	-	-	-	-	-
8	9.5 to 2.36mm (3/8 in. to No.8)	-	-	-	-	-

The maximum size of aggregate that can be used generally depends on the size and shape of the concrete member and the amount and distribution of reinforcing steel. The maximum size of aggregate particles generally should not exceed the values shown in the Table below.

Size number	Nominal size, sieves with square openings	37.5mm (1½ in.)	25.0mm (1 in.)	19.0mm (¾ in.)	12.5mm (½ in.)	9.5mm (⅜ in.)	4.75mm (No. 4)	2.36mm (No. 8)	1.18mm (No. 16)
1	90 to 37.5 mm (3½ to 1½ in.)	0 to 15	-	0 to 5	-	-	-		-
2	63 to 37.5 mm (2½ to 1½ in.)	0 to 15	-	0 to 5	-	-	-		-
3	50 to 25.0mm (2 to 1 in.)	35 to 70	0 to 15	-	0 to 5	-	-		-
357	50 to 4.75mm (2 in. to No.4)	-	35 to 70	-	10 to 30	-	0 to 5		-
467	37.5 to 4.75mm (1 ½ in. to No. 4)	95 to 100	-	35 to 70	-	10 to 30	0 to 5		-
5	25.0 to 12.5mm (1 to ½ in.)	100	90 to 100	20 to 55	0 to 10	0 to 5	-		-
56	25.0 to 9.5mm (1 to 3/8 in.)	100	90 to 100	40 to 85	10 to 40	0 to 5	0 to 5		-
57	25.0 to 4.75mm (1 in. to No.4)	100	95 to 100	-	25 to 60	-	0 to 10		-
6	19.0 to 9.5mm (¾ to 3/8 in.)	-	100	90 to 100	20 to 55	0 to 15	0 to 5		-
67	19.0 to 4.75 mm (¾ in. to No.4)	-	100	90 to 100	-	25 to 55	0 to 10	0 to 5	-
7	12.5 to 4.75mm (½ in. to No.4)	-	-	100	90 to 100	40 to 70	0 to 15	0 to 5	-
8	9.5 to 2.36mm (3/8 in. to No. 8)	-	-	-	100	85 to 100	10 to 30	0 to 10	0 to 5

6. COMPOSITION OF CONCRETE

a) Cement and Aggregates

The fine aggregate and the coarse aggregates shall be measured separately by weight. The proportions weight of cement to fine aggregate and coarse aggregate shall be determined by mix design approved by the Engineer / Project Manager. The Contractor shall propose mix designs duly supported by cube tests for each grade of concrete for the approval of the Engineer / Project Manager.

b) Water Cement ratio

The quality of water used shall be just sufficient to produce a dense concrete of adequate strength and workability for its purpose. For all external if work and foundations the water / cement (W/C) ratio shall not exceed **0.55**.

c) Workability

The workability shall be controlled by direct measurement of the water content, allowance being made for any water in the fine and coarse aggregates. The concrete shall be just sufficiently workable to be placed and compacted, without difficulty, by the means available.

The workability shall be determined by either the slump tests as directed by the Engineer / Project Manager and these shall be performed in accordance with the methods given in **ASTM C143** ***"Standard Test Method for Slump of Hydraulic-Cement Concrete"***. The slump for each grade of concrete shall be determined during the Preliminary Test mixes and the value obtained shall not be modified without the written consent of the Engineer / Project Manager. Unless otherwise permitted or specified, the concrete shall be pro- portioned and produced to have a slump of 75 mm or less if consolidation is to be done by vibration, and 125mm or less if consolidation is to be by methods other than vibration. A tolerance of upto 25mm above the indicated maximum shall be allowed for individual batches provided the average for all batches or the most recent 10 batches tested, whichever is fewer, does not exceed the maximum limit, Concrete of lower than usual slump may be used provided it is properly placed and consolidated.

7. ADMIXTURES/ PLASTICIZERS/ FIBERS

Admixtures shall only be allowed to be used with written permission of the Engineer / Project Manager. If air-entraining agents, water reducing agents, set retarders or strength accelerators are permitted, the dosage of fiber shall be determined after consideration of the dosage recommended by the manufacturer.

Polypropylene Fibers (PPF) shall be allowed to be used with written permission of the Engineer / Project Manager. The dosage of fiber shall be determined after consideration of the dosage recommended by the manufacturer.

For water proofing (mitigation of water penetration) of concrete, admixtures may be used. These additives shall be lignosulphonate polymer based water proofing cum plasticizing admixtures. The product must be free of chlorides and shall have a specific gravity not less than 1.17 and shall comply with **ASTM C-494 Type A & D.**

The Contractor shall submit concrete mix design for approval, prior to the commencement of work. No work shall be carried out without getting written approval of concrete Design Mix from the Engineer / Project Manager.

8. FORMWORK

a. General

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

- Earth cuts shall not be used as forms for vertical surface of reinforced concrete work unless required or permitted.

- Mud centering shall not be permitted.

- Formwork shall be of **wrought timber**, steel, plywood, proprietary building boards which gives the required finish to the surface of concrete. Wooden formwork shall be free from loose knots and shall be well seasoned.

- The formwork shall conform to the shape, line and dimension as shown on the plans and be so constructed as to remain sufficiently rigid during the placing and compacting of the concrete and shall be sufficiently tight to prevent loss of liquid from the concrete.

  The design and engineering of the formwork as well as its construction shall be the responsibility of the contractor. Where necessary to maintain the specified tolerances the formwork shall be cambered to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete and due to construction loads. Design of formwork shall, in general, conform to ACI 347-68.

  In normal circumstances (General where temperatures are above 20^{o}C (68^{o}F)) and where ordinary cement is used forms may be struck after expiry of the following periods:

Concrete work	Period
Walls, columns and vertical sides of beams	48 hours or as may be decided by the Engineer / Project Manager.
Slabs (shores or props left under)	6 days
Beams soffits (shores or pros left under)	12 days
Removal of shores or props to slabs: i). Spanning upto 14 ft ii). Spanning above 14 ft.	 10 days 16 days
Removal of shores or props to beams: i). Spanning upto 20 ft ii). Spanning above 20 ft.	 18 days 25 days

  For rapid hardening cement 3/7 of the above period will be sufficient in all cases except vertical sides of slabs beams and columns which should be retained for minimum 24 hours.

b. Making Forms

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

c. Rigid with Allowance for Camber and Bulges

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

d. Materials and Labour

The Contractor shall supply all materials and labour, necessary for a good and speedily erection of form work such as shuttering, planks, struts, bolts, stays, gangways, boards, fillets etc. and shall do all that is essential in executing the job in a workman like manner to the satisfaction of the Engineer / Project Manager.

e. Form work not to interfere or injure work

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

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

f. Joints in Formwork

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

g. Treatment and Inspection of Forms

All rubbish particularly chipping, shavings and saw dust etc. shall be removed from the interior of the forms, immediately before placing concrete. Forms shall be coated with approved mould oil before reinforcement is placed. Surplus oil on forms and any oil on reinforcing steel shall be removed.

h. Removal of Shuttering

No struts or timbering which serve the purpose of supporting the shuttering or centering shall be struck and removed before the minimum periods for the main classes of work given as under:

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

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

i. Injury or damage

The Contractor shall be responsible for any injury to the work and any consequential damages caused by or arising from the removal and striking of forms, centering and supports, and any advice, permission or approval given by the Engineer / Project Manager or his Authorized Representative, related to the removal and striking of forms, centering and supports shall not relieve the Contractor from the responsibilities herein defined.

j. Treatment after Removal of Forms

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

k. Form work shall not be measured or paid for separately and shall be deemed to be included in the unit price of concrete whether cast-in-situ or precast and subsequently fixed in position.

9. BATCHING OF CONCRETE

The Contractor shall provide such means and equipment as are required to determine accurately control the amount of each separate ingredient entering the concrete. Such means, the equipment and its operation shall at all times be subject to approval by the Engineer / Project Manager. The amount of cement, water, sand and each size of coarse aggregate entering each batch of concrete shall be determined by weighing or by volumetric measurement if permitted by the Engineer / Project Manager.

10. MIXING CONCRETE

10.1. Mixings General

The concrete shall be mixed only in the quantity required for immediate use. Concrete that has developed an initial set shall be rejected.

Concrete shall be thoroughly mixed in a mixer of an approved size and type that will ensure a uniform distribution of the materials throughout the mass.

All concrete shall be mixed in mechanically operated mixers. Mixing plant and equipment for transporting and placing concrete should be arranged with an ample auxiliary installation to provide a minimum supply of concrete in case of breakdown of machinery or in case the normal supply of concrete should be disrupted. The auxiliary supply of concrete shall be sufficient to complete the casting of a section up to a construction joint.

Equipment having components made of aluminum or magnesium alloys, which would have contacted with plastic concrete during mixing, transporting or pumping of Portland cement concrete, shall not be used.

Concrete mixers shall be equipped with adequate water storage and a device for accurately measuring and automatically controlling the quantity of water used.

Materials shall be measured by weighing except as otherwise specified or where other methods are specifically authorized by the Engineer / Project Manager. The apparatus provided for weighing the aggregates and cement shall ensure accurate measurement of each ingredient.

The accuracy of all weighing devices except that for water shall be such that successive quantities can be measured to within one (1) percent of the desired value. Cement in standard packages (bags) approved by the Engineer / Project Manager need not be weighed. The water measuring device shall be accurate to plus or minus half percent ± 0.50%. All measuring devices shall be subject to the approval of the Engineer / Project Manager. Scales and measuring devices shall be tested at the expense of the Contractor as frequently as the Engineer / Project Manager may deem necessary to ensure their accuracy.

Weighing equipment shall be isolated so that vibration or movement of other operating equipment do not affect the accuracy of reading. When the entire plant is running, the scale reading at cut-off shall not vary from the weight designated by the Engineer / Project Manager more than one (1) percent for cement, one and half (1½) percent for any size of aggregate or one (1) percent for the total aggregates in any batch. Where volumetric measurements are authorized by the Engineer / Project Manager the weight proportion shall be converted to equivalent volumetric proportions. In such cases, suitable allowances shall be made for variations in the moisture condition of the aggregates, including the bulking effect in the fine aggregates. Boxes or similar containers of the exact volume required shall be filled and struck off. Measurement by wheel barrow volumes will not be permitted.

10.2. Mixing at Site

Concrete mixers may be of the revolving drum or the revolving blade type and the mixing drum or blades shall be operated uniformly at the mixing speed recommended by the manufacturer. The pick-up and throw-over blades of mixer shall be restored or replaced when any part or sections is worn two and half (2.5) cms. or below than the original height of the manufacturer's design. Mixers and agitators, which have an accumulation of hard concrete or mortar, shall not be used.

When bulk cement is used and volume of the batch is one cubic meter or more, the scale and weigh hopper for Portland cement shall be separate and distinct from the aggregate hopper or hoppers. The discharge mechanism of bulk cement weigh hopper shall be interlocked against opening before the full amount of cement is in the hopper. The discharging mechanism shall also be interlocked against opening when the amount of cement in the hopper is underweight by more than one percent or overweight by more than three (3) percent of the amount specified

When the aggregates contain more water than the quantity necessary to produce a saturated surface-dry condition, representative samples shall be taken and the moisture content determined for each kind of aggregate.

The temperature of mixed concrete immediately before placing, shall be **not more than thirty two (32) degree C**. Aggregates and water shall be cooled as necessary to produce concrete within this temperatures limit. If ice is used to cool the concrete, discharge of the mixer will not be permitted until all ice is melted.

The batch shall be so charged into the mixer that some water will enter in advance of cement and aggregates. All water shall be in the drum by the end of the first quarter of the specified mixing time.

Cement shall be batched and charged into the mixer by means that will not result in loss due to the effect of wind, or in accumulation of cement on surfaces of conveyors or hoppers, or in other conditions which reduce or vary the required quantity of cement in the concrete mixture.

The entire contents of a batch mixer shall be removed from the drum before materials for a succeeding batch are placed therein. The materials composing a batch except water shall be deposited simultaneously into the mixer.

All concrete shall be mixed for a period of not less than one and half (1½) minutes after all materials, including water, are in the mixer. During the period of mixing, the mixer shall operate at the speed for which it has been designed.

Mixers shall be operated with an automatic timing device that can be locked by the Engineer / Project Manager. The time device and discharge mechanism shall be so interlocked that during normal operation no part of the batch will be discharged until the specified mixing time has elapsed. In case of failure of the timing device, the Contractor will be permitted to operate while it is being repaired, provided he furnishes an approved timepiece equipped with minute and second hands. lf the timing device is not repaired within twenty four (24)

hours, further use of the mixer will be prohibited until repairs are made.

The first batch of concrete material placed in the mixer shall contain cement, sand and water in excess to the requirement of mix, to ensure that the drum does not extract mortar from the mix changing its design characteristics. When mixing is to stop for a period of one hour or more, the mixer shall be thoroughly cleaned.

10.3. Plant Mixing

At central mixing plant, batches shall be discharged from the weighing hopper into the mixer either directly by gravity or by an elevating container large enough to contain the batch. The plant shall be arranged to ensure that there is no loss of cement during transfer from weighing hopper to the mixer drum. The mixing time shall neither be less than fifty (50) second, nor more than ninety (90) seconds.

The plasticizer, accelerator or retarder or water reducing admixture, if required, shall be fed separately at the rate recommended by the manufacturer, as established by laboratory trials.

10.4. Partial Mixing at the Central Plan

When a truck mixer, or an agitator provided with adequate mixing blades, is used for transportation the mixing time at the stationary plant mixer may be reduced to thirty (30) seconds and the mixing completed in a truck mixer/agitator. The mixing time in the truck mixer or agitator equipped with adequate mixing blades shall be as specified for truck mixing.

10.5. Stiff Concrete Mix

For mixing concrete of zero slump to be laid by pavers, gravity mixer shall not be used. Only force mixer of moving blades shall be allowed to ensure homogenous mix.

10.6. Hand Mixing

Hand mixing of materials shall not be allowed in any case.

11. CONSOLIDATION

a). All concrete shall be consolidated by vibration, spading, rodding or forking so that the concrete is thoroughly worked around the reinforcement, around embedded items and into corners of forms, eliminating all air or stone packets which may cause honey-combing, pitting or planes of weakness. Internal vibrators shall have a minimum frequency of 8000 vibrations per min. and sufficient amplitude to consolidate the concrete effectively. They shall be operated by competent workmen, use of vibrators to transport concrete with forms shall not be allowed. Vibrators shall be inserted and withdrawn at points approximately 450mm (18") apart. At each insertion, the duration shall be sufficient to consolidate the concrete but not sufficient to cause segregation, generally from 5 to 15 seconds. A spare vibrator shall be kept on the job site during all concrete placing operations.

b). Over-vibration or vibration of very wet mixes is harmful and should be avoided.

12. HAULING & DELIVERY OF MIXED CONCRETE

12.1. Hauling

Mixed concrete may be transported to the delivery point in truck agitators or truck mixers operating at the speed designated by the manufacturer, provided the consistency and workability of the mixed concrete upon discharge at the delivery point is suitable for adequate placement and consolidation in place.

Truck agitators shall be loaded not to exceed the manufacturer's rated capacity. They shall maintain the mixed concrete in a thoroughly mixed and uniform mass during hauling.

Bodies of non-agitating hauling equipment shall be so constructed that leakage of the concrete mix, or any part thereof, will not occur at any time, and they shall be self-cleaning during discharge.

For zero slump concrete to be laid be paver, concrete will be allowed to be hauled in open trucks. However concrete hauled in open-top vehicles shall be protected during hauling against rain or exposure to the sun for more than twenty (20) minutes when the ambient temperature exceeds twenty five (25) degree C.

No additional water shall be incorporated in to the concrete during hauling or after arrival at the delivery point.

The rate of discharge of mixed concrete from truck mixer agitators shall be controlled by the speed of rotation of the drum in the discharge direction with the discharge gate fully open.

When a truck mixer or agitator is used for transporting concrete to the delivery point, discharge shall be completed within one hour, or before two hundred fifty (250) revolutions of the drum or blades, whichever comes first, after the introduction of cement to the aggregates. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is thirty (30) degree c or above, a time less than one hour will be required except when retarder is used in which case it shall be one (1) hour.

When non-agitating hauling equipment is used for transporting concrete to the delivery point, discharge shall be completed within one hour after the addition of the cement to the aggregates. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is thirty (30) degree C or above, the time between the introduction of cement to the aggregates and discharge shall not exceed forty five (45) minutes.

12.2. Delivery

The organization supplying concrete shall have sufficient plant capacity and Transportation vehicles to ensure continuous delivery at the rate required. The rate of the delivery of concrete during concreting operations shall be such as to provide for the proper handling, placing, and finishing of the concrete. The rate shall be such that the interval between batches shall not exceed twenty (20) minutes. The methods of delivering and handling the concrete shall be such as will facilitate placing with the minimum re-handling and without damage to the structure of the concrete.

12.3. Re-tempering

The concrete shall be mixed only in such quantities as are required for immediate use and any concrete that has developed initial set shall not be used. Concrete that has partially hardened shall not be re-tempered or remixed.

13. HANDLING AND PLACING CONCRETE

13.1. General

In preparation for the placing of concrete all saw dust, chips and other construction debris and extraneous matter shall be removed from inside the formwork, and struts, stays and braces serving temporarily to hold the forms in correct shape and alignment, pending the placing of concrete at their locations, shall be removed when the concrete placing has reached an elevation rendering their services unnecessary. These temporary members shall be entirely removed from the forms and not buried in the concrete.

No concrete shall be used that does not reach its final position in the forms within the time stipulated above under item "Hauling and Delivery of Mixed Concrete".

Concrete shall be placed so as to avoid segregation of the materials and the displacement of the reinforcement. The use of long troughs, chutes and pipes for conveying concrete to the forms shall be permitted only on written authorization of the Engineer / Project Manager. In any case the Engineer / Project Manager will reject the use of equipment for concrete transportation that will allow segregation loss of fines, or in any other way will have a deteriorating effect on the concrete quality.

Open troughs and chutes shall be of metal or metal lined; where steep slopes are required the chutes shall be equipped with baffles or be in short lengths that reverse the direction of movement.

All chutes, troughs and pipes shall be kept clean and free from coatings of hardened concrete by thoroughly flushing with water after each run; water used for flushing shall be discharged clear off the structure.

When placing operations would involve dropping the concrete more than one and half (1½) meters, it shall be conveyed through sheet metal or other approved pipes. As far as practicable the pipe shall be kept buried in the newly placed concrete. After initial set of the concrete the forms shall not be jarred and no loading of any kind shall be placed on the ends of projecting reinforcement bars.

The concrete shall be placed as nearly as possible to its final position and the use of vibrators for extensive shifting of the mass of fresh concrete will not be permitted.

13.2. Pneumatic Placing

Pneumatic placing of concrete will be permitted only if authorized by the Engineer / Project Manager. The equipment shall be so arranged that no vibration will occur that might damage freshly placed concrete.

Where concrete is conveyed and placed by pneumatic means, the equipment shall be suitable in kind and adequate in capacity for the work.

The machines hall be located as close as practicable to the work. The discharge lines shall be horizontal or inclined upwards from the machine. At the conclusion of placing the concrete, the entire equipment shall be thoroughly cleaned.

13.3. Pumping

The placing of concrete by pumping will be permitted only if specified in the Special Provisions or if authorized by the Engineer / Project Manager. The equipment shall be so arranged that no vibration will occur that might damage freshly placed concrete.

Where concrete is conveyed and placed by mechanically applied pressure the equipment shall be suitable in kind and adequate in capacity for the work. The operation of the pump shall be such that a continuous stream of concrete without air pockets is obtained. When pumping is completed the concrete remaining in the pipeline if it is to be used, shall be ejected in such a manner that
there will be no contamination of the concrete or separation of the ingredients. After this operation, the entire equipment shall be thoroughly cleaned.

13.4. Placing Concrete Under Water

Concretes hall not be placed under water except where inevitable in which case approval must be sought from the Engineer / Project Manager and the work carried out under his immediate supervision. In this case the method of placing shall be as hereinafter specified.

Concrete deposited under water shall be Class A concrete with a minimum cement content of three hundred fifty (350) Kg per cubic meter of concrete.

The slump of concrete shall be maintained between ten (10) and fifteen (15) cm. To prevent segregation it shall be carefully placed in a compact mass, in its final position, means of a tremie, a bottom-dump bucket, or other approved means, and it shall not be disturbed after being placed. Water must not be allowed to flow past the fresh concrete surface.

A tremie shall consist of a tube having a diameter of not less than 25 cm constructed in sections having flanged couplings fitted with gaskets with a hopper at the top. The tremie shall be supported. So as to permit free movement of the discharge end over the entire top surface of the work and so as to permit rapid lowering when necessary to retard or stop the flow of concrete. The discharge end shall be closed at the start of work so as to prevent water entering the tube and shall be completely submerged in concrete at all times; the tremie tube shall be kept full to the bottom of the hopper. When a batch is dumped into the hopper, the flow of concrete shall be induced by slightly raising the discharge end, but always keeping it in the placed concrete. The flow shall be induced until the work is completed.

When the concrete is placed with a bottom-dump bucket, the top of the bucket shall be open. The bottom doors shall open freely downward and outward when tripped. The bucket shall be completely filled and slowly lowered to avoid backwash. It shall not be dumped until it rests on the surface upon which the concrete is to be deposited and when discharged shall be withdrawn slowly until well above the concrete.

Dewatering may proceed when the concrete seal is sufficiently hard and strong. All laitance or other unsatisfactory material shall be removed from the exposed surface by scraping, chipping or other means, which will not injure the surface of the concrete.

13.5. Compaction

Concrete, during and immediately after placing shall be thoroughly compacted, except lean concrete under footings and concrete deposited under water. Concrete in walls, beams, columns, etc. shall be placed in horizontal layers not more than thirty (30) centimeters thick except as hereinafter provided. When less than a complete layer is placed in one operation, it shall be terminated in a vertical bulkhead. Each layer shall be placed and compacted before the preceding layer has taken initial set to prevent injury to the green concrete and avoid surfaces of separation between the layers. Each layer shall be compacted so as to avoid the formation of a construction joint with a preceding layer, which has not taken an initial set.

The compaction shall be done by mechanical vibration. The concrete shall be vibrated internally unless special authorization of other methods is given by the Engineer / Project Manager or is provided herein. Vibrators shall be of a type, design, and frequency approved by the Engineer / Project Manager. The intensity of vibration shall be such as visibly to affect a mass of concrete with a 3 cm slump over a radius of at least half a meter. The Contractor shall provide a sufficient number of vibrators to properly compact each batch immediately after it is placed in the forms. Vibrators shall be manipulated so as to thoroughly work the concrete around the reinforcement and embedded fixtures and into the corners and angles of the forms and shall be applied at the point of placing and in the area of freshly placed concrete. The vibrators shall be inserted into and withdrawn from the concrete slowly. The vibration shall be of sufficient duration and intensity to compact the concrete thoroughly but shall not be continued at any one point to the extent that localized areas of grout are formed. Application of vibrators shall be at points uniformly spaced and not farther apart than twice the radius over which the vibration is visibly effective. Vibration shall not be applied directly to the reinforcement or to sections or layers of concrete that have hardened to the degree that the concrete ceases to be plastic under vibration. It shall not be used to make concrete flow in the forms over distances so great as to cause segregation and vibrators shall not be used to transport concrete neither in the forms nor in troughs or chutes.

Vibration shall be supplemented by such external vibrator as is necessary to ensure smooth surfaces and dense concrete along form surfaces and in corners and locations impossible to reach with the normal vibrators.

13.6. Concrete in Hot & Cold Weather

a) Concrete in hot weather

Concerting shall be avoided in timely hot weather and shall be done only in better part of the day. It should be particularly avoided in dry, hot and windy weather for member with large surface areas exposed to the weather. Aggregate shall be carefully stored under shelter and shall be sprinkled with cold water from time to time to check high temperature.

Water, to be used for concreting, shall be carefully used and, if necessary, crashed ice shall be added to bring the temperature as low as 70^{O} F (21.1^{O} C) in order to at resulting temperature of concrete is not above 90^{O} F (32^{O} C). Execs of water shall not be added and the specified water of cement ratio shall be maintained.

b) Concrete In Cold Weather

When depositing concert is unavoidable at a temperature below 36^{O} F (2.2^{O} C), precaution shall be taken to ensure that the concert shall have a temperature of at least 40^{O} F (4.4^{O} C), at the time of placing of concert. The temperature of concert shall be maintained at not less than 40^{O} F (4.4^{O} C) until it is thoroughly hardened. Sand or other material shall not be used in the prevention of freezing and no frozen materials or material containing ice or snow shall be used.

13.7. Surface finishes/ rendering

a) General

Concrete surface finishes shall be classified as follows:- Bridge
Deck Surface Finish
Sidewalk Surface Finish Ordinary
Surface Form Finish Class 1
Surface Form Finish

The bridge deck surface finish shall be given to the surface of the bottom Slabs of all box type underpass structures.

The requirements for sidewalk surface finish apply to the surface of the bottoms labs in box culverts, except that the acceptable variation from a three-meter straightedge shall be 10 mm, and brooming shall be omitted.

The ordinary surface form finish shall be the final finish applied to all Surfaces after removal of forms, unless otherwise specified or called for on the drawings.

The Class 1 surface form finish shall be applied only where specified or as required by the Engineer / Project Manager when the ordinary surface finish did not produce the required smooth, even surface of

uniform texture and appearances.

b) Bridge Deck Surface Finish

A smooth riding surface of uniform texture, true to the required grade and cross-section, shall be obtained on all bridge roadway decks. The Contractor may use hand tools, or finishing machines or a combination of both, conforming to the requirements specified herein for finishing bridge roadway deck concrete.

Finishing of concrete placed in bridge decks shall consist essentially of compacting and striking off the surface of the concrete as placed and floating with longitudinal floats the surface so struck off. The placing of concrete in bridge roadway decks will not be permitted until the Engineer / Project Manager is satisfied that the rate of producing concrete will be sufficient to complete the proposed placing and finishing operations within the schedule time, that experienced finishing machine operators and concrete finishers are employed to finish the deck, that fogging equipment and all necessary finishing tools and equipment are on hand at the site of the work and in satisfactory condition for use. Finishing machines shall be set up sufficiently in advance of use to permit inspection by the Engineer / Project Manager during the daylight hours before each Pour.

The adjustment and operation of deck finishing machines shall be verified by moving the machine over the full length of the deck section to be placed and traversing the float completely across all end bulkheads before placement of concrete is begun.

Unless adequate lighting facilities are provided by the Contractor, the placing of concrete in bridge decks shall cease at such time that finishing operations can be completed during daylight hours.

Rails for the support and operation of finishing machines and headers for hand-operated strike-off devices shall be completely in place and firmly secured for the scheduled length for concrete placement before placing of concrete. Rails for finishing machines shall extend beyond both ends of the scheduled length for concrete placement to a sufficient distance that will permit the float of the finishing machine to fully clear the concrete to be placed. Rails or headers shall be adjustable for elevation and shall be set to elevations, with allowance for anticipated settlement, camber, and deflection of false work, as required to obtain a bridge roadway deck true to the required grade and cross-section. Rails or headers shall be of a type and shall be so installed that no springing or deflection will occur under the weight of the finishing equipment and shall be so located that finishing equipment may operate without interruption over the entire bridge roadway deck to be finished.

Rails or headers shall be adjusted as necessary to correct for unanticipated settlement or deflection which may occur during finishing operations.

Should settlement or other unanticipated events occur, which in the opinion of the Engineer / Project Manager would prevent pouring of bridge deck conforming to the requirements of these specifications, placing of deck concrete shall be discontinued until corrective measures satisfactory to the Engineer / Project Manager are provided. In the event satisfactory measures are not provided prior to initial set of the concrete in the affected area, the placing of concrete shall be discounted and a bulkhead installed at a location determined by the Engineer / Project Manager. All concrete in place beyond the bulkhead shall be removed.

Unless otherwise permitted by the Engineer / Project Manager, bridge deck concrete shall be placed in a uniform heading approximately parallel to the bridge pier or bent caps. The rate of placing concrete shall be limited to that which can be finished before the beginning of initial set except that concrete for the deck surface shall not be placed more than (03) meters ahead of strick off.

After the concrete has been placed, compacted and consolidated, the surface of the concrete shall be carefully struck off by means of a hand operated strick board operating on headers, or by a finishing machine operating on rails. A uniform deck surface true to the required grade and cross-section shall be obtained.

Following strike off, the surface of the concrete shall be floated longitudinally. In the event strike-off is performed by means of a hand-operated strike board, two (2) separate hand- operated float boards for longitudinal floating shall be provided. The first float shall be placed in operation as soon as the condition of the concrete will permit and the second float shall be operated as far back of the first float as the workability of the concrete will permit.

In the event the strike off is performed with a finishing machine, longitudinal floating of the concrete shall be performed by means of a hand-operated float board or a finishing machine equipped with a longitudinal

wooden float. The longitudinal wooden float on the finishing machine shall have a length of not less than two and half (2.5) meters nor more than three and half (3.5) meters. When both strike off and longitudinal floating are to be performed by finishing machines, one machine, with operator, shall be used for strike off and a second machine, with a second operator, shall be used for longitudinal floating. Longitudinal floating may be performed with the same finishing machine that is used for strike off provided that the length of
deck unit being placed is not more than 10 meters and the strike off operation is completed for said deck unit before the condition of the concrete requires that longitudinal floating be started.

Finishing machines used for strike off having a wheel base 1.8 meters or less shall be followed by 2 separate hand-operated float boards for longitudinal floating. All the provisions in this item pertaining to hand-operated float boards shall apply to the 2 separate float boards for longitudinal floating.

Longitudinal floats, either hand-operated or machine-operated, shall be used with the long axis of the float parallel to the center line of the bridge roadway. The float shall be operated with a combined longitudinal and transverse motion planning off the high areas and floating the material removed into the low areas. Each pass of the float shall lap the pervious pass by one- half the length of the float. Floating shall be continued until a smooth riding surface is obtained. In advance of curing operations, the surface of the concrete shall be textured by brooming with a stiff bristled broom or by other suitable devices, which will result in uniform scouring. The operation shall be performed at a time and in a manner to produce a hardened surface having a uniform texture.

Hand-operated float boards shall be from three and half (3.5) to five (5) meter long, ribbed and trussed as necessary to provide a rigid float and shall be equipped with an adjustable handle each end. The float shall be wood, not less than two and half (2.5) cms thick and from ten (10) cm to twenty (20) cm wide. Adjusting screws spaced as not to exceed 60 cms on centers shall be provided between the float and the rib. The float board shall be maintained free of twist and true at all time.

Hand-operated float boards shall be operated from transverse finishing bridges. The finishing bridges shall span completely the roadway area being floated & a sufficient number of finishing bridges shall be provided to permit operation of the floats without undue delay. Not less than two (2) transverse finishing bridges shall be provided when hand-operated float boards are used. When a finishing machine is used for longitudinal floating, one finishing bridge equivalent to the transverse finishing bridge specified herein shall be furnished for use by the Engineer / Project Manager.

All finishing bridges shall be of rigid construction and shall be free of excessive wobble and springing when used by the operators of longitudinal floats and shall be easily moved.

Immediate following completion of the deck finishing operations, the concrete in the deck shall be cured as specified in item 401.3.8 "Curing Concrete" hereinafter.

The finished surface of the concrete shall be tested by means of a straightedge three (3.0) meter long. The surface shall not vary more than three (3) mm from the lower edge of the straightedge. All high areas in the hardened surface in excess of three (3) mm as indicated by testing shall be removed by abrasive means. After grinding by abrasive mean has been performed, the surface of the concrete shall not be smooth or polished. Ground areas shall not be of uniform texture and shall present neat and approximately.

Where the concrete of the bridge deck is to be covered by bituminous surfacing, earth or other cover, two and half 2.5 cms or more in thickness, the surface of the concrete shall not vary more than nine (9) mm from the lower edge of the three (3) meter straightedge Bridge deck surface under the curbs, railings and sidewalk shall be struck off to the same plane as the roadway and left undisturbed when future widening is shown on the plans.

c) Sidewalk Surface Finish

After the concrete has been placed it shall be compacted and the concrete shall be struck off by means of a strike board, floated with a wooden or cork floating and finish with a broom. An approved edging tool shall be used on all edges and at all expansion joints. Brooming shall be transverse to the line of traffic and if water is necessary, it shall be applied to the surface immediately in advance of brooming. The surface shall not vary more than six (6) mm under a three-meter straightedge, and the finished surface shall be free of blemishes.

d) Ordinary Surface from Finish

Ordinary surface finish shall consist of filling holes or depressions in the surface of the concrete, repairing

all rock pockets, removing stains and discoloration visible from traveled ways. Ordinary surface finish shall be applied to all concrete surfaces either as a final finish or preparatory to the Class 1 finish. On surfaces, which are to be buried underground or surface, which are enclosed, such as the cells of box girders; the removal of fins will not be required.

Except as provided herein, all from bolts and any metal placed for the convenience of the Contractor shall be removed to a depth of at-least two and half (2.5) cms below the surface of the concrete. All rock pockets and other unsound concrete shall be removed. The resulting holes or depression shall be cleaned and filled with mortar. From bolts projecting into the cells of box girders need not be removed unless permanent access is provided into the cells, in which case such bolts shall be removed flush with the surface of the concrete. Mortar used to fill bolt holes shall consist of one part cement and two parts sand. Other depressions and pockets shall be filled with either packed mortar or air blown mortar as directed by the Engineer / Project Manager. Mortar shall be cured in conformance with the requirements in item 401:3.8 (c) "Curing Structures"

If rock pockets or holes in the opinion of the Engineer / Project Manager, are of such an extent or character as to affect the strength of the structure materially or to endanger the life of the steel reinforcement, he may declare the concrete defective and require the removal and replacement of the portions of the structure affected.

e) Class 1 Surface from Finish

Class 1 surface finish shall consist of finishing the surfaces of the structure as necessary to produce even surfaces of uniform texture and appearance, free of unsightly bulges, depression and other imperfections. The degree of care in building forms and character of materials used in form work will be a contributing factor in the amount of additional finishing required to produce even surfaces of uniform texture and appearance, free of unsightly bulges, depressions and other imperfections, and the Engineer / Project Manager shall be the sole judge in this respect.

After completion of the ordinary surface finish, areas which do not exhibit the required smooth, even surface of uniform texture and appearance shall be sanded with power sanders or other approved abrasive means until smooth, even surfaces of uniform texture and appearance are obtained. The use of power carborundum stones or disks will be required to remove bulges and other imperfections.

Class 1 surface finish shall not be applied until a uniform appearance can be obtained.

Class 1 surface finish may be required to be applied as the final finish for the following surfaces, unless otherwise directed by the Engineer / Project Manager.

i. All form finish surfaces of bridge super-structures except the under surfaces between girders and the inside vertical surfaces of T girders.

ii. All surfaces of bridge piers, columns and abutments, and retaining walls above finished ground and to at least three tenth (0.3) meter below finished ground.

iii. All surfaces of open spandrel arch rings, spandrel columns and abutment walls.

iv. All surfaces of pedestrian undercrossing, except floors and surfaces to be covered with earth.

v. Surface above finished ground of culvert headwalls, end walls and retaining walls.

vi. Surface inside of culvert barrels having a height of one and half (1.5) meters or more for a distance inside the barrel at least equal to the height of the culvert.

vii. All surface of railings.

f) Surface Rendering

All faces of concrete which are to come in contact with backfill or pavement materials shall be applied two coats of hot bitumen of approved quality, before placing any material around concrete.

14. FINISHING

a). Finishing of concrete surfaces shall be performed only by skilled workmen and as directed by the Engineer / Project Manager. Formed surfaces upon or against which backfill or concrete is to be placed will require

no treatment after form removal except for the removal and repair of defective concrete and for the specified curing. Unformed surfaces that will be covered by backfill or by concrete shall be finished by sufficient leveling and screeding to produce an even uniform surface.

b). A hard steel trowel finish shall be applied to unformed surfaces that will be exposed or subjected to the action of flowing later. Floating and trowelling shall be started as soon as the screeded surface has stiffened sufficiently, and shall be the minimum necessary to produce a surface that is free from screed marks and is uniform in texture.

15. CURING AND PROTECTION

a). The concrete shall be kept continuously wet by the application of water for a minimum period of Seven (07) days after the concrete has been placed. Beginning immediately after placement, concrete shall be protected from premature drying, excessively hot or cold temperatures and mechanical injury and shall be maintained with minimal moisture loss at a relatively constant temperature for the period necessary for hydration of the cement and hardening of the concrete. Cotton mats, burlaps, rugs, carpets or earth or sand blanket, may be used as a curing medium to retain the moisture. The entire surface of the concrete shall be kept damp by applying water with a nozzle that so atomizes the flow that a mist and not a spray is formed.

At the expiration of the curing period the concrete surface shall be cleared of all curing mediums.

b). Surface exposed to the air may be cured by the application of an imperious membrane (i.e. curing compound) with prior written approval from the Engineer / Project Manager.

c). For concrete surfaces not in contact with forms, one of the following procedures shall be applied immediately after completion of placement and finishing:

- Ponding or continuous sprinkling.
- Application of absorptive mats or fabric kept continuously wet.
- Application of sand kept continuously wet.

d). Curing shall be continued minimum Seven (07) days in the case of all concrete except concrete with Rapid-hardening Portland Cement for which the minimum period shall be three (03) days.

16. TEST OF CONCRETE QUALITY

Samples of fine and coarse aggregate to be used shall be selected by the Engineer / Project Manager. It shall be the responsibility of the Contractor to designate the source or sources of aggregate and obtain the necessary samples and submit them for testing at least thirty (30) days before actual concreting operations are to being.

Samples of aggregates shall be obtained and tested in accordance with the following standard AASHTO methods and ASTM standards.

i)	Sampling aggregates	T-2
ii)	Sieve analysis	T-27
iii)	Amount of material passing the no. 200 sieve	T-11
iv)	Organic impurities	T-11
v)	Mortar Strength	T-71
vi)	Sodium sulphate soundness	T-104
vii)	Friable particles	T-112
viii)	Abrasion loss	T-96
ix)	Specific Gravity	T-84
x)	Absorption	T-85
xi)	Production of Plastic Fines	T-210
xii)	Fineness Modulus	T-27
xiii)	Sand Equivalent	T-17
xiv)	Potential Reactivity of Carbonate Rocks for Concrete Aggregate (Rock Cylinder Method)	ASTM C 586
xv)	Potential Alkali Reactivity of Cement Aggregate Combinations (Mortar-Bar Method)	ASTM C 227
xvi)	Potential Reactivity of Aggregates (Chemical Methods)	ASTM C 289

No aggregate for testing during the production of concrete shall be sampled at the discharge gates of the bins feeding the weight hopper. The Contractor, at his expense, shall provide safe and suitable facilities for obtaining the samples no concreting work on the project will be permitted until the Engineer / Project Manager signifies in writing his approval. Following the performance of the necessary tests, on all materials involved in making concrete.

17. MEASUREMENT AND PAYMENT

17.1. General

Except otherwise specified herein or elsewhere in the Contract Documents no separate measurement and payment will be made for the under mentioned specified works related to the relevant items of the Bills of Quantities but shall not be limited to the following. The cost thereof shall be deemed to have been included in the quoted unit rate of the respective items of the Bills of Quantities.

17.2. Plain and Reinforced Concrete

a) Measurement

Concrete shall be measured as executed but no deduction shall be made for the following:-

- Volume of any steel embedded in the concrete
- Volume occupied by water pipes, conduits etc. not exceeding 25 sq.cm. each in cross sectional area.
- Voids not exceeding 0.10 Sq.M. in work given in Sq.M. If any void exceeds 0.10 Sq.M. total void shall be deducted.
- Void, which are not to be deducted as specified above, refer only to opening or vents which are wholly within the boundary of measured areas. Openings or vents which are at the boundary, measured areas shall always be subject to deductions irrespective of size.

Concrete work shall be classified and measured separately as listed under items of Bills of Quantities.

Measurement of acceptably completed works of plain and reinforced cement concrete will be made on the basis of concrete placed and compacted in position within the neat lines of the structure as shown on the drawings or as directed by the Engineer / Project Manager.

b) Payment

Payment will be made for the acceptable measured quantity of plain and reinforced cement concrete on the basis of unit rate quoted in the Bill of Quantities and shall constitute full compensation for all the works related to the items.

STEEL REINFORCEMENT

1. SCOPE

The work under this section of specifications consists of furnishing, cutting, fabricating, bending and placing steel reinforcement and Welded wire, fabric of the type, size, shape and grade required in accordance with these specifications, in concrete structures or elsewhere as shown on the drawings and special provisions or as directed by the Engineer / Project Manager.

2. APPLICABLE STANDARDS

Latest editions of the following ASTM Standards shall be applicable and used. In lieu of ASTM standards, Pakistan Standards/Specifications may be used where applicable.

ASTM Standards

ASTM A 615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A 706	Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.
ASTM A 305	Minimum Requirement for the deformations of deformed steel bars for concrete reinforcement.
ASTM E290	Standard Test Method for Bend Testing of Material for Ductility
ASTM A1034	Standard Test Methods for Mechanical Splices for Steel Reinforcing Bars
ASTM C876-09	Standard Test Method for Corrosion Potentials of Uncoated Reinforcing Steel in Concrete
ASTM A185	Standard Specification for Steel Welded Wire Reinforcement
ASTM A1022	Standard Specification for Deformed and Plain Stainless Steel Wire and Welded Wire for Concrete Reinforcement
ASTM A884	Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement
ASTM A775	Standard Specification for Epoxy-Coated Steel Reinforcing Bars

Pakistan Standards

PS 241	Tensile Testing of Steel
PS 244	Bend test for Steel
PS 580	Rolled deformed Steel bars (intermediate grade) for concrete reinforcement. PS 605 Rolled deformed steel bars (hard grade) for concrete reinforcement.
PS 606	Rolled formed Steel bars (structural grade) for concrete reinforcement. PS
607	General technical delivery requirement for steel

In addition to the above, other standards of ASTM may be specified by the Engineer / Project Manager.

3. MATERIAL AND SIZE OF BARS

a). Reinforcement for concrete shall conform to the respective ASTM Standards as specified in the Drawings and in the Contract Documents or as may be specified by the Engineer / Project Manager.

Unless otherwise specified, all plain reinforcing bars shall comply with the requirements of ASTM A 615 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement and ASTM A 706 Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement and shall have a minimum yield strength of 40,000 psi (280 MPa).

b). Unless otherwise specified, all deformed reinforcing bars shall comply with the requirements of ASTM A 615 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement and ASTM A 706 Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement and shall have a minimum yield strength of 60,000 psi (420 MPa)

c). Reinforcement of all types is to be stored at on site in an approved manner so as to avoid damage.

d). If the Engineer / Project Manager directs, the Contractor shall test the samples of reinforcement at his cost and submit to him the test report.

e). Steel wire mesh reinforcement shall conform to requirements of ASTM Designation A185 - Standard Specifications for Welded Steel Wire Fabric for concrete reinforcement. It shall be used where shown on the Drawings.

f). Reinforcement shall be free from all loose or flaky rust and mill scale, or coating, including ice, and any other substance that would reduce or destroy the bend. Reduced sections steel reinforcement shall not be used.

4. DELIVERY & STORAGE

Steel reinforcement bars shall be kept in bundles firmly secured and tagged. Each bar or bundle of bars shall be identified by marks stamped on hot or cold or painted on or by any other means, The identifying marks shall contain the following information:

- Name of the producer or his trade.
- Standard to which the bars have been manufactured.
- The class type and strength
- The diameter
- The number of the test certificate

The method of storage shall be approved by the Engineer / Project Manager. Reinforcing bars shall be stored in racks or platforms above the surface of ground and shall be protected free from scaling, rusting, oiling, coatings, damage, contamination and structural defects prior to placement in works. Bars of different diameters and grades of steel reinforcement shall be kept separately.

5. BAR BENDING SCHEDULES

The Contractor shall prepare bar bending schedules of all the reinforcing steel bars and these bar bending schedules shall be submitted to the Engineer / Project Manager for his approval. The Contractor shall obtain approval of the bar bending schedules atleast one month prior to the actual execution of the works at site.

6. FABRICATING, BENDING & PLACING

a). All metal reinforcement shall be free from loose mill scale, loose rust, mud, oil, grease, or other harmful matter immediately before the concrete is placed.

b). Reinforcement is to be accurately placed as shown in the drawings, and secured against displacement by using 16 gauges GI wire ties or suitable slips at intersections and supported from the formwork by using concrete, metal or plastic chairs and spacers or hangers of an approved pattern. Where concrete blocks are used for ensuring the cover, they shall be made of mortar not leaner than 1 part of cement to 2 parts of sand.

c). Bars used for concrete reinforcement shall be fabricated in accordance with the dimensions shown in the bar bending schedule approved by the Engineer / Project Manager.

d). The cutting tolerance for all bars shall be **± 1 inch** (25 mm).

e). Where an overall or an internal dimension of a bent bar is specified in the schedule, the bending tolerance, unless otherwise stated, shall be as in **Table - 1**.

f). Bent bar reinforcement shall cold bent to the shapes shown on the drawings bars shall be bent around a pin having the following diameters (D) in relation to the diameter of the bar (d):

Strips & columns tie bars	D = 4 x d	
Other bars having d < 3.5 cm (1-3/8") (No. 11 bars)	D = 5 x d	D = 10 x d
d > 3.5 cm (1-3/8")		

Table -1
Bending Tolerances

Dimensions of bent bars		Tolerance	
Over	**Up to & including**	**Plus**	**Minus**
Inch	Inch	Inch	Inch
--	36	2	2
36	72	2	4
72	--	2	10

g). Vertical bars in columns shall be offset at least one bar diameter at lapped splices. To ensure proper placement, templates shall be furnished for all column dowels.

h). Reinforcement shall not be bent or straightened in a manner that will injure the material.

i). No bars shall be bent twice in the same place, nor shall they be straightened after bending.

j). Unless permitted, by Engineer / Project Manager, reinforcement shall not be bent after being partially embedded in hardened concrete.

k). Bars which depend for their strength on cold working shall not be heated for any reason. Other kinds of reinforcement larger than 40 mm in diameter may be bent by the use of heat at cherry
- red heat (not exceeding 840 Bars) bent shall not be cooled by quenching.

l). No splice of reinforcement shall be made except as shown on the working drawings.

m). Welding shall be permitted for bars only under suitable conditions and with suitable safeguards in accordance with AWS D1.4-79. All welded splices shall be in conformance to "Structural Welding Code – Reinforcing Steel - AWS D1.4-79. Welding is allowed for bars provided the type of reinforcement bar has the required welding properties. Tack welding may be used to fix in position bars that cross each other, only with prior approval of the Engineer / Project Manager.

n). Exposed reinforcement intended for bonding with future extensions is to be effectively protected from corrosion. Protection is also to be provided to reinforcement partly built into concrete where the exposed pat is to be built into later concrete.

o). No concreting is to be carried out until the reinforcement has been checked and approved by the Engineer / Project Manager.

p). All detailing shall be done as per ACI standards **ACI - 315 and ACI - 318**.

q). Minimum Concrete clear cover for reinforcing steel shall be as follows:

Structural Members	Minimum Cover (inch)	Minimum Cover (mm)
a) Concrete cast against and Permanently exposed to earth	3.0	75
b) Concrete exposed to earth or weather		
Bar Dia > 20 mm	2.0	50
Bar Dia > 16 mm	1.6	40
c) Concrete not exposed to weather or in contact with ground		
Slabs, Walls	0.8	20
Beams, Columns (Primary Reinforcement)	1.6	40

All reinforcing steel shall be held firmly in place before and during the placing of concrete by means of wires and supports adequate to prevent displacement during the course of construction.

7. MEASUREMENT & PAYMENT

7.1 General

Except otherwise specified herein or elsewhere in the Contract Documents, no separate measurement and payment will be made for providing and installing chairs, supports, hooks, spacers, binding wires and laps not shown on Drawings including wastage and rolling margin, the cost of which shall be deemed to have been included in the quoted unit rate of the respective items of the Bill of quantities.

7.2 Measurement

All measurements of acceptably completed works of reinforcement shall be made in linear dimensions end to end according to the cut lengths shown in bar bending schedules approved by the Engineer / Project Manager and converted into theoretical weight as per schedules.

7.3 Payment

Payment will be made for acceptable measured quantity of reinforcement on the basis of unit rate per kg quoted in the Bills of Quantities and shall constitute full compensation for all the works related to the item.

BRICK LAYING AND STONE MASONRY

1. CONFORMITY TO STANDARDS

Except as otherwise specified, all brickwork shall be carried out in conformity with British Standard Code of Practice CP 121, 101 "Brickwork" as applicable to the work shown on the drawings.

2. MATERIALS

2.1. Brick shall be of first class quality, good, hard, well burnt clay, uniform in shape and color, and shall measure 9"x4-3/8"x2-11/16" so that every four courses laid shall measure a foot in height. The brick shall be free from defects, cracks, chips, stones, nodules of lime or kinker or other blemishes. The brick would not absorb more than 1/6th of its weight, when soaked in water for one hour. The minimum compressive strength of the bricks shall be 1250 psi, with an average for five bricks not less than 1500 psi when tested flat in accordance with BS-1257 "Method of Testing Clay Building Bricks". Bricks of only one kiln shall be used throughout the work, unless otherwise approved by the Client.

2.2. Stone for masonry shall be obtained from approved section of an approved quarry. It shall be hard, tough, durable of uniform colour and free from faults and cleavage and of a kind proven satisfactory by previous use for specified purpose. Stone shall be dressed to exact sizes and shapes with exposed faces chisel dressed. Stone shall be minimum 5" in thickness, 12" in width and 18" in length. All visible edges shall be free from chippings and bed surface of face stones perfectly normal to visible face for at least 3". At least 50% of the total volume of masonry shall be of stone having a volume not less than 1 cft. each. Dry stones shall not absorb more than 5% water of their weight when immersed in water for hours.

2.3. Cast Stones or concrete grill work blocks shall conform to BS-1217 (1945) as applicable and made from nominal 1:2:4 cement concrete as specified in section "Concreting". It shall be of true shapes, size and shade as shown on drawings or as instructed at site.

2.4. Light Weight Concrete Block shall be made from cement concrete by using additive for producing a density of 75-lbs./cft. The additive for producing light weight concrete shall be used according to the manufacturer's printed instructions. The size of the concrete blocks shall be as shown on drawings and as approved by the Client.

2.5. Mortar for Masonry shall be made in the proportions by volume as specified in bill of quantities. Mortar for light weight concrete block masonry shall be cement-lime-sand mortar of 1:1:6 proportions. Cement and water shall be as specified in section "Concreting". Sand and other fine aggregate shall conform to BS-1200 "Sand for Plain & Reinforcement Brickwork and for Masonry". Mortar for masonry work shall be used within half an hour of wetting. Mixing shall be done mechanically, unless otherwise specifically permitted by the Client.

2.6. Wall Ties: Metal wall ties shall conform to the requirements of BS-243 "Metal Wall Ties" where applicable. All wall ties shall be galvanized. Wall ties may be embedded or fastened to rawal plugs or "Fisher 6-mm Nylon Plugs" or inserted in dove-tail slots or as approved.

3. SAMPLES

The samples of all the material for masonry work shall be approved by the Client, and same type of material shall be used during the work. If the Client desire to get the material tested, this will be got done by the Contractor from a laboratory approved by the Client at Contractor's expense.

4. BRICK MASONRY WORK

Brick-Laying: The bricks shall be laid in mortar specified in bill of quantities, and to sizes and shapes shown on the drawings. Before laying, bricks shall be soaked in water tanks, to be constructed by the Contractor at his own cost, for at least four hours, and shall be so handled that they do not get damaged.

Brick shall always be laid in English bond, unless otherwise specified, with frogs upwards. Bricks shall be laid with bed and vertical joints properly filled with specified mortar, raked out ½" deep for

plastering/ pointing and for unexposed foundation or plinths flush pointed with the same mortar used for laying. Brick work must be truly plumb and must be checked by plumb-bobs and straight edges frequently. Work shall be kept clean of mortar droppings or splashes before setting hard. Where required, shaped or chamfered surfaces shall be cut and chiselled finely such that when placed in position they do not require leveling up with extra mortar. Where work has to be left, the wall shall be left in slope and in no case the difference of height between various walls shall be more than 5' at any section of the building.

All brick work shall be bonded where it abuts other brickwork. Where brick walls or partitions intersect or abut, it shall be necessary to interlock the masonry of the two walls in such a way or use wall ties so as not to leave a straight vertical joint between the two walls. Where brickwork abuts concrete, wall ties engaging in 3" long galvanized dove-tail slots cast in concrete members shall be provided at every fourth-course, or fixed to approved Nylon plugs in drilled holes in concrete member as approved. In cavity wall construction, wall ties shall be placed 5' apart horizontally and 12" vertically and staggered. Top of walls on which slabs/beams will rest shall be finished with a smooth level bed of 1:3 cement sand mortar and covered with two layers of building paper weighing 8-lbs./%sft. or polythene sheet (2-layers) with overlaps.

Built-in anchor bolts, inserts, pipe supports, hangers, pipe sleeves, dowels, ties and all items shown on the drawings or specified are required to be built into the masonry as the work progresses. Frames and other built-in works shall be maintained in their proper position and bracing shall not be removed until they are securely held by the masonry. The spaces around all built-in items shall be filled with masonry, where shown on drawings. Contractor shall leave openings in masonry for air-conditioning ducts and grills, plumbing pipes, electric conduits, etc. The masonry shall be kept properly cured for at least 10 days where cement mortar is used. Where according to plans and sections the masonry would require cut bricks to be used, the same shall be done by the Contractor at no extra cost to obtain correct thickness according to drawings.

Vertical joints in alternate courses must be directly one over the other and horizontal joints shall be truly level. The thickness of joints must be kept uniform 3/8" to 1/2" unless otherwise specified, throughout the work.

5. STONE MASONRY WORK

Stone masonry work shall be carried out using approved stones that result in uniform colored and textured surfaces with truly horizontal and vertical joints in coursed masonry work. Through bond stones shall be marked and uniformly spaced in masonry work. Stones shall be soaked for 2 hours prior to laying. Every stone shall be laid in the work on its natural quarry bed or in such a manner that stresses borne by it come normal to such bed. Each stone shall be set with both bed and vertical joints filled with mortar, and thoroughly bedded in.

Unless otherwise specified stones shall be laid in 1:4 cement sand mortar. Entire masonry in any structure shall be carried up to a uniform level, and where breaks are unavoidable joints shall be made in gradual steps. Cross-walls shall be fully bonded to main walls. Exposed surfaces shall be finished as specified; when not specified, joints shall be struck 1/2" deep simultaneously with masonry work, and face of work shall be kept clean. Contractor shall suitably protect the work from rain and frost during construction and cure it by moistening for 10 days after laying.

6. CAST STONE MASONRY AND GRILL WORK

All relevant specifications as in clause of Brick Masonry shall apply to masonry with cast stone and concrete grill work. The exposed visible faces of cast stone or grill work units shall be well rubbed and ground to present uniform finish. Unless given otherwise in BOQ or drawing, mortar for jointing shall be 1:3 cement sand mortar. Where mild steel reinforcement is shown on drawings or specified in Bill of Quantities, the same shall be provided and anchored properly.

7. LIGHT-WEIGHT CONCRETE MASONRY

Masonry with light-weight block shall conform to all relevant requirements of the clause for brick masonry work's specifications. Concrete blocks should be thoroughly dry before they are used and care shall be taken to protect them from rain and dampness. Each lot shall be inspected by the Client before use, and if the blocks are not thoroughly matured and dry, the same shall not be used until approved. The blocks should be laid on a full bed of mortar and the joint well flushed up. The top of the walls shall be protected by suitable means from rain and frost. The blocks should

have a rough textured face and the joints should be raked out to a depth of about 1/2" as the work proceeds.

8. CEMENT CONCRETE BLOCK MASONRY

Cement concrete blocks shall conform to BS-2028, 1364 (1968) "Concrete Blocks" and BS Code of Practice-122 "Brick Work and Block Work".

The blocks shall be manufactured from cement, coarse aggregate 3/4" to 3/16" grading and sand or from "all in aggregate" which shall be such that not more than 5% shall exceed the maximum size of 3/4" and not more than 60% shall pass a BS 1/2" sieve and retained on 3/16" sieve. The block density (block weight divided by gross volume) shall not be less than 94-lbs./cft. and compressive strength shall not be less than 500psi for non-load bearing walls and 1500psi for load bearing walls.

The blocks shall be manufactured by the use of compact mechanically operated mixer, vibrating and moulding, block making machines. Vibration or compacting shall be done in accordance with the recommendations of the manufacturers and/or to the satisfaction of the Client.

The sizes of the blocks may be 12"x6"x4", 12"x6"x6" or 12"x6"x9". The blocks shall be kept on pallets until cured for 2 days.

Block masonry shall be constructed in a systematic bond as directed by the Client in the mortar specified in BOQ and no more bats shall be used than are necessary to complete the bond. For walls of thickness greater than 6" or hollow walls, header and stretcher course similar to brickwork or as directed by the Client shall be used. No joint shall be thicker than 3/8". All masonry work shall be kept wet and cured for at least 10 days.

9. MEASUREMENT

All types of masonry work shall be measured by volume, except masonry walls, veneering and cladding upto 4.5" thick which may be measured by superficial area.

All openings and built-in members of other materials like beams, lintels, bed plates, etc. shall be deducted unless the superficial area of openings and above items is one sq.ft. or less. Wall thickness shall be those shown on drawings and not those actually achieved at site.

10. RATES AND PAYMENT

The rates shall be comprehensive and inclusive of full compensation for everything required to be furnished (including mortar) and done to complete the BOQ item in all respects as per specifications of this Section. The rates of masonry pay items shall not cover the following, unless otherwise specifically required in BOQ, which shall be measured and paid for under separate pay items in BOQ:

a) Reinforcement and all types of inserts like anchors, ties, sleeves, hoop iron, etc.

b) Specially made sills, cornices, drip courses and filling material in cavity walls.

BRICK AND CEMENT CONCRETE BLOCK WORK

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 / Project Manager, 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.

2. MATERIALS

2.1 Portland Cement

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

2.2 Mortar Sand

Sand for mortar used in construction of brickwork/ blockwork 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.

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 / Project Manager at the Contractor's cost.

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 / Project Manager.

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. 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.

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 / Project Manager. 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.

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 / Project Manager 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.

6. JOINTING

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

6.1 Exterior exposed joints shall be tightly formed to a weather joint with the point of the trowel.

6.2 Interior exposed joints shall be tightly formed to a concave joints.

6.3 Joints which are subsequently covered with plaster or other finish materials shall be struck flush.

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.

7.1 Soaking

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

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 / Project Manager. 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 coarses 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 coarses and 3 joints as laid shall not exceed by more than 1 inch the height of 4 bricks as piled one upon the other.

7.3 Curing

All brick work involving use of cement shall be cured by water curing or other acceptable methods. The Engineer / Project Manager 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.

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 / Project Manager.

8.1 Concrete Block Making

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 / Project Manager. They shall be operated according to the instructions laid down by the manufactures.

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.

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.

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

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.

8.2 Properties of Blocks

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 / Project Manager.

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.

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.

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 / Project Manager, to ensure that all batches of block strengths are to be determined in accordance with ASTM C-140 Standard.

8.2.5 The test shall be carried out by a laboratory approved by the Engineer / Project Manager. Evidence shall be produced that the block manufacturer has an efficient method of quality control. The Engineer / Project Manager 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.

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 / Project Manager.

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.

8.4 Erection

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 e kept free from mortar or other debris.

Unless otherwise shown on the drawings or specified by the Engineer / Project Manager, 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.

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.

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. Chiseling of completed walls or the formation of holes shall only be carried out with the approval of the Engineer / Project Manager.

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. Toothing into load-bearing walls shall not be permitted.

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.

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.

8.5 Curing and Repairs

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.

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 ±1/8 inch.

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 / Project Manager grants permission, in writing, to patch or replace the defective area.

9. MEASUREMENT AND PAYMENT

9.1 Material (Brick and cement concrete block work)

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

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 / Project Manager.

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.

TERRAZZO AND MARBLE FINISHES OR WORK

1. CONFORMITY TO STANDARDS

Unless otherwise specified, terrazzo works shall be in conformity with British Standard CP-204 "In- Situ Flooring Part-I, 'General' and Part-3 Terrazzo Flooring" as applicable to the work shown on the drawings and specified in the Bill of Quantities.

2. MATERIALS

Cement, Sand, Aggregate for Concrete and Water shall conform to specifications of the Section "Paving".

Marble Chips shall be crushed marble and best quality white or colored, sound and hard local marble chips approved by the Client, and of the required sizes.

Dividing Strips shall be of brass or aluminum conforming to the requirements of the BS "Cold Rolled Brass Sheets or Aluminum Strips" or glass strips 5-mm thick.

Marble for Wall Facing and Floors shall be best quality polished local marble of uniform texture free from all defects, obtained from Mullaghori or equal approved, as required in BOQ and approved by the Client.

Metal Fixing shall be of suitable non-ferrous metal like Copper, Phosphor- bronze, gunmetal and of shape and dimensions adequate to carry the loads, as approved by the Client.

Onyx: The onyx shall be of approved color and shade obtained from Quetta or equal approved, sound and free from all defects.

Glazed Wall Tiles shall conform to BS-1281 "Glazed Ceramics Wall Tiles" of approved size and color.

Angle Clips for precast toilet partitions shall be chromium plated steel clips as shown on drawings.

Bolts of precast toilet partitions shall be 5/16" brass bolts chrome-plated with acorn heads, fitting to wall anchors.

Pipe for Toilet Partition shall be galvanized iron conforming to BS-1387. Angle for stair nozing shall be cold rolled aluminum angles of the size required.

3. SAMPLES

All materials used for Terrazzo and marble work as well as samples of terrazzo floor and marble work shall be submitted to the Client and their approval obtained, and same type of material will be used throughout the work. If the Client require the material to be tested, this shall be got done by the Contractor at his own cost from a laboratory approved by the Client.

4. IN-SITU TERRAZZO FLOORING

The floor shall consist of a wearing surface of consistency and thickness as specified laid over 1:2:4 concrete of the specified thickness. The net thickness specified for wearing surface shall be that obtained after grinding and polishing. 1:2:4 concrete shall be mixed and laid in the manner specified for cement concrete floor using a minimum quantity of water for workability. The cement concrete shall be leveled with a trowel and straight edge, consolidated and finished with steel trowels to an even but rough surface. The top layer of cement marble chips mixed in the proportion of 1:2 (1-cement and 2-marble chips) shall be laid over it within 12 hours. The cement and marble chips must be mixed dry in such quantities as are sufficient for a unit area of one 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 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 color shall then be well- trowelled into the surface leaving a plain smooth surface.

Floor shall be laid in panels of about 4'x4' or of size as directed by the Client. Dividing strips of brass, aluminum, glass or terrazzo as specified shall be provided and fixed to exact levels making an allowance for grinding. Brass or Aluminum strips shall not be less than 0.064" thick and of width equal to the total thickness of cement concrete base and Terrazzo topping. In case of terrazzo strip, a groove 3/4" wide and of thickness of the finished floors shall be left between the panels of terrazzo, which shall be filled with terrazzo of the same specifications as for floor mixed with approved color. The Contractor shall produce perfectly straight and sharp lines for this in filling between the panels. Three days after laying, the top layer must be evenly and smoothly machine- ground with carborundum blocks of coarse, medium and fine grades so as to ensure that all marble chippings are evenly exposed all over the surface. If marble chips are not evenly exposed, the Contractor shall remove the wearing surface and relay at his own cost. The surface after grinding shall be left undisturbed and cured for 2 to 3 weeks, after which it shall be cleaned of dirt and dust by rubbing gently with pumice stone or washing soda in sufficient water. Three days after the surface has been cleaned it shall be rubbed hard with 1:10 solution of oxalic acid using felt. The surface shall then be cleaned and washed with plenty of water. After the surface has dried a final gloss shall be given by chemical polishing the surface using approved Polish to the satisfaction of the Client.

5. TERRAZZO DADO AND SKIRTING

The marble chips and cement shall conform to specifications for floor. Mixing shall be done in the same manner and proportion. The plastered surface over which the terrazzo topping 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 required thickness. Before the base course has set, the layer of terrazzo mixture (of the specifications for Flooring) shall be well trowelled into the surface of the base to a thickness which after grinding shall result in the finished thickness as required. A layer of neat cement of the specified color shall then be well trowelled into the surface leaving a plain smooth surface. After 24 hours 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. They shall be with 1/4" radius cove at floor unless otherwise shown. Grinding, finishing and polishing shall be done as per terrazzo floors.

6. TERRAZZO ON STAIRS

The stair risers and treads shall be finished according to exact sizes including the terrazzo topping making allowance for grinding of terrazzo. The nozing shall be flush with the terrazzo toppings and shall be protected by aluminum angles if specified or shown on drawings. The angles shall be firmly secured by means of counter-sunk brass screws and cast together with the step. Terrazzo shall be ground finished and polished as per terrazzo floors.

7. TERRAZZO FINISHED PRECAST PARTITIONS FOR TOILETS

Partitions for toilets shall be precast RCC slabs finished with 1/4" thick finished and polished terrazzo on both faces. The finished thickness of these walls shall be 2". RCC slab shall conform to specification for "Concreting" and terrazzo to Section 5.5. Fixing of these partitions to floor, walls, etc. shall be as directed by the Client and as shown on drawings.

8. PRECAST PRESSED TERRAZZO TILE FLOOR

Where required floors shall be constructed of Terrazzo Tiles laid on a mortar bed. Unless otherwise specified tiles shall be 12"x12"x 1.1/8" thick hydraulically pressed terrazzo tiles with min. 1/2" thick wearing layer with cement to chips ratio not less than 1:2 by weight and coloring matter (if any) not exceeding 10% by weight of cement used in the mix. Tiles shall be factory pressed with a pressure of not less than 2000 psi and factory ground. These shall be of a color pattern and chip size as approved by the Client using Portland cement or white cement as specified. Tiles shall be laid true to lines and perfectly even on a mortar bed using 1:3 cement sand by volume of 1/2" average thickness over 1.1/2" thick 1:2:4 concrete floor screeds unless specified otherwise.

When laying has been completed all joints will be grouted with factory supplied pigmented cement mortar to match the basic cement matrix of the tiles. Top of floor shall then be left undisturbed and cured for 2 weeks, surface thoroughly cleaned, and ground and polished to a full gloss as for in- situ terrazzo.

9. ACID-PROOF TILE FLOORS, SKIRTING AND LINING

Acid proof tiles shall be of specified sizes and design, whether glazed or un- glazed and whether plain or non-skid and of (M/s. EMCO or M/s. International Ceramic Industries, Islamabad, make or approved equal). Acid-proof cement (NF-10 of M/s. EMCO or approved equal) shall be applied to back and sides of joints. The work shall be laid and cured as per written instructions of the manufacturer. Finished work shall conform to required lines, grades, etc.

If specified, Epoxy mortar of approved make shall be used in lieu of acid-proof cement NF-10.

If both acid-proof cement and epoxy mortar are specified to be used, acid-proof cement shall be used as above leaving the half depth of the tiles joints unfilled which shall be filled with epoxy mortar. Acid-proof tiles and mortar/epoxy work shall be laid over concrete 1:2:4 and/or cement sand mortar base as may be specified. If specified, specially moulded "Cove" tiles shall be used as skirtings.

10. MARBLE FACING AND FLOORING

For marble facing to walls, selected marbles of specified thickness and sizes not less than 2'x1' or as may be specified shall be used. Slabs shall be fixed to masonry or concrete with brass or other approved clips two at top and two at bottom of each slab. The surface over which the marble slabs are required to be fixed shall be cleaned of all dirt and dust. Marble slabs shall be laid over a 1:2 cement mortar plaster layer truly in plumb with copper clamps as specified, each slab laid on 5 dabs of 4"x4" each in 1:2 cement sand mortar and grouted with white/colored cement as specified. For marble floors selected marble of approved color and quality and specified thickness and size shall be embedded over 1/2" thick 1:2 cement mortar laid uniform and finished truly level with square edges.

Marble Slabs on Kitchen, Vanity Counter top and Stair Steps to use as specified in BOQ. The cured marble floor and wall facings shall be finished and polished to full gloss.

11. MARBLE PARTITIONS

Partitions shall be set true and level. Where partitions abut masonry walls, these shall be secured as shown on drawings. At other joints 3 angle clips shall be provided at each inter-section. Where slabs bear on floor they shall be secured with brass dowels not less than 2 per slab.

12. GLAZED WALLS TILING

The wall which is to receive glazed tiling shall be thoroughly soaked with water. Then 1:1 cement sand rendering shall be applied and left slightly rough. The tiles well soaked in water shall be bedded in 1:1 cement sand mortar, the mortar being buttered on the back of the tile to give a bed 1/4" thick after which the tile shall be pressed and tapped home in correct position.

The grouting shall be done with white or tinted cement as required. Any fixture required to be fixed in the glazed wall tiling shall be done with tiles cut to exact size with proper tools. Where whole tiles can be used, pieces shall not be permitted.

13. MEASUREMENT

Unless given otherwise in BOQ, work of this section shall be measured by superficial area. Urinal

partitions may be measured by number.

14. PAYMENT AND RATES

The rates shall be full compensation for everything required to be furnished like materials, labor, T&P scaffolds, etc. and the work done like roughening and cleaning/washing of the existing surfaces, batching, mixing, dividing and laying in panels including the panel dividing strips (if and

as mentioned in BOQ drawings) leveling, compacting, jointing, curing, grinding, washing, cleaning, repairing, polishing, finishing, fixing/installing, etc. for the work completed (laid/installed) in its required place/position, in all respects conforming to these specifications. The rate for terrazzo on stairs shall not include providing and installing metallic protectors to stairs nozing.

In case of Cast-in-Situ Terrazzo Work Items: the following shall be as specified in BOQ or shown on drawings:

a) Thickness of PCC 1:2:4 or 1:3 cement plaster base.
b) Thickness of 1:2 terrazzo topping.
c) Color of cement to be used in topping.
d) Panel dividers, if to be provided.

In Case of BOQ Items for Tiles Work: (terrazzo tiles, glazed ceramic tiles, acid proof tiles/ slabs, etc.) the following shall be as specified in BOQ/shown on drawings:

a) Quality (color, design, etc.) of tiles.
b) Thickness and mix ratio of bedding materials/ bases.
c) Jointing material in case of Acid proof tiles.

ROOFING AND WATER-PROOFING

1. CONFORMITY TO STANDARDS

All roofing work shall conform to relevant standards as applicable to the work specified. Except where otherwise specified, the work of water-proofing shall comply with the requirements of British Standard CP-144. "Roof Coverings, Part- I, 'Built-up-Bitumen Felts' and Part-2 'Mastic Asphalt'" as applicable to the work specified.

2. MATERIALS

Materials shall be delivered to the site in manufacturer's original unopened containers with manufacturers label bearing type, grade, name and quality, etc., clearly marked thereon. A copy of printed instructions of manufacturers shall be supplied to the Client.

Cement shall conform to Specifications as described under Section "Concreting".

Additive for Foam Concrete shall be of manufacture approved by the Client.

Water shall be as described under section "Concreting".

Bitumen shall conform to BS-1310 having a softening point lower than 160 deg.F and shall be Special Industrial Bitumen (S.I.B.) grade 10/20, PB3 or PB4.

Bitumen Felt shall conform to BS-747:1968, fine sand surfaced Bitumen Felt type IB, fiber based "Sealock", "Master" or equal.

Sand shall be as specified under section "Plasterer".

Gravel shall be 1/4" to 3/8" size and shall be washed free of dust, soil or foreign matter, and 100% passing through a 1/2" screen and dried.

G.I. Corrugated and Plain Sheets shall conform to relevant standards and shall be of 22-SWG thickness.

Asbestos Cement Corrugated Sheet shall conform to Pakistan Standard Specification No. PS- 430:1964 and shall be 6-mm thick.

Steel Bolts, Nuts, Washers, Screws shall conform to the requirements of BS-916 "Black Bolts, Screws & Nuts" and BS-1083 "Precision hexagon bolts, screws, nuts and plain washers" as applicable & BS-1494 "Fixing Accessories for Building Purposes".

Wood Screw: All fixing accessories for sheet roofing, J-hook bolts, Limpet patent dome washers, anchoring bolts and nuts for connecting sheets to each other, etc. shall be hot dipped galvanized as per BS-720 Part-I "Hot Dip Galvanized Coating".

3. SAMPLES

The Contractor shall get samples of all the materials used for the items under this section approved by the Client, and same type of material shall be used throughout the work. Any material required by the Client to be tested, shall be got tested by the Contractor at his own cost from a laboratory approved by the Client.

4. MEMBRANE WATER-PROOFING

a) General: Membrane water-proofing shall consist of number of layers indicated in the BOQ. It shall not be carried out when ambient temperature is below 40 deg.F, or before any pipes, drains, etc. with flashings around them have been installed.

b) Surface Preparation: All surfaces to receive water-proofing shall be clean and perfectly dry. All pits, holes, crevices shall be filled up with mortar and all high spots chipped off and ground

smooth and the surface carefully swept clean. Primer (Asphalt 50%, turpentine oil 50%) shall be applied to the surface and left to dry for 24 hours.

c) Application of Water-proofing: Leveling, surfacing & making proper slope for rain water drainage at roof in cement mortar 1:6 and laying Paint Coat of S.I.B @ 3.25 lbs / %Sft. over Bitumen Felt (Jute based) over sticking Coat of (S.I.B) 3.25 lbs / %Sft. over Primer Coat of bitumen 0.45 lbs / %Sft. Mixed with kerosene oil & sand blasting @ 5 Cft. / %Sft. Complete in all respects.

d) Turn-ups, overlaps and reinforcement at corners and around fixtures: Felt water-proofing shall be continued to turn up at slab edges and along partition walls and fixtures to a minimum of 6" height. Additional 2 layers felt treatment shall be provided at all corner angles. At all other places where membrane is subjected to unusual strains water-proofing felts shall have a minimum of 3" side and end laps and laps in succeeding layers shall be staggered by 11" so that in every three layers each lapped joint is covered by two continuous layers.

e) Protective Coating: Unless specific concrete or tile paving is called for above the water- proofing membrane, the final mop coat of bitumen while hot shall be provided with a blinding layer of washed dry peagravel or coarse sand as specified at 4-Cft./%Sft.

5. FOAM CONCRETE

Light weight concrete shall be prepared by using approved chemical additives to cement in such quantities and by such methods, according to printed instructions of the approved manufacturers, as will ensure the weight of concrete per Cft. required by BOQ and drawings, and the crushing strengths specified. The Contractor shall procure all materials and equipment necessary for the work, which shall be carried out after prepared samples have been approved by the Client. Foam concrete shall be laid in panels and true to levels and slopes as directed by the Client. All foam concrete shall be blinded by a monolithic surface layer 1/2" thick in 1:3 cement sand mortar finished smooth. Work shall be cured per Section "Concreting" for seven days.

6. CORRUGATED SHEET ROOFING

Roofing sheets shall rest on horizontal purlins so as to come under the ends and to give at least one or two lines of intermediate support. Each sheet shall be laid with 6" minimum lap at the end and a side lap of 2 corrugations. Each sheet must be fastened at the corners and every third corrugation along the ends, and evenly at the sides at intervals of not more than 2'. Holes for fastenings shall be drilled and not punched and shall be located always at ridges. Sheets are to join each other with Jhook bolts of 1/4" dia through 5/16" dia holes. Each bolt shall have a galvanized limpet dome washer at the top and a bitumen washer over the hole. Ridges and hips shall be covered by special ridge and hip section or with plain G.I. sheeting 22-SWG laid in length with end and side laps of at least 9", fastened as specified.

Sheets shall be fastened down just above the eaves by continuous lengths of 1.5"x1/2" flat iron bolted down at not more than 5' intervals by 1/2" dia bolts with 3"x3"x1/8" washer at the lower end and embedded 12" into the wall.

7. MUD AND TILE ROOFING & WATER PROOFING

Unless otherwise given in BOQ the work will consist of a coat of Primer per Clause 4 (b) on clean dry surface, two coats of Special Industrial Bitumen or approved equal applied at 17-lbs./%Sft. Each coat having a neat surface free of pin holes, bubbles, blemishes etc. a layer of polythene sheet of 500 gauge (5-mill = 0.005" thick) having 3" overlaps at joints, compacted earth, one inch thick mud plaster, a layer of first class burnt clay tiles 1.5" thick grouted in 1:3 cement sand mortar. Materials shall conform to the relevant specifications of this and other sections. Completed work shall be cured for 10 days.

8. MEASUREMENTS

All quantities shall be measured net, without any allowance for overlaps, turn ups, etc. Roofing and Water proofing shall be measured by superficial area, except that foam concrete insulation shall be measured by volume. Slopping roofs shall be measured along the slope.

9. PAYMENT AND RATES

The rates shall be full compensation for everything required to be furnished (like labor, T&P, scaffolds, materials) and done (like heating, transporting, laying, etc.) for the work item complete in place in all respects, conforming to these specifications.

Pay Item for Membrane Water Proofing

Rate shall cover work as per Clause 4 but the number of felt layers, numbers of piles of the felt, weight of felt per roll of 72'x3' and whether the top flood coat shall be covered with sand, pan gravel or polythene sheet 0.005" indicated gauge, shall be as given in BOQ/ drawing.

Pay Item for Light Weight Foam Concrete Insulation

Rate shall cover work per Clause 5, excluding the monolithic plaster layer at top which shall be paid for under a separate item under this Section or Section "Plastering". Density and average thickness of foam concrete shall be as indicated in BOQ.

Pay Item for Water Proofing and Mud & Tile Roofing

Rate shall be for work as per Clause 7 and the average thickness of compacted earth shall be 3", unless given otherwise.

Pay Item for Corrugated Sheet Roofing

The rate shall cover work as per Clause 6 including its fixing arrangement (except the support system like rafters and purlins) like J or hook bolts, limpet and bitumen washers including their galvanizing/ painting as per specifications Section-10, laps, hips, ridge and gutter pieces, etc. complete system as per actual requirements.

CARPENTRY AND JOINERY

1. CONFORMITY TO STANDARDS

Except as otherwise specified, work under this section shall conform to relevant British Standards as applicable to work.

2. MATERIALS

Timber: shall conform to the applicable requirements of BS-1986 "Quality of Timber and Workmanship in Joinery" Part-I 'Quality of Timber'. Timber shall be well seasoned, uniform in substance and color, free from large or dead knots, cross grains, winds, shakes, cracks or other blemishes. The fibre shall be straight and smooth and shall not give a dull appearance.

Ply-wood: shall conform to the applicable requirements of BS-1455 "British made Plywood" for workmanship and quality. Unless otherwise required or shown on the drawing the thickness of the plywood shall be ¼" and shall be Teak, Sheesham or commercial veneered for all exposed faces as given in BOQ or on drawings.

Panelling Boards: Where called for in the BOQ or shown on the drawings, paneling boards shall be factory-pressed boards of required thickness with Teak or Sheesham veneer on the exposed face and commercial ply on the back, with high density particle board in - between, as specified and approved by the Client. Edges and ends of boards where visible shall be provided with a veneer of matching grain and quality.

Formica: It shall be of required shade and pattern and of best quality as approved by the Client.

Flush Doors: shall conform to BS-459 "Flush Wood Doors" and Code of Practice CP-151 Part-I "Flush Wood Doors".

Metal Fixing Accessories: Fixing accessories shall conform to the requirements of applicable British Specifications in particular:

- BS-325 "Black Counter Sunk Nuts and Washers".
- BS-916 "Bolts, Screws and Nuts" BS-1210 "Wood Screws".
- BS-1494 "Fixing Accessories for Building Purposes".
- BS-1202 "Wire Nails and Cut Nails for Building Purposes".

Wire Gauze: unless otherwise specified in BOQ, shall be of best quality uniformly woven wire webbing 12x12 mesh per sq.in made from 22-gauge galvanized iron wire. All wire gauze panels shall be in one piece, no joint being allowed in the gauze.

Wood Preservative: shall be creosote or penta-chlorphenol and shall conform to the applicable requirements of BS-1266 "Classification of Wood Preservatives and their method of application".

Glue: shall conform to the applicable requirement of BS-745 "Animal Glue for wood" or BS-1204 "Synthetic Resin (Phenolic and Amine Plastic) Adhesives for construction work in Wood".

Putty shall be an elastic glazing compound suitable for interior and exterior glazing and shall conform to the requirements of BS-544 "Linseed oil putty for use in wooden frames". The putty for metal frames shall be of a type specially prepared for use with metal frames conforming to the applicable requirements of the BS or of a make approved by the Client.

Paint shall be as specified under section "Painting & Decorating".

Hardware shall be of best quality and make of approved manufacture. Their sizes, materials and number shall be as detailed in the drawings/bills of quantities.

3. SAMPLES

Samples of material used for the work under this section shall be submitted for approval by the Client and same type of material shall be used throughout the work. If the Client require the

material to be tested, this shall be got done by the Contractor at his own cost from a Laboratory approved by the Client. Any material rejected by the Client shall be removed from the site immediately.

4. WORKMANSHIP

4.1. General

Wood work shall be neatly and truly finished to exact dimensions and details as shown on the drawings. All joints shall be simple tenon and mortise joints unless otherwise specified or directed by the Client, and shall fit truly and fully. Holes of correct size shall be drilled before inserting screws. Driving in or starting in screws with hammer shall not be allowed. All screws shall be dipped in oil before being inserted in correct size holes which shall be drilled for the purpose. All portions of timber, built into or against masonry or concrete or used as sub-frame for railing or paneling, shall be treated with wood preservative as specified.

If after the wood work has been erected, any undue shrinkage, distortion or bad workmanship is discovered the Contractor shall forthwith replace or amend the same without any extra charge, to the satisfaction of the Client.

4.2. Frames for Doors, Windows etc.

Door and window frames shall conform to the applicable requirements of BS-1567 "Wood Door Frames and Linings". The door frames shall be of best quality Deodar wood or of the timber specified and shall be fabricated to exact size and dimensions as shown in the drawings. The vertical members of frames shall be embedded in floors at least 2" deep for which extra length no extra payment shall be made. Frames shall have rebate to receive the leaves as shown on the drawings. The frames shall be suitably secured to the brickwork or concrete by holdfasts or expansion bolts as shown on the drawings or as approved by the Client. Stop shall be of best quality timber of the same specification as that for frames.

4.3. Panelled Doors & Windows

Shall conform to the applicable requirements of BS-459 "Paneled and Glazed Wood Doors" Part-I and BS:CP-151 Part-I. Doors shall be of best quality well-seasoned Deodar Wood or the timber specified. Panels shall be of solid wood, veneered ply-wood, or glass as indicated in the drawings. Stiles, rails and beads shall be of well-seasoned best quality specified wood.

4.4. Flush Doors

Shall conform to the applicable requirements of BS-459 "Flush Wood Doors" and BS:CP-151. Door leaf shall be of well-seasoned solid core of Deodar wood block board cross grained and face veneered with 5-ply 6mm thick plywood of specified finish on each side. Door leaf shall have an inner frame and well-seasoned edge strips of quality and design shown on drawings on all four edges of leaf. Face veneers shall be free of saps, streaks, knots and irregularities and shall be suitable for taking required finish. Veneer construction shall provide for equal stress on both sides to ensure absence of warp. Flush doors shall be screwed to the frames by means of hinges which shall be counter sunk in the wooden frames.

4.5. Wiregauzed Doors and Windows

They shall be of size and design as shown in drawings or indicated in BOQ. Wire gauze shall be fixed to the frame of the leaf after being stretched from out to out of rebate and fixed taut. The screw shall not be less than 1.25" in length nor spaced farther than 9". All exposed arises of the fillet shall be finished with a small neat mould.

4.6. Paneling

It shall be of well-seasoned best quality required wood. Unless otherwise indicated in BOQ or drawings, the planks shall be ¾" thick. Deodar wood battens shall be screwed to hard wood plugs fixed in slab or wall creosoted before fixing as specified. Deodar wood panels shall be screwed to the Deodar wood under-frame as shown on the drawings. Deodar wood beading shall be provided wherever indicated on the drawings. Panels shall be so fixed that a uniform surface with equal gaps or joints results in a pleasing appearance.

4.7. Wood Handrails

Shall be of best quality well-seasoned wood. Handrails shall be accurately shaped to detail and made in as long sections as possible. Joints shall be fastened with concealed handrail bolts. All changes in direction shall be smooth, even, carved out of one solid piece. Handrails shall be secured to metal railing with ¼" x 2" screws at 12" centers.

4.8. Sub-frames for wall paneling, wood floors & cat-walks

They shall be of best quality Deodar wood, of sizes as shown on drawings and securely fixed in position using hard wood plugs, bolts etc. using enough number of nails, screws etc. as specified and directed by the Client. The timber members shall be given 2-coats of wood preservative before they are installed in position.

4.9. Hardware

It shall be carefully fitted and securely attached. Upon completion of the work all locks and hinges shall be oiled and all hardware shall be demonstrated to work freely in the presence of Client. Key shall be fitted into their locks and upon acceptance of the work, keys shall be tagged and delivered to Client.

5. PAINTING

All wooden doors, windows, paneling etc. shall be painted or polished as required, and as specified under section "Painter and Decorator". Hard woods shall be polished and soft woods shall be painted.

6. MEASUREMENTS

6.1. General Wood Work

The measurement of wood work (general) or planking shall be the net measurement after fixing in position, no allowance being made for waste, overlaps, rebates or the dimensions supplied beyond those specified. The length of each piece, however, shall be taken overall so as to include projection for tenons or scarfs. Measurement shall be made by superficial area, volume or length as given in BOQ.

6.2. Doors & Windows

These shall be measured by the superficial area of the clear opening in brick work or masonry, no allowance being made for overlaps, architraves, beadings and the like; except that in case of doors having frames on two sides only with a void at bottom between the floor and the leaf, height shall be the leaf height. In case of any special rate being paid, measurement shall be taken of the least squares or rectangles to contain the opening in question. Fixed wire-gauze and wire-gauze leaves shall not be measured for separate payment.

6.3. Wood Hand Rails

Shall be measured by length. Metal work (Balustrades, Anchors etc.) shall be measured and paid under section "Steel & Metal Worker".

7. PAYMENT AND RATES

The rate and prices shall be full compensation for everything furnished and done for the work item installed/ fixed complete in all respects, and as per these specifications, drawings, instructions of the Client and Conditions of Contract. It should be specifically noted that the rates are also inclusive of the following:

- Hardware per Hardware Schedule; hold fasts, plugs, fixed wire gauze or wire gauze shutters; architraves, stops, beadings, mouldings, tower bolts and mortice locks (Japan made) etc. all as shown on the drawings and as specified.

- Finishing (painting, polishing etc.) wood preservatives as specified in section "Painting and Decorating".

DOORS & WINDOWS

1. GENERAL

Wood work is the process of converting timber into a desired shape and creating it into its final position. It is mostly carpenter's and jointer's work.

2. QUALITY OF TIMBER

Timber shall conform to general specification according to the species stipulated in the item of work. Timber shall be from the heart of a sound and full grown tree, the sap wood being entirely removed. It shall be uniform in substance and color straight in fiber, free from large or dead knot, twists, cracks, incipient decay, plain shakes or blemishes of any kind and shall be thoroughly seasoned. Any timber rejected by the Engineer / Project Manager shall be removed by the contractor from the site of work within 24 hours.

3. SCANTLING AND PLANKS

All scantlings, planks, etc. shall be sawn straight and be of uniform thickness and of full measurement from end to end and shall be stacked in the directions of grains. All planks and scantlings shall be sawn in excess of actual measurements to allow for planning.

4. FINISHING AND WORKMANSHIP

All work shall be neatly and truly finished to the exact dimension required. Wood work which is exposed to view shall be accurately planed to the required dimensions.

All workmanship is to be of the best description and all joints must fit accurately without wedging or filling.

All wood work shall be carried out either in accordance with the drawings or as directed by the Engineer / Project Manager.

5. JOINERY

Unless otherwise specified, all joints shall be simple, tenon and mortise, joints with the ends of the tenons exposed to view. All joints or scarfs shall fit truly and fully. Where specified the ends of the tenons shall not show. Joints shall be painted with white or red lead before the frames are put together.

Holes of correct size shall be drilled before inserting screws. Driving in screws with a hammer is prohibited. All screws shall be dipped in oil before being inserted in the timber. The number and size of nails and screws shall be subject to the approval of the Engineer / Project Manager. The heads of nails or screws shall be sunk and puttied or dealt with as required by the Engineer / Project Manager.

6. EXPOSED WOOD WORK

Wood posts in exposed position must rest on a stone or cement concrete base and be fixed by a holding down bolt. Tenons projecting into the stones or concrete base are prohibited. The holding down bolts shall be at least ⅝" in diameter and fixed to a washer and embedded in plinth at least
½" below the stone base. The bolt must pass through the base and project 9" through the bottom of the post, being secured to it by a nut let in through a cavity which must be subsequently plugged.

7. EASING OF DOORS AND WINDOWS

The Contractor shall be responsible for the easing or otherwise of all doors and windows, etc. and the closing of all open joint which may occur within the period prescribed in the agreement which in the opinion of the Engineer / Project Manager should be attended to.

8. INSPECTION

All wood work shall be passed and initialed by the Engineer / Project Manager before being finally fixed in position. No timber work shall be pained, tarred or oiled without prior approval of the Engineer / Project Manager.

9. ALUMINUM WINDOWS AND VENTILATORS

a). The term "aluminum" shall mean 'wrought aluminum alloys for general Engineer / Project Managering purposes' in accordance with the BS 1470 - 1475 series and `cast aluminum' shall be aluminum cast by permanent mound or gravity die techniques to BS 1490 using LM6 alloy.

b). The Contractor shall submit samples of components to the Engineer / Project Manager for approval together with test certificates which show that the components possess the following characteristics.

MECHANICAL PROPERTIES	
Cupping test to DIN 53156	9 mm
Bend test to DIN 53152	Less than 5 mm
Reverse impact to ASTM 27944-69	100-150 CM/KG
Indentation hardness to DIN 3153	More than 100
Pencil hardness	2H
Cross cut test to DIN 53151	Gt.0

CONTINUOUS HEAT RESISTANCE	
After 1000 hours at 120°C	Slight yellowing of white shades

CORROSION AND WEATHERING TEST	
Humidity test to DIN 50017 on zinc phosphated steel sheet	No change after 500 hours
Salt spray test to ASTM B 117 on zinc phosphated steel sheet	No loss of adhesion after 20 rounds
Weathering in Florida (USA) and industrial climate	Excellent results

CHEMICAL RESISTANCE		
Test Medium	**Time**	**Result**
Premium petrol (gasoline)	10 minutes	No change
Ethanol	10 minutes	No change
Toluene	10 minutes	No change
Butylacetate	10 minutes	No change
Trichloroethylene	10 minutes	Softening
Acetone	10 minutes	Softening
Hydrochloric acid, 10%	4 weeks	No change
Sulfuric acid, 10%	4 weeks	No change
Acetic acid, 10%	4 weeks	No change
Soda solution, 1%	4 weeks	No change
Nitric acid, 1%	4 weeks	No change
Fuel oil	4 weeks	No change
Ammonia, 10%	4 weeks	No change
Caustic soda lye, 10%	4 weeks	Detached

9.1. Surface Finish

a). In addition to specific surface finishes, the contractor shall where necessary adequately treat or seal the permanently hidden parts of metal work from deterioration and corrosion (excluding standard hollow sections).

b). Mill finish aluminum will not be accepted unless specified or to the Engineer / Project Manager's written approval or to be subsequently decorated.

c). The design of metal components shall comply with the requirements of BS 4479 in as much as they are applicable to the specific component and where a British Standard exists for the component it shall also be complied with.

d). All fixings shall be of materials compatible with the component being fixed and where dissimilar metals are used adequate precautions, such as coating or sleeving, shall be taken to prevent electrolytic corrosion.

e). All nuts and bolts shall be adequately protected from corrosion and all exposed bolts including carpenters and joiners metalwork are to be capped with an approved dome headed nut.

9.2. Protective Coatings and Finishes

a). Primers

Section of primers shall be in accordance with BS 5493 and shall comply to BS 2523, BS 3098 or BS 4652.

b). Galvanizing

729 and BS 2989 and unless specified otherwise shall be 85mm (6.0g/m2)

c). Anodizing

i. Where indicated on the drawings or specified elsewhere aluminum shall be anodized in accordance with BS 1615 Grade AA25 and BS 3987 to the colour and finish approved by the Engineer / Project Manager.

ii. Anodizing shall be by the "Anoloc" process to give 25 micron minimum depth and a certificate of anodizing shall be submitted to the Engineer / Project Manager.

iii. Sections shall be anodizing before cutting into length to suit the fittings dimensions.

d). Polyester Powder Coating

i. Powder coatings shall comply to BS 6496 or BS 6497 as applicable to the material to be coated.

ii. Polyester powder coating shall be to a minimum film thickness of 100 microns and carried out by an approved specialist to the specified colour.

iii. Steel to receive polyester powder coatings shall be first galvanized in accordance with Clause 1.5.2.

iv. Aluminum sections to receive polyester powder coating shall be first cleaned, degreased and primed with two-pack each primer.

e). Painting

When described on the drawings/schedules painting of metalwork shall be in accordance with Section 7 of this specification.

10. COMPONENTS

10.1 General Requirements

a). All components shall be obtained from an approved supplier/ fabricator and the contractor shall submit to the Engineer / Project Manager for his approval a complete set of shop drawings indicating dimensions, materials, components, fixings etc, prior to commencement of fabrication.

b). The design of metal components shall comply with the requirements of BS 4479 in as much as they are applicable to the specific component, and where a British Standard exists for that component it shall also be complied with.

c). The shop drawings referred to in clause.2.1. (i) above shall conform to the design, dimensions and general descriptions as shown on the drawings/schedules and as specified.

d). The aluminum work shall be designed and fixings designed and anchored so that the component will not be distorted nor the fasteners overstressed as a result of thermal movement of the component, the glazing or the adjacent structure.

e). All fixings shall be of materials compatible with the component being fixed and where dissimilar metals are used adequate precautions, such as coating or sleeving, shall be taken to prevent electrolytic corrosion.

f). All nuts and bolts shall be adequately protected from corrosion and all exposed bolts including Carpenters and Joiners metalwork are to be capped with an approved dome headed nut.

10.2 Aluminum Windows, Doors and Screens

a). Aluminum windows shall be manufactured to BS 4873 and tested to BS 4315 Part 1 to comply with sever exposure rating as defined in BS 6375 Part 1.

b). The Contractor shall obtain from the window manufacturer all design calculations in respect of wind loading for external windows and screens and submit them to the Engineer / Project Manager for approval.

c). Aluminum framed sliding glass doors shall be in accordance with BS 5286.

d). Glazing shall be installed at the factory at the time manufacture in accordance with Section 12 of this specification.

e). All main frame sections, door members, stiles etc. shall not be less than 2.5 mm thick. Covers, flashings, glazing clips etc. shall not be less than 1.5 mm thick.

f). Glazed sections shall be provided with high quality neoprene gasket and polypropylene woodpiles which fit within the relevant groove in the profile and be integral with the extrusion and system.

g). All fixings, ironmongery, locks and locking devices, fly screens, glazing, weather-stripping etc. necessary for the proper and intended function of the proper and intended function of the component shall be included with the component and shall be allowed for within the Contractors Tender and shall be easily replaceable.

h). Ironmongery to such fabricated components shall be of comparable quality to the ironmongery used elsewhere and suited to the proposed operation of the component and the component shall be suitably strengthened, lapped and modified to receive the ironmongery and the finish shall match the finish of the units.

i). When shown on the drawings/schedules or specified, particular requirements for ironmongery and any other integral parts of the component shall be included.

j). All frames, angles, channels and the like shall be non-ferrous and fixed with countersunk aluminum screws or as indicated on the drawings/schedules all of which shall be finished to match exactly the colour and finish of the adjacent aluminum components and sections or to the specified finish/ colour.

k). Fly screens, where indicated, shall be of fiber glass coated PVC and the screen assembly shall be integral with the window / door framing.

10.3 Workmanship

a). All metal shall be undertaken in accordance with sound Engineer / Project Managering and smithy practice and as much metalwork as possible shall be undertaken in properly equipped workshops with site work restricted to fixing and other operations that cannot be undertaken prior to delivery to site.

b). All finished components shall be wrapped, taped or otherwise protected with non-absorbent coverings and delivered to site at a time to eliminate or reduce to a minimum, storage on site prior to fixing.

c). Protective coverings shall be sufficiently removed for jointing, assembly and fixing purposes and afterwards replaced.

d). After erection all metal work with applied finishes shall be adequately protected from any damaged and any such work which is scratched, marked or damaged in any way shall be suitably repaired if appropriate, to the Engineer / Project Manager's approval or, if so instructed by the Engineer / Project Manager, replaced at the Contractor's expense.

e). The contractor shall submit to the Engineer / Project Manager evidence that the thickness of protective/ decorative coatings are not less than as specified and in cases of doubt the Engineer / Project Manager may instruct the Contractor to send sample pieces to independent testing laboratories and the cost of all such testing shall be borne by the Contractor.

f). All window, door, screen, and other like frames shall be made to allow a 5 mm tolerance all round the opening in the structure and junctions shall be finished off by applying an approved sealant onto a closed cell polystyrene foam backing strip or as otherwise shown on drawings or specified.

g). All aluminum sections shall present clear, straight and sharply defined lines and be free from any defect or imperfection and when assembled in frames shall have an overall size tolerance of ± 1.5 mm, shall be square and with a maximum difference in the diagonal length of 3 mm.

h). Welding shall be undertaken in accordance with the appropriate British standard for the type of metal being joined.

i). Aluminum fixed against or into cementitious materials or stone/brickwork shall be adequately protected by plastic spacers/sheeting or two coats of bituminous paint applied to the fixed face of the component.

10.4 Shop Drawings

Submit complete shop drawings and calculations for all work of this section to the Consultant for approval. Do not commence fabrication until written approval has been obtained.

Shop drawings shall include, but not be limited to the following:-

a). Plans, elevations and sections at 1:50 scale of all Curtain Wall installations.

b). Typical large scale unit elevations and sections at 1:20 scale, including Curtain, Wall and high level insulated panel.

c). Full size details of all component. members in place showing sizes, details methods of installation agreed tolerances, allowance for deflection of the structure, movement joints, junctions at walls, columns, ceilings, floors, anchorages, hardware, reinforcement, glazing, sealing and all other pertinent data to fully describe the work.

d). Full size details of each glazing condition showing glass, gasketry types and brand names of all materials and sizes of glass, together with drainage and ventilation of the glazing system.

e). Details of cleaning cradle guides.

f). Submit structural calculations in connection with the design of all Curtain Wall and window fabrication and installation, framework, components, fixing and glass.

10.5 Samples

a). Submit to the Consultant for approval, duplicate samples each 300 mm long of all frame sections that will be used in the External Curtain Wall, finished in the approved anodizing/powder coating color, and showing the light and dark limits. The accepted samples shall become standard for the job.

b). Submit sample corners of Curtain Wall units complete with glass and gaskets. Each leg of the frame to be 600 mm long properly jointed and sealed at the corner. Sample to be constructed from the approved aluminum sections. Obtain Consultant's acceptance in writing to these samples, before ordering or commencing fabrication. Approved samples shall become standard for the job.

c). Submit duplicate samples of all glass to Consultant for acceptance. No materials should be ordered or works commenced until samples have been accepted.

i. Sample of each type of glass, size 300 x 300 mm bearing name of the manufacturer and the type, thickness and quality of glass.

ii. Samples of double glazed vision panel and spandrel panel of size 1000x 1000 mm prepared from the accepted glass sample.

d). Submit duplicate samples of all caulking and sealing materials and glazing gasketry in appropriate and reasonable form to Consultant for acceptance. Contractor should not order materials or begin work until Consultant's acceptance of samples has been obtained.

10.6 Manufacturer's Data

Submit to Consultant for approval duplicate copies of all manufacturer's specifications, recommendations and standard details for all work of this section covering fabrication, finishing, installation, hardware and accessories, glazing sealing, and other information required for complete description of the work.

Include certified Testing Laboratory Reports sufficient to show full compliance with the specified performance requirements.

10.7 Co-ordination

Co-ordinate work of this Section with that of other trades affecting or affected by this work and cooperate with the other trades as is necessary to assure steady progress of all work of the Contract; obtain all information from other agencies required for the satisfactory fabrication, erection and performance of the Curtain Walling system.

10.8 Guarantee

a). The Contractor shall furnish to the Employer a written unconditional Guarantee for all work of this section, against faulty materials or workmanship for a period of ten (10) years from the date of Substantial Completion of the Project. The Guarantee shall state that any fault in workmanship or materials which may develop within the guarantee period shall be made good or replaced and reinstalled promptly, including the making good or replacement or reinstallation of adjacent work disturbed, without additional cost to the Employer.

This guarantee shall be in addition to and not in lieu of other obligations of the Contractor under the Contract.

b). Provide a written guarantee, signed and issued in the name of the Employer stating the sealed glazing units and other glazing units 'are guaranteed against improper fabrication, improper installation, de-lamination, discoloration or other faults for a period of ten (10) years and that any such defective units will be replaced within this period, without additional cost to the Employer.

These guarantees shall be in addition to and not in lieu of other obligations of the Contractor under Contract and other Agreements.

c). A technical inspector of the curtain walling manufacturer will be required to inspect the entire system and will be required to certify to the Consultant that the fabrication, erection and installation works done by the Contractor are fully in conformity with the standards, methods, specifications and codes of practice used by the manufacturer. Such certificate must be submitted by the Contractor prior to Virtual Completion of the Project.

10.9 Field Measurements

The Aluminum fabricator shall check actual window dimensions in the construction work by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Co-ordinate fabrication schedule with construction progress as directed by Contractor and if necessary, to proceed with fabrication without field measurements to avoid delay of the work, precede but co-ordinate and control deflection and installation tolerances to ensure proper fit of the window assemblies.

10.10 Standard

Except as otherwise indicated or specified, materials, construction and workmanship for aluminum windows of this section, the terminology, standards of performance and the design of the windows and glass shall comply with all Codes and Regulations, Local Building Regulations, Safety regulations and any other regulations applicable to the installation.

Manufacturers are to work to BS Standards or DIN Standards as appropriate. Where there is no standard in one range of standards, then the other appropriate standard shall apply:

B.S. 1474	Wrought Aluminum and Aluminum alloys for general Engineer / Project Managering purposes -bars, extruded round tubes and sections.
B.S. 2987	Anodic Oxide coatings on wrought aluminum for external Architectural Applications
DIN 4102	Behavior in fire of building materials and components.
B.S. 961	Fixing accessories & regulations
B.S. 1331	Fixing accessories & regulations
B.S. 1769	Fixing accessories & regulations
B.S. 1494	Fixing accessories & regulations
B.S. 2874	Fixing accessories & regulations
DIN 18800	Fixing accessories & regulations DIN
18801	Fixing accessories & regulations DIN
18357	Fixing accessories & regulations DIN
18360	Fixing accessories & regulations

10.11 Performance and Testing Requirements

The installation to be designed to meet or exceed the requirements of the specification as given in this section, in accordance with B.S. 6375/4315 : 1968 and DIN 18.055.

a). The installation and glass thickness are to be designed to withstand a basic wind speed of 45 m /s for the Abu Dhabi area, adjusted to a wind speed of 50 m/s with dynamic pressures of + 2180 N/m2 at the 90 meter level.

b). The window and cladding constructions are to meet the following requirements:

i. Wind Loading: No window elements to suffer permanent distortion or other damage with deflection not greater than 1/175 negative pressures of 2180 N/m2.

ii. Adequacy of fixings at positive and negative differential pressures of 2180 N/m2 are to be assured.

iii. Performance when tested to B.S. 4315 : 1968 in respect of:

- **Water Penetration**

  There is to be no water leakage when the window is subjected to continual steady pressure for the five minute periods at 50 N/m2 (5 mm H^2O increments up to a maximum of 350 N/m2) (35 mm H^2O).

- **Water Penetration After Wind Gusting**

  The window assembly is to be subjected to three cycles of positive and negative wind loading up to a maximum pressure of 1830 N/m2 (183 mm H^2O).
  The pressure is to be held at zero between each half cycle.

- **Air Infiltration**

  There is to be no air infiltration greater than 3 m3/h per meter length of joint when the window assembly is subjected to a test pressure of 200 N/m2 (20 mm H2O).

c). Performance tests through a recognized independent testing laboratory or Agency in accordance with the specifications given above, and provide certified test results for:

i. Water penetration
ii. Water penetration after Wind gusting
iii. Air infiltration.
iv. Deflection of window members due to positive and negative wind loading pressures.

The Contractor shall allow for all costs including the test chamber and support structure for the test units.

If any test unit fails to pass the initial testing, the Contractor shall make all necessary corrections: and have the test(s) repeated at no additional cost to the Employer.

Three copies of the Test Report shall be forwarded to the Consultant.

The Contractor shall allow for the costs for the Consultant to witness the tests.

The Contractor shall note that suitable testing laboratories are located in Europe and America. He shall allow for all costs in connection with testing to the Consultant's approval, including attendance of the Consultant if required, at testing. All the traveling and accommodation expenses, etc., shall be deemed to be included in these costs.

10.12 Sliding Windows and Doors

a). Weather-stripping -high density acrilan or wool weather pile shall be used. There should be double brushes at every contact between shutter and frame sections for complete insulation. These should be present consistently throughout the unit between the inside and the outside and no portions without it are permitted.

b). The rollers for sliding shutters for both windows as well as doors shall be of adjustable type. The adjusting screws must be accessible in the assembled state of the shutters and a vertical adjustment of 75 mm should be possible.

c). All sections for sliding windows and doors should be hollow section and the cross section dimensions of the sections should be not less than 60 x 40mm.

d). The outer frame must be suitable for accommodating sliding fly screens as required.

e). The handle-latch set should have all visible surfaces of anodized Aluminum or similar non- rusting materials to approval. The handle must have a proper grip. A small projecting flange or a recess in the shutter sections cannot be accepted to serve as handles. The latching mechanism should not be surface mounted but should be concealed within the sections.

f). Sash rails of vertical sliding windows are to be of tubular' box sections with corner joints of outer frames and sashes interlocked, and the balance mechanism is to be an approved proprietary product.

10.13 Side Hung Windows. Doors and Ventilators

a). All windows and doors should be weather-stripped with heat resistant PVC sections. The weather protection should be achieved by a positive compressive action against the PVC section and should not depend on an external contact with the PVC section. At every contact between two profiles two weather-stripping sections should be provided to complete weather protection.

b). The bottom sections for hinged doors must be capable of being adjusted vertically if necessary. The gap between the bottom section and the floor should be covered with a pair of special splay-type PVC sections.

c). The shutter sections for both windows as well as doors shall be hollow section type and shall be overall size 57 x 454 mm (including flanges).

d). The shutters of the windows and doors should be assembled with concealed corners of high rigidity. Hinges should be concealed with the sections.

e). Hinges shall be in anodized aluminum with stainless steel pins and nylon washers. Handles shall be in anodized aluminum and mounted with self-lubricating nylon washers.

f). A mortice cylinder rim automatic deadlock of high quality with double pin tumbler is to be used.

g). Windows shall have anodized aluminum handles and a latching mechanism securing the shutter to the frame both at the top and bottom.

h). Fittings where required:

i. Single action door closer concealed in the head bar of the outer frame and mounted on an adjacent pivot at the threshold and dead lock fitted.
ii. The left hand leaf of double doors with flush bolts at head and sill with deadlock fitted to the right hand leaf.
iii. Escape doors to have panic bolt assembly with vertical elements concealed in the stile and door close as in (a).

10.14 Louvers

For details of louvered windows refer to windows details. Louvers will generally be aluminum. Fly screens will be fitted internally to all louvers

11. FRAME OF DOORS WINDOW, VENTILATIONS FAN LIGHT ETC.

11.1 Fixing of Frames

Frame shall be fixed to the masonry by means of holdfasts of required size. Unless otherwise specified, ventilators, fan light and clear storey windows shall be provided with 2 holdfasts, windows with 4 holdfasts and doors with 6 holdfasts.

12. LV HOLD FAST

The size of the holdfast for doors shall be 12" x 1-½" x ¼" and for windows, ventilators 9"x1½"x¼". The ends of the holdfast shall be split and bent.

The Contractor's rate for holdfast shall include the cost of screws concrete fixing etc. complete.

Unless other specified in the schedule of quantities, the cost of the holdfast shall not be included in the cost of door and window frames. Where the holdfast is to have a pivot, the same shall be of the diameter shown on the drawing and shall be riveted to the flat of the holdfast. Holdfast must have one of its ends split and must be embedded in 1:2:4 cement concrete for the full length of the hold fast and the width of the wall. The depth of embedding will be 6".

13. TRUSSES ROOFS SCANTLING AND DUNNAGE

Wood work shall be done in best workmanship, properly wrought and framed in trusses. All joining shall be according to the detailed drawings and trusses be secured in position with proper anchoring as given in the drawings.

14. FULLY PANELED SHUTTERS

14.1 Panel

Panels shall be made of solid wood or hard board or ply wood or any other material as specified in the item of work. These shall be truly cut and framed into the beds to a depth not less than ⅜". The thickness of panels shall be as specified. Panels shall be one piece upto 12" size in case of deodar and other species except for teak where it shall be 18". In larger sizes, panels shall be joined but the joint shall be glued and dowelled together to avoid all possibility of its opening afterwards.

Panels shall be finished smooth so that no mark is visible. Unless otherwise specified simple moulded projected beading shall be fixed all-round the panels on both the faces of shutters.

14.2 Shutter frame

All styles and rails shall be properly mortised and shall be tenoned. The thickness of tenon shall not exceed ⅓ and not be loss than ¼th of the thickness of the plank and the width shall not exceed 5 times the thickness. All rails over 7" in depth shall have double tenons. All tenons shall pass completely through styles and shall be secured by hard wood pins.
All tenons at the final assembly of the doors shall be glued and wedged top and bottom of the tenon with glued wedges.

14.3 Fixing

Unless otherwise specified, leaves are to be hung on hinges of brass or iron of the size and number as directed by the Engineer / Project Manager. All hinges shall be counter sunk into the Chowkhats as well as in the leaf, the recess being cut to the exact size and depth of the hinges, no subsequent packing being tolerated. The hinges will be fixed by means of screws of the approved size.

14.4 Frame finishing

The frame shall be rebated on one side ½" deep and to the full thickness of the shutter as specified in the bill of quantities. The other side shall have a returned bead or be chamfered or rebated or grooved according to design.

15. FULLY GLAZED SHUTTERS

15.1 Shutter frame

All styles and rails shall be properly mortised and shall be tenoned. The thickness of tenon shall not exceed ⅓ and not be loss than ¼th of the thickness of the plank and the width shall not exceed 5 times the thickness. All rails over 7" in depth shall have double tenons. All tenons shall pass completely through styles and shall be secured by hard wood pins.

All tenons at the final assembly of the doors shall be glued and wedged top and bottom of the tenon with glued wedges.

15.2 Shutters

Sash bars shall be of the same thickness as of the leaf and shall be 1" to 1-¼" wide, according to the size of the doors and shall be twice rebated and mitered on the outside unless otherwise specified. The size of the rebate shall be ⅜" x ½" to receive the glass and its fixing.

15.3 Glazing

Unless otherwise specified, all glass shall be patent, flattened sheet or plate glass of the best quality. Unless otherwise required all glazing shall be frosted or ground glass as approved by the Engineer / Project Manager.

The glass shall be of the following weights per Sft. for the various sizes mentioned below:-

a). Not exceeding 1 sft. 16 or 18 oz (1/12" & 3/32" thick respectively or 2mm 1.70/ 2.40)
b). Exceeding 1 sft. but not exceeding 2 sft. 24 oz (⅛" thick approx. or 3mm 2.50/4.40)
c). Exceeding 2 sft. but not exceeding 4 sft. 32 oz (5/32" thick approx. or 4mm 3.50/4.40)
d). Exceeding 4 sft. but not exceeding 6 sft. 40 oz (7/32" thick approx. or 5mm 4.50/5.40)
e). Exceeding 6 sft. Plate glass (¼" thick)

The glass shall be free from specks, bubble, distortions and flaws of any kind and shall be properly cut to fit the rebates of the sashes truly, etc., so as to leave a uniform space of 1/16" all-round the panels.

When plate glass is required or specified, it shall be unless otherwise described, "Polished Patent Plate Glass" of the approved quality. It shall be of a unusual light color, shall be transparent. It shall be such as to give clear vision. It shall not be confused with thick drawn sheet glass.

Glass will be secured to shutters with fillets of wood of the same quality as of the leaves or with putty. The fillets shall be plain or molded. The glass shall be protected from contact with wood by a piece of leather or putty to act as a cushion, the putty will consist of double boiled linseed oil and best whiting well mixed up by hand, the whiting will be specially dry and pass through a sieve of 45 meshes to an inch and will be mixed with as much linseed oil as will form it into a stiff paste. This, after being well kneaded, shall be left for 12 hours and worked up in small paste till quite smooth. If the putty becomes dry it should be restored by heating and working, it up again while hot. The putty will be colored to suit the color of the doors or windows, etc. and all putty shall be given a coat of oil paint to protect it from air.

No glass will be inserted in frames until they have been primed and prepared for painting so that the putty may adhere properly.

If frosted glasses are used they will be fixed with the frosted face away from the putty. No glazing shall be considered complete until all splashes and other stains have been removed from the surface of the glass.

16. FITTINGS

Iron, brass, chromium, oxidized or any other types of fittings as specified in the nomenclature, shall be of heavy type. The section and make of all fittings shall be subject to the approval of the Engineer / Project Manager and samples of approved fittings shall be supplied to his office for reference as and when required.

However, sliding bolts, handles, eye-hooks, wooden cleats, wooden stoppers, floor sockets, etc. and other special fittings such as locks, metal stays stoppers, door closers and special handles, etc. and where required will be separately paid for.

17. CAT LADDERS

a). Cat ladders where noted on the drawings shall be steel and unless otherwise detailed shall be constructed as follows. Stringers shall be 50 x 6 mm flat attached to the structure with 75 x 75 x 6 mm plates bolted to the structure so that the clearance of the stairs from the structure is not less shall 300 mm.

b). Treads shall be formed of 19 mm tube riveted to the stringers.

c). Safety loops shall be fitted to cat ladders more than 2000 mm long and thereafter at 1000 mm intervals. The width across the loop shall be 685 mm and the distance from the centre line of the stringers to the inside of the back of the loops measured at right angles to the stringers shall be 762 mm. The loop material shall be minimum 50 x 6 mm.

18. MEASUREMENT

All wood work will be paid by net measurement, no allowance being made for wastage or for any dimensions supplied beyond those specified. The length of each piece will be measured overall so as to include projections for tenons and scarfs. Similarly deductions due to taking out of rebate or providing moldings will not be made.

The area of shutters will be measured with the doors shut, i.e. measurement of the overlapping area at the meeting styles will not be recorded.

19. PAYMENTS

Payment shall cover all the requirements of work as included in the nomenclature of BOQ item of work and shall include the cost of all labour, material and fittings, carriage, sawing, joinery work, placing, framing, scaffolding, tools and plants put will be include the cost of holdfast.

GLASS AND GLAZING

1. GENERALLY

1.1 Samples

Samples not less than 150 mm squares shall be submitted for approval for all types of glass to be used in the Works.

1.2 Storage

All glass products will become stained if stored in a humid environment. This staining may take the appearance of a "rainbow" effect or, in extreme cases, a milky coat on the surface of the glass, and is more visible. To prevent staining, the following recommendations should be followed:

- Check the glasses immediately upon delivery in order to make sure that they are dry and undamaged.
- Storage should be in Aluminum Foil packing or proper packing, and in racks which are only to be opened at the time of usage. After using, remaining pack should be repacked to avoid damage of coating.
- Store in racks at a 3º-7º angle to the vertical in a dry, well-ventilated location, protected from rain and running water.
- The storing place should be free from wide, sudden changes in temperature and humidity.
- Do not leave the glasses exposed to the sun inside any package as this may lead to thermal breakage.

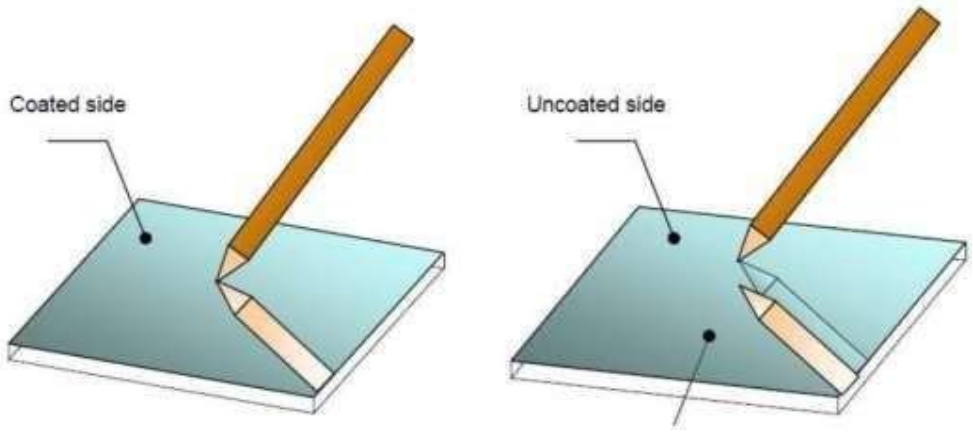
Glass shall be stored in a shaded and ventilated area and shall be protected from dirt and accidental damage. Care shall be taken to prevent the accumulation of water between the sheets and any glass stocks that show signs of dampness shall be separated and dried.

1.3 Indicators

Painted or stuck on indicators shall not be used on solar control or coloured glass. White wash may be used on ordinary glass but shall be restricted to small central areas of the panes.

- Coating detectors or simple coating detection methods should be used to confirm coating side.

Coating side Identification Method:



1.4 Cleaning

All glass shall be cleaned to remove smears, excess compound and sealant on completion. Broken or damaged glass shall be replaced prior to handover of the Works.

- Standard washing equipment with cylindrical brushes and demineralized water should be used. Never use circular disk brushes.

- The panes being washed should never stop inside the washing unit, especially when the brushes are working / Running.
- It is suggested that after washing, the glass panes be always checked for any stain or scratches.

1.5 Cutting

- The cutting table must always be kept clean and free of glass splinters.
- As for any coated glass, it must always be placed on the cutting table with the glass non coated side facing down to avoid the risk of damaging the coating with glass splinters.
- "Using Speed Cutter or T cutter" Care should be taken to avoid damaging the glass edges.
- Cutting oil: the use of volatile cutting oil such as ACW PE 5250 or ACW PE 5503 is recommended. Please do not use Kerosene oil.
- When stacking cut plates prior to further processing or between the processing phases, these plates should be separated by means of either:
  - cork pads
  - Foam interlayers.
- Cork pads are to be preferred, as foam interlayers may more readily absorb water or other undesirable contaminating agents. Check that the cork pads do not leave glue marks after washing.

1.6 MATERIALS

a. Glass

i. Glass shall comply with BS 952 and shall be used in accordance with BS 6262.

ii. Transparent glass shall be clear float or polished plate glass not less than 4 mm nominal thickness. Sheet glass shall not be used in the Works.

iii. Wired glass shall be square pattern Georgian wired (13 mm square).

iv. Patterned and rough cast (obscured) glass shall be to the approval of the Engineer / Project Manager.

v. Solar control glass shall be body tinted, surface modified or surface coated float glass as specified elsewhere in the contract documentation and shall be of a thickness recommended by the manufacturer for the size of pane.

vi. Hermetically sealed flat double glazing units shall comply with BS 5713.

vii. Toughened glass shall be processed float or polished plate glass satisfying the impact requirements of BS 6202, Class B.

viii. Glass bricks shall be hermetically sealed hollow transparent or translucent glass blocks complying with BS 952, Part 1, of the sizes, surface patterns and colours specified on the drawings.

ix. Roof lights shall be of the types specified on the drawings, constructed in compliance with the requirements of CP 153, Parts 1, 2 and 4 and obtained from a manufacturer to be approved by the Engineer / Project Manager.

x. All glass shall be of accurate size with clean, undamaged edges and surfaces which are not disfigured.

xi. Curved glass shall be obtained from an approved manufacturer / supplier to the shape as detailed on the drawings.

xii. Patterning of glass shall be carried out as described on the drawing by an approved specialist and shall be performed by sand blasting, grinding or acid embossing. Patterning to mirrored glass shall be on the silvered face unless otherwise specified or approved by the Engineer / Project Manager.

xiii. Pre-stressed borosilicate glass (min. 6mm) thick shall be used as a fire resistant material where detailed on the drawings.

xiv. Glazing, clear or frosted, shall be in conformity with requirements of BS:CP-152 "Glazing and fixing of glass for buildings" and BS-952. All glass used shall be even, free from specks, bubbles, tints, distortion and flaws of every kind. Unless otherwise specified in the Bills of Quantities, the glass shall conform to weights per Sft for various sizes as below:

- Not exceeding 12"x14" - 16 oz (about 1/14" thick).
- Exceeding 12"x14" but not exceeding 24"x24" - 21 oz (1/10" thick).
- Exceeding 24" x24" but not exceeding 30"x30" - 26 oz (1/9" thick).
- Exceeding 12"x14" but not exceeding 36"x36" - 32 oz (1/7" thick).
- Exceeding 36"x36" plate glass - (¼ thick). (1/10" thick).

xv. Weight of glass as required for the largest panel in any unit of door or window, etc. shall be employed in all panels irrespective of their size

b. Mirrors

i. Mirrors shall be manufactured from float or polished plate glass minimum 6 mm thick and shall have ground and polished edges. The silvering shall be protected by a copper backing and protective paint coating.

ii. Mirrors shall be silver coated and should be lead and copper free.

c. Accessories

i. Distance pieces, setting and location blocks shall be plasticized polyvinyl chloride complying with BS 2571 (softness number 35 to 45), rigid nylon or sealed hardwood. PVC shall not be used for heavy glass panes, solar control glasses or sealed double glazing units.

ii. Screws for fixing mirrors shall be brass with a detachable, screw-on chrome plated brass dome to BS 1494, Part 2. Sleeves and washers shall be polyethylene.

2. WORKMANSHIP

a. Glazing - Generally

i. External glazing shall be wind and watertight on completion.

ii. All rebates and grooves shall be clean, dry, free from burrs and other projections, smooth and undistorted.

iii. The minimum thickness of glass other than fully toughened glass shall be 6 mm when situated in the following locations:

1. Any hinged fully or partly glazed door and any adjacent side panel.
2. Any sliding fully or partly glazed door and any adjacent fixed light.
3. Any glass wholly or partially within a zone between floor level and 800 mm above floor level.

iv. Glazing to internal wood doors and screens shall be bedded in self-adhesive black velvet or approved proprietary tape and secured with hardwood glazing beads fixed with brass cups and screws.

v. Glazing to external wood doors and screens shall be bedded in approved polymer mastic performed tape and secured with hardwood glazing beads fixed with brass cups and screws.

vi. All rebates to wood doors and screens shall be primed and sealed.

vii. Wire glass shall be fixed with the wires parallel to the surround and aligned in adjacent

panels in single and double doors.

viii. Fire resistant glazing channel shall be butt jointed at corners and fixed with 38 mm countersunk brass screws at not more than 200 mm centres and not more than 50 mm from each end. The butt joints of glazing channels for one hour fire resisting doors shall be sealed with intumescent mastic.

ix. All glazing work shall be carried out in conformity with BS:CP-152. Glass will be fixed after first coat of paint or polish has been applied. Glass shall be fixed with best quality putty, wood or steel moulding as required. Glass shall be protected against damage. After inspection, any labels and paint spots shall be removed from the glass and glass shall be washed clean. Damaged or broken glass shall be removed and replaced by the Contractor at his own expense.

b. Glazing Aluminum Windows Externally

i. Generally the glazing system shall utilize snap-in beads and neoprene glazing gaskets. Other glazing techniques involving the use of glazing compounds, sealants etc., shall be submitted to the Engineer / Project Manager for approval together with details of similar installations successfully employed elsewhere in the Gulf region.

ii. Unless otherwise indicated elsewhere in the contract documentation the maximum permitted size of an external glass pane with all four edges fully supported in a low rise building (maximum 10 metres high) shall not exceed the areas given in Table 4.2.

iii. The recommendations of the glass manufacturer shall apply in all situations not covered by Table 4.2 and where the information is not provided in the contract documentation. The recommendations shall be based on a 3 second gust exceeding 46 metres/ second at 10 metres above ground level occurring in Pakistan. on average only one in 50 years and a ground roughness category of 1.

iv. The depth of rebates for bead glazing shall not be less than that shown in Table 4.3 and the minimum edge clearance (distance between the edge of the glass and the surround) shall not be less than 3 mm for any glass up to and including 12 mm nominal thickness. The recommendations of the glass manufacturer shall apply for all glass over nominal thickness.

v. The minimum edge cover to single glazing shall be as Table 4.04 and equal all round each pane. The edge cover and clearance to double glazing units shall be as recommended by the manufacturer of the units.

vi. Setting blocks shall be used between the bottom edge of the glass and the frame or surround, to support and centralize the glass in the opening. The minimum length of each block shall be equal to 30 mm per square metre of glass area and the width shall be equal to the thickness of the glass (or glass insulating unit) plus the back clearance.

vii. Location blocks, shall be used in opening windows and doors between the edges of the glass, other than the bottom edge, to prevent movement when they are opened. Each block shall be at least 25 mm long and the width shall be equal to the thickness of the glass (or glass insulating unit) plus the back clearance.

viii. Setting and location blocks shall be positioned as near to the quarter points of each side as possible.

ix. The glazing gaskets shall be positioned on both sides of the glass and shall be correctly sized so that when forced into the space between the glass and surround sufficient pressure is provided to support the glass structurally and to form an effective seal against the weather. Care shall be taken to ensure that the gasket is correctly located in the grooves and the glass is completely bedded.

c. Fixing Mirrors

Mirrors shall be fixed with spacer washers to compensate for irregularities in the wall surface and with sleeves and washers to prevent contact between the mirror and the fixings.

3. STANDARDS AND TABLES

a. Standards

The standards referred to in this Section are:

BS 952	Glass for glazing
BS 1494	Fixing accessories for building purposes BS
2571	Flexible PVC compounds
BS 5713	Hermetically sealed flat double glazing units
BS 6206	Impact performance requirements for safety glass and safety plastics for use in buildings
BS 6262	Code of Practice for glazing for buildings

- **Glass**

EN 572 - 2	-	For Clear and Tinted
EN 1096	-	For Coated Glasses

- **Maintaining a AOQ (Average outgoing Quality) to 100 % for final processed glass in line with**

EN 12150	-	For Tempered Glass
EN 12543	-	For Laminated Glass
EN 1279	-	For Insulated Glass

b. Maximum Areas for Glass Panes Situated Externally

TYPES OF GLASS

	NOMINAL THICKNESS IN mm					
	4 m2	**5 m2**	**6 m2**	**7 m2**	**10 m2**	**12 m2**
Transparent Float or Polished Plate	1.30	2.00	3.00	4.00	5.50	8.00
Wired cast	-	-	1.25	-	-	-
Rough cast and pattered	-	-	1.80	-	-	-
Fully toughened	0.70	1.20	1.75	-	-	-
Transparent laminated	-	-	2.80	4.00	5.50	-

Notes:-

1. The table is based on a 3-second mean wind loading of 1600N/m2
2. The table does not apply where the building exceeds 10 metres high or where the length/ breadth ratio of pane is greater than 3:1 and is therefore considered as two-edge supported.

c. Minimum Rebate Depths for Bead Glazing

NOMINAL GLASS THICKNESS mm	MINIMUM REBATE DEPTH mm
4	10
5	12
6	12
10	15
12	15

STEEL AND METAL WORK

1. CONFORMITY TO STANDARDS

Unless otherwise specified all work carried out under this section shall conform to British Standard- 449 "The use of Structural Steel in Building" CP-113 and other BS as applicable to the work. Aluminum work shall conform to BS-1476/ HE-9 and ASTM-6063.

2. MATERIALS

Steel Channels, Angle Iron, Rolled I Beams, Plates & Bars shall conform to the applicable requirements of BS-15 "Mild Steel for General Structural purposes".

Steel Plates shall conform to the requirements of BS-1449 "Steel Plates Sheets and Strips".

Metal Casement Windows and Casement Doors Shall conform to BS-99 (1967) "Steel Windows generally for domestic and similar buildings". Where locally rolled T-Sections of steel for doors and windows are used, these shall be standard sections 1/8" thick and 1" deep unless other sizes are required.

Galvanizing: All fixing accessories for windows and doors where specified and nuts, bolts, screws, hinges, stay pegs, Iron beadings, breadings, brackets, stays, rests, etc. shall be hot- dipped galvanized as per BS-729 Part-I, "Hot dipped Galvanized Coatings".

Steel Bolts, Nuts, Washers: Bolts per BS-4190 to be strength grade 4.8 if Cold Forged or 4.6 if Hot Forged and the Chemical composition shall be selected by the manufacturer (except that the maximum Sulphur and Phosphorous content shall not exceed 0.006 percent) to give the Mechanical properties.

Also if the steel is produced by an oxygen process, the Nitrogen content shall not exceed 0.008%. The principal mechanical properties required for these grades of steel are as follows:-

Min. Tensile Strength Min.	-		40 kg/sq.mm.
Yield Strength	-	(Grade 4.6)	24 kg/sq.mm.
	-	(Grade 4.8)	32 kg/sq.mm.
Brinell Hardness	-	Min.	110
	-	Max	170
Elongation after fracture	-	(Grade 4.6)	25% Min.
	-	(Grade 4.8)	14% Min.

For nuts the chemical composition limits are given as follows:

Carbon	0.50% Max.
Phosphorus	0.110% Max.
Sulphur	0.150% Max.

And the Principal Mechanical properties are:

Proof load Stress:	-	(Based on the Tensile Stress Area of the Bolt) = 40 kg/sq.mm.
Brinell Hardness	-	Max. 302

Washers shall conform to BS-4320 and only Black Washers, unless otherwise specified, made of mild steel shall be used. The bolts shall be supplied subdivided by type and diameter, oil-protected on the threaded parts to prevent oxidation and damage from impacts.

Testing: Each supply shall be accompanied by a mill test certificate indicating the mechanical characteristics of materials.

The Client reserves the right to inspect periodically the Contractor's shop and take samples in order to verify the mechanical resistance of the materials.

Wood Work: of this section shall conform to specifications in section "Carpentry and Joinery".

Painting: shall conform to BS:CP-231 "Painting" as applicable and as specified in section "Painting & Decorating".

3. SAMPLES

Samples of the materials used for the work under this section shall be submitted and approval of the Client obtained and same type of material shall be used throughout the work. If the Client require the material to be tested, this shall be got done by the Contractor at his own cost from a Laboratory approved by the Client.

4. STEEL CASEMENT WINDOWS, VENTILATORS ETC.

All sections shall be hot rolled low carbon steel one piece sections with flanges rolled integrally as per BS-990, flanges forming the weathering contacts as both inside and outside points of closure. Composite steel sections made by welding channels, angles and plates shall be accepted in lieu of one piece section only when specifically called for or when shown on drawings. Such sections shall be continuously welded in a staggered manner. Corners of frames shall be mitred, solid welded and shall be finished flush and smooth on surfaces that will be exposed after installation. All members shall be in one length without splices, and shall be straightened so that they shall not be more than 1/16" from a straight plane in either direction for the full length of members. Doors, windows shall be installed plumb, level, in alignment and properly braced to prevent distortion. These shall be erected in position using proper holdfasts or counter sunk bolts and screws as shown on drawings and approved by the Client.

Hinges for windows shall be of steel or malleable iron with non-ferrous bushings or washers. Two hinges and one locking handle in smooth finished solid bronze per window shall be furnished but for window exceeding 5' in height three hinges and two point locking devices with steel connecting rods shall be furnished. Ten inches long solid Bronze or moulded heavy gauge galvanized iron peg stay, one for each openable panel, shall be provided. Pegstays and locking devices shall be manufactured as per standard design approved by the Client and shall be secured to windows with corrosion resisting bolts and screws. Metal glazing bead if specified or shown on the drawings shall be galvanized and of minimum 18-SWG thickness.

5. GLAZING

Glazing shall be as specified under Section "Carpentry and Joinery".

6. WIRE GAUZE DOORS, WINDOWS & VENTILATORS

Wire gauze shall be as specified in section "Carpentry and Joinery". Wire gauze shall be stretched taut and fixed to the members with nuts and bolts or screws with M.S. flat beading/ moulding over it, as shown in drawings.

7. ROLLING SHUTTERS

Rolling shutters shall be of solid-front made of 22-gauge G.I. sheet strips. G.I. sheet strips shall be 2.5" wide and shall be machine moulded. Covers & slits shall be of approved make and design. Shutters shall be secured to structure by means of holdfasts, bolts and nuts. The rolled top portion shall be encased in 1/8" thick sheet casing. When installed, the shutters shall be capable of smooth and easy operation and shall be provided with approved type of handles and eyes for padlocks etc. They will be painted as per Section "Painting & Decorating".

8. RAILING

Iron railing shall be well formed to the shape, size and material shown on the drawings with sharp lines, curves, angles and smooth surfaces. Balustrades shall be formed with all turns and easings and shall be secured to the top rail at intervals of 12" on centres or as directed. Balusters shall be set parallel to each other, and the balusters and posts shall be anchored into stairs, curbs and slabs, etc as directed. The space between the railing balusters or posts and the openings for

anchorage shall be solidly filled with molten lead, trimmed flush with the finished floor, stairs or curb. Wall handrails shall be supported on rail brackets, securely fastened to back plates fixed to walls.

Painting: shall be done as per Section "Painting & Decorating".

9. STRUCTURAL STEEL WORK

Steel members shall be sound and free from cracks, scales, blisters, surface flaws, laminations, cracked edges and other defects. The structures shall be shop fabricated in accordance with drawings but assembled, welded, riveted or bolted at site prior to being lifted in position. Assembly shall not be allowed on the false work. All members shall be cut truly square so as to butt properly and splices and joints shall be made only in such position as shown on drawings or as directed by the Client. All field work or fabrication, riveting, bolting and welding shall be carried out in workmanlike manner. Bending, straining or pounding with sledges shall not be allowed during erection. The structure shall be given one coat of specified lead primer. All connections and meeting surfaces of structural steel work shall be covered with sufficient primer to ensure that it squeezes out around riveting or bolting. The structure shall be anchored by bolts and bed plates embedded in masonry or concrete. The shoe plates shall be fabricated alongwith, and the slotted sides shall be correctly aligned and fixed according to the position shown on the drawings.

Painting shall be done as per Section "Painting & Decorating".

10. M.S. GRILLS

The grills shall be manufactured using M.S. flats in sizes and designs required and fixed as shown on drawings. Painting shall be done as per Section "Painting & Decorating".

11. ALUMINIUM CASEMENT DOORS AND WINDOWS

All sections shall be from high strength aluminum alloy, full sections being extruded integrally having mechanical joints. PVC weather strip shall be used to render joints between the walls and outer frame, between the moving panel frame and receiving limb of the fixed frame etc. proof against dust and moisture.

The sliding panels shall have Nylon Rollers and corresponding rail for friction- free operation. PVC glazing channel of approved design shall be used for glazing.

All the aluminum sections shall be anodized as per BS and shall have a special smooth and durable shop finish of lacquer.

All other specifications as to being level, plumb, flush and butt with the walls shall apply as given under "Steel Casement Windows, Ventilators etc".

To avoid damage to aluminum frames during construction, the Contractor shall be required to furnish and use at his own cost one or more aluminum frames of typical windows/ ventilators of exactly same dimensions as a template to be temporarily installed at each location so that all plastering, curing, surface preparation, finishing around the frame etc. is completed true to size; after which the temporary frame will be removed and replaced by the actual frame. The rate for aluminum doors/windows also includes all weather strips, etc. as specified including any costs of template frames, their fixing, etc.

12. AUTOMATIC SLIDING ALUMINIUM DOORS

These shall be provided at selected openings as shown on the drawings. The sizes shall vary according to the architectural requirements. All doors shall be center opening and sliding sideways. The glazing shall not be less than ¼" thick which shall be smoke tinted, reflecting and polished plate glass perfectly matching with the glazing provided elsewhere in the works.

The door shall be supported in top and bottom rails and shall be provided with antifriction bearings preferably hermetically sealed for long life. The mechanical arrangement shall consist of a system of noiseless levers, steel ropes and guides for moving the openable portion of door uniformly in forward and backward directions. Rubber or PVC pads shall be provided to reduce any impact due to erratic functioning of the mechanical system. The drives shall be provided by means of

reversible electric motor of appropriate capacity. The opening and closing operation shall be controlled by means of electronic beam and floor detectors. The controlling arrangement shall incorporate necessary contactors and relays for operation of the motor.

The doors shall be provided with means of operating them manually both from inside and outside in the event of power failure. The bidder shall submit with the tender four sets of technical literature; detailed drawings and illustrated pamphlets completely describing the system adopted by the manufacturer. Any deviation from the above specifications shall be clearly mentioned.

13. MEASUREMENTS

Unless given otherwise in BOQ, doors, windows, ventilators and the like shall be measured by the superficial area. Structural steel work including bolts, nuts, washers, shims, plates, flats, etc. shall be measured by weight.

Doors including folding/ collapsible doors (except the gates like those in boundary/compound walls, sliding doors and rolling shutters), windows, ventilators, fixed glazings and grills - area shall be the area of the opening in masonry/ concrete in which they are fixed.

Gates and Sliding Doors – area shall be the area of the leaves (one side only).

Rolling (Roll-up) Shutters shall be measured from the external faces of the vertical guides (channels) for width and from the floor level to the top of the cover-box for height.

HAND RAILS

Pipe-hand rails shall be measured by length.

Wooden hand rail shall be measured and paid under section "Carpentry and Joinery".

RAILING & BALUSTRADE UNDER HAND RAILS:

i. The balustrade (balusters, anchors, flats under hand rails, etc.) for central railing of stairs shall be measured by area. Length shall be same as the length of the hand rail; and the height shall be the height from the top of the finished floor of landings upto the bottom of the pipe hand rail or upto the top of the flat under the wood hand rail, as the case may be.

ii. Support System for stairs wall side railing, shall be measured by length which shall be equal to the length of the hand rail supported.

iii. Railing like Verandah/ Balcony railings

Hand rails shall be measured as per 'HAND RAILS'' above, Support System under the hand rails shall be measured as the balustrade in (i) above.

iv. Pipe Railings

Shall be measured by area. Length shall be measured along the top (horizontal as well as sloping) and the height shall be from top of the finished floor and/or landing upto the top of the railing.

14. PAYMENT AND RATES

The rates shall be full compensation for everything required to be furnished and done to complete the work item in all respects and fixed/installed in its place, conforming to these specifications, BOQ, drawings, manufacturers' printed catalogues/instructions in case of special items, and conditions of Contract. Since the rates are for work items complete in all respects, it is further clarified that the rates shall also include the following:

a) Glass and glazing work per drawings and specifications Section-9.
b) Fixed wire gauze/wire gauze shutters, if shown on drawings.
c) Painting, polishing as per specifications Section - II.
d) Galvanizing, anodizing, lacquering, finishing, etc. as may be required according to nature of work.

e) Hardware including spring hinges, locks, handles, push plates, kick plates, door closers, eyes, catches, peg stays, sliding bolts, latches, hasps and staples, hinges, coat hooks, etc. as per hardware schedule given on drawings.
f) Anchors, hold fasts, lugs, etc.
g) Rollers, top and floor tracks, etc. in case of sliding doors; and side vertical guides and top casing (box) etc. in case of roll-up shutters.

15. STRUCTURAL STEEL WORK

15.1. Scope

These specifications relate to the structural steel-work in all sorts of works.

15.2. Materials

a) **Washers:** Plain washers shall be made of steel.

b) **Dimensions:** All structural rolled shapes and the forms, weights, tolerances, etc. of all rolled shapes and other members used in any structure shall conform to the BS-4 and other relevant BS except as otherwise shown on the drawings.

Dimensions, forms, weight and tolerances, etc. of all rivets, bolts, ruts, etc. shall conform to the requirements of the latest appropriate BS except as otherwise shown on the drawings.

15.3. Workmanship

a) **Fabrication:** All materials, before and after fabrication, shall be straight and shall be free from twists and loose scale or rust.

The cutting of members' lengths shall be performed by shearing, sewing or machine flame cutting. Bend frame cutting may be permitted subject to the approval of the Client. Sheared or cropped edges shall be dressed to a neat workmanlike finish and shall be free from distortion where parts are to be in metal-to-metal contact. Care shall be taken to ensure that the clearances specified on the drawings are worked out. Erection clearance for cleated ends of members connecting steel to steel shall not be greater than 1/16" at each end. The erection clearance at ends of beams without web cleats shall not be more than 1/16" greater than the diameter of the bolts unless otherwise required by the Client.

Holes through more than one thickness of material for members, where possible, shall be drilled after the members are welded tightly clamped or bolted together. Punching may be permitted before assembly provided the holes are punched 1/8" less in diameter than the required size and reamed after assembly to the full diameter. The thickness of material punched shall be not greater than 5/8".

When holes are drilled in one operation through two or more separate parts, these parts, when so required by the Client, shall be separated after drilling.

Holes in connecting angles and plates, other than splices, also in secondary members and light framing, may be punched full size through material not over ½" thick, except where required for close tolerance or barrel bolts.

All matching holes for rivets and black bolts shall register with each other so that a gauge 1/16" less in diameter than the diameter of hole will pass freely through the assembled members in a direction at right angles to such members. Finished holes shall be not more than 1/16" in diameter larger than the diameter of the rivet or black bolt passing through them, unless otherwise required by the Consultant.

Holes for close tolerance and barrel bolts shall be drilled to a diameter equal to the nominal diameter of the shank or barrel subject to a tolerance of +0.005" to –0". Preferably, parts to be connected with close tolerance or barrel bolts shall be firmly held together by tacking to bolts or clamps and the holes drilled through all the thickness in one operation and subsequently reamed to size. All holes not drilled through all thickness in one operation shall be drilled to a smaller size and practically, the parts shall be drilled and reamed separately through hard bushed steel jigs.

Holes for rivets or bolts shall not be formed by a gas cutting process. The component parts shall be assembled in such a manner that they are neither twisted nor otherwise damaged, and shall be so prepared that the specified cambers, if any, are provided.

b) **Riveting:** Rivets shall be heated uniformly throughout their length, without burning or excessing, scaling and shall be of sufficient length to provide a head of standard dimensions. They shall, when driven completely fill the holes and if countersunk, the countersinking shall be fully filled by the rivet, any protrusion of the countersunk head being dressed off flush, if required.

Riveted members shall have all parts firmly drawn and held together before and during riveting, and special care shall be taken in this respect for all single riveted connections. For multiple riveted connections, a service bolt shall be provided in every third or fourth hole.

Whenever practicable, machine riveting shall be carried out by using machines of the steady pressure type. All loose, burned or otherwise defective rivets shall be cut out and replaced before the structure is loaded, and special care shall be taken to inspect all single-riveted connections.

Special care shall be taken in heating and driving long rivets.

c) **Bolting:** Where necessary, washers shall be tapered or otherwise suitably shaped to give the heads and nuts of bolts a satisfactory bearing.

The threaded portion of each bolt shall project through the nut atleast one thread.

In all cases where the full bearing area of the bolt is to be developed, the bolt shall be provided with a washer or sufficient thickness under the nut to avoid any threaded portion of the bolt being within the thickness of the parts bolted together.

d) **Welding:** The welders shall be experienced persons in structural steel work welding and shall qualify tests prescribed in BS-449.

e) **Machining of Butts, Caps and Bases:** Stanchion spices and butt joints of compression members dependent on contact for the transmission or compressive stresses, shall be accurately prepared to butt so that the permitted stress in bearing is not exceeded nor eccentricity of loading created which would induce secondary bending in the members. Stanchion caps and bases shall be prepared in a similar manner to the above and where this is obtained by machining, care shall be taken that any attached gussets, connecting angles or channels are fixed with such accuracy that they are not reduced in thickness by more than 1/16".

f) **Slab Bases and Caps**: Slab bases and slab caps, except when cut from material with true surfaces, shall be accurately machined over the bearing surfaces, and shall be in effective contact with the end of the stanchion. A bearing face which is to be grouted direct into a foundation need not be machined if such face is true and parallel to the upper face.

To facilitate grouting, holes shall be provided where necessary in stanchion bases for the escape of air.

g) **Marking:** Each piece of steel work shall be distinctly marked before delivery, in accordance with a marking diagram, and shall bear such other marks as will facilitate erection.

h) **Shop Painting:** All surfaces shall be painted with one coat of red oxide primer unless otherwise required. The surface to be painted shall be cleaned to remove all loose scale and loose rust. Shop contact surfaces shall be prime painted unless specified to the contrary. They shall be brought together while the paint is still wet.

Surface not in contact, but inaccessible aftershop assembly, shall receive the full specified protective treatment before assembly. This does not apply to the interior of scaled hollow sections.

In the case of surfaces to be welded, the steel shall not be painted or metal coated within a suitable distance of any edges to be welded if the paint specified for the metal coating would be harmful to welders or impair the quality of the welds.

Welds & adjacent parent metal shall not be painted prior to deslagging, inspection and approval.

i) **Erection:** The suitability and capacity of all plant and equipment used for erection shall be to the satisfaction of the Client. All structural steel at the site shall be stored and handled so that members are not subject to excessive stresses and damage.

The positioning and leveling of all steel works, the plumbing of stanchions and the placing of every part of the structure with accuracy shall be in accordance with the drawings and to the satisfaction of the Client.

During erection the work shall be securely bolted or otherwise fastened, and if necessary temporarily braced so as to make adequate provision for all erection stresses and conditions, including those due to erection equipment and its operations. Neither riveting, permanent bolting nor welding shall be done until proper alignment has been obtained.

j) **Painting after Erection:** All surfaces to be painted shall be dry and thoroughly cleaned from all loose scale and rust. All rivets and bolts heads and site welds after de-slagging shall be cleaned. Damaged or deteriorated paint surfaces shall first be made good with the same type of paint as shop primer paint. In the galvanized steel pipe railing all welds shall be ground smooth and painted with two coats of grey zinc base paint of approved quality. The site painting shall not be done in rainy weather or when the humidity is such as to cause condensation on the surfaces to be painted.

k) **Bedding of Steel Work on Concrete:** Bedding shall be carried out with neat cement grout of a consistency to completely fill the distance between the base plate and the top of concrete surface. The bedding shall not be carried out until the steel work has been finally leveled and plumbed.

l) **Shop Drawings:** The steel work drawings supplied are design drawings. The Contractor shall prepare detailed shop drawings giving all the fabrication and erection details. The work shall not commence before the shop drawings are submitted and approved by the Consultant in writing.

CEMENT PLASTER

1. SCOPE

The work under this section of the Specification consists of furnishing all plant, labour, equipment, appliances and materials and in performing all operations in connection with providing and installation of cement plaster, and specified external rendering complete in strict accordance with this section of the Specifications and the applicable drawings and subject to the terms and condition of the Contract. The scope of this section of Specification is covered with detailed Specifications as laid down herein.

2. APPLICABLE STANDARDS

Latest editions of following Pakistan, British & ASTM standards are relevant to these specifications wherever applicable.

Pakistan Standard

PS 232 Ordinary Portland Cement

ISO (International Organization for Standardization)

R 597 Definitions and terminology of cement
R 679 Method of testing strength of cements, Compressive and flexural strength of plastic mortar (Rilem - (embureau method)
R 680 Chemical analysis of cement & main constituents of Portland cement R 681 Chemical analysis of cement - mixer Constituents of Portland cement R 682 Chemical analysis of cements - determination of sulphur as sulphide

ASTM (American Society for testing and Material)

C 144 Aggregate for Masonry mortar
C 631 Bonding compounds for interior plastering

BSI (British Standards Institution)

BS 812 Methods for sampling and testing of mineral aggregates, sands and fillers
BS 1199 Sands for external renderings internal plastering with lime and Portland cement and floor screeds.
BS 1369 Metal lathing (steel) for plastering
BS 5262 External rendered finishes
BS 5492 Internal plastering

3. GENERAL

a). Except as may be otherwise shown on surfaces specified, all plaster work, both internal and external shall be Sulphate resisting cement plaster of the require d thickness as shown on the drawings.

b). Plastering shall not commence unit all sanitary pipes, rackets, frames and all sorts of inserts and embedded items are fixed in position. It shall be the responsibility of the Contractor to make sure that all such wok is carried out before starting of plaster work. Chiseling and repairing of cement plaster shall not be permitted without the approval of the Engineer / Project Manager.

c). Sample of materials shall be submitted to the Engineer / Project Manager for his approval prior to use in the works.

4. MATERIAL

a). Cement for plaster shall be Sulphate resisting cement (BS 4027 or PS 612) as specified and shall conform to requirements specified in the section "Plain and Reinforced Concrete".

b). Sand for plaster shall comply with the requirements of BS 1199, BS 1200 or the draft Pakistan Standard "Sand for Plaster' as directed by the Engineer / Project Manager.

c). Water for plaster shall conform to requirements specified in the section for "Plain and reinforced concrete".

d). All materials and workmanship for plaster, not explained in these Specifications, shall comply with the requirements of relevant BS CP 211 and CP 221 as directed by the Engineer / Project Manager.

e). All plaster works shall be water proof with 1:4 cement mixed with approved water proofing agent.

5. PROPORTIONING AND MIXING

a). Measurement of materials by volume shall be by containers of known capacity to maintain consistent proportions. No lumpy or caked material shall be used. Mixing equipment boxes and tools shall be clean. Materials shall be proportioned as specified on the Drawings, in the Bill of Quantities or as directed by the Engineer / Project Manager. Mixing shall be continuous until all ingredients are evenly distributed and thoroughly mixed.

b). Only limited water shall be added for proper workability and such quantity of mortar shall be prepared which can be consumed in thirty minutes after preparation. Preparation of mortar in bulk quantity for use during the entire day or for any other time more than that stipulated above is expressly prohibited. Remembering shall not be permitted and all mortar which has begun to stiffen shall be discarded.

6. PREPARATION OF SURFACE TO BE PLASTERED

Concrete surface to be plastered shall be cleaned to remove all grease, form oil and other surface impurities which will otherwise adversely affect the adhesion of plaster to the surface concerned. The surface of all concrete shall be lightly hacked by approved means to give the required key for plastering.

7. APPLICATION OF PLASTER

a). The plaster of thickness less than the specified thickness shall be rejected. If the plaster is to be more than 13 mm thick, it shall be done in two coats. The surface of first coat shall be made rough before the second coat is applied. The plaster shall not have wavy surface and shall be perfectly in plumb. The edges and corners shall represent a straight line. The plaster shall be kept wet continuously for at least ten (10) days. No extra payment shall be allowed for jambs, junctions, corners, edges, round surfaces or for more than one layer of plaster required due to any unevenness in the work done by the Contractor.

b). Plaster containing cracks, blisters, pits, discoloration or any defects shall not be acceptable. Any such plaster or loose plaster shall be removed and replaced with plaster in conformity with these specifications and as additionally directed by the Engineer / Project Manager.

Contractor shall cut out and patch all defective work at his own cost. All damaged plaster shall be patched as directed by the Engineer / Project Manager. Patching plaster shall match appearance of and shall be finished level with adjoining plaster.

8. MEASUREMENT & PAYMENT

Plaster shall be measured as executed in number or square meters/ feet as shown on drawings and as directed by the Engineer / Project Manager. Payment shall be made for the accepted measured quantity on the basis of unit rate quoted in the Bills of Quantities and shall constitute full compensation for all the works related to the item.

PAINTING AND DECORATING

1. SCOPE

The scope of this section of the specifications covers lime-washing, painting, distempering, polishing, lacquering and treatment to metals, wood, masonry, concrete, plaster and other surfaces.

2. APPLICABLE STANDARDS

All work under this section shall conform to BS-CP-231 as applicable and the specifications of this section "Brushes for Painting" shall conform to BS-2092.

3. WHITE WASHING

3.1. **Lime:** shall conform to BS-890 "Building Lime". It shall be non-hydraulic high calcium lime stone, (white or fat lime), containing 95% upwards of calcium oxide. It shall be stored unslaked in dry and weather proof condition.

3.2. **Preparation of Surface:** The surface shall be clean, smooth and completely dry before white- wash is applied. The plaster shall not be trowelled to make a glazed surface.

Holes and irregularities in the surfaces shall be repaired with lime putty and the surface shall be allowed to dry before white-wash is applied. 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.

Cement concrete surface shall be scraped off with a wire brush to remove greasy patches, if any, and washed with soap-suds. The surface shall be rinsed with water to remove traces of alkali. A coat of Sodium Silicate and water in the ratio 1:5 shall be given on the entire concrete surface to avoid future scaling or flaking off. Half to one part (by weight) of tallow in small lumps shall be added to 16 parts of quick lime, slaking it with only just sufficient water to form a thick paste, stirring occasionally and allowing it to stand till it cools down. The paste shall then be thinned down to required consistency by adding water, shall be strained and applied to surface.

3.3. Preparation of Whitewash

Whitewash shall be prepared from pure fat lime brought to the site of work in an unslaked condition and in order to slake the lime, water shall be added to it in a tub till the mixture attains the consistency of cream, and is allowed to rest for 24 to 48 hours. It shall then be strained through coarse cloth and 4 ounces of gum or rice dissolved in hot water shall be added to each cubic foot of it.

3.4. Application

Whitewash shall be applied with a brush. Each coat shall consist of four strikes, one in each direction. Each coat of whitewash shall be allowed to dry and be inspected by the Client or their authorized subordinate. The next coat shall not be applied unless the previous one has been approved by either of them. A dry coat must not show any sign of cracking, nor must whitewash come off readily on fingers when rubbed.

Whitewash, when completed, shall form an opaque coat of uniform white color, through which the old work does not show and shall present a smooth regular surface free from powdery matter.

3.5. Number of Coats

Three coats of whitewash shall be sufficient. In case the surface is still not in an acceptable condition, the Contractor shall provide additional coats at no extra cost to the Client.

3.6. Protection and Cleaning

All floor, doors, windows and other articles etc., shall be properly protected from whitewash and cleaned after completion of work.

3.7. Measurement

All the work under this section shall be measured by actual area over which treatment is applied. Deduction shall be made for the openings of any size from the two sides, unit of measurement shall be % Sft or m^2 as given in BOQ.

3.8. Payment and Rates

The rates shall be full compensation for everything furnished and done to complete the whitewash in all respects including provision, erection and removal of scaffolds, ladders, etc, as per drawings, these specifications and conditions of contract.

3.9. Pay Item

Payment shall be made under the relevant BOQ item for "**Whitewash on new surfaces".**

4. COLOUR WASHING

4.1. Lime: It shall comply with provisions of Clause 3.1.

4.2. Preparation of Surface: Surfaces shall be prepared as specified in Clause 3.2.

4.3. Preparation of Colour Wash

It shall be prepared by adding the approved coloring pigment to the whitewash prepared as per Clause 3.3 which has been strained. The mixture shall be thoroughly stirred and passed through a clean, fine cloth. Only such quantity of color wash shall be prepared as can be consumed in a day.

4.4. Application

The surface shall be given a coat of whitewash prior to color wash. Each coat of color-wash shall be allowed to dry and shall be inspected by the Client. The next coat shall not be applied unless the previous one has been approved by them. The first coat of white wash and the color- wash coats shall be applied with brush. Each coat shall consist of four strokes, one in each direction. The completed wash shall be of uniform color, free from blots, lines or cut shades and shall present a smooth regular surface which shall neither crack nor come off readily on fingers when rubbed. Each room shall be finished in one operation and work shall not start in a room so late that it cannot be finished the same day.

4.5. Number of Coats

One coat of white wash and two coats of color wash shall be sufficient. If the surface is still not in an acceptable condition, the Contractor shall apply additional coats of color wash at no extra cost to the Client.

4.6. Protection and Cleaning

It shall be done as per provisions of Clause 3.6.

4.7. Measurement

The method of measurement shall be as specified in Clause 3.7.

4.8. Payment and Rates

The provisions of Clause 3.8 shall apply here too.

4.9. Pay Item

Payment shall be made under the relevant BOQ item for: **"Color-Wash on new Surfaces".**

5. PAINTING WITH WATER PAINTS

(Water bound/oil bound Distempers / Emulsion).

7.1. Materials

All materials shall of known make/brand and of approved shades.

7.2. Storage

Primers and distempers/emulsions shall be brought to site in sealed containers bearing the name of the manufacturer and shall be used within one year of the date of their manufacture.

7.3. Time of Application and Weather

Water paints shall not be applied earlier than 12 months, unless plastered surfaces are primed per printed instructions of the manufacturers of the paints. Water paints shall not be applied in damp weather nor when it is excessively hot and dry.

7.4. Preparation of Surface

Surfaces shall be cleaned of all loose, foreign materials, grease, oil and dust. Efflorescent salts shall be allowed to diffuse to the surface until white residue stops appearing on the surfaces. All loose powder shall be removed by sweeping with a brush or using a rubbing stone and sand paper. All surfaces shall be perfectly smooth, dry and clean. All holes shall be filled with gypsum which shall be allowed to set hard.

7.5. Priming

The plastered surface shall be given on coat of the quality mineral turpentine or white spirit and applied as per printed instructions of the manufacturer, and allowed to dry overnight.

7.6. Filling

Any minor interior filling of the surface shall be carried out at this stage. Putty for filling shall be made by mixing 4 parts of good quality chalk (and one part of Zinc Oxide powder if recommended by the printer manufacturer) with the primer till a smooth knifing paste is formed. Filling shall be allowed to dry overnight. No filling shall be done on exterior surfaces.

7.7. Mixing

Water paints shall be stirred and mixed to a smooth consistency, adding water and stirring all the time. Quantity of water to be added shall be recommended by the manufacturer. Entrapment of air and foaming shall be avoided. The quantity of paints prepared shall be just sufficient for a day's work.

7.8. Application

Water paints shall be applied by approved brushes or rollers which shall be washed in hot water after each day's work.

Water paints shall be applied quickly and boldly leaving no dry edge. The brushes shall be dipped in paint and stroked cross-wise on the wall, then immediately stroked up and down and stopped. The brush shall be loaded fairly generously and full even coat shall be applied without brushing out too far. These four strokes shall constitute one coat.

Unless otherwise specified or directed, two men shall work on a wall together, one working from the ceiling downwards as far as he can reach and the other following him applying the distemper from below. No patchy overlap shall be allowed.

7.9. Number of Coats

One coat of priming and two coats of distempering shall be sufficient to produce the desired finish. Additional costs, if required to have the desired finish, shall be applied by the Contractor at no extra cost to the Client

7.10. Colour

Color shall be of specified/ approved shade.

7.11. Protection and Cleaning

It shall be done as specified in Clause 3.6.

7.12. Measurement

Method of measurement shall be as given in Clause 3.7.

7.13. Payment and Rates

The provisions of Clause 3.8 shall apply here too.

7.14. Pay Items

Unless given otherwise in BOQ, payment shall be made under the following item as applicable:
"Painting with Distemper/ Emulsion of indicated brand and make on new surfaces".

6. PAINTING WITH CEMENT PAINTS

6.1. Materials

It shall be weather shield or approved equal cement paints.

6.2. Storage

The paint shall be brought to site in sealed containers bearing manufacturers' label and stored in dry, air-tight condition.

6.3. Preparation of Surface

The surfaces shall be clean, dry and sound. These shall be cleaned of all loose, foreign matters, and greasy spots. The surfaces shall not be too smooth and glazy. Cement paints shall not be applied on gypsum plaster, metal and wood.

6.4. Mixing

The contents in the containers shall be loosened by rolling or shaking before use. In a clean pail, two volume of paint of required color shall be added to one volume of water or as specified by the manufacturer and then stirred to a smooth paste and allowed to stand for 10 minutes. Then add water in quantity not more than that added in first stage, to produce a full bodied paint. No more paint shall be mixed than that can be applied within 30 minutes in hot weather and within one hour otherwise. Use of excessive water shall be avoided as it gives patchy results. Where paints of different color may have to be mixed together to obtain the required shade, mixing shall be done by trowel on a clean board till mixing is complete.

Where the backing is smooth or dense (including concrete and old cement paint surfaces), is of dark color or where the work is carried out in an exposed position, sand shall be added to the paint as under:

One volume of fine clean sand to four volumes of paint shall be introduced between the first and second stages of mixing. Sand shall be mixed only as per printed instructions of the paint manufacturer. If the sand affects the color, the addition shall be restricted to the first coat only.

6.5. Weather

Weather conditions should be favorable. Cement paints shall not be applied on frozen surfaces or when there is a risk of frost or rain. In hot weather, these shall be applied out of the sun.

6.6. Application

The surface shall be wetted down with clean water before application of paint. Paint shall be applied by means of brush after the soaking shine is over. The first coat shall be well scrubbed into the surface and allowed to harden (minimum 24 hours in warm climates and longer in cold climates) before the second coat is applied. The brushes shall be washed in clean water frequently.

6.7. Curing

After the first coat hardens, the surface shall be soaked evenly, four or five times and the second coat shall be applied after leaving for at least overnight. Subsequent coat shall not be applied unless previous coat has been cured. In dry and hot climates, it is necessary that each subsequent coat shall not be applied unless the surface is soaked evenly with water (preferably with hose pipe).

6.8. Number of coats

Three coats shall be sufficient to produce the desired result, failing which additional costs shall be applied by the Contractor at no extra cost to the Client.

6.9. Color: It shall be of shade specified or as approved.

6.10. Protection and Cleaning: the Provisions of Clause 3.6 shall apply.

6.11. Measurement: The provision of Clause 3.6 shall apply.

6.12. Payment and Rates: The Provisions of Clause 3.8 shall be applicable.

6.13. Pay Item: Payment shall be made under the relevant BOQ item for: **"Painting with weather shield (as indicated on new) surfaces"**

7. APPLICATION OF PRESERVATIVES TO WOOD WORK

7.1. Scope

All portions of wood built into or against masonry, concrete and plaster, or used as sub-frames for railing, paneling, doors etc. and all other wood work which shall remain unpainted, shall be treated with wood preservative.

7.2. Wood Preservatives

These shall be solignum, creosote, tar, Termidor wood preservative or approved equal chemical.

7.3. Application

Solignum, creosote, tar shall be heated to just short of boiling. If tar is specified to be used, it shall be thinned with kerosene oil or common country spirit in the following manner:

"4 parts tar to 1-part kerosene or 1-gallon tar to ½ pint of country spirit; 2- lbs unslaked lime shall be mixed with 1-gallon or tar to prevent running. The mixture shall than be heated to a near boiling point. It shall than be applied with a stiff flat brush or a spraying machine. The ends of the timber pieces shall be liberally coated and, where possible, shall be dipped in the hot solignum of creosote. The second coat shall be applied when the previous one has dried. "Termidor/ Dursbon Wood Preservative" or other approved chemical shall be used as per printed instructions of the manufacturers.

7.4. Measurement, Payment and Rates

Supply and application of wood preservatives shall not be measured separately for direct payment, but the rates and prices under section "Carpentry, Joinery and Glazing" or any other section for the wood work items shall be inclusive of supply and application of wood preservatives

8. PAINTING WOOD WORK WITH ENAMEL PAINT SYSTEM

8.1. Materials

All materials shall be of specified or approved equal make, packed in sealed tins bearing the name of the manufacturer, name of the paint, batch number and date of manufacture. All paints shall be used within one year of their manufacture.

Primer shall be "Paint Priming Red and White Lead Brushing" of Paintex Ltd., or approved equal.

Undercoat: shall be "Dulux Synthetic Enamel" or approved equal.

Enamel Paints shall be "Dulux Synthetic Enamel" or approved equal when glossy finish is required; or "Dulux Synthetic Camouflage Enamel" or approved equal where non-glossy finish is required; or "Duwel Synthetic Enamel" or approved equal where fast drying is required.

8.2. Surface Preparation

Planning and Rubbing: Unless otherwise specified, wood work to be painted shall be finished smooth with the plane, but free from plane marks of every kind and rubbed smooth with sand paper, first with 2.5 grade and then with 1.5 grade or pumice stone.

Knotting: After rubbing, all knots in the wood shall be killed or covered with:

a) Two coats of patent knotting (shellac dissolved in naphtha).

OR

b) Shellac varnish (5 oz shellac mixed with 1 pint of methylated spirit of vine, thoroughly dissolved and stirred with ½ oz red lead)

OR

c) A preparation of red lead and glue size in equal weight applied hot. Knots in Deodar or other resinous wood shall be painted over with hot lime. This paint shall be scraped off after 24 hours, the knots primed with red lead and glue laid hot. Then one coat of knotting varnish shall be applied.

Rubbing: After knotting, the surface shall be rubbed again with pumice stone, or fine sand paper before the priming cost is applied.

8.3. Priming

Before fixing the wood work in position, and on the smooth, moisture free wood surface:

Two coats of the primer specified in Clause 8.1 shall be applied. The primer shall be thinned with approved quality of mineral spirit, if required. The primed surface shall be allowed to dry hard for 24 hours before scuffing and over coating.

8.4. Undercoating

The primed surface shall be scuffed. One coat of the "undercoat" specified in Clause 8.1 shall then be applied and allowed to dry hard for 24 hours. It shall then be wet flatted with 400 grade paper, the surface wiped dry and then petrol wiped before over-coating. The undercoat shall not be left unpainted for long as it is unsuitable for exposure. One coat of "Enamel Paints" specified in Clause
8.1 may be used in lieu of the specified "Undercoat".

8.5. Stopping or Filling

All holes, cracks, gapping joints and other defects shall be stopped with an approved putty. The surface shall then be allowed to dry for 6 to 8 hours

8.6. Finishing

Two coats of the specified enamel paint shall then be applied, allowing 16 hours between coats. The surface shall be sand papered before applying each coat. The paint may be thinned to improve brushing quality, particularly during summer. Upto 10% mineral spirit may be added if brushes are used; or upto 25% white spirit may be added if paint is applied by spraying.

8.7. Protection and Cleaning

The requirements of Clause 3.6 shall apply.

8.8. Number of Coats

Two coats of primer, one undercoat and two finish coats, shall be sufficient to produce the required finish, failing which the Contractor shall apply additional finish coats to give the desired results at no extra cost to the Client.

8.9. Measurement, Payment and Rates

Painting shall not be measured separately for direct payment, and the rates and prices under section "Carpentry, Joinery and Glazing" or any other section for the wood work items shall be inclusive of painting as per Clause 8.

Where painting item has been specifically provided in BOQ, the measurement, rate and pay item shall be as under:

Measurements:

Painting shall be measured by superficial area. The unit of measurement shall be 100 Sft or m^2 (Sq. Metre) as given in BOQ. Moulded work of all kinds, unless otherwise specified, shall be measured by running the tape over and into all elevations and depressions. In the case of other classes of work painted on both sides, the flat area of the surface on one side including glazing and frame (chowkat) shall be multiplied by the factors given below to arrive at the correct measurement of both sides for the purpose of making payment.

i.	Panelled or battened doors and windows:	2 times
ii.	Glazed or party glazed doors of windows:	2 times
iii.	Plate glass windows (large glazed area)	1 time
iv.	Wire gauze doors or windows	1 time
v.	Trellis work	2 time
vi.	Grated doors and windows and other grating:	1 time
vii.	Palisade fencing:	0.6 time

Note: In the case of chowkat having two rebates, one for wooden door and the other for wire gauze shutter, the surface area of the frame (chowkat) shall be included in the measurement of only one door.

8.10. **Payment and Rates** shall be full compensation for everything furnished and done to complete painting in all respects as per these specifications, drawings and conditions of contract, including also providing, erecting and removal of ladders, scaffoldings, etc.

8.11. **Pay items:** Payment shall be made under the relevant BOQ item for:

"Painting new wood surfaces with Enamel Paint System".

9. WAX POLISHING WOOD SURFACES

9.1. Material

"Mansion" wax polish or approved equal shall be used. If allowed by the Client, wax polish shall be prepared by adding two parts boiled lined oil to two parts bees wax and heating over a slow fire. When dissolved and still warm, add one part turpentine. The polish shall contain a minimum of colouring material to keep the polished surface as light as possible.

9.2. Preparation of Surface

New wood work to be polished shall be finished smooth with the plane making sure that no plane marks are left after finishing.

The surface shall be made perfectly smooth by rubbing it with sand paper or pumice stone.

It shall then be stopped and rubbed perfectly smooth first with medium grained sand paper and then with fine sand paper. The final rubbing shall be done with sand paper which has been slightly moistened with linseed oil and rubbed for a few seconds.

9.3. Application

Wax polish shall be applied with a clean cloth pad and rubbed continuously for at least half an hour.

When the surface is quite dry, the second coat shall be applied in the same manner and rubbed continuously for one hour, or till the surface has dried.

The final coat shall then be applied and rubbed for two hours (more if necessary), till the surface has assumed a uniform gloss and is quite dry, showing no signs of stickiness when touched. The final polish depends largely on the amount of rubbing which shall be done continuously with uniform pressure and with frequent change in direction.

9.4. Protection and Cleaning

It shall conform to the requirements of Clause 3.6.

9.5. Measurement, Payment and Rates

Provisions of Clause 8.9 for painting, shall apply here. Payment for wax polishing, where a pay item has been specifically given in BOQ, shall be made as under:

"Wax Polishing new wood surfaces"

10. FRENCH POLISHING WOOD SURFACES

10.1. Material

16 qts. of Linseed oil, 2 qts. Spirit of vine, 1
qts. of vinegar, 1 qt. of turpentine,
1 qt. of copal varnish, 1 pint of muriatic acid.

10.2. Preparation of French Polish

The oil shall be heated and the whole mixed up.

10.3. Preparation of Wood Surface

The surface shall be prepared as specified for varnishing.

10.4. Filling

After the surface has been prepared it shall be painted with a filler composed of 5-lbs of whiting mixed with 1/3 of a gallon of methylated spirit and then rubbed with sand paper. Alternatively, a piece of rag moistened with linseed oil shall be rubbed on the surface and then Plaster of Paris,

Red Ochre (sufficient to tint it) and linseed oil shall be mixed together to form a stiff paste which shall be applied sparingly and rubbed hard on the surface to fill up the pores of the wood.

10.5. Application

A thin coat of polish shall then be rubbed with sand paper a few hours later, and then second coat shall be applied. The surfaces shall be rubbed again and third coat applied. To finish off, the surface shall be rubbed lightly and quickly with a circular motion by means of a piece of a flannel rolled into the form of a rubber, covered with a piece of rag slightly damp with methylated spirit. If the rage sticks, the surface shall be touched with linseed oil.

10.6. Protection and Cleaning

It shall conform to the requirement of Clause 3.6.

10.7. Measurement, Payment and Rates

The provisions of Clause 8.9 for "Painting" shall apply here. Payment for French Polishing, where a pay item has specifically been given in BOQ, shall be as under:

"French Polishing new wood surface"

11. VARNISHING WOOD SURFACES

11.1. "ICI Synthetic Clear Varnish" or approved equal shall be used.

11.2. Preparation of Surface

New Wood work to be varnished shall be finished smooth with the plane making sure that no marks are visible on the finished surface. It shall be rubbed perfectly smooth with sand paper or pumice stone.

Knotting: shall be done as specified under Clause 8.2.

Stopping: The surface of the wood shall be then stopped, with hot weak glue size (1-lb of glue making about 1-gallon of size) so as to close up the holes. The surface when it dries up shall be again thoroughly sand papered. After rubbing the surfaces another coat of the same glue size shall be applied cold.

If the wood work is to be stained, the staining colour shall be mixed with second coat of size which shall be applied regularly, evenly and quickly keeping the colour on the flow.

If the wood work is of an oily nature, a little "Multani Mitti" and ochre shall be added to the first coat of size (otherwise varnish would not dry readily).

The sized wood shall then be rubbed with sand paper leaving the colour even and rubbing with the grain.

11.3. Application

Varnish shall then be applied in very thin coats with a special fine-haired varnishing brush and not with an ordinary paint brush. Unless otherwise specified, the best Copal varnish shall be used. If more than one coat have been specified the first coat shall be rubbed with fine sand paper. Other coats shall be applied as directed by the Client.

11.4. Protection and Cleaning

It shall conform to the requirement of Clause 3.6.

11.5. Measurement, Payment and Rates

The provisions of Clause 11.8.9 for Painting shall apply. Where a pay item has been given in BOQ, payment shall be made for varnishing as under:
"Varnishing new wood surfaces"

12. PAINTING IRON AND STEEL WORK

12.1. Material

All materials (cleaners, pre-treatments, Primers, Etch/Wash Primers, Fillers, Undercoat and Synthetic enamel paints) shall be of ICI Ltd; Paintex Ltd; Johson & Nicholson of Pakistan Ltd; or approved equal make, and shall be delivered to site of work in original sealed containers bearing manufacturer's label, batch number, date of manufacture and manufacturer's name. All the materials and processes shall be suitable for the surface to be painted and for the conditions under which the painted surface has to perform, and shall be as per printed recommendations and instructions of the manufacturers as approved by the Client.

12.2. Weather

Painting shall not be done in damp, wet, stormy or extremely hot weather. Too quick drying in the baking heat of the sun shall be avoided.

12.3. Preparation of Surface

The surface shall be thoroughly cleaned of all rust, scale and foreign matter by means of steel scrapers, chisels, steel wire brush, sand paper, sand blasting or any other suitable mechanical means as may be required by the Client, till the bright shining surface of the iron appears. The surface shall then be cleaned with dry cotton waste and the primer applied immediately especially if the weather is damp, to avoid rusting.

If proper mechanical means cannot be employed, cleaners like Deoxidine 125 of Paintex Ltd., or as approved may be used. Dirt, grease, etc. may be removed by washing with white spirit and wiping with clean rags.

12.4. Pretreatment / Phosphating

Only where specifically indicted, pre-treatments with Lithoform (for galvanized surfaces), Kephos of Paintex Ltd., or approved equal shall be applied.

12.5. Priming (Shop Coating)

Over cleaned galvanized surfaces, one coat of Dulux Etch/Wash Primer (or approved equal) and then one coat of "Zinc Chromate Yellow" of Paintex Ltd., or "Kromik", "Galvanized Iron Primer" of Johnson Nicholson of Pakistan Ltd., or approved equal primer shall be applied.

Over cleaned, un-galvanized surfaces, Paintex Synthetic Red Lead Primer, Dulux Synthetic Red Lead Primer, Dulux Red Lead Primer, Dulux Red Oxide Zinc Chromate Primer, Zinc Chromate Yellow Primer of Paintex Ltd., "Kromik" Synthetic Red Lead Primer, or approved equal shall be applied in one or two coats as recommended by the Manufacturers.

12.6. Filling

The shallow metal indentations shall be filled with "Knifing Filler" of Paintex Ltd., or approved equal, applied in thin layers over primer. Each layer shall be allowed to dry for one hour and the final layer for 8 hours before wet flatting with 320 grade paper. The flatted surface of filled areas and other metal surface exposed during flatting shall be primed before overcoating with finish.

12.7. Finishing

Two or three coats (as may be necessary for recommendations of the manufacturers, and required to produce the desired finish) shall be applied by means of brushes, rollers or conventional spray. Sixteen hours shall be allowed between coats, and each coat (except the final coat) shall be lightly sand papered. To improve brushing, particularly during summer, upto 10% mineral spirit if brushes are used, or upto 10% white spirit if rollers are used or upto 25% white spirit if conventional spray equipment are used, may be mixed.

12.8. Protection and Cleaning

The requirements of Clause 3.6 shall apply.

12.9. Number of Coats: As specified above.

12.10. Measurement, Payment and Rates

The provisions of Clause 8.9 shall apply. When a pay item for painting iron and steel surfaces has been given in BOQ, payment shall be made as under:-

"Painting new iron/galvanized iron/steel surfaces with synthetic enamel paint system"

13. PAINTING WITH SPECIAL PAINTS

13.1. "Kemobel" Chemical Resistant Finish over new Plaster, Concrete, Masonry, Wood, Steel and Iron Surfaces

Iron and steel shall be blasted clean. When this is not possible, all dirt, grease and chemical contamination shall be removed, followed by chipping, scraping and wire brushing to remove all loose mill scale and surface rust.

One coat of "Kemobel Metal Primer" (or approved equal) over cleaned iron and steel surfaces or one coat of "Kemobel Concrete Primer" (or approved equal) over cleaned surfaces of concrete, plaster, masonry and wood shall be applied. The primer shall be allowed to dry for 8-16 hours. Then two coats of "Kemobel" finish (or approved equal) shall be applied by brush or spray.

Measurement: shall be net superficial area (actual area painted).

Payment and Rates: shall be full compensation for everything provided and done to complete the "Kemobel Chemical Resistant Finish" as specified above, as per drawings and conditions of contract.

Pay Items: Payment shall be made under the relevant BOQ item for: "Kemobel Chemical Resistant Finish Over the specified new surfaces".

13.2. "Kemobel Chlorinated Rubber Thick Coating" Over Iron, Mild Steel and Concrete Surfaces:

Surfaces shall be cleaned and one coat of appropriate "Kemobel" Primer (or approved equal) applied as specified in Clause 13.1.

Then one or two coats (as indicated in the pay item) shall be "Kemobel Chlorinated Rubber Thick Coating" (or approved equal) shall be applied after allowing the primer to dry for 8-16 hours. Then two coats of "Kemobel" finish shall be applied by brush or spray.

If galvanized surface is to be coated, the fabricator's pre-treatments shall be removed with solvent washing and abrasion followed by Dulux Wash Primer two pack (or approved equal), before applying the appropriate "Kemobel" primer (or approved equal).

Measurement, Payment Rates: As provided in Clause 13.1 shall apply.

Pay Items: Payment shall be made under the relevant BOQ item for:

"Kemobel Chlorinated Rubber Thick Coating over new surfaces indicated in BOQ". The rate shall be for the complete system, except that the number of thick coatings shall be one or two as indicated in BOQ".

13.3. Permobel Epoxy Finish Over Concrete, Masonry Plaster, Wood, Steel, Asbestos Cement Sheet Surfaces

Structural and heavy steel shall be grit, shot or sand blasted to SA2.5 and other steel degreased and derusted. Other contaminants shall be removed with abrasive paper and solvent.

Priming: Over grit, shot or sand blasted surfaces, one coat of "Permobel Zinc Rick Primer" of Paintex Ltd (or approved equal) shall be applied. Nine (9) parts by volume of Primer Component

"A" shall be mixed with one part component "B" and the mixture allowed to stand for 10 minutes before use. The mixture must be used within 36 hours. Over surfaces not grit, shot or sand blasted, one coat of "Permobel Epoxy Red Oxide Zinc Chromate Primer" of Paintex Ltd (or approved equal) shall be applied, by mixing 2 parts component "A" with one part component "B" before use.

Primer shall be applied unthinned over porous surfaces (wood, concrete, A.C. sheets, plaster, masonry and the like). Primers shall allowed to cure for 12-18 hours before application of finish.

Finishing: Two (unless indicated three in the pay item) unthinned coats of "Permobel Epoxy Finish" of ICI Ltd (or approved equal) shall be applied over the primed surfaces, allowing for overnight drying between coats. "Permobel Thinner" of Paintex Ltd (or approved equal) shall be used to thin the primer and finishes and to clean the brushes.

Measurement, Payment and Rates: As provided in Clause 13.1. **Pay**

Items: Payment shall be made under the relevant BOQ items for: "Permobel

Epoxy Finish over new surfaces".

The type of surface and numbers of finish coats shall be as indicated in BOQ/drawing.

13.4. Epoxy Concrete/Plaster Finish

The surface shall be ensured to be sound, firmly adhering and free from dirt, grease, etc. Four parts of base shall be mixed thoroughly with one part hardener by volume, "Epoxy Thinner" of Paintex Ltd (or approved equal) shall be used, if required for brushing or spraying. Two coats of "Epoxy" of Paintex Ltd (or approved equal) shall be applied, allowing 12-16 hours for drying between coats. 5-7 days shall be allowed for full curing before use, especially in case of floor.

Measurement, Payment and Rates: As provided in Clause 13.1. **Pay**

Items: Payment shall be made under the relevant BOQ items for: "Epoxy

Finish over new Concrete/Plaster surfaces".

13.5. Painting with Coaltar Epoxy, over steel, hard concrete and hard cement renderings:

a) Painting Steel Surfaces

Steel surface shall be sand blasted and cleaned of all traces of dust and grit, then Paintex Coaltar Epoxy (or approved equal) shall be applied with 4-6 hours of blasting. In cases where whole of the area (as in case of tanks) cannot be blasted for painting within 4-6 hours, small area be blasted, cleaned and coated with "Permobel Protective Primer" of Paintex Ltd (or approved equal) and left for painting. Two coats of Coaltar Epoxy shall then be applied allowing 12-16 hours (not more than 24 hours in any case) between the two coats.

b) Painting hard concrete/hard renderings

The surface shall be dry right through. All loose and friable material shall be removed by thorough sand papering. All minor cracks and holes shall be made good with Epoxy Sand Mortar (or Paintex Ltd or approved equal) which shall be allowed to cure for 12-16 hours before painting. Two coats of Coaltar Epoxy) of Paintex Ltd (or approved equal) shall then be applied, allowing 12-16 horus (not more than 24 hours in any case) between two coats.

c) **Measurement, Payment and Rates:** As provided in Clause 13.1.

d) **Pay Items:** Payment shall be made under the relevant BOQ items for:

"Painting Steel/Concrete/Cement rendering with Coaltar Epoxy"

13.6. Painting Wood or Metal Surfaces with Aluminium Paint:

All dirt, rust, oil, greasy spots and grime shall be removed. Metal surfaces shall be cleaned by wirebrushing and scraping. The surface shall be wiped clean with a solvent soaked rag. One coat of appropriate Dulux Primer (or approved equal) shall then be applied.

The two components of Aluminium Paint of Paintex (or approved equal) shall be mixed thoroughly. Two coats of the paint shall then be applied by brush or spray, allowing overnight interval between coats.

Measurement, Payment and Rates: As provided in Clause 13.1.

Pay Items: Payment shall be made under the relevant BOQ items for:

"Painting new Wood / Metal surface (as indicated in BOQ) with Aluminum Paint."

BITUMEN COATING

1. PREPARATION OF SURFACE

The base course shall be rendered free from all ruts and pot holes or other defects and shall have a camber as directed by the Engineer / Project Manager.

The surface shall be swept clean and free from dust, dirt or other deleterious matter, by hand brushing using wire brushes and finally by dusting with gunny bags.

2. MINERAL AGGREGATE

The graded screened bajri/ crushed stone shall consist of clean, consolidated, durable materials of uniform quality throughout, free from soft or disintegrated or other objectionable matter and shall not contain any dust. The bajri shall be of ½" standard size (i.e. passing though ¾" square mesh and retained on 3/8" square mesh) and ¼" standard size (i.e. passing 3/8" square mesh and retained on 1/10" square mesh) for second coat.

3. APPLICATION OF FIRST COAT OF BITUMEN

The bitumen as for the grade and shall be heated in a proper heating plant to the temperature and it shall be maintained at the same temperature. It shall be applied to the surface by means of pressure spryer at 25 lbs./100 Sft.

4. SPREADING OF CHIPS OR BAJRI

Immediately following the application of bitumen, stone chips or bajri in perfectly dry condition shall be uniformly and evenly sprayed at 6 cft. per 100 sft. over the whole surface which has been sprayed. Precaution shall be taken so that the whole of the bitumen surface is covered with uniform layer of chips or bajri without any accumulation of surplus chips or bajri at any point. Hand brooming or light drag brooming shall follow the application of the chips prior to rolling.

5. ROLLING

Immediately following the application of the stone chips or bajri and the completion of light brooming the whole area shall be rolled with a roller weighing 8 to 10 tons. Rolling must be done carefully so as not to crush the stone or bajri. The roller must be accompanied by spreading chips or bajri to fill any surface voids.

The second coat should be applied immediately after the first coat. The consolidated surface should be examined and any excess chips or bajri removed by hand. Depressions should be made up by the addition of more chips or bajri.

6. PREPARATION OF SURFACE FOR SECOND COAT APPLICATION

The sprayer used for applying the bitumen shall be operated in such a way as will ensure an even and uniform distribution of the bitumen on the road surface. Excessive deposits of bitumen on the road caused by stopping and starting the sprayer or distributor or by leakage, should not be allowed. Spraying shall in all cases be carried out parallel to the central line of the road.

The edges of the bitumen surface shall be defined by wire or other cord lines stretched and pegged in position.

7. APPLICATION OF THE SECOND COAT OF BITUMEN

The Bitumen of the grade and the made specified shall be heated in a proper heating plant to the temperature and shall be maintained at the same temperature. It shall be applied using pressure sprayer, evenly and uniformly at the rate of 45 lbs. per 100 sft. the same precautions as those specified for the first coat should be observed during spraying.

8. SPREADING OF CHIPS OR BAJRI

While the bitumen is still hot, it should be blinded with ¼" size (i.e. passing through 3/8" square mesh and retained on 1/10" square mesh) stone chips or bajri as specified. This blindage must be clean and contain no dust and the rate of application should be approximately 3½ cft. per 100 square ft. After spreading it should be brushed evenly over the surface.

9. ROLLING

Final rolling should be carried out with 8 to 10 ton power roller. Consolidation will be complete when the Bitumen has absorbed as mush of the blindage as possible. After rolling, the road may be thrown open to traffic and, two or three weeks later, loose blindage on the surface may be removed. If, at any subsequent date, there are any signs of the road bleeding, coarse sand shall be spread over it by the contractor.

TERMITE CONTROL TREATMENT

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 including side-walks and paving abutting building for a distance of at least 7 feet beyond building line. The scope also covers treatment of all wood works with insecticides before installation in position.

2. MATERIAL

a). An emulsible concentrate 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 elements and concentrations.

i). "Aldrin" Chemical toxicant, emulsifiable to 0.5% with clean water.
ii). "Dieldrin" Chlorinated hydrocarbon, emulsifiable to 0.5% with clean water.

b). Insecticide (Dieldrin or Aldrin) shall be obtained from the Government of Pakistan, Department of Agriculture, 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 / Project Manager.

c). Pure turpentine shall be used for dilution of insecticide, in approved proportion for application to wood work where such application is required.

3. QUALITY ASSURANCE

a). In addition to the requirements of these specifications, recommendations substrata and comply with manufacturer's instructions and for the work, including preparation of application.

b). A professional operator shall be engaged license in accordance with regulations authorities for application of soil treatment who shall have of governing solution.

4. EXTENT OF APPLICATION

a). Insecticide solution shall be applied with approved pressure spraying equipment maintaining a pressure of 150 psi to all applications to, on or in earth.

b). 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.

c). Insecticide 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 side-walks and paving abutting buildings for distance of at least 7 feet beyond building line. Solution shall be applied in amounts of not less than 0.122 gallon/sq.ft of area. If applied over gravel or sand fill, application shall be not be less than 0.150 gallon/sq.ft. of area. Insecticide shall penetrate to a depth of 1 inch minimum in porous earth at bottom and 2 inches to 3 inches at sides of excavations.

d). 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.

e). 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.

f). 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.

g). All wood work 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.

5. STANDARDS

All methods of termite protection used herein shall be in accordance with the standard practices of National Pest Control Association, U.S.A and the British Wood Preserving Association.

6. SAMPLES Abp TESTS

The Contractor shall supply samples of all the materials to be used for insecticide control for approval of the Engineer / Project Manager and testing in accordance with the specified standards. Rejected materials shall be removed from the site immediately.

7. 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 2 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.

8. MEASUREMENT & LAYMENT

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 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.

a). Termite control treatment on wood works.
b). Turpentine & Water required for mixing insecticide solution.
c). Transportation of material and storage at site.
d). Anti-termite treatment on stockpiled backfill material.
e). Anti-termite treatment on side walks and paving abutting buildings for a distance of at least 7 feet beyond line.

8.2. Termite Control Treatment

a). 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.

b). Payment

Payment will be made for acceptable measured quantity of termite control treatment on the basis of unit rate per square foot quoted in the Bills of Quantities & shall constitute full compensation for all the works related to the item.

PLUMBING

PLUMBING SYSTEM

1. GENERAL INFORMATION FOR PLUMBING SYSTEM

Standards mentioned or referred to on the drawings and this Specification shall be the prevailing Standard Code of Practice in Pakistan.

In these Specifications or other documents, foreign standards as listed below are to be used as comparable standards for convenience:

i. British Standards Institute

ii. British Standard Codes Of Practice

iii. Pakistan Standards Institute

iv. American Society for Mechanical Engineer / Project Managers (ASME)

v. American Society for Testing Materials (ASTM)

vi. Underwriter's Laboratories, Inc. (UL).

vii. American Society of Plumbing Engineer / Project Managers

viii. The Institute of Plumbing, UK

ix. Chartered Institution of Building Services Engineer / Project Managers

1.1. Testing Institutes / Laboratories

Contractor must use institutes/laboratories for testing of materials as approved by the Architect/ Engineer / Project Manager.

1.2. Scope of the Contract

The work included in the Contract comprise the furnishing and installing of all materials and equipment necessary to form the complete construction of the works shown on the Contract drawings and/or described in the Specification.

The construction materials, equipment, finishes, fixtures etc. shall be the same of closely similar to those shown on the Contract drawings and/or described in this Specification.

All works shall be constructed in accordance with the Specification and with the Contract drawings and approved shop drawings.

The Contractor shall be responsible that all materials and items, mentioned and/or described in this Specification and Additional Technical Requirements (ATR) if any and/or shown on the drawings and/or deemed necessary for the proper and workmanlike execution of this project will be supplied, processed, fixed, finished and tested by him unless specifically stated otherwise in the Contract documents.

The Owner reserves the right to engage other specialist Contractors on this project and/or to procure any additional materials required for this project directly from suppliers.

1.3. Samples

Samples required by the Engineer / Project Manager are to be provided without delay at the Contractor's expense and shall, if required, be in accordance with the relevant standard method of sampling. The samples will be taken in such a way and such a method that they can be considered to be representative of the full quantity of materials or work from which they are taken. The samples, when approved, will be kept by the Architect/Engineer / Project Manager, who will reject materials or workmanship not corresponding in quality and character with the approved samples.

Suitable, labeled boxes or containers for the storage of samples shall be provided by the Contractor at his own expense.

1.4. Inspection and Tests

Materials shall, unless otherwise directed by the Architect/Engineer / Project Manager, be tested before leaving the manufacturer's premises and the Contractor shall obtain and supply to the Engineer / Project Manager's representative for his approval certificates from the manufacturer, showing that the materials have been tested according to the relevant specification or standard. The certification from the manufacturers in no way absolves the Contractor from his responsibility of retesting the materials from approved laboratories/agencies.

The Contractor shall provide labour, where required, for tests carried out in accordance with the Contract.

The cost of all tests shall be at the expense of the Contractor.

1.5. Proprietary Materials and Articles

Where in this Specification mentioned makes or named products of individual manufacturers this is only an indication of the quality and type of goods which are satisfactory to the Architect/Engineer / Project Manager. The Contractor may substitute similar products of at least equal quality and suitability, subject to the Contractor proving the quality and suitability and to the approval of the Architect/Engineer / Project Manager.

1.6. Working Drawings on Site

Working drawings for all works are to be kept on site at all times. The drawings shall be in a good readable condition and of the latest issued revision. The term "working drawings" means either the contract drawings, later issued execution drawings or shop drawings made by the Contractor.

1.7. Shop Drawings and As-Built Drawings

Where required in this Specification and where considered necessary for proper execution of the Works, the Contractor shall prepare the detailed and shop drawings shall be issued to the Architect/Engineer / Project Manager in duplicate for checking and approval. The Contractor shall supply to the Engineer / Project Manager and to other contractors concerned three prints of the final approved drawings.

The Contractor shall prepare as-built drawings for all executed works. The Contractor shall submit to the Owner the originals (reproducible) of his shop drawings and of the as-built drawings five copies on printing paper. The drawings shall be submitted to the Architect/Engineer / Project Manager for approval prior to the issue of the Certificate of Completion.

1.8. Contractor's Staff

The Contractor shall make available for this project all staff members that will be required for the proper and smooth running of the project and to ensure timely completion. Such staff shall have proper qualifications and experience for the disciplines that they will be engaged on.

The Contractor shall propose, for the approval by the Architect/Engineer / Project Manager, his senior staff members for the following disciplines:

a) Programming and Scheduling of the Works, liaison with other contractors.

b) Selection and Ordering of plumbing materials.

c) Organization of the works and quality control.

d) Surveying.

e) Preparation of shop drawings and as-built drawing.

The Contractor shall also submit at the same time, for the approval by the Architect/Engineer / Project Manager, the names and qualifications of other staff that will be employed on this project, including but not limited to the name of the Superintendent of works as mentioned in the Conditions of Contract.

1.9. Inspection of the Work

a) The representatives of the Owner and the Consultant will make periodic visits to the site during construction to ascertain that the work is being executed in reasonable conformity with all plans and specifications, but will not execute quality control at all times. Contractor must maintain the quality control as intended in the contract documents.

b) Correct all deficiencies immediately as noted during field inspections.

c) Request in writing that a final inspection of all services.

d) Do not issue this written request until:

e) All deficiencies noted during job inspections have been corrected.

f) All systems have been balanced and tested and are ready for operation.

g) All balancing reports have been submitted and reviewed.

h) All instruction manuals have been submitted and reviewed.

i) The cleaning up is finished in all respects.

j) All spare parts and replacement parts specified have been provided and receipt of the same acknowledged.

1.10. Correction after Completion

a) Remedy all work in accordance with the General Conditions of Contract during the Maintenance period.

b) Attend immediately to any and all the defects occurring during the period defined above and repair in a manner to prevent recurrence. This contractor is responsible for all work required by other trades necessary to repair the works of this section, or necessary to repair damage caused by the failure of any part of this section.

1.11. Guarantees

a) The Contractor will guarantee all material and workmanship for at least 12 months after preliminary take over by the Owner.

b) All guarantees from equipment suppliers will be vested in the Owner, regardless of whether the Contractor who supplied the equipment is still associated with the project or not.

c) Guarantees will be full guarantees and will include all overhead, profit, incidental charges and sundries.

d) Where damage is caused to any other item by any failure of the item guaranteed, then the guarantee shall also include the costs incurred in rectifying that damage.

1.12. Maintenance

a) Maintenance is defined as the Contractual Liability to maintain the equipment in working condition, PLUS the regular checks and servicing of equipment during the maintenance period, including all the consumables and spare parts to keep the equipment in best working order.

b) Regular maintenance shall be as necessary, but in any event not less frequently than monthly. Breakdown calls shall be attended immediately.

c) Maintenance period shall be 1 year from the date of handing over for all fire fighting works.

SOIL / WASTE & RAIN WATER DRAINAGE SYSTEM
SEWERAGE & WATER SUPPLY SYSTEM
PLUMBING SERVICES

2. SCOPE OF WORK

The work shall include supply, installation, testing, commissioning, adjustment and setting to work of the drainage installation.

The contractor is to assume full responsibility for the correct functioning of the system and to carry any liability or guarantee as may be necessary to protect all parties in this regard.

The drainage services subcontractor shall be responsible for coordination with other trades and services and shall provide all materials, labour and supervision, equipment, tools, appliance, services, etc. for carrying out the following items of works:

Drainage connections of plumbing fixtures, floor gully and drain trenches to installed under floor drain pipe work.

i. Soil and waste drainage system

ii. Storm water drainage systems

iii. Sewerage system

iv. Water supply systems

Protective painting of all materials installed within this section of the contract. Identification of

all services.

All builder's work including breaking and making good of walls, floors, etc., equipment foundation pads, sleeves, etc.

Hoisting of heavy equipment.

SOIL / WASTE & RAIN WATER DRAINAGE SYSTEM

3. UPVC SOIL / WASTE & RAIN WATER DRAINAGE NETWORK

i. The soil / waste system shall be double stack together with vent installation. All work shall be installed and tested in accordance with BS 5572 code of practice for sanitary works.

ii. Surface water drainage network

iii. Rain water from the roof shall be piped down via separate pipe work to connect as shown on drawing.

iv. Rain water shall be free discharge at ground floor.

3.1. Installation

a) uPVC Vent pipes shall extend through roof and terminate 600mm (24") above it with vent cowl. Vent pipes passage through the roof shall be made watertight by proper flashing.

b) All changes of direction shall be gradual and not abrupt, 45 degree fittings shall be used wherever possible, and 90 degree fittings shall be of the long sweep type. All unnecessary turns and off sets shall be carefully avoided, and run as directly as possible from the sanitary fixtures to the vertical stacks.

c) Concealed pipes shall be installed in such a manner as to permit easy accessibility for maintenance this applies particularly to valve locations.

d) All pipes shall be fixed in neatly arranged lines, and adequately pitched horizontal lines to allow the system to be properly vented and drained. Air pockets, traps and sags shall be carefully avoided.

e) Supports, clamps and hangers shall be made of galvanized steel with rubber internal rubber seal, fixed with drilled plugs. Cutting and pinning of fixings will not be permitted.

f) Run building drains at a minimum grade of 1% (1:100) pitch unless otherwise noted, downward in the direction of flow. Pitch branch connections to stacks from fixtures at 2% (1:50) where possible.

g) Provide all the required appurtenances to make the drainage system complete in compliance with code requirements including traps, pipe fittings, hangers, and the like.

h) Wherever possible, vent stack offsets shall be made with 45 degree fittings.

i) Take special care in setting roof drains to ensure that they are set at an elevation which will prelude formation of puddles.

j) Install connections to roof drains in conjunction with the roofing specified under civil works, so that the building is adequately protected during construction from damage by storm water.

k) No short radius bends to be used.

l) Use short "Tee Wye" fittings in vertical piping only.

m) Any piping passing through roofs shall be so arranged to be a minimum of 200mm (8") from walls or other obstructions so as to permit proper flashings which are provided by another trade.

n) Where drainage pipe work crosses fire rated partitions, walls and floors, provide proprietary fire rated in tumescent sleeves with a fire rating equal to or greater than the fire rating of the respective wall or floor.

o) All soil/waste and rain water lines hung from the ceiling shall be supported at not more then 3' ft. centers for horizontal pipe and 3' ft. for vertical pipes.

3.2. Clean-outs on Soil Waste Vent and Storm Water Installation

a) Clean-outs shall be installed at each change of direction of drainage pipes, greater than 45 degrees, inside the building, and where indicated on the drawings. Clean-outs shall be not more than 10m apart in horizontal lines. A cleanout shall be provided at or near the foot of each vertical waste or soil stack.

b) Clean-outs on concealed piping shall be extended through and terminate flush with finished wall or floor. Pits or chases may be left in the wall or floor, provided they are of sufficient size to permit removal of the cleanout plug and proper cleaning of the system.

c) Where it is necessary to conceal a clean-out plug, a heavy duty covering plate shall be provided, which will permit ready access to the plug.

d) Clean-out plugs shall be of heavy duty with seal and lock. Final finish shall be to the approval of the Architect/Engineer / Project Manager.

e) Clean-outs shall be of the same nominal size as the pipes up to 100mm (4") pipe diameter and not less than 100mm (4") for larger piping.

f) Clean-outs shall be so installed that there is a clearance of not less than 45cm for the purpose of Roding and cleaning.

g) Provide clean-outs at foot of all stacks, changes of directions, at the ends of branch runs, in straight runs as required and where indicated. Terminate as specified under "Clean-outs".

3.3. Material

a) Unless otherwise indicated drainage, vent and rain water pipes and fittings inside/out-side the building (except Toilet / Kitchen / Retail areas) shall be of Upvc to BS 4514 for pipe sizes up to 75mm (3") dia and Upvc / ABS to BS 5255 for pipe sizes 32- 50mm dia and smaller. Fittings shall be push fit type.

b) All pipes under building and those subject to traffic specially under roads shall be protected with reinforced concrete.

3.4. Floor / Roof / Drains

a) Floor drains/Floor gully & P-traps unless otherwise indicated shall have Upvc traps of minimum water seal of 70 mm, and shall be provided with adjustable and removable strainers. The open area of strainer shall be at least two thirds of the cross sectional area of the drain line to which it connects. Floor drains shall have heavy duty stainless steel cover with a removable strainer and cover plate. Floor drain shall have built in Roding eye.

b) All floor drains / clean-outs must be coordinated with floor tiling layout.

c) Dish washer drains, in kitchen areas, shall include a nickel bronze funnel secured to the grating.

d) Roof Rain-water outlet shall be Promenade roof drain outlets, 302 x 302 mm size, as by Wade, or approved equal.

3.5. Openable Cap On Clean-Out Cover Installation

Open-able cap shall be of nickel/ bronze body heavy duty with seal and lock. Final finish shall be to the approval of the Architect / Engineer / Project Manager.

Open-able cap shall be of the nominal size pipes diameter.

SEWERAGE SYSTEM

4. GENERAL REQUIREMENTS

a) Pipe connections to manholes, septic tanks and percolating pits shall be made in a completely watertight and approved manner.

b) Pipes shall be kept clean until final acceptance of the work. Exposed ends of all incomplete lines shall be closed with wooden plugs and adequately secured at all times when pipe laying is not actually in progress.

c) Pipes shall be installed on a good foundation and adequate means taken to prevent settlement. Pipes laid in smooth bed as per detail drawing shall be provided with a solid uniform bearing throughout their entire length

d) Precautions shall be taken to protect incomplete work from floating due to storms or from any other cause. All pipe lines or structures not stable against uplift during construction shall be well braced or otherwise protected.

e) All completed underground lines shall be subject to the inspection and approval of the Architect / Engineer / Project Manager. All pipes shall be true to line and grade. The full circle of the pipe shall be visible at the manholes.

4.1. Installations

The drains shall be laid truly straight in line and to an even gradient.

Excavations shall be made true and even to falls. The bottoms being trimmed to correct level and well rammed. Remove mud, rock projections, boulders and hard spots and replace with approved fill material well consolidated.

Minimum width of trench shall be 300 to 600mm greater than external diameter of pipe.

Before laying, all pipes and components shall be checked for defects and joint spaces cleared of dirt.

Socketted pipes to be laid with sockets uphill.

Where lubrication of the joint is required the pipe manufacturer's recommended lubricant shall only be used.

Lay and compact bed of granular material to provide 100mm thickness over the full width of the trench. Scoop out locally at pipe sockets where socketted pipes are used. Adjust pipes to line and level and ensure that pipe barrels rest uniformly on the bedding.

Add granular side fill uniformly each side of pipes compacting by hand. Any trench sheeting should be lifted before the fill is compacted.

The granular material shall be compacted in 100mm layers by hand up to 100mm minimum distance above top of pipes.

Granular material shall be locally available crushed rock graded in relation to pipe size as follows:

100 mm nominal size aggregate	100mm dia. pipes
100 or 150 mm. Ditto.	150mm dia. pipes
100 or 150. Ditto.	200mm dia. pipes & above

During bad weather, or in wet fine- grained soils such as clays, silts or sands, it is important to prevent the trench bottom being churned up drawing work in the trench. In such cases a blanket of granular material 75mm thick laid over the trench bottom immediately after excavation, or alternatively a sealing layer of weak concrete 50mm thick, is required.

Drains below roadways, car parks, and any area subject to vehicular traffic where less than 600mm of cover shall be bedded and surrounded with concrete 150 mm minimum thickness all round with provision for movement joints.

Granular fill shall be laid in 100mm layers and had compacted to a level 300mm minimum above top of pipe followed by main backfill material placed and compacted in 300mm layers any trench sheeting being withdrawn as the work proceeds. Heavy mechanical compactors shall not be used until there is at least 300mm cover over the pipes.

4.2. Gully Traps

Where indicated on drawings provide curb gully unit of ductile iron hinged grate, road retaining bar with clear opening size 250x250mm. Unit to be black bitumen coated and shall be designed to deter ingress and help prevent blockage. AGRP grid shall be provided as standard.

4.3. Testing of Drainage / Sewerage Pipe Systems

After the correction is made the pressure test shall be repeated until the system is proved tight.

Underground drainage pipes shall be tested by plugging the end of the pipe and filling with water to a minimum head of 3 meters. The test pressure shall be maintained for 08 hours. Pipes and joints shall be inspected and approved before backfilling the trench.

Underground drainage/sewer and wash-down drainage pipes shall be tested by plugging the end of the last manhole pipe and filling with water 1st. manhole to last manhole. The test pressure shall be maintained for 8 hours. Pipes and joints shall be inspected and approved before backfilling the trench.

All drainage systems shall be tested for proper flow to ensure their freedom from any obstruction. The Contractor shall disassemble, clear; repair and re- assemble obstructed piping at his own expense. After re-assembly the piping shall again be subjected to the pressure test.

4.4. Sewer, Drainage & Rain Water Piping Matrial

The sewer collected from internal plumbing fixture shall be carried to the manholes to city manhole underground Upvc class "D"

The sewer collected from internal plumbing fixture shall be carried to the manholes to septic tank and from septic tank the sewer water will be sewerage treatment plant through underground Upvc class "D" Pipes.

The treated waste water use for irrigation system from sewerage treatment plant through drainage submersible pumps will be underground Upvc pressure pipe "Schedule "40"

The hose bib brass body from irrigation to connection as shown on drawing

4.5. Flow Of Drain / Slope

Run building drains at a minimum grade of 1% (1:100) slope unless otherwise noted, downward in the direction of flow, Slope branch connections to stacks from fixtures at 2% (1:50) where possible.

Provide all the required appurtenances to make the drainage system complete in compliance with code requirements including traps, pipe fittings, hangers, and the like. Wherever possible, vent stack offsets shall be made with 45 degree fittings.

Take special care in setting roof drains to ensure that they are set at an elevation which will prevent formation of puddles.

Install connections to roof drains in conjunction with the roofing specified under civil works, so that the building is adequately protected during construction from damage by storm water.

GENERAL REQUIREMENTS OF WATER SUPPLY SERVICES & PLUMBING FIXTURE

1. SCOPE OF WORK

The work shall supply installation, testing, commissioning, adjustment and setting to work of the Plumbing and Water services installation.

The contractor is to assume full responsibility for the correct functioning of the system and to carry any liability or guarantee as may be necessary to protect all parties in this regard.

The plumbing services contractor shall be responsible for coordination with other trades and services and shall provide all materials, labour and supervision, equipment, tools, appliance, services, etc. for carrying out the following items of works:

- Domestic hot water/ hot water return and cold water System.

Thermal and protective insulation of pipe works.

- Protective painting of all materials installed within this section of the contract.

Identification of all services.

All builder's work including breaking and making good of walls, floors, etc., equipment foundation pads, sleeves, etc.

Hoisting of heavy equipment.

- Plumbing Fixtures.

1.1. Pipe Works Installation

Pipe materials shall be as specified elsewhere herein. The Contractor shall install unions or pairs of flanges in the pipe work system at the following locations:

a) At intervals not greater than 15 m.

b) To enable the disconnection of all items of plant, equipment, pumps and valves for maintenance purposes.

c) To enable sections of pipe work to be subsequently dismantled and re-fixed without disturbing other pipe work, plant, equipment and building fabric.

d) Where indicated on the drawings.

e) Pipe work shall be run neatly, parallel to walls or grid lines on plan and shall, where necessary, set around columns and projections. All vertical pipe shall be plumb. Direction changes in pipe groups shall be set out from a common centre point.

f) All screwed and flanged joints shall be easily accessible.

g) Where pipes are fitted around columns or piers, the direction change shall be made using short sets and shall be supported from the floor on the centre line of the column.

h) It shall be the responsibility of the Contractor to ensure that the pipe work systems are at least 300 mm from any electrical conduit, cable or wiring.

i) Pipes entering or leaving ducts shall be square to them. All pipe work shall be fixed in such a manner as to be readily accessible for tools, welding operations or removable without dismantling adjacent pipe work.

j) Where pipe work passes through walls, etc., the Contractor shall ensure that these pipes are not subsequently bedded in by making good by other trades.

k) Pipe work passing through brick or concrete shall be enclosed in a PVC pipe sleeve of such diameter that the pipe maybe removed without cutting or deforming the pipe work. In particular where plastic pipes pass through a fire rated wall, fire arresting sleeves shall be used with a packing of in tumescent strip between the pipe and sleeve.

l) Pipe work passing through internal or external dry sheet construction walls shall pass through formed holes of such size that the pipe work may be removed without cutting or deforming the pipe.

m) All holes through such walls shall be closed after the erection and testing of the pipe work by means of removable split closing plates on both sides of the wall. All closing plates shall be manufactured from galvanized sheet steel of not less than 16g thickness in the case of brick or concrete walls. All closing plates shall be painted or finished in accordance with the requirements of this specification.

1.2. Storage and Protection

a) The Contractor shall ensure that all pipe work and fittings delivered to the site for inclusion in the Works are stored in an approved manner to avoid deterioration due to accidental damage and atmospheric conditions.

b) The Upvc/PPR pipe work components should, at all times, be stored in a location offering protection from direct sunlight, i.e. from ultra violet light and the associated heating effect, it being remembered that materials close to the ground will be heated by reflection in sandy locations.

c) Upvc/PPR pipes should be protected from direct sunlight and heat of the sun by providing shaded areas.

1.3. Pipe Work Supports

a) All pipe work shall be adequately supported. All support installations shall be in accordance with relevant British Standard Specifications and Codes of Practice, except where modified or extended by the contract documents.

b) Supports shall allow free movement for expansion or contraction of pipe work and shall be located to ensure that pipe work branches or fittings are not fouled by the support during expansion or contraction of the pipe work service.

c) Double banking of pipe work from a single support position will be permitted, provided the normal operating temperature of the fluids in the two pipes do not differ by more than 30 degrees C., but only where space restrictions prohibit individual support. Triple banking will not be permitted.

d) Where double banking is necessary, the larger of the two pipes shall be uppermost, and where pipes are the same size but manufactured from different materials, then the pipe having the material with the lowest coefficient of expansion shall be uppermost. Support intervals for double banked pipe work of different sizes shall relate to the smaller size.

e) Vertical rising pipes shall be supported at the base and the support shall withstand the total weight of the pipe and fluid contained.

f) Supports shall not be permitted which clamp the pipe so that it is in contact with building fabric or structure.

g) All supports shall be specifically designed for the outside diameter of the pipe concerned (including specified packing). Oversized brackets will be rejected.

h) Pipe work shall be supported individually by hangers consisting of malleable split rings with malleable iron sockets or steel clevis type hangers.

i) Pipe work shall be supported as recommended by the manufacturer as required in the specification and in particular on both sides of all changes in direction. Pipe work shall be supported such that no load is imposed upon plant machinery. Pipe work shall be supported at intervals not exceeding the following:

j) Water pipe work Spacing for supports

(32 mm)	(1.2 m)	(15 to 50)	(1.05 m)
(40 mm)	(1.2 m)	(65)	(1.02 m)
(50 mm)	(1.2 m)	(80)	(1.35 m)
(80 mm)	(1.0 m)	(100)	(1.75 m)
(110 mm)	(1.0 m)	(150)	(2.00 m)
(150 mm)	(2.7 m)	(200)	(2.04 m)
(200 mm)	(2.7 m)		

k) All pipe supports shall be manufactured in accordance with BS. 3974 Part 1: 1974. All Steel work used for the fabrication of hangers, pipe supports brackets and anchors, should be milled steel. All fixing hardware shall be either of steel. Complete pipe work shall be supports with properly made hangers and supports as per manufacturer's or Engineer / Project Manager recommendations. Anchors will be where as required.

1.4. Pipe Expansion

a) Pipe work shall be supported in such a manner as to permit free movement due to expansion and contraction. Pipe work supports shall be arranged as near as possible to joints and changes in direction and each support shall take its share of the load. The spacing of the supports shall not exceed the intervals given elsewhere herein. Where there are two or more pipes the support spacing may be based on the centers required by the smallest bore pipe work.

b) Vertical rising pipe work shall be supported at the base or as indicated to carry the total weight of the riser. Branches from risers shall not be used as a means of support for the riser.

c) Provision for movement due to expansion and contraction shall be made either by loops, special expansion joints or by changes in direction of the pipe work. Supports at such points shall be arranged to ensure that all movement is taken up by the loop, joint or change in direction of the pipe work.

1.5. Puddle Flanges

a) Where pipe work passes through the external walls of the buildings or trenches below ground level, the Contractor shall supply and cast or build puddle flanges into the structure.

b) Puddle flanges are to be manufactured from the same material as the pipe work of which they form a part.

c) Each puddle flange shall comprise a length of pipe, flanged or screwed at each according to diameter with an un-drilled slip on flange welded or nut-bolts on the outside at a point where it will be located mid way in the thickness of the wall. The puddle flange is to be painted externally with two coats of bituminous paint before being built into the structure.

1.6. Pipe Fittings Material

a) Polypropylene Random (PP-R) (PN20) pipes a fittings confirming to internal dia Din 8077 with fusion jointing will be used for cold / hot and hot water returned pipe size dia ½" to 2 ½" (dia 20 mm to dia 100 mm)

b) Water supply cold/hot & hot water return pipe shall be of galvanized steel conforming to BS- 1387/1967, medium quality. Pipe and fittings shall be of malleable iron screwed or flanged or threaded.

c) The piping system shall be of Stainless Steel Schedule 40 ASMT pipe and fittings with Mechanical joints or threaded with applicable pressure rating and installation shall be carried as per. shall be installed show on detail layout.

d) Polyethylene (PE-80) sdr-17.6 pipes a fittings confirming to BS 6572:1985 with fusion but welding jointing will be provided for cold water pipes underground outside the building

1.7. Pipe Insulation

All hot water supply pipe work shall be insulated with canvas cloth 8oz closed cell electrometric rubber foam with density off 55 ÷ 70 kg / m3 with thickness of 19mm.

1.8. Jointing of PPR Pipes

PP-R pipe fusion jointing sequence shall be carried out as per the written recommendations of the manufacturer and it must be stated that any omission or variation from the jointing procedure will result in a marked reduction in the efficiency of the joint. It is essential in the jointing process that only electric heater recommended by the manufacturer is used to make fusion joints.

1.9. Valves

a) Ball, and gate valves including jointing material (flange/adaptor) shall be used on service pipelines where regulation is required, and shall be supplied and fitted in positions indicated on the Contract Drawings. Valves shall be of the same nominal bore as the pipeline in which they are indicated.

b) Provide angle valves for incoming water supply to all fittings.

c) Gate valves confirming (BS-5154) up to 50mm dia. shall be bronze body with threaded ends bronze wedge disc, high quality packing and gland, non rising stem with screwed bonnet. Gate valves confirming (BS-5152) 65mm dia. and larger shall be flanged cast iron body, non rising stem, bronze trim wedge disc type complete with hand wheels, bolted bonnet and stuffing box.

d) Check valves including jointing material (flange/adaptor) confirming (BS-5154) upto 50mm dia. shall be threaded bronze pattern swing type with renewable disc and screw in cap. Valves confirming (BS-5152) 65 mm dia to 100 mm dia shall be flanged cast iron swing type with renewable seat and disc components.

1.10. Pressure Reducing Valve

a) Pressure reducing valves shall be pilot controlled, hydraulically operated, diaphragm type with low bypass capability. The low flow bypass capability shall be achieved by using a balanced direct acting PRV as an integral part of the main valve. At very low flows when the main valve is almost completely closed, to prevent the possibility of cavitations the direct acting valve shall bypass the main valve and maintain flow threaded PEX or Cpvs quick- connect end connection with threaded union.

b) PRVs shall be bronze construction including the trim. The pressure reducing valves shall be suitable for maximum working pressure that exist within the system and downstream pressure should be site adjustable between 2 and 7 bar. Water supply drawings for the minimum locations at which PRVs shall be required.

c) Valves shall always be installed in accessible locations to permit easy operation and maintenance.

1.11. Automatic Air Venting

a) Automatic air vent (eliminators) shall be provided at all high points in water pipe work system and as shown on drawings. They shall be installed at the highest points of the sections they are intended to vent.

b) Air vents on water systems shall be of float type, air eliminator of approved manufacture, having bottom inlet and top outlet with screwed connections. They shall have a stainless

steel float valve and valve seat, incorporate a stainless steel check valve and shall be so designed as to allow the internal parts to be removed for maintenance or inspection without disturbing pipe work. Air vents shall be suitable for the system pressures and temperatures. An air release pipe shall be connected to the air outlet and taken to the nearest suitable discharge point. Insect screen shall be provided on all open vents and overflows.

1.12. Strainers

The Contractor shall install strainers in the pipeline before the following items of equipment:

1.13. Float Valve

Ball float valve should be the internally hydraulically balanced double seated pattern. The operating mechanism should be properly fixed to an arm of brass which in turn shall be fixed to tinned copper float. The valve shall be of bronze body. The valve faces shall be synthetic rubber. The hinge pin and bushes shall be copper alloy.

1.14. Hose-Bib

House bib 3/4" diameter should be of having regrind able bronze discs with the disc seat integral with the valve body. The disc and seat should be accessible via a screwed cap for re grinding without removal of the disc.

1.15. Unions and Flange

Unions and Flanges should be furnished and installed at each threaded or flanged connection to all equipment or valves. The faces of flanges being connected should be alike in all cases. Unions and flanges should be located so that pipe can be easily disconnected for removal of equipment, valve or tank.

PRESSURE BOOSTER PUMP SET.

a) The booster water pump 2Nos. working and 1 Nos. stand-by pump set. shall be complete with pump, "L" channel skid frame, CC foundation, complete electrical panel suitable specify electric motor, discharged and suction connection with valves and accessories as per typical connections of pump shown on the drawings.

b) The pump shall be suitable for quiet and continuous operation at actual head and discharge, the pump shall be closed coupled type, single stage, stainless steel body and impeller.

c) The casing and bearing housing shall be of stainless steel, highest point in the casing should be provided with air vent and lowest point should be provided with drain plug.

d) The shaft seals shall be mechanical seal type.

e) The impeller, impeller guide, glands, stuffing box ring, and shaft sleeve shall be of stainless steel.

f) The shaft shall be of steel, turned and ground.

g) The bearing frame assembly of the pump should be fitted with no graspable ball bearing equiv. lent to electric motor's bearing standard.

h) The pump and motor shall be mounted on a common base plate of heavy structural MS steel.

i) The pump casing shall be designed to withstand a discharge head specified plus the static head on system plus 50% of total head, but not less 10 Bars.

j) The electric motors shall be drip proof type provided with suitable starters and totally enclosed. Fan cooled type, with overload pro section.

k) The pumps shall be non-overloading at any point on the characteristic curve.

l) The complete discharge and section header

m) The S.S type flexible connection shall be provided on section and discharge header.

n) The non-retune valve shall be provided on discharge header

o) The gate valve shall be provided on discharge header

p) The pressure gauge shall be provided on discharge header

q) The pressure tank as per pumps manufacture (F-G) type

r) Complete Electrical Panel as per pumps manufacture

1.16. Water lifting pump.

Pump shall be of the horizontal type end suction case made of cast iron, free of foundry imperfections and other detrimental defects.

Impellers shall be of bronze, of the enclosed type, statically balanced. They shall be adjustable horizontally by means of an adjustable nut located on top of the driver.

Pump shaft shall be of polished stainless steel and shall be supported by bearings above and below each impeller.

The pump seal shall be mechanical type.

Motor - shall be drip proof, 2900 RPM and shall be especially selected for quiet operation. The horse power of the motor shall be of such a size as to insure non overloading of the motor through the capacity range of the pump.

Installation - A concrete base 100mm higher than the surrounding floor shall be provided. Construct base and install as shown by the detail on the drawings. Provide a minimum of four Nos. 15mm anchor bolts from concrete to pump base.

Specify electric motor, discharged and suction connection with as under accessories as per typical connections of pump shown on the drawings.

1.17. Hydrostatic Testing of Water Piping Systems

a) All water piping systems shall be hydrostatically tested for at least 1.5 the working pressure for ensuring complete tightness under the test pressure and for the duration of time as specified under the respective system concerned.

b) Systems may be tested as a whole or in sections to facilitate the progress of the work.

c) No part of any piping system shall be tested to pressure less than 100psi specified test pressure measured at the highest point of the system.

GENERAL REQUIREMENTS OF FIXTURES AND SANITARY SERVICES

All fixtures shall be free from imperfections, true as to line, angles, curves and colours, smooth, water tight and complete in every respect.

All fixtures specified to be of vitreous ware, shall be fired vitreous China ware of the best quality, non- absorbent and burned so that the whole mass is thoroughly fused and vitrified producing a material white or coloured, which when manufactured will show a homogeneous mass, close drained and free from pores. The glazing and vitreous china fixtures shall be of colour approved by the ENGINEER / PROJECT MANAGER, thoroughly fused, and united to the body, without discoloration, ships, or flaws and shall be free from craze. Wrapped or other imperfect fixtures will not be accepted.

All plumbing fixtures proposed to be supplied shall be indicated at the time of tendering, and all fixtures should be approved by the ENGINEER / PROJECT MANAGER, prior to installation.

All fixtures shall be furnished by one manufacturer unless otherwise specified.

All fittings, cast brass set screws, escutcheons faucets, traps, exposed piping etc. shall be of brass, chrome plated over nickel plate with polished finished. All supports nut, etc. visible shall likewise to chrome plate over nickel plate.

After insulation of plumbing accessories, the Contractor shall ensure their protection against damage, misuse and general deterioration. Fixture outlets shall be plugged with suitable material to prevent entry of external debris. All chrome plated and other metallic fittings shall be provided with a copper of grease to prevent their deterioration. All items prior to handing over must be in perfect condition in the visual and operational sense.

All CP fittings and accessories shall be first quality, locally manufactured, unless otherwise indicated.

1. INSTALLATION OF PLUMBING FIXTURES

Provide all hangers, supports, brackets, etc., for the proper installation of water closet, urinals, wash basins, sinks, flushing tanks etc. Requiring supports shall be in accordance with the manufacturer recommendations, and as approved. Where necessary the supports should be built into partitions or walls, and should be set as the Construction progresses.

All plumbing fixture shall be set in a neat, finished and uniform manner making the connections to all fixtures at right angle to the wall unless otherwise directed by Consultant. Roughing for this work must be accurately laid out so as to conform with finished wall materials. Fixtures are not be set until as directed by the Consultant /Architect.

All fixtures and trimmings in so far as practicable shall be of one manufacturer.

All exposed chromium plated fittings such as pipes; valve etc shall be protected immediately after installation. During installation strap or padded wrenches shall be used to change plated pipe and fittings etc.

All fixtures shall be set straight and true. The setting shall be level and flush with finished floors and partitions.

Plumbing fixtures shall be supplied complete with all required trimming, vitreous china fixtures shall be of first class quality with smooth glazed surfaces, free from warp cracks, discoloration's or other imperfections.

Fixture mounting heights and spacing shall be as detailed on the Architectural and plumbing drawings.

Protect fixture from damage before and after installation.

Fasten fixture carriers securely to slab construction with power driven expansion shields and bolts.

Clean and adjust all fixtures and trim before acceptance.

ELECTRICAL WORKS

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 SCOPE

This section covers the furnishing of labor, materials and equipment under other sections of this Contract; installation of all equipment, as may be furnished by the Engineer / Project Manager; and furnishing and installation of all additional equipment and materials needed for the electrical requirements of this Contract.

The scope of work includes, but is not limited to the following:

- Switchboard and Panel boards
- Interior Power and Lighting Systems
- Exterior Lighting
- Grounding and Bonding
- All other Electrical and Auxiliary Works
- Emergency and Security Lighting System
- Generators and Automatic Transfer Switch and Fuel Tanks
- All interconnecting wiring and cabling including cable glands, boxes, conduits, cable trays, ladders, termination kits, etc.., underground cable ducts and manholes, trenches, supports, steel poles, foundations and associated miscellaneous civil Engineer / Project Managering works
- All necessary instruments for testing of switchgear, control gear and auxiliaries for equipment, foundation bolts, fixings, locks, etc., any replacement fuses or devices required, used during the Commissioning Period.
- Spares and Special Tools for Maintenance
- The supply of Drawings, Operating and Maintenance Manuals and other Documentation in accordance with this Specification
- Erection, Testing and Commissioning of all relevant equipment

Work shall include furnishing all labor, materials, tools, equipment and services to construct and install, test and commission the complete electrical system as indicated on the drawings, specified herein and subject to the requirements of the Conditions of Contract. For any deviations from the contract drawings pertaining to the ratings of electrical equipment, due to the use of codes and standards of the country in which the equipment is manufactured, it shall be the responsibility of the Contractor to verify the precise requirements and to provide and/or adjust to their correct settings or sizes, cables, circuit breakers, starters, overload heaters, relays, instrument transformers, etc., this shall be at no added extra cost to the Client.

1.1.1 Contract Provision

The Contractor will be required to make provision for the following and his prices shall be deemed to include for any cost arising there from:

- Transportation of labor and materials to and from the Site of Works
- Suitable accommodation for the storage of plant and materials
- All lifting tackle and gear required for the necessary execution of the Works

- Workshop facilities for the drilling of brackets, lighting, welding and light fabrication

- Supply and installation of any component of work whether or not shown on the drawings and/or described in the Specifications and/or Bill of Quantities, but which can reasonably be inferred as necessary for proper completion of the Work.

The General and Special Provisions shall apply to all works under this Section.

1.1.2 Training of Technical Personnel

A rate shall be included in the Schedule of Prices to provide for the training of selected members of the Client's Technical Staff in the event of this option being taken up.

1.1.3 Related Works

This Section covers the requirements for the installation of electrical equipment furnished under other sections of this Contract.

1.1.4 Alternatives

Redesign of or part of electrical or mechanical work, which is required due to the Contractor's use of an alternate item, arrangement of equipment and/or layout other than specified herein; shall be done only by the Contractor at his own expense, if approved by the Engineer / Project Manager. Redesign and detailed drawings shall be subject to acceptance and approval of the Engineer / Project Manager. No additional compensation will be provided for changes in the work, either his own or others, caused by such redesign.

Alternate proposal shall only be permitted if equal to or better and only if with considerable savings to the Client than what is specified herein and when deemed by the Client as of absolute necessity. Contractor may proceed only upon concurrence by the Engineer / Project Manager and upon approval of all redesign details, which may have direct or indirect impact on other disciplines. No additional cost will be provided for changes in the work. Redesign or altered drawings, reviewed by the Engineer / Project Manager, shall not relieve the Contractor of any or all of his contractual obligations and responsibilities with the Client for proper and complete installation and operation of all materials and equipment, including related accessories as required or detailed on the Contract.

Although substitution in general is forbidden, proposed alternatives may be submitted for approval. The Contractor shall provide sufficient data to allow evaluation of proposed alternative and determination of compliance with Contract documents. The Contractor shall list any proposed deviation from these Contract documents.

1.2 REFERENCES

1.2.1 International Standards

The design, manufacture, installation practices and testing of the materials, plant equipment and systems are to be supplied, constructed and rated in accordance with the standards or approved International Standard of design or manufacture unless otherwise specified. In all cases, the latest issue of Publications, Specifications, Standards and/or Codes of Practice shall apply.

Approved Standards include:

- The Regulations for the Electrical Equipment of Buildings (lEE)
- British Standard Specifications (BS)
- National Electrical Code (NEC)
- National Electrical Manufacturing Association (NEMA)
- International Electrotechnical Commission (IEC)
- Illumination Engineer / Project Managering Society (IES)
- Commission International de l' Eclairage (CIE)
- National Fire Protection Association (NFPA)

1.2.2 National Local Codes

The Work shall also consider local National Electric Codes, Regulations and Standards.

1.2.3 Regulations

All supplies and services offered response to this specification shall conform to the latest standards. The design, equipment and installation requirements shall comply with the standards and recommendations laid down by the following:

- Regulations for Electrical Installations as issued by the K-Electric / National Electric Power Regulatory Authority.
- Standards relating to Electrical Installations and equipment as issued by International Electrotechnical Commission (I.E.C.) and British Standard Institute (BSI)
- Regulations for Telephone System Installation as issued by PTCL
- National Electrical Code issued by National Fire Protection Association (NFPA), Boston, U.S.A.
- Rules of the RESCUE for Fire Alarm Installation
- Where two or more applicable standards and/or the Specifications are on conflicts, the most stringent shall apply.

The Contractor shall be responsible for ensuring that all items of electrical systems comply with the requirements of these Governing Standards; that the manufacturers comply with all the necessary instructions and that these instructions are included in the Operating and Maintenance Instructions when submitted.

The Contractor shall be responsible for providing all electrical equipment with the necessary, warnings signs and instructions. These shall cover maintenance, working, operating and access or egress. All electrical equipment rooms shall have a notice permanently secured to all doors stating "No Admittance to Unauthorized Personnel". Where the noise level is in excess of 80 dbA, there shall be installed a warning notice on all doors in accordance with the Governing Standards for reducing the exposure of noise to operating personnel.

All notices shall be permanently engraved with the text in English.

1.3 COORDINATION

The drawings indicate the extent and general location and arrangement of electrical equipment, conduit and wiring, poles, manholes, trenches, etc. All works shall be carefully laid out in advance, coordinating electrical features with architectural, structural and mechanical features of construction. Any conflicts which occur necessitating departures from the drawings shall be submitted in the form of details of departures and reasons therefore as soon as practicable for written approval.

Where any of the electrical work may interfere with the work of other trades, assist in working out space conditions to make a satisfactory adjustment. If requested by the Engineer / Project Manager, the Contractor shall prepare, scaled working drawings and sections which clearly show how the work is to be installed in relation to the work of other trades.

1.4 SUBMITTALS

1.4.1 General

All materials and equipment shall be submitted for review in accordance with the requirements set forth at the Conditions of Contract. All submittals shall have a key identification number to facilitate filing and retrieval. Submittals for each class of equipment such as panel boards, Transformer,

Generator, etc. shall be completed and shall cover all types in that class. Partial submittals shall not be acceptable and shall be returned to the Contractor.

1.4.2 Shop Drawings

Unless otherwise permitted by the Engineer / Project Manager all shop drawings shall be prepared on AO at least scale 1:50 sheet and drawn to a suitable metric scale for plans and layout. Shop drawings shall be submitted for installations and layout of but not limited to the following:

- Cables installation and routing
- Conduit and trunking installation and routing
- Receptacles (socket outlets) and light switches installation
- Boxes and fitting installation
- Lamps and luminaires installation and layout
- Disconnect switches and circuit breakers installation
- Motor starters and control equipment installation details and control diagrams
- Grounding (earthing) materials installation
- Panel boards installation
- Auxiliary and fire alarm systems equipment installation including control diagrams
- Lightning protection materials installation
- All other detail drawings as shall be required by the Engineer / Project Manager
- Schematic for main and sub-main distribution

The working shop drawings shall be complete submittals including the manufacturer's drawings and shall show the exact site conditions with specific dimensions, locations and arrangement of the equipment itself, dimensions of mounting bases and pads working clearances from neighboring equipment, external connections including the location, number and size of cables and conduits connected to the equipment and the schematic and wiring diagrams showing interconnections of all local and remote devices.

Submission of the manufacturer's working shop drawings and data shall include:

- Equipment wiring diagrams, schematic diagrams and certified dimension sheets for the 415V switchboards and 11 kV switchgear/substation, motor control centers, control panels, safety switches, circuit breakers, transfer switches, power transformers, engine generator sets, telephone system, cctv system, public address system and panel boards with specific descriptions of the standard electrical equipment used.

- Time-current characteristic curves for all circuit breakers and fuses.

- Complete working shop drawings showing the exact location and number of all the surface or recessed mounted lighting fixtures, after the Contractor has done the coordination with the type of the suspended ceiling actually installed and the location of equipment and devices installed under other sections of these Specification.

The Contractor shall submit for approval number of specified in general condition copies of prints of working shop drawing and detail drawings of the entire installation.

The working shop drawings shall be submitted early enough to get the approval as specified in general conditions prior to any construction and not before getting the approval of the Engineer / Project Manager for the equipment shown on the working drawings. This should be coordinated to conform to the general program and schedules of work for all trades.

1.4.3 Progress Drawings

Provide and keep the job all times, one complete and separate set of black line prints of the electrical work on which shall be clearly, neatly and accurately noted, promptly as the work progresses, all architectural and electrical changes, revisions and additions to the work. Whatever work is installed otherwise than as shown on the Contract Drawings, such changes shall be noted.

Indicate daily progress on these prints by coloring in the various conduit, ducts, trunking, cable trays, fixtures, apparatus and associated installation works erected.

1.4.4 As-built Drawings

The Contractor shall provide the as-built drawing, as approved by the Engineer / Project Managers, in DXF format or AutoCAD DWG format, either in floppy diskettes or in CD-ROM, as per the Project Documentation requirement. The drawings shall be submitted not later than (2) months after completion of the Project, or putting into operation, whichever is earlier. An addition, (3) sets of hard copy of all relevant drawings, which will be required and maintenance, shall be supplied in bound book forms immediately after the commissioning of the Project.

The Contractor shall supply, (3) sets of all operation and maintenance manuals in original, from the manufacturer in bound book form, at least (2) weeks prior to commissioning of the equipment. These shall also be supplied, in computer diskettes, based on popular Microsoft window based publishing software programs, along with the as-built drawings as mentioned above, as specified in the Project Documentation.

1.4.5 Builders Work

Lay electrical works in advance of pouring concrete slabs and construction of walls. Obtain Engineer / Project Manager's approval before commencing builder's work in connection with electrical installation. Related coordinated shop drawings shall be submitted for approval as per the related Clause 1.1.5 of this section. Materials approval shall be obtained as per procedure detailed in Clause 1.1.9 below. The Contractor shall make it certain that drawings property coordinated with other works are submitted immediately after signing of the Contract and approval of drawings and the materials are obtained at least one month prior to the commencement date of the construction.

Check with other trades to ensure equipment and material can be installed in space provided. Provide other trades with information necessary for them to execute their work. Details on drawings which are specific regarding dimensions and locations, are for information purposes. Coordinate with other trades to ensure work can be installed as indicated.

1.4.6 Programs

The Contractor shall produce a work program based on CPM or Bar chart form indicating the time required for various operations to complete the Project in time. The following points shall be highlighted in the program.

- Mobilization
- Drawing/submittals
- Approvals
- Equipment Delivers including Delivery periods from supply sources
- First fix
- Main/sub-main distribution equipment
- Second fix
- Fixing of light fittings
- Testing
- Commissioning and handing over

1.4.7 Materials/ Manufacturer's Data

On submittal sheet, the Contractor shall indicate the general classification of materials, e.g. Raceways and Fittings; Luminaires; Panel boards; etc. Moreover, the Contractor shall attach a product compliance sheet indicating the specifications provisions, the product specifications and the deviation, if any.

"Submittals for each manufactured item shall be current manufacturer's descriptive literature of catalogued products, equipment drawings, diagrams, performance and characteristic curves, and catalogue cuts."

Publication Compliance: Where equipment or materials are specified to conform to industry and technical society publications of organizations such as ANSI, ASTM, UL or IEC Standards, submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance. In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word "shall" had been submitted for "should" wherever

it appears. Interpret references in these publications to the "authority having jurisdiction", or words of similar meaning, to mean the Engineer / Project Manager. In lieu of the label or listing, submit a certificate from an approved independent testing organization, adequately equipped and complete to perform such services, stating that the item has been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's publication.

Certified Test Reports: Electrical equipment and materials shall be approved by an adequately equipped, recognized, and independent testing laboratory of the country where the equipment has been manufactured, indicating that the equipment is in conformance to the code requirements of the country.

Certificates of Compliance: Submit manufacturer's certifications as required on products, materials, finish, and equipment indicated in the technical sections. Certifications shall be documents prepared specifically for this contract. Preprinted certifications and copies of previously submitted documents will not be acceptable. The manufacturer's certifications shall name the appropriate products, equipment, or materials and the publication specified as controlling the quality of that item.

1.4.8 Samples

As specified elsewhere samples of the materials such as individual circuit breakers, luminaires, cables, conduit, receptacles and switches, etc. shall be submitted.

1.4.9 Manuals

Complete operations and maintenance data for all equipment furnished under Electrical Division, shall be submitted in accordance with the requirements set forth at the Conditions of Contract. The manuals shall be prepared specifically for this installation and shall include all required catalog cuts, drawings, equipment lists, descriptions, complete parts lists address of vendors of relevant equipment etc., that are required to instruct operating and maintenance personnel unfamiliar with such equipment.

Operation and Maintenance Manual: Submit at least four (4) copies of manuals as required for systems and equipment indicated in the technical sections and shall be in the English language. Furnish three copies, bound in hardback binders or an approved equivalent. Furnish one complete manual prior to performance of systems or equivalent tests, and furnish the remaining manuals prior to contract completion. Inscribe the following identification on the cover the words: **"OPERATION AND MAINTENANCE MANUAL"**, name and location of the system, equipment, building, name of Contractor, and contract number. Include in the manual the names, addresses, and telephone numbers of each sub-contractor installing the system or equipment and the local representatives for the system or equipment.

Include a table of contents and assemble the manual to conform to the table of contents, with tab sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in. The manual shall include:

- Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the system or equipment
- A control sequence describing start-up, operation and shutdown
- Description of the function of each principal item of equipment
- Installation and maintenance instructions
- Safety precautions.
- Diagrams and illustrations.
- Testing methods.
- Performance data.

Spare Parts: Provide sufficient spare parts submit to the Engineer / Project Manager a list of all spare parts to be required for a further two years operation from the date of issue of the Maintenance Certificate.

Spare parts are required where quantities for each item or equipment is recommended by the manufacturer.

Spare parts to be delivered to central Client stores.

Appendix: List of qualified permanent servicing organizations for support of the equipment, including addresses and certified qualifications.

1.4.10 Closeout Submittals and Record Drawings

As required under the Condition of Contract, the Contractor shall keep an accurate record of the installation as work is carried out, including length, size, number, location and depth of all conduits, pipe ducts, and cables installed therein, and connections to all machines, plant equipment, and terminal boxes, including all internal connections. Cooperate with the suppliers of control centers, and annunciators to enable them to provide accurate records of the internal connections and functions of the equipment installed. Record drawings shall include, but not be limited to the following:

- All amendments, additions, etc., to the location of outlets, equipment, and sizes and routes of conduits and cables including lengths.
- Amended drawings of all detailed circuit diagrams and cabling diagrams, indicating conductor sizes, conduit numbers, all terminal numbers, and sequence of operations.
- New drawings of any extensively modified detail in the original Contract drawings, and of further details provided or obtained during construction.
- Schedules for all panel boards relating circuit breaker numbers to circuit function and rating.
- Schedules for all terminal boxes and terminal strips relating terminal numbers to incoming and outgoing wires and general function (power or control).

1.5 QUALITY ASSURANCE

1.5.1 Factory Tests and Inspection

The Client reserves the right to witness factory testing and inspection of any equipment furnished under these Division Electrical specifications. The Contractor shall furnish the Engineer / Project Manager with any sketches, test setups, and instrumentation and shall notify the Engineer / Project Manager at least 20 days in advance of the time each shop test will be made.

1.5.2 Inspection of the Works

The Engineer / Project Manager shall perform inspections of the work as he requires from time to time, and shall witness the tests performed by the Contractor as specified in Quality Control paragraphs of this section. Any work not acceptable to the Engineer / Project Manager shall be removed and redone at the Contractor's expense.

1.5.3 Coordination Study

For the high-voltage and/or medium voltage switchgear manufacturer, the manufacturer shall conduct a complete coordination study of relays, circuit breakers, and all other protective devices. The coordination study shall include the entire distribution system starting with the smallest 415/240 volt, 3-phase and/or single phase, 50 Hz circuits' protective device on the load end, to the nearest protective device on the substation line side.

The study shall include, but not be limited to, the following:

- A tabulation of circuit breaker trip settings
- Motor starting profiles for all motors sized 40 kilowatt and above
- Transformer damage curves and protection evaluated in accordance with IEC, ANSI/IEEE C57.109 (if applicable)

The coordination study shall be bound in a standard paper size report. The study shall be provided in accordance with the requirements set forth at the Conditions of Contract. Final selection of all protective device settings or sizes shall be subject to review and acceptance by the Engineer / Project Manager.

1.5.4 Standardization

All materials and equipment supplied under this section of the works shall wherever possible be standardized and of metric uniform design to facilitate maintenance and operation and to limit storage of spare parts and tools. All materials of the same kind of service shall be identical and made by the same manufacturer.

All components of the same size and rating used in the works shall wherever practicable be interchangeable with one another. All circuit breakers, fuses, contactors, relays, etc., shall be of the same make and design unless particular location and duty make such standardization impracticable.

1.5.5 Derating

All ratings given in the Contract Documents are standard ratings. For components and accessories for which no specific ratings or sizes are indicated, the Contractor shall select rating and sizes that will be suitable for the site conditions. Twenty percent (20%) shall be minimum derating factor for such items.

The cable and wire sizes indicated on the drawings are the design sizes required for the site conditions and for the ratings of the specified equipment. Therefore, for the actual equipment, the sizes of cables need further selections. For wires or cables where no specific sizes are indicated, the sizes shall be determined by suitably derating the current ratings of those wires and cables as per the rating factors indicated in the latest regulations of the country of origin.

1.5.6 Spare Capacity

Spare capacity shall be provided to allow for future expansion and future loads. Where required in the contract drawings, there shall be spares for conduits, spare space for installing future equipment, and spare circuits at panel boards and switchgears. If during the field-testing prior to handing over the Works, the required spare capacity is not available, the Contractor shall replace or add to any component or equipment to the system at no cost to the Client.

1.6 DELIVERY, STORAGE AND HANDLING

1.6.1 Delivery

The equipment furnished under this section shall be prepared for shipment, delivered, stored, and handled.

Deliver electrical materials and equipment in original cartons or containers with seals intact as applicable. Unless otherwise specified, deliver conductors in sealed cartons or on sealed reels, ends of reeled conductors factory sealed. Deliver large multicomponent assemblies in sections that facilitate field handling and installation.

1.6.2 Handling

All exothermal welding materials and molds shall be stored and protected against absorption of moisture. Welding charges, which show signs of moisture absorption during storage or during installation, shall be discarded and replaced. Before making the first weld of the day or after a delay between welds, it is expected that a charge may be fired in the empty mold to condition the mold.

All grounding, insulating and electrolyte materials shall be protected from degrading by any cause and from loss by any cause.

Handle materials and equipment in accordance with best industry practices and manufacturer's recommendations. Lift large or heavy items only at the points designed by the manufacturer. Use padded slings and hooks for lifting as necessary to prevent damage.

The contractor shall inform the Engineer / Project Manager by the receiving of equipment to inspect before installation.

Store materials and equipment on the ground and under cover. Prevent corrosion, contamination or deterioration. Unless the equipment item is specifically designed for outdoor exposure in a non- operating mode, all items shall be stored in a protected area.

1.7 PROJECT CONDITIONS

1.7.1 Environmental Requirements

All equipment and materials shall be suitable for use in an ambient temperature range from 50°C to 55°C under severe marine environment with tropical and sandstorm condition. Equipment and materials shall be sized so that their ratings will not be exceeded nor their functional use degraded in any way under these ambient conditions. Motor starters and other thermally-sensitive equipment that is installed outdoors where exposed to sunlight shall be provided with a sun screen or other provisions to avoid false tripping or damage due to solar energy. Moreover, equipment shall be protected against salt spray, corrosion, and blowing sand and dirt.

All services installed below grade on corrosive soil due to presence of moisture, salts, acids and other substances that would cause corrosion, shall be protected with acceptable treatment or encasement. Materials such as grounding cables, mats and plates where meant to have electrical contact with earth shall be made of materials resistant to corrosion while maintaining good electrical conductivity. Other means such as grounding pits with provision for replaceable ground rods will be considered where deemed necessary.

All electrical equipment shall be rated for an ambient temperature of 55°C outside and 50°C inside the building. The ground temperature at 75cm depth varies from 20°C in winter to 40°C in summer. It is the responsibility of the Contractor to take into account the effects of any severe and arduous conditions in the design and utilization of all electrical equipment.

1.7.2 Underground Service

Underground service conductors shall be continuous from the service entrance equipment to the indoor/outdoor power system connection at the transformer substations and/or low voltage switchgear up to the main switchboard/panel board of the building. The underground portion of the conduit shall be encased in a concrete envelope having a wall thickness of not less than 76 mm.

Where a conduit enters through a concrete floor, the curved portion shall not be visible above the finished floor and the entire conduit below the floor slab shall be encased in a concrete envelope having a wall thickness of not less than 76 mm. Ends of the underground conduit shall be protected by suitable caps until connections are made.

1.7.3 Electricity Supply

The Supply Authority (K-Electric) will make available, at the incoming terminals of each Main Switchboard (Medium Voltage Panel) a 3 phase + Neutral, 4 wire, 415 V, 50 Hz supply of adequate capacity and having the following tolerances:

- Voltage ± 6%
- Frequency ± 4%

Phase rotation of supply to B S 158

Neutral: Solidly earthed at transformer location Obtain
system: TNS

Obtain fault level and fault duration time from the Supply Authority (K-Electric). Obtain confirmation from the Supply Authority of the size and number of cables they will provide to Main Switchboard. Allow for adequate and appropriate cable glands, lugs and boxes.

1.8 WARRANTY

All materials and equipment shall be warranted against workmanship defect or failure for a period of time from date of acceptance as stipulated in the Conditions of Contract.

PART 2 PRODUCTS

2.1 MATERIALS

The materials used in all systems shall be new, unused and as herein specified. All materials where not specified shall be of the very best of their respective kinds in accordance with the industry standard to which they are made.

2.1.1 Standard Products

Materials and equipment to be provided by the manufacturers shall be essentially the standard catalogued products of a manufacturer regularly engaged in the manufacture of such products. Materials and equipment shall meet the applicable requirements of the specification and shall essentially be in satisfactory use for at least 2 years.

Standard catalog items and IEC sizes, ratings, capacities, and voltages shall be given preference.

2.1.2 Prohibited Materials

Aluminum conduits, fittings, supports and conductors are not acceptable unless specially approved for each use, or location, and manufacturer standards.

2.1.3 Equipment Enclosures

All equipment shall be properly derated for ambient heat, altitude and similar climatic conditions which shall affect the operation and performance.

Outdoor electrical equipment enclosures (panels, luminaires, etc.) shall be corrosion resistant, rainproof and dustproof, indoor electrical equipment enclosures shall be dustproof, unless otherwise specified or indicated on related documents or drawings. Minimum index of protection (IP) for outdoor wet areas shall be IP66 and for indoor IP30.

Equipment located in damp or wet locations shall meet exterior requirements. Refer to environment conditions (Item 1.8 above).

2.1.4 Factory Finishes

Unless otherwise specified in a specific technical provisions section, the sheet metal surfaces of electrical equipment enclosures shall be electo-statically painted for interior and exterior metal surfaces. The color shall be medium light gray or as per manufacturer's standard. Hardware shall have a corrosion-resistant finish.

2.1.5 Ratings

The required output ratings of all electric equipment shall be referred to a continuous duty at a coolant temperature of 45°c, Class F, for insulation and Class B for temperature rise unless particularly specified elsewhere.

2.1.6 Nameplates

Shall be as per manufacturer's standard, and of durable quality.

2.1.7 Common Requirements for Packaged Equipment

Where two or more units of the same class of material or equipment are required, the Contractor shall provide products of a single manufacturer.

2.1.8 Deviations

The requirements laid down in this specification, drawings or requisition orders, have to be strictly followed. Any deviation, arising during tendering, and manufacturing of the relevant equipment for any reasons, must be submitted for approval and confirmed in writing by the Engineer / Project Manager.

Deviations in quality or quantity that are not listed or inspected shall in no way relieve the Contractor from responsibility.

2.2 PERFORMANCE AND DESIGN REQUIREMENTS

2.2.1 Suitability to Environment

Contractor shall be responsible to evaluate and assess all ambient conditions where electrical equipment, devices and fixtures shall be installed. Contractor is not relieved of the responsibility to replace any material with prior approval if found unsuitable for the environment where it is to be installed.

2.2.2 Design Criteria

The criteria for this project shall be taken as:

Ambient Air Temperature,	55 max
Ambient Ground Temperature, °C	45 max
Relative Humidity	90% max
Altitude, meters	0 (sea level)

Electrical services shall enter the facility at 11KV-415Y/214 volts, three-phase, four-wire, 50 Hz, unless otherwise specified or indicated on the drawings.

The main grounding (earthing) arrangement is a TN-S system.

2.3 ACCESSORIES

2.3.1 Nameplates

Shall be as manufacturer's standard.

2.3.2 Danger Signs

Provide danger signs on all electrical panel boards, switchboard, main distribution panel board, and other live energized equipment.

All nameplates, signs and other notices shall conform to the requirements of IEEE, or IEC standards and shall be engraved (of durable quality) in English.

2.4 FABRICATION

2.4.1 Surface Preparation

Remove all casting projections, weld flux or splatter, by hand scraping, hand impact tools, etc., follow by wire brushing or power grinding. Sharp corners or sheared edges shall be dulled and radiused with power grinder to improve paint adherence.

Exposed grooved surfaces shall be finished smooth by filling and thoroughly cleaned as required to provide a smooth uniform surface for painting.

2.4.2 Shop Painting

Unless otherwise specified, all iron and steel surfaces, except copper and stainless steel shall be shop primed with a vinyl primer and then given two or more shop coats of vinyl base light gray enamel finish. The shop coating, including primer, shall have a dry film thickness of at least 0.155 mm.

PART 3 EXECUTION

3.1 WORKMANSHIP

All materials and equipment shall be installed in accordance with the recommendations of each manufacturer as approved by the Engineer / Project Manager to conform to the contract documents. The installation shall be done by workmen skilled in this type of work. All electrical works shall be installed in a neat, workmanlike manner. Exposed conduits shall be installed straight, plumb and level, parallel to or perpendicular to beams

and walls; where vertical shall be installed plumb.

3.2 ACCEPTABLE INSTALLERS

3.2.1 Regulations for Electrical Installations

The Contractor shall plan methods of wiring and installation of components into the Works in compliance with all regulations, requirements and recommendations of the Governing Standards, and shall comply with all local codes and ordinances. The Contractor shall be responsible for the full compliance with the requirements of the applicable Standards and IEC 364 "Electrical Installations in Buildings", NFPA 70, IEEE and ANSI C2, throughout the installation of the Works including any temporary works required.

An installation or part thereof complying with the herein specified standards is one in which:

- Is suitable for its intended purpose
- Has a supply adequate for its maximum possible demand
- Comprises equipment suitable for the environment to which it will be subjected
- Comprises equipment correctly selected as regards to compatibility and maintainability
- Embodies protective measures for safety which remain effective over its intended life
- Has been constructed or installed so as to facilitate an efficient and safe operation
- Has been installed using good workmanship and proper materials
- Is constructed so that periodic inspection, testing, maintenance and repairs can be readily and safely carried out
- Has been inspected, tested and certified as complying with the appropriate standards and regulations.

The Contractor shall ensure that his employees are familiar with requirements of the herein specified Governing Standards and the requirements of the "Industrial Safety and Health" Regulations.

3.3 PREPARATION

Before installing any materials, the Contractor shall make certain that there are accepted shop drawings available in his files for the material being installed. All electrical equipment furnished in this and other sections of the specification shall be connected according to the schematic diagrams indicated on the drawings or on the accepted drawings furnished by the manufacturer of the equipment.

3.4 INSTALLATION

3.4.1 Setting of Equipment

All equipment shall be installed level and plumb. Sheet metal junction boxes, equipment enclosures, sheet metal raceways, etc., mounted on water-bearing or earth-bearing walls, and shall be separated from the wall by corrosion-resistant spacers not less than 6mm.

3.4.2 Sealing of Equipment

All distribution panel boards, power panels, disconnect switches, lighting control panel and similar equipment shall be permanently sealed at the base, and all openings into equipment shall be screened or sealed as required to prevent the entrance of rodents and insects the size of wasps

and muddaubers. Sealing material at the base shall be nonshrink grout as specified in the Grout section. Small cracks and openings shall be sealed from inside with silicone sealant.

3.4.3 Repair of Existing Works

The work shall be carefully laid out in advance and where cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings or other surfaces necessary for the proper installation of supports or/and anchorage for electrical works. This work shall be carefully done and any damage to building, piping or equipment shall be repaired by skilled personnel of the trade involved, at the satisfaction of and at no additional cost to the Client.

3.4.4 Thermal Expansion

Conduits and raceways crossing expansion joints or areas subject to difference in temperatures shall be provided with approved factory-made fittings to compensate for mechanical stress on raceways.

3.4.5 Use of Different Materials

All metallic frames, structures and raceways used for electrical installations shall be made of the same materials. Where deemed as of absolute necessity, only approved compatible transition joints shall be used while maintaining the cross-section of the conduit system.

3.4.6 Ducts

All ducts and conduit system shall be of the same materials. Where only approved compatible transition joints deemed of absolute necessity shall be used while maintaining the cross-section of the conduit system.

3.4.7 Wiring

Install wiring for control systems, power feeder and branch circuits, lighting branch circuits, communication and auxiliary systems such as fire alarm and security, in separate raceways unless otherwise indicated. Install power system wiring for "Emergency", "Life Safety", "Critical", systems in separate raceways.

3.4.8 Wet, Damp, or Dry Location Work

Provide products as appropriate for wet, damp, or dry location as defined by NFPA 70.

3.4.9 Manufacturer Installation Instructions

Install equipment in accordance with the manufacturer's Installation instructions and recommendations.

3.4.10 Fire and Smoke Barrier Penetrations

Install fire stopping to raceways, boxes and electrical equipment installed in or penetrating fire - rated or smoked barrier assemblies, in a manner which maintains the fire resistance rating or barrier intent.

3.4.11 Field Painting

In a manner satisfactory to the Engineer / Project Manager, touch-up or refinish factory -applied paints or finishes which are chipped, defaced, scratched, or in any other way disturbed due to handling, installation or general construction work.

3.5 CONSTRUCTION

3.5.1 Sleeves and Forms

The Contractor shall provide and place all sleeves for conduits penetrating floors, walls, partitions, etc. Locate all necessary slots for electrical work and form before concrete is poured.

Where exact locations are required by equipment for stubbing-up and terminating conduit concealed in floor slabs, the Contractor shall request shop drawings, equipment location drawings, foundation drawings, and any other data required by him to locate the concealed conduit before the floor slab is poured.

Where such data is not available in time to avoid delay in scheduled floor slab pours, the Engineer / Project Manager may elect to allow the installation of such conduit to be exposed. No additional compensation for such change will be allowed.

All openings, sleeves, penetration, and slots shall be sealed as specified herein.

3.6 FIELD QUALITY CONTROL

3.6.1 Field Service

All roughing in works for embedded items shall be subject to inspection to the Engineer / Project Manager and cleared prior to concrete pouring, closing of shuttering or closure of walls, ceiling and floors where electrical service shall be concealed or embedded. The Engineer / Project Manager has the authority to stop any electrical work found to be non-compliant with the project specification.

3.6.2 Field Tests

In conjunction with the coordination study, the Contractor shall test and calibrate all protective devices in accordance with the manufacturer's specification prior to making the proper device setting before the initial energization of the conductors and equipment. Field setting of adjustable protective devices shall be indicated on electrical drawings that show the proper wiring of the protective devices and the rating and wiring on nonadjustable devices.

The Contractor shall provide all test equipment and personnel and submit written copies of all test results. As an exception to requirements that may be stated elsewhere in the contract, the Engineer / Project Manager shall be given 15 working days' notice prior to each test.

3.7 PROTECTION

3.7.1 Care of Equipment

During construction, all electrical equipment and cable insulation shall be protected against absorption of moisture, and metallic components shall be protected against corrosion by strip heaters, lamps, or other suitable means. This protection shall be provided immediately upon receipt of the equipment and maintained continuous until the equipment is put into operation.

GROUNDING AND BONDING

PART 1 GENERAL

1.1 SCOPE

This section covers the furnishing and installing of a complete grounding system for the facility.

The words "earth" and "earthing" as used herein are synonymous with the words "ground" and "grounding" and may be used interchangeably within this specification.

1.2 REFERENCES

1.2.1 Governing Standards

Except as modified or supplemented herein, all materials required in this section including their installation shall conform to the applicable requirements of the following standards. Standards current at the time of tender shall be used.

American National Standards Institute ANSI

No.	
C2	National Electrical Safety Code (NESC)
C135.3	Zinc-Coated Ferrous Ground Rods for Overhead or Underground Line Construction

American Society for Testing and Materials ASTM

No.	
B8	Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

Institute of Electrical and Electronic Engineer /
Project Managers IEEE No.

81	Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System

National Fire Protection Association NFPA

No.	
70	National Electrical Code

International Electro-technical Commission (IEC)
British Standard (BS)
Pakistan Building Codes & Regulations

1.3 RELATED SECTIONS

The following Sections include requirements which relate to this section: 00320

	Geo-technical Report
16050	Basic Electrical Materials and Methods
16231	Package Engine Generator
16320	Distribution Transformer (Oil)

1.4 SUBMITTALS

Submit the following in accordance with Conditions of the Contract, Division-I Specification Sections and Division- Section "Basic Electrical Materials and Methods".

- Grounding calculations detailed enough to reach the required overall earthing resistance. However, the final test report results after installation shall remain the effective proof of reaching the requested

- earthing resistance value.

- The Contractor shall submit manufacturer's catalog sheets with catalog numbers marked for the items furnished, which shall include:

  - Exothermal welding materials
  - Terminal Lugs and clamps
  - Copper ground cable
  - Ground rods
  - Ground connection hardware

Shop drawings and data shall be submitted m accordance with the requirements forth at the Conditions of Contract.

- Samples
- Post-installation test procedures
- Final test report

PART 2 PRODUCTS

2.1 MATERIALS

Ground Wires	ASTM B8, soft drawn bare copper
Insulated Ground	PVC or XLPE insulated copper in green and/or green-yellow color and shall conform to IEC 502 and NEMA WC 7.
Ground Rod	Rods made of copper clad steel shall conform to BS. Ground rods shall be not less than 20 mm in diameter and three 3.6 m in length.
Grounding plates copper,	minimum 600 mm by 60 mm by 6 mm thick.
Exothermic welds	Molds, cartridges, materials and accessories as recommended by the manufacturer of the molds for items to be welded. Molds and powder shall be furnished by the same manufacturer.
Flexible braided cable strap	Copper, 250 mm by 35 mm thick ground post clamps. Clamps shall be of the anti-electrolysis type

2.2 PERFORMANCE AND DESIGN REQUIREMENTS

2.2.1 Grounding and Bonding

Grounding and bonding shall as a minimum be in accordance with the IEC. All exposed non- current-carrying metallic parts of electrical equipment, metallic raceway systems, metallic cable armor, grounding conductor of non-metallic sheathed cables, grounding conductor in non-metallic raceways and neutral conductor of the wiring system shall be grounded. Bonding shall be provided where necessary to assure electrical continuity and the capacity to conduct safely any fault current likely to be imposed. Non-current-carrying metal parts of service equipment shall be effectively bonded together. If available on the premises of each building served, metal underground water pipe shall form the grounding electrode system where it conforms to the IEC requirements. An additional electrode as required by the IEC shall supplement the metal underground water pipe. If the metal underground water pipe is coated with an insulation material or there is no underground metal pipe, ground connection shall be made of driven rods or gradients control mats on the exterior of the building.

A bonding jumper not smaller than 16 mm sq. copper shall be connected between the communication and power grounding electrodes where separate grounding electrodes are used.

Equipment Criteria, Ground wires for substations mam panels and distribution panels shall be annealed pure copper with 98 percent conductivity. Wires shall be as indicated or as a minimum in accordance with the grounding requirements of IEC latest edition.

Grounding connectors shall be high strength, high conductivity copper alloy. Ground Rods: Ground rods shall be copper clad (not less than 0.38 mm thick) steel not less than 20 mm in diameter, 3.6

m long, with hardened tip and cap, driven full length into the earth and where practicable below permanent moisture level. If the maximum resistance of grounding system shown in paragraph "Grounding Resistance" cannot be attained, additional rods shall be installed from those shown on drawings. If the resultant resistance exceeds these values, measured not less than 7 days after rainfall, the Engineer / Project Manager shall be notified immediately. Where multiple rods are installed, they shall not be less than 3.0 m apart.

Grounding Electrodes: Grounding electrodes shall be provided for ground loop conductor and located at the perimeter of the building. Extend driven ground rods into the existing undisturbed earth for a distance of not less than three (3) meters. Ground rods shall be set not less than 600 mm from the edge of walkways nor more than three meters from the structure.

The completed installation shall have a maximum total resistance to ground using the fall-of- potential method described in IEEE 81 of 5 ohms, under normally dry conditions when a ground loop is not used. Use a ground loop when two of any three (3) ground rods, driven not less than three meters into the ground, a minimum of three meters apart, and equally spaced around the perimeter, give a combined value exceeding 50 ohms immediately after having been driven. For ground loop a continuous 70 mm sq. bare stranded copper cable (or as shown on the drawings) or equivalent material having suitable resistance to corrosion shall be installed. Lay ground loop around the perimeter of the structure in a trench not less than 750 mm below grade, at a distance not less than 600 mm nor more than 3 000 mm from the nearest point of the structure. Install a ground loop in earth undisturbed by excavation, not earth fill, and do not locate beneath roof overhang, or wholly under paved areas or roadways where rainfall cannot penetrate to keep soil moist in the vicinity of the cable. Make connections between ground conductors and grounds or ground loop, and between ground loop and grounds electrically continuous. Where so indicated, provide an alternate method for grounding electrodes in shallow soil by digging trenches radially from the building. A 70 mm sq. bare copper cable (or as shown on the drawings) arranged in a star pattern with the structure at the center for radial systems shall be installed. Bury the radials at least 750 mm below grade external to the structure.

PART 3 EXECUTION

3.1 INSTALLATION

All works below grade shall be thoroughly coordinated with all underground services and structures. Grounding and bonding works must, in all circumstances prevent any dissimilar metal contact that will cause galvanic corrosion. Bonding shall be made only after thorough inspection of metal parts to be bonded. Grounding conductors shall be run with all three phase feeders, and all single and three phase branch circuits.

3.1.1 Bonding

Metallic raceway system shall have electrical continuity with equipment individually and directly connected with the building ground, independent on a raceway system, as herein specified. All raceways shall contain an appropriately sized green grounding conductor.

Enclosures to the panel boards shall be individually and directly connected to the building ground. The grounding conductor shall be as indicated on the drawing and shall be connected from the building ground to a copper ground bus terminal strip located in each panel board.

Doors of panel boards, MCC's, switch disconnects, and other electrical equipment should be bonded by suitable bonding jumpers.

Polarized receptacles, lighting fixtures, and equipment enclosures shall be grounded with an identified (green color) insulated conductor not smaller than 4.0 mm sq. connected with the branch circuit ground-bus terminal strip. The ground-bus terminal strip in each panel board enclosure shall be isolated and independent of the system neutral terminal strip.

Conduits stubbed-up below a switchboard or motor control center shall be fitted with insulated grounding bushings and connected with the equipment ground bus.

Liquid tight flexible metal conduit m sizes 40 mm and larger shall have bonding jumpers.

Grounding electrodes shall be driven as required. Where rock is encountered grounding plates may be used in lieu of grounding rods.

All equipment enclosures, motor and transformer frames, conduits systems, cable armor, exposed structural steel and similar items shall be grounded.

Exposed connections shall be made by means of grounding clamps. Exposed connections between different grounding conductors shall be sealed with NoOxide Paint Grade A or equal. All buried or inaccessible connections shall be made by exothermic welding process as specified herein.

All grounding conductors subject to physical damage shall be installed in steel conduits and electrically bonded thereto on both ends.

Care shall be taken to ensure good ground continuity, in particular between the conduit system and equipment frames and enclosures. Where necessary, jumper wires shall be installed.

3.2 QUALITY CONTROL

3.2.1 Field Tests

The completed equipment grounding system shall be subjected to megger test at the service disconnect enclosure ground bar to ensure that the ground resistance does not exceed 5 ohms. Certified test reports shall be submitted for review by the Engineer / Project Manager's Representative.

All exothermal weld connections shall successfully resist moderate hammer blows. Any connection which fails such test or which, upon inspection, indicates a porous or deformed weld, shall be remade at no additional cost to the Client.

All exothermal welds shall encompass 100 percent of the ends of the materials being welded. Welds which do not meet this requirement shall be remade.

Deficiencies: Where ground resistances exceed specified values, and if directed, modify the grounding system to install and connect additional rods as directed by the Engineer / Project Manager until the required value is obtained without any additional cost to the contract

CONDUCTOR AND CABLES

PART 1 GENERAL

1.1 SCOPE

This section covers the furnishing and installation of all insulated wires and cables including control/ instrumentation cables for voltages 600 volts nominal or lower; except wire and cable for special applications, such as low level circuits for analog signals, data and supervisory control, communication and telemetering systems.

1.2 REFERENCES

1.2.1 Governing Standards

Cables and wires shall comply with the following stand are as appropriate: BS

1442	Galvanized mild steel wire for armouring cables
BS 2484	Straight concrete clay ware covers BS
2897	Aluminum strip armour for cables
BS 3506	Unplasticised PVC pipe for industrial purposes
BS 4066	(IEC 332) Tests on electric cables under fire conditions
BS 4660	Unplasticised polyvinyl chloride (PVC-u) pipes and plastic fittings of nominal sizes 110 and 160 for below ground gravity drainage and sewerage
BS 5308	Instrumentation cables
BS 5467	(IEC 502) cables with thermosetting insulation for electricity supply for voltages of up to and including 600/1000 V and 19000/30000 V
BS 6004	(IEC 227) PVC insulated cables (non-armoured) for electrical power BS
6007	Rubber insulated cables for electric power and lighting
BS 6207	(IEC 245) mineral insulated cables
BS 6234	Polythene insulation and sheath for cables BS
6346	PVC insulated cables for electrical supply BS
6360	(IEC 228) copper conductors for cables BS
6500	(IEC 227) insulated flexible cords
BS 6622	(IEC 502) cables with extruded cross linked polyethylene insulation, for rated voltage 3800/6000 V up to 19000/30000 V
BS 6746	PVC insulation and sheath of electric cables
BS 6746C	Color chart for insulation and sheath of electric cables BS 6899 Rubber insulation and sheath of electric cables
BS 7671	Requirements for electrical installations
ISO 9000	Quality management and assurance standards
BS EN 29453	Soft solder alloys-chemical composition and forms Cable terminations shall comply with the following specifications:

BS 1858	Bitumen based compounds for electrical purpose
BS 4579	Performance of mechanical and compression joints in electric cable and wire connectors
BS 6121	Mechanical cable glands for elastomer and plastic insulated cables
BS 6910	Cold pour resin compound and heat shrink cable joints in the voltage range up to 1000 V AC and 1500 V DC.

1.2.2 General Equipment

Stipulations: Section General Equipment Stipulations shall apply to all equipment furnished under this section.

1.3 SUBMITTALS

Submit the following in accordance with the requirements set forth at the Conditions of Contract.

1.3.1 Drawings and Data

Descriptive literature, drawings and test reports for all cable materials shall be submitted. Literature submitted should be marked to clearly indicate any particular specification paragraph for which the material applies. Sheets or drawing showing more than the particular item under consideration shall have crossed out all but the pertinent description of the item for which review is requested.

1.3.2 Samples

In addition to complete specifications and descriptive literature, a sample of the largest and smallest size of each type of cable shall be submitted for review before installation. Each sample shall have the manufacturer's full surface printing identification label.

The samples shall be retained until completion of the Contract. The Engineer / Project Manager reserves the right to subject any of the samples submitted to tests and will be in no way responsible for damage or breakage as a result of any such tests.

1.4 DELIVERY, STORAGE AND HANDLING

1.4.1 Delivery

All cables shall be delivered to site with seals intact and bearing the manufacturer's label indicating classification, size, description, length and grade. All labels shall be retained and kept in a logbook to be available for inspection by the Employer/ Engineer / Project Manager.

1.4.2 Storage

Cables shall be stored at normal temperatures and out of direct sunlight. Cables not on purpose- built cable reels shall be coiled neatly, allowing for any limitations of bend radius and protected against mechanical damage. Cable ends shall be sealed to prevent ingress of moisture.

Care shall be taken to ensure that all cables are adequately protected while stored on site prior to erection. No damaged cable shall be used.

1.4.3 Handling

Whenever possible, cranes shall be used with suitable spindle through the center of the reel. In the absence of hosting equipment, temporary ramp shall be provided to move cable reels to and from storage area. Cable reels that have been dropped will be subject to rejection by the Employer/ Engineer / Project Manager, because of flatting of the cable inner layers. Drums shall be rolled in the direction of indicating arrows.

1.5 PROJECT CONDITIONS

1.5.1 Environmental Requirements

As specified in Section 16050, Electrical Materials and Methods.

PART 2 PRODUCTS

2.1 MATERIALS

Wire and cable to be furnished shall conform to the detailed requirements specified herein. Color

identification of flexible cords	IEC 173
Bare copper cables for earthing (grounding)	IEC 228 Class 2
PVC insulated or PVC Sheathed cables, 0.6/1 kV	IEC 502
XLPE insulated or PVC Sheathed cables, (90°C)	IEC 502 0.6/1 kV
XLPE/SWA/PVC Direct Buried Armored Cable	IEC 502
Cable glands for single and multi-core PVC	BS 6121, BS 5467
Surge arrestors for cables	IEC 99 Part 1
Cable conductor identification by color or numerals	IEC 446
Stranded copper cable Conductors	IEC 228 Part 1 and 2
Stranded copper wire	IEC60227 and BS 6004
Cable joints, encapsulated resin type	IEC 502 or IEC 455
Cable joints, heat shrink type	IEC 502 or IEC 684

2.1.1 Rated Circuit Voltages

All cable shall have minimum rated circuit voltages of 600/1000 volts. Wire shall be 450/750 volt.

2.2 PERFORMANCE AND DESIGN REQUIREMENTS

2.2.1 Cable Design Criteria

All cables shall conform to the applicable provisions of the IEC and local standard.

Each type of cable used throughout the installation shall be supplied by one manufacturer only. Conductors

above 3 mm sq. shall be stranded copper.

Conductor Insulation: Unless specified or indicated otherwise, or required to be otherwise by NFPA, all power and lighting and instrumentation cables shall be rated 600/1000 Volt, type PVC/PVC 85 °C or XLPE cables (armored and nonarmored).

Cable Types: The following types of wiring systems shall be used for power circuits and controls:

- 600/l000 V rated PVC insulated armoured cables.

  - PVC/SWA/PVC cables: 600/1000 V Grade, to BS6346
  - Conductor: Annealed high conductivity copper, stranded, shaped and laid in an approved manner
  - armour: Single layer of galvanized steel wires for multicore cables
  - insulation: Color coded to BS 67 46C

- PVC for sheath and insulation to BS 6746
- cables shall be terminated with compression glands as specified below, giving adequate mechanical support by locking on the armour and ensuring a high earth continuity.

- PVC insulated PVC Sheathed (PVC/PVC) Cables

  - to BS 6346, 600/1000 V Grade, or to BS 6004, 300/500 V Grade
  - flat twin and three core cables shall be to BS 6004 and incorporate an earth conductor placed between the red and black core for two core cables and between the yellow and blue cores for three core cable.
  - conductor: annealed high conductivity copper, stranded, shaped and laid in an approved manner.
  - insulation: Color coded to BS 6746C
  - PVC for sheath and insulation: to BS 6746

- Single core PVC insulated Wires

  - cable shall be to BS6004, rated 450/750 V, with high conductivity copper conductors and PVC compound insulation. Color coding shall be in accordance with table 51 A of BS 7671.

  - Wires shall be continuous from outlet and no splice shall be made except within outlet and junction boxes. A separate neutral wire shall be provided for each circuit. Wires shall be left sufficiently long enough (minimum 150 mm) to permit making final connections.

- Mineral Insulated Cables

  - To BS 6207: Part 1, rated 600/1000 V
  - cable shall comprise of a pressure packed magnesium oxide insulation contained within a continuous soft ductile copper sheath and copper conductors embedded in the dielectric in standard formation
  - cable termination kit shall comprise of conductor insulation of neoprene sleeving retained by cone shaped beads beneath a fiber sealing disc. Each conductor shall be identified with regard to phase etc., by means of sleeving placed over the neoprene insulation.
  - cable seals shall comprise of screw-in-pot type seals, with brass ring glands designed to accommodate the pot seal.

- Terminals

  - for cable up to 6 mm sq. : two screw pinching type
  - for cable over 6 mm sq. : grip lug type cable sockets
  - brass saddles: purpose made, two fixing screw type

- Heat Resistant and High Temperature Cable

  - to BS 6500, or BS 6004 300/500 V grade, designated EPR (ethylene polypropylene rubber) insulated HOFR sheathed, 85 °C or EPR insulated OFR sheathed, 60 °C. Conductor(s) shall be flexible class 5 tinned copper to BS 6360. Insulation shall be type GP.1 to BS 6899. Outer sheath shall be HOFR (heat, oil, fume resistant) or BS4066 Part 1, temperature rating 60 oc or 85 °C.

  - high temperature cable shall be to BS 6500 or BS 6007, designated 300/500 V grade silicone insulated glass braided, 180 °C. Conductors shall be flexible Glass 5 tinned copper to BS 6360. Insulation shall be silicone rubber Type EI 2 to BS 6899. Outer sheath shall be treated glass fiber braid temperature rating 180 °C.

- Flexible Cable

  - to BS 6007, or BS 6500, rated in accordance with manufacturer's labels.

  - flexible cables subject to excessive heat shall be insulated as (8) above, (a) or (b) as per the Project Documentation required.
- 600/1000 V rated XLPE Insulated Cable

- to BS 5467, 600/1000 V grade, designated XLPE/SWA/PVC for armoured multicore cable and XPLE/PVC for unarmoured cable
- conductors: plain annealed copper to BS 6360
- cable shall comprise of plain copper, stranded circular conductors insulated with an adequate thickness of extruded cross linked polyethylene.
- conductors shall be laid up together and warmed circular with suitable performed fillers and warnings, bound with polythene terephthalate (PTP) tape and covered with an extruded PVC sheath, minimum 1.4 mm thick for multicore cable.
- armourd multicore cable shall have steel wire armouring and extruded sheath of black PVC.
- armoured single core cable shall have a luminium wire armouring and extruded sheath of Black PVC
- outer sheath of single core cables shall be at least 2.5 mm thick
- conductor screen: non-metallic comprising either semi-conducting tape or a layer of extruded semi-conducting material
- prevent void formation in insulation by careful control of its passage through temperature graded water baths
- cable shall be terminated with compression glands as specified below, giving adequate mechanical support by locking on the armour and ensuring high earth continuity

- Instrumentation Cables - Analogue Signals
  - to BS 5308 Part 2, Type 2300- 500 V
  - single copper conductor 1/08 mm
  - polyethylene insulation
  - individual screen of aluminum backed polyester tape with tinned copper stranded drain wire
  - collective screen of aluminum backed polyester tape with tinned copper standard drain wire
  - extruded PVC bedding
  - galvanized steel wire armour
  - PVC outer sheath, gray
  - Core identification as BS 5308, Part 2.

- Instrumentation Cables -Digital Signals
  - to BS 5308 Part 2, Type 2 300-500 V
  - single copper conductor 1/0.8 mm
  - polyethylene insulation
  - collective screen of aluminum backed polyester tape with tinned copper stranded drain wire
  - extruded PVC bedding
  - galvanized steel wire armour
  - PVC outer sheath, Gray
  - Core identification as BS 5308 Part 2

Cable Sizing and Selection: The applicable IEC or local regulations for Electrical Installations shall be used as the basis for sizing cables and conductors.

Minimum wire size shall be 4 mm sq. for power and lighting circuits; 6 mm sq. for current transformer secondary circuits; 3 mm sq. for potential transformer, digital signal, relaying, and control circuits; 1.5 mm sq. for annunciator circuits, analog signal and alarm circuits.

Voltage drop on main distribution cables shall not exceed one and half percent (1.5%) and on sub- circuits shall not exceed one percent (1%). These percentages may vary but the voltage drop shall not exceed two and half percent (2.5%) from the source of supply to the farthest end of any subcircuit and/or originating from the nearest substation.

No cable shall be loaded to more than 80 percent of its current carrying capacity after application of all the appropriate derating factors.

The spacing of cables shall be as determined in the calculation of the derating factors for the current carrying capacity of cables.

When required, instrumentation cables shall be selected taking into account of the following:

- Loop resistance shall be less than 50 ohms.
- The EMIIRFI environment through which the cable is to pass which will affect the screening and conduit requirements.
- Cable route to be used e.g. direct burial.
- Electrostatic interference shall be reduced by using a conductive screen around the signal wires and grounding the screen at one location only.

Cable and Conductor Identification

- Power Cables: All conductors shall be identified by colored insulation. Mains, sub-mains and final sub-circuit phase cables shall be identified by using their respective phase colors, i.e., red, yellow and blue. The neutral conductors shall be colored black, the ground conductors shall be colored green and/or green-yellow.

  Color coding shall be in accordance with Table SlA of BS 767

  All conductors shall be identified in distribution and panel boards by their circuit numbers. Neutral and ground cables shall further be identified by their respective circuit number and phase letter, i.e. R, Y and B. This identification shall be made by permanent clip-on or push-on plastic identification bands. In the case of larger conductors the identification shall be by means of push-on numbers or a suitable plastic bar that is tie-wrapped onto the cables.

  At all outlet points, all phase and switch conductors are to be identified as specified herein.

2.2.2 Cables in Conduits and Trunking

All cables for lighting, smaller power, instrumentation and auxiliary services, including low and extra low voltage services, shall be multi stranded single core PVC, butyl, or silicone insulated as required for 450/750 Volt grade as set forth in IEC and local specification having stranded copper conductors. The minimum cable size shall be 1.5 mm sq. (7/.050mm Dia.).

All cables shall be color coded in accordance with Table SlA of BS 7679 and local Standards.

Marker sleeves shall be fitted to each end of cables and at suitable distances along its length. Sleeves and markers shall be of the proprietary type manufactured for the particular applications, and they shall be of the correct size to ensure a tight fit on the cable. Where cables changed direction, or are routed through conduits, cables identification sleeves shall be fitted.

Cables shall be contained within a protective enclosure of a size not less than that complying with IEC or local standards throughout its whole length.

Cables installed in conduits, trunking shall be so grouped that the cables of all phases and the neutral, are drawn into the same conduit. The lead and return conductors shall always be drawn into the same conduit. Not less than three single core cables shall be enclosed in any one conduit or trunking compartment.

The grouping of cables fed from different distribution units shall not be permitted. Also the grouping of cables of different service systems shall not be permitted.

Where cables are installed in trunking, they shall be grouped in their respective circuits or services and taped or bound by means of nylon cable straps at one-meter intervals for purpose of identification.

2.2.3 Cable Support Systems

For above ground installations the method of fixing PVC/XLPE insulated and PVC sheathed cables shall be either laid on cable trays or ladder rack or clipped to the building structure by suitable cable clamp. All single core unsheathed cables shall be run in a conduit or trunking system.

Fasteners: Cable clamps shall be of either non-ferrous metal, or plastic material, claw or split clamp type suitable for the size and type of cable and shall be so selected so that all clamps can be tightened down without exerting undue pressure or strain on the cables.

In the case of vertical cables, the clamps shall be so designed and of sufficient number to grip the cable firmly to prevent creeping. No cable runs shall be without fittings.

All cable hangers and racks shall be submitted for inspection by the Employer/ Engineer / Project Manager prior to the installation of cables. Where cable routes are subject to numerous changes in level and direction additional cable hangers shall be provided.

2.3 INSTALLATION INSTRUCTIONS

The following manufacturer's information shall be provided for each size, conductor quantity, and type of cable furnished:

- Minimum bending radius, in millimeter for multiple-conductor cables, this information shall be provided for both the individual conductors and the multiple-conductor cable.

- Pulling tension and sidewall pressure limits, in kilograms.

- Upon request, compatibility of cable materials and construction with specific materials and hardware manufactured by others shall be stated. Also, if requested, recommendations shall be provided for various cable operations, including installing, splicing, terminating, etc.

2.4 TESTS, INSPECTIONS AND VERIFICATIONS

2.4.1 Cable Data

Manufacture of the wire and cable shall not be started until all materials to be used in the fabrication of the finished wire or cable have been approved by the Employer/ Engineer / Project Manager. Cable data shall be submitted for approval including dimensioned sketches showing cable construction, and sufficient additional data to show that these specifications will be satisfied.

Independent Tests:

The Employer/ Engineer / Project Manager may at any time make visual inspections, continuity or resistance checks, and insulation resistance readings. A cable's failure to pass these tests and inspections, or failure to produce readings consistent with acceptable values for the application, will be grounds for rejection of the cable. All cable installations that failed these tests shall be replaced by the Contractor, at no cost to the Client.

Reports:

Results of tests made shall be furnished. No wire or cable shall be shipped until authorized. Lot number and reel or coil number of wire and cable tested shall be indicated on the test reports.

PART 3 EXECUTION

3.1 INSPECTION

The outside of each cable reel shall be carefully inspected and protruding nails, fastenings, or other objects which might damage the cable shall be removed. A thorough visual inspection for

flaws, breaks, or abrasions in the cable sheath shall be made as the cable leaves the reel, and the pulling speed shall be slow enough to permit this inspection. Damage to the sheath or finish of the cable shall be sufficient cause for rejecting the cable. Cable damaged in any way during installation shall be replaced by and at the expense of the Contractor.

3.2 PREPARATION

3.2.1 Cable Protection

Cables shall be carefully handled during installation to avoid damage of any kind. They shall be unreeled or uncoiled slowly in order to prevent damage to the insulation or sheath due to sudden bending. Repeated bending shall be avoided. Sharp links shall be avoided in unreeling, uncoiling and pulling.

The pulling of cables into conduits or ducts shall be carried out with all possible care. The cable reels or coils shall be positioned so that the cable may be trained into the conduit or duct as directly as possible, with the minimum of changes of direction or of bending. The cable end shall be provided with a suitable protector to guard against damage to the insulation or sheath. Where several cables are contained in one conduit or duct, all cables shall be pulled-in together.

The pulling tension shall not exceed the maximum tension as recommended by the cable manufacturer.

Long lengths of cable shall be laid using an adequate number of drum jacks, rollers and other handling accessories. Make-shift-arrangements will not be acceptable. Care shall be taken to break the rotation of the reel and cables shall not be dragged over loose earth, concrete or any surface detrimental to the insulation. Cables shall not be stretched but shall be adequately supported on rollers or manhandled into position.

Before cables are pulled through ducts, the ducts shall be checked for cleanliness and smoothness. Where ducting is longer than two meters, a cable wire mesh cable stocking shall be used to attach the cable to the draw-in rope.

The minimum bending radii shall be not less than that recommended but the cable manufacturer and contra twisting shall be avoided.

Spacing between cables shall be suitable for the derating factors applied to the cable installation design. Cables shall be installed using the loop-in principle, unless otherwise specified no straight through or tee joints will be permitted.

3.2.2 Cable Routing

The general route of all cables shall be indicated on the drawings and/or as directed by the Employer/ Engineer / Project Manager if there are no drawings. The Contractor shall include for all deviations required by the building structure and other services. The final routes of all cables shall be submitted to the Employer/ Engineer / Project Manager before any work in connection with the cable installation is commenced.

Cable shall be installed with a minimum of 300 mm clearance of any equipment or pipework including lagging associated with other services. Where this condition is or difficult to maintain, the Employer/ Engineer / Project Manager's Representative consent shall be obtained prior to the installation being commenced.

Where cables are situated below floor level in sub-stations and switch rooms, they shall be run either in formed concrete open ducts, PVC or under fire resisting access flooring. No cables shall be buried directly in concrete flooring or foundations.

Where cables pass through holes in panels or other metalwork, they shall be protected by rubber grommets, compression glands or their equivalent.

Where cables are run vertically heavy gauge sheet metal guards shall be supplied and fixed where there is a possibility that the cable could sustain mechanical damage.

3.2.3 Segregation

Cables of different voltages and duties shall be segregated and particular attention shall be paid to the avoidance of induced 'spikes' or ' electrical noise' on adjacent circuits due to high currents and/or switches surges.

3.2.4 Grounding

All which cannot be insulated as defined in the Governing Standards and is associated with cable runs shall be bonded to earth or to the cable armoring where this latter methods is approved.

Where steel wire armoured cables are specified and the resistance of the armoring is unsatisfactory, a supplementary earth (ground) cable shall be run with the affected cable. This cable shall be sized to ensure compliance with the wiring regulations for earthing.

3.3 INSTALLATION

3.3.1 Cable Installation

Cable shall be installed m accordance with IEC standards and local code.

Cables shall not be buried in solid or hard setting building finishes unless prior approval has been given by the Employer/ Engineer / Project Manager. The Contractor shall ensure that cables when run in building finishes are immediately protected against mechanical or any other damage. The Contractor shall also be in attendance when finishes are applied and shall ensure that no damage or displacement occurs.

Cables shall be installed parallel to the building lines and shall not be run diagonally in floor or ceiling finishes.

Single cable passing through walls and floors shall be protected by means of tubular PVC or steel sleeves of sufficient size to give minimum 13 mm clearance all round the cable. Sleeves passing through floors shall extend above the floor level a minimum of 40 mm.

Where passing through walls the sleeve shall finish flush with the finished surface. All sleeves shall be tightly packed with suitable fire resistant materials of an approved type. All cables rising from floor level to equipment or in other locations where accidental damage may occur shall be protected.

Cables shall be straightened and dressed neatly on the runs by approved methods. All bends shall have an inside radius of not less than that recommended by the cable manufacturer and in no case shall it be smaller than the bending radii shown in the appropriate standards.

Where multi-runs of cables occur they shall be fixed to cable trays.

Cables shall be tagged at both ends, inside each panel, and every 10 m of the run. Tag shall be metal type and shall read both the cable size and the target panels or loads (From/To).

Megger conductor phase-to-phase and phase-to-ground for continuation and insulation tests before connecting the utilization devices for 100% feeders, branch circuit and motor circuit.

HIGH VOLTAGE CABLE

PART 1 GENERAL

1.1 SCOPE

This section covers the furnishing high voltage cables, including armored and unarmored single and multiple conductor power cables.

1.2 DESIGN CRITERIA

The cables shall be designed for the following environmental conditions:

- Air ambient temperature at point of use
- Relative humidity
- Occasional sand storms
- Salty air
- Soil conditions vary from dry sand to wet silt or clay
- In some areas the soil is alkaline, in others it is acidic or salt

The cable shall be rated for 90°C continuous temperature, 130°C maximum emergency temperature and 250°C short circuit temperature.

1.3 REFERENCES

1.3.1 Governing Standards

Except as modified or supplemented herein, all equipment and materials required in this section including their installation shall conform to the applicable requirements of the following standards. Standards current at the time of tender shall be used.

BS 1442	Galvanized Mild Steel Wire for Armoring Cables
BS 2484	Straight Concrete Clay Ware Covers
BS 2897	Aluminum Strip Armour for Cables
BS 3506	Unplasticised PVC Pipe for Industrial Purposes
BS 4066	(IEC 332) Tests on Electric Cables Under Fire Conditions
BS 4660	Unplsticised Polyvinyl Chloride (PVC-u) Pipes and Plastic Fittings of Nominal Sizes 110 and 160 for Below Ground Gravity Drainage and Sewerage
BS 5308	Instrumentation Cables
BS 5467	(IEC 502) Cables with Thermosetting Insulation for Electricity Supply for Voltages of up to and Including 600/1000 V and 19000/30000 V
BS 6004	(IEC 227) PVC Insulated Cables (non-armored) for Electrical Power
BS 6007	Rubber Insulated Cables for Electric Power and Lighting BS
6207	(IEC 245) Mineral Insulated Cables
BS 6234	Polythene Insulation and Sheath for Cables
BS 6346	PVC Insulated Cables for Electrical Supply
BS 6360	(IEC 228) Copper Conductors for Cables
BS 6500	(IEC 227) Insulated Flexible Cords
BS 6622	(IEC 502) Cables with Extruded Cross Linked Polyethylene Insulation, for Rated voltage 3800/6000 V up to 19000/30000V
BS 6746	PVC Insulation and Sheath of Electric Cables
BS 6746C	Color Chart for Insulation and Sheath of Electric Cables BS
6899	Rubber Insulation and Sheath of Electric Cables
BS 7671	Requirements for Electrical Installations
ISO 9000	Quality Management and Assurance Standards
BS EN 29453	Soft Solder Alloys-Chemical Composition and Forms
	Cable terminations shall comply with the following specifications:
BS 1858	Bitumen Based Compounds for Electrical Purposes
BS 4579	Performance of Mechanical and Compression Joints m Electric Cable and Wire Connectors
BS 6121	Mechanical Cable Glands for Elastomer and Plastic Insulated Cables

BS 6910	Cold Pour Resin Compound and Heat Shrink Cable Joints in the Voltage Range up to 1000 V AC and 1500 V DC

1.4 QUALITY ASSURANCE

1.4.1 Installer's Qualifications

The Contractor shall submit data showing that he has successfully installed systems of the same type and design as specified herein, or that the Contractor has a firm contractual agreement with a subcontractor having not less than five years' experience in the design and installation of such systems. Data shall include names and location of at least two installations of such systems, he or his referenced subcontractors has installed. The references shall indicate type and design of each system and certification that each system has been performed satisfactorily in the manner intended for not less than three years.

1.4.2 Engineer / Project Manager's Acceptance and Contractor's Responsibility

The Engineer / Project Manager's acceptance of the Contractor's working drawings shall not relieve the Contractor from responsibility for errors, omissions, or deficiencies in the work. The Contractor shall verify actual conditions in the field and shall take all measurements necessary for proper installation of this work.

1.5 SUBMITTALS

Submit the following in accordance with the requirements set forth at the Conditions of Contract.

1.5.1 Data

Equipment, performance and manufacturer's catalog data shall be provided for the following items:

- Single core XLPE/SWA/PVC Direct Buried Armored Cable
- Multicore XLPE/SW A/PVC Direct Buried Armored Cable
- Single core XLPE/PVC Unarmored Cable
- Multicore XLPE/PVC Unarmored Cable

1.5.2 Instructions

Manufacturer's Instructions shall be provided showing the recommended sequence and method of installation for the following:

- High Voltage Power Cable Systems
- Termination

1.5.3 Statements

Listing of products installed shall be provided showing qualifications of Cable Splicers to the Engineer / Project Manager's Representative prior to specified work

1.5.4 Reports

Test Reports for the following shall be in accordance with the paragraph entitled, "Field Testing," of this section.

- Dielectric Absorption Tests
- High-Voltage Tests
- Radiographic Tests

1.5.5 Certificates

Certificates of Compliance shall be provided for the following showing that the cable manufacturer has made the applicable factory conducted tests on each shipping length of cable. Certified copies of test data shall show conformance to the referenced standards and shall be approved prior to delivery of cable.

- Conductor Resistance

- Thickness of Armour
- Ionization
- High-Voltage
- Flammability
- Mechanical Integrity
- Bending Test
- High-Voltage Time Test
- Dielectric Power Loss
- Power-Factor Tests
- Qualifications of Cable Splicers
- Dielectric Pothead Tests

1.6 SHIPMENT

Cable shall be shipped on reels such that the cable will be protected from mechanical injury. Each end of each length of cable shall be hermetically sealed and securely attached to the reel.

Minimum reel drum diameter shall be 14 times the overall diameter of the cable. A pulling eye shall be installed by the manufacturer for each length of cable supplied for installation in ducts, manholes, and utility trenches.

PART 2 PRODUCTS

2.1 CONSTRUCTION OF CABLES

Cable shall be armored type, rated 11000 Volts, and shall comply with BS 6622. Single core cable shall be designated 11 kV XLPE/AWNPVC. Multi-core cable shall be designated 11 kV XLPE/SWNPVC.

Conductors shall be stranded aluminum complying with BS 6360, covered with a semi-conducting screen extruded on to the conductors.

Insulation shall be extruded cross linked polyethylene suitable for continuous operation at 90 °C, able to accept a final temperature of 250 °C in the event of a short circuit, and covered with a screen consisting of an extruded semiconducting layer and a copper tape layer.

Armored cables shall have secure bedding, over the core or core assembly, for the armor. For single core cable, the bedding shall consist of a PVC sheath. For multicore cable, the bedding shall consist of non-hygroscopic fillers.

Single core cable shall have aluminum wire armor. Multi-core cables shall have galvanized steel wire armor. Cable shall be covered with a red colored PVC sheath.

Electrical design stress at any point in the insulation shall not exceed 3 kV per mm.

2.1.1 Conductors

The cable shall have single conductor of plain aluminum Class 2, of concentric strand wires. The conductor shall be of compacted circular shape.

2.1.2 Conductor Screening

Each conductor shall be covered with an extruded semi-conductive material layer. The screening shall be tightly fitted to the conductor but shall be easily cold strippable. The conductor screens shall bond thoroughly to the insulation but shall be easily distinguished from it by its different color.

2.1.3 Insulation

Each conductor shall have ozone-resistant layer or cross-linked polyethylene (XLPE) extruded on the conductor screen.

2.1.4 Insulation Screening

A semi-conductive material layer which shall have a different color from that of the main insulation shall be extruded on the core. The screening layers shall be easily removable without damaging or scratching the main insulation or leaving traces over it during splicing or terminating the cable.

2.1.5 Copper Sheath

On the core insulation, two screening flat copper tapes each having 0.1 mm thickness shall be helically applied and overlapped over the insulation shield.

The overlap for each tape shall be 2': 1/3 of its total width so that max. D.C. resistance of cu screen at 20° per km of cables : S 0.65 ohm.

2.1.6 Filling and Inner Covering

The three cores shall be assembled together, the interstice filled with non hygroscopic; non- conductive material which may be extruded or not so that the completed cable assembly is of substantial circular cross-section.

The inner covering wrapping the three cores together shall be of extruded corrosion resistant material. The material is used for the filler and inner covering shall be suitable for the cable operating temperature. The thickness of the inner covering shall be in accordance with the attached table of dimensions.

2.1.7 Metallic Armour

The metallic armour is of a double tape type and shall be of steel. The tapes shall be hot or cold rolled of commercial quality. Special consideration shall be given to the possibility of corrosion, not only for mechanical safety, but also for electrical safety.

It shall be applied on an inner covering in accordance with IEC 60502 standard. The material and dimensions of the steel tapes shall be in accordance with IEC 60502 standard.

The tape armour shall be helically applied in two layers so that the outer tape is approximately central to cover the gap of the inner tape. The gap between adjacent turns of each tape shall not exceed 50% of the width of the tape.

2.1.8 Outer Jacket

The cable shall have an over sheath of extruded PVC st-2. The over sheath shall be non- hygroscopic, sunlight resistant and suitable for soil conditions in Project Site.

The cable shall be marked throughout its length with the following items:

- Voltage rating
- Size
- Manufacturer's name
- Year of manufacture
- Customer's name

Intervals of marking shall not exceed one meter and each mark shall serially indicate the length of the cable remaining.

2.2 IDENTIFICATION OF THE CABLE PHASES AND MARKING

Identification for phases shall be carried using colored plastic ribbon between the semi-conducting layer and copper screen (RED, YELLOW, BLUE).

The cable shall be marked throughout its length with the following items:

- Voltage rating
- Size
- Number of conductors

- Manufacturer's name
- Year of manufacture
- Customer's name (Engineer / Project Manager)

Intervals of marking shall not exceed one meter and each mark shall serially indicate the length of the cable remaining.

2.3 MULTIPLE-CONDUCTOR UNARMOURED CABLES

Cross-linked polyethylene insulated IEC 502:

Cross-linked Polyethylene with PVC Jacket: Multiple-conductor, crosslinked polyethylene- insulated, red sheath polyvinyl chloride-jacketed unarmored cable shall conform to IEC 502. Conductor screen shall be extruded, semi-conductor compound, insulation screen (non-metallic part) shall be graphite layer with a lapping tape or extruded semi-conductive material, and for metallic part shall be copper tapes 0.10 millimeter thickness. Taped bedding shall be used.

2.4 MULTIPLE-CONDUCTOR, SWA CABLES

2.4.1 Cross-linked Polyethylene with PVC Jacket

Multiple-conductor, cross linked polyethylene-insulated, red sheath polyvinyl chloride-jacketed steel wire armored (SWA) cable shall conform to IEC 502. Conductor screen shall be extruded semi-conductor compound, insulation screen (non-metallic part) shall be graphite layer with a lapping tape or extruded semi-conductive material and for metallic part shall be copper tapes 0.10 millimeter thickness. Extruded PVC bedding shall be used. Armour shall be galvanized steel tapes or steel wires applied helically over the PVC bedding.

2.5 SINGLE-CONDUCTOR UNARMOURED CABLES

2.5.1 Cross-linked Polyethylene with PVC Jacket

Single-conductor, polyethylene-insulated, red sheath polyvinyl chloride-jacketed unarmored cable shall conform to IEC 502. Conductor screen shall be extruded semiconductor compound, insulation screen (non-metallic part) shall be graphite layer with a lapping tape or extruded semi- conductive material and for metallic part shall be copper tapes 0.10 millimeter thickness.

2.6 SINGLE-CONDUCTOR SWA CABLES

2.6.1 Cross-linked Polyethylene with PVC Jacket

Single-conductor, polyethylene-insulated, red sheath polyvinyl chloride-jacketed SWA cable shall conform to IEC 502. Conductor screen shall be extruded semiconductor compound, insulation screen (non-metallic part) shall be graphite layer with a lapping tape or extruded semi-conductive material and for metallic part shall be copper tapes 0.10 millimeter thickness.

2.7 CABLE SUPPORTS AND FITTINGS

Cable supports, related fittings, and accessories for use in corrosive underground locations, such as manholes, shall be provided with a factory applied coating of polyvinyl chloride of at least 0.51 millimeter thick. Polyvinyl chloride (PVC) coated items shall have a uniform thickness and be free of blisters, breaks, and holidays. PVC compound shall conform to IEC.

Cable racks, cable tray supports and related fittings shall be IEC standard or heavy duty nonmetallic glass-reinforced nylon or polycarbonate.

2.8 SPLICE KITS

Approved connectors shall be provided for splices and terminal connections of all aluminum conductors. The connector shall fit the conductor to which it shall be connected, and the assembly shall have joint contact surfaces not less than 50%. (As recommended in writing by the splicing kit manufacturer for specific sizes, ratings and configuration of cable conductor and splices specified). Include all components required for complete splice with detail instruction. Comply with IEC Code.

2.9 SOLID TERMINATIONS

Termination for high voltage cable shall be in the switchgear or cable entrance Compartment of transformers. Type of termination fitting shall be as required to match conductor to equipment, built-up insulation and heat shrink stress cone as manufactured by Raychem (or approved equal) for the type of cable specified.

PART 3 EXECUTION

3.1 INSTALLATION

High-voltage cables shall be installed in accordance with IEC.

Cable shall be installed in underground duct banks; in conduit above and below grade; inside buildings; by open wire method; on insulator hooks; on racks; in wall and ceiling mounted cable trays and manholes; and by direct burial.

Cables shall be secured with heavy-duty cable ties in trays mounted horizontally, where cable rests on tray bottom. Cable ties shall be installed at minimum of 3000-millimeter intervals.

Cables shall be secured with PVC coated, metallic or non-metallic cable clamps, straps, hangers, or other approved supporting devices, ceilings, and in cable trays mounted vertically, where tray bottom is in a vertical plane. When field cuts or other damage occurs to the PVC coating, a liquid PVC patch shall be applied to maintain the integrity of the coating. After the installation is complete, an inspection shall be performed to ensure the absence of voids, pinholes, or cuts.

Contractor shall ensure that all cable trays are properly secured and supported prior to installing new armored cable. Contractor shall add new permanent and/or temporary tray support devices as required to preclude cable tray failure during cable pulling or after cable is installed.

Cable or conductors of a primary distribution system shall be rejected when installed openly in cable trays or openly racked along interior walls; (in the same raceway or conduit with ac/de control circuits or ac power circuits operating at less than 600 Volts; or in a manner allowing cable to support its own weight).

3.1.1 Moisture-testing Before Pulling

Contractor shall ensure that radii of bends, potheads, fittings, cable risers, and other conditions are suitable for the cable and conform to the recommendations of the cable manufacturer.

3.1.2 Protection During Splicing Operations

Blowers shall be provided to force fresh air into manholes or confined areas where free movement or circulation of air is obstructed. Waterproof protective coverings shall be available on the work site to provide protection against moisture while a splice is being made. Pumps shall be used to keep manholes dry during splicing operations. Under no conditions shall a splice or termination be made with the interior of a cable exposed to moisture. A manhole ring at least 150 millimeters above ground shall be used around the manhole entrance to keep surface water from entering the manhole. Unused ducts shall be plugged and water seepage through ducts in use shall be stopped before the splice is started.

3.1.3 Duct Cleaning

Ducts shall be thoroughly cleaned before installation of power cables. A standard flexible mandrel shall be pulled through each duct to loosen particles of earth, sand, or foreign material in the line. Mandrel length shall be not less than 300 millimeter long, and shall have a diameter 13 millimeter less than the inside diameter of the duct. A brush with stiff bristles shall then be pulled through each duct to remove the loosened particles. Brush diameter shall be the same as or slightly larger than the diameter of the duct.

3.1.4 Pulling Cables in Ducts and Manholes

High-voltage cables shall be pulled into ducts with equipment designed for this purpose, including power-driven winch, cable-feeding flexible tube guide, cable grips, and lubricants. A sufficient

number of trained personnel and equipment shall be employed to ensure the careful and proper installation of the cable.

Cable reel shall be set up at the side of the manhole and above the duct, allowing the cable to enter through the opening without reverse bending. Flexible tube guide shall be installed through the opening in a manner that will prevent the cable from rubbing on the edges of any structural member.

Cable shall be unreeled from the top of the reel. Payout shall be carefully controlled. Cable to be pulled shall be attached through a swivel to the main pulling wire by means of a pulling eye or suitable cable grip permitted only on cables less than 60 meter long and less than 50 millimeter in diameter.

Woven-wire cable grips shall be used to grip the cable end when pulling small cables and short straight lengths of heavier cables.

Pulling eyes shall be attached to the cable conductors to prevent damage to the cable structure.

Pulling eyes and cable grips shall be used together for PVC sheathed cables to prevent damage to the cable structure.

Minimum bending radius shall be in accordance with the following:

Cable Type	Minimum Bending Radius Multiplier Times Cable Diameter
Armored cables	8
Unarmored cables with lapping tape	12

Cables shall be liberally coated with a suitable cable-pulling lubricant as it enters the tube guide or duct. Grease and oil lubricants shall be used only on armored cables unarmored sheathed cables shall be covered with wirepulling compounds when required which have no deleterious effects on the cable. Rollers, sheaves, or tube guides around which the cable is pulled shall conform to the minimum bending radius of the cable.

Cables shall be pulled into ducts at a speed not to exceed 0.25 meter per second and not in excess of maximum permissible pulling tension specified by the cable manufacturer. Cable pulling using a vehicle shall not be permitted. Pulling operations shall be stopped immediately with any indication of binding or obstruction and shall not be resumed until such difficulty is corrected. Sufficient slack shall be provided for free movement of cable due to expansion or contraction.

Cable splices made up in manholes shall be firmly supported on cable racks as indicated. No cable splices shall be pulled in ducts. Cable ends shall overlap at the ends of a section to provide sufficient undamaged cable for splicing. Cables to be spliced in manholes shall overlap the centerline of the proposed joint by not less than 600 millimeter.

Cables cut in the field shall have the cut ends immediately sealed to prevent entrance of moisture. Unarmored cables shall be sealed with rubber tape wrapped down to 75 millimeter from the cable end. Rubber tape shall be cover-wrapped with polyvinyl chloride tape. Armored cables shall be sealed with wiping metal making a firm bond with the end of the sheath or with a disk of lead fitted over the end and wiped to the sheath.

3.1.5 Direct Buried Installation

Cable direct buried, unless otherwise specified furnish a bed of soft clean sand 100 mm depth at the bottom of trench , and the same over cable. Install concrete tiles to the whole route of the cable with 50 mm thickness and covering at least 200 mm over the outer edge of the cable from both sides.

Then storing in backfilling with selected soil and reach to 95% compaction minimum. Before reaching to the finished grade level by 300 mm install warning tape to cover the whole routes indicating "DANGER ELECTRICAL CABLES" in English.

In road crossing, install UPVC pipe embedded in concrete encasement and install warning tape and install spare pipes not less than 25 % of the same size.

Permanent markers shall be installed at each 50 m of the cable runs, changes in direction, buried splices and cable ends.

Cables shall be installed as required by drawing and manufacturer's recommendation and according to standard length of cable in case of long distance routes with one as a maximum in certain route.

Use kits which are compatible with conductor size, material and type and according to the manufacturer's recommendations.

Install terminations at ends of conductors and seal multi-conductor cable ends with standard kits and glands.

3.1.6 Grounding

The armouring of metal sheathed cables grounding connection's shall be made by means of screw
- type pressure connectors to grounding pads of connections provided on the switchgear in accordance with IEC. All underground connections shall be made by exothermic welding and then encapsulated in epoxy resin (Jointing). A separate protective conductor shall connect the sheath, armouring, ground metal bodies of terminators, splices and hardware according to manufacturer's written instructions and IEC codes.

3.2 INSPECTION AND TESTING

3.2.1 ENGINEER / PROJECT MANAGER reserves its right to carry out inspection during fabrication stages and to witness the testing of cables.

3.2.2 Attendance of Consultant representative during fabrication stages and testing must not relieve the manufacturer of his full responsibility for furnishing the cables in accordance with the requirements of this specification, and shall not give him the right to invalidate any claim which Consultant may make because of defective material or faulty workmanship.

3.2.3 Unless otherwise specified or approved in writing by Consultant all cables shall be tested at the factory in accordance with the latest applicable issues of the IEC standards or approved equivalent. All routine and type tests shall be performed by and at the expense of manufacturer. The type and routine test certificates shall be delivered by Consultant.

3.2.4 Quality control procedure shall be submitted with tender documents.

3.3 GUARANTEE TABLES

The tenderer shall thoroughly fill in the attached guarantee tables (technical particulars and performance).

3.4 MISCELLANEOUS

3.4.1 The cable length on each reel shall be as long as possible to minimize the number of joints and as shown in the attached tables.

3.4.2 All cable ends shall be firmly secured to the reel and shall be covered by heat-shrinkable end caps.

3.4.3 The cable drum shall be covered with wooden slabs of suitable thickness.

3.4.4 All cables shall be supplied on reels whose size is not to exceed 2.6 m diameter and 1.6 m width including protruded bolt length. The reels may be returnable as per agreement between the tenderer and Consultant.

3.4.5 On each reel the following data shall be printed on both sides: High

Voltage Power Cables Manufactured by:

Voltage Class: kV

Number of Cores and Cross-section: mm sq.

Type of Insulation:

Length of Cable: Meters

Net Weight: kgs

Gross Weight: kgs

Reel No.:

Important Note:

- The factory laboratory must be equipped with all modern instruments and equipment required to perform all routine and special tests of IEC 60502 with the accuracies mentioned in IEC 60502

- Offers from tenderers having no such laboratories shall not be considered

- Dimensions shall be measured by digital and microscopic instruments. The thickness of insulation at any place, may however be less than the specified nominal value provided that the difference does not exceed 0. 1 mm + 10% of the specified nominal value.

  The measured smallest thickness of the PVC oversheath, at any point shall not fall below 80% of the specified nominal value by more than 0.2 mm.

- The thickness of insulation at any place may however be less than the specified nominal value provided that the difference does not exceed 0.1 mm + 10% of the specified nominal value.

- The dimension of the armour shall not fall below the specified nominal value by more than 10%.

- The measured smallest thickness of the P.V.C oversheath, at any point, shall not fall below 80% of the specified nominal value by more than 0.2 mm.

  We certify that the above mentioned data are guaranteed for the offered cable.

FIELD TESTING

Each shall be subjected to dielectric-absorption and high-voltage tests after the installation of power cables has been completed, including splices, joints, and terminations, and before the cable is energized.

Test equipment, labor, and technical personnel shall be provided as necessary to perform the electrical acceptance tests.

Arrangements shall be made to have tests witnessed and approved by the Consultant's representative.

Each power-cable installation shall be completely isolated from extraneous electrical connections at cable terminations and joints. Safety precautions shall be observed.

Each power cable shall first be given a full dielectric-absorption test with 2 500-Volt insulation- resistance test set. Test shall be applied for a long enough time to fully charge the cable. Readings shall be recorded every 15 seconds during the first 3 minutes of test and at 1 minute intervals thereafter. Test shall continue until three equal readings, 1 minute apart, are obtained. Minimum reading shall be 200 mega ohms at an ambient temperature of 16 degrees C. Readings taken at other than 16 degrees C ambient temperatures shall be corrected accordingly.

Upon successful completion of the dielectric absorption test, the cable shall be subjected to a direct-current high-potential test for 5 minutes with test voltages applied in accordance with IEC for cross-linked, polyethylene-insulated cable.

Leakage current readings shall be recorded every 30 seconds during the first 2 minutes and every minute thereafter for the remainder of the test. When the leakage current continues to increase after the first minute, the test shall be immediately terminated and steps taken to find and correct the fault. When a second test becomes necessary, this test procedure shall be repeated.

Upon satisfactory completion of the high-potential test, the cable shall be given a second dielectric- absorption test as before.

Results of the second dielectric-absorption test shall agree with the first test and shall indicate no evidence of permanent injury to the cable caused by the high-potential test.

Test data shall be recorded and shall include identification of cable and location, mega ohm readings versus time, leakage current readings versus time, and cable temperature versus time.

Final acceptance shall depend upon the satisfactory performance of the cable under test. No cable shall be energized until recorded test data have been approved by the Consultant's Representative.

Radiographic tests shall be performed on all potheads at the discretion of the Consultant's Representative to determine if voids exist in the pothead. Unacceptable terminations shall be reworked at no additional expense to the Consultant.

PACKAGED ENGINE GENERATOR

PART 1 GENERAL

1.1 SCOPE

This section covers the equipment, installation and testing of diesel engine and driven electric generator units. The engine generator unit/s shall be installed as indicated on the drawings.

The engine-generator unit shall be a skid-mounted, indoor type unit consisting of an engine, an alternator, auxiliary systems, controls, and accessories as specified and as required for a complete operating system.

Equipment furnished under this section shall be assembled, erected, and placed in proper operating condition in full conformity to the specifications of the equipment manufacturer unless exceptions are noted by the Consultant. The engine-generator unit shall be a standard product of the manufacturer and shall be a packaged type unit, fully shop assembled, wired, and tested, requiring no field assembly of critical moving parts.

1.2 REFERENCES

1.2.1 Governing Standards

Except as modified or supplemented herein, all equipment and materials required in this section including their installation shall conform to the applicable requirements of the following standards. Standards current at the time of tender shall be used.

British Standards

BS No.

4999	Alternators
5514	Engines

National Fire Protection Association

NFPA No.

Occupational Safety and Health Act OSHA No.

B 55514 Reciprocating Internal Combustion Engines Performances. International Commission (IEC) Standard- IEC 34.1

1.3 COORDINATION

All equipment specified in this section shall be furnished through a single manufacturer who shall be responsible for the design, manufacture coordination, and proper installation and operation of the entire system.

1.4 SUBMITTALS

Submit the following in accordance with the requirements set forth at the Conditions of Contract.

1.4.1 Drawings and Data

Complete descriptive and Engineer / Project Managering data shall be submitted. These data shall consist of drawings and photographs in sufficient detail that the construction of the equipment is indicated, together with details, specifications, performance curves, installation drawings, schematics, and wiring diagrams; and foundation drawing showing location detail and size of anchor bolts. Data submitted shall include the following:

Engine Data
- Manufacturer
- Model

- Number of cylinders
- RPM
- Bore x stroke
- Rated capacity kW
- BMEP at rated kW (including any parasitic loads and generator efficiency)
- Make and model of governor

Generator Data
- Manufacturer
- Model
- Rated kVA
- Rated kW at 0.8 PF
- Voltage
- Temperature rise above 50 C ambient for Stator Field
- Class of insulation

Generator Efficiency Including Excitation Losses and at 80 Percent PF
- Full load
- 3/4 load
- 1/2 load
- l/4 load

Guaranteed Fuel Consumption Rate
- Full load liters/hour
- 3/4load liters/hour
- 1/2 load liters/hour
- 1/4load liters/hour

Engine-generator Unit and Accessories
- Weight of base-mounted unit
- Overall length
- Overall width
- Overall height
- Exhaust pipe connection size and location
- Airflow required for combustion and ventilation, m3/min
- Heat rejected to room by engine and generator, Btu/hour
- Heat rejected to jacket water and lubricating oil, Btu/hour
- Height from bottom of base required for removing piston with connecting rod, also for removing cylinder liner.

1.4.2 Test Reports

Copies of the manufacturer's certified shop test record of the complete engine driven generator. The engine-generator log test sheets and a performance review report shall be signed by the engine tester and certified by the manufacturer. The report shall include brief outlines of all test procedures and shall compare actual test results to the requirements of these specifications by means of calculations, graphs, or charts.

Submit name and address of nearest factory authorized service and parts facility.

1.4.3 Operations and Maintenance Manuals/Charts and Spare Parts Data

Complete operations and maintenance manuals/Charts including spare parts data and wiring diagrams of all equipment furnished under this section.

1.5 PROJECT CONDITIONS

1.5.1 Power Supply

The power supply for the engine-generator accessories will be 380Y/220 Volts AC, 50 Hz, three- phase, 4-wire or as may be required by manufacturer's standard.

1.6 DELIVERY, STORAGE AND HANDLING

1.6.1 Storage

The Contractor shall acknowledge storage conditions at the time of submitting his Tender. If the equipment will not be operational within 90 days after manufacture, the manufacturer shall crate and prepare the equipment for export transportation and long-term storage. Precautionary measures for prolonged storage shall be provided by the manufacturer at the factory. The Contractor shall be responsible for storage and maintenance of the protective measures as recommended and instructed by the manufacturer while stored at the storage site. The manufacturer's warranty on units held in prolonged storage exceeding three months shall be covered by special agreement reflecting the storage conditions.

1.6.2 Packaging

In addition to the protection specified for prolonged storage, the packaging of spare units and spare parts shall be similar to export packing and shall be suitable for long term storage in a damp location. Each spare item shall be packed separately and shall be completely identified on the outside of the container.

Instructions for the servicing of equipment while in long-term or prolonged storage shall accompany each item of equipment. Advisement of enclosed instructions with each package shall be noted on the exterior of the package in English.

1.7 SPARE PARTS

A list of all spare parts required for adjustment, operation, and maintenance of the equipment shall be submitted in accordance with the requirements set forth at the Conditions of Contract.

In addition, all special tools required for adjustment, operation, and maintenance of the equipment plus the following spare parts shall be furnished with each unit:

- Five sets of air filter elements
- Five sets of lube oil filter elements
- Five sets of fuel oil filter elements
- One thermostat

One set of gaskets required for routine operational maintenance, but not limited to, the following:

- cylinder head gaskets
- oil pan gaskets
- water pump gaskets
- exhaust manifold gaskets
- thermostat housing gaskets

- One set of hoses and belts including one of each different size and type
- Two complete fuel injection nozzles or ejectors

1.8 INSTRUCTIONS AND TRAINING ON OPERATION AND MAIN1ENANCE

Contractor shall provide instructions and training for the staff to be assigned in the operation and maintenance of the equipment specified under this section. Training and instructions shall be in accordance with the requirements set forth at the Conditions of Contract.

PART 2 PRODUCTS

2.1 PERFORMANCE AND DESIGN REQUIREMENTS

2.1.1 Service Conditions

The engine-generator unit shall provide standby electrical power. The unit shall automatically start on closure of an "Engine Start" contact in automatic transfer switch and when manually initiated from the control panel.

The engine-generator unit shall be designed to provide power for both initial and future requirements as specified herein.

2.1.2 Design Conditions

The engine and generator shall be directly connected, free from injurious torsional or other vibrations, and shall be mounted on a steel sub-base. Each engine-generator unit shall be designed to operate under the following conditions:

Ambient Temperature in Summer (max)	55°C
Ambient Temperature in Winter (min)	2°C
Relative humidity	95%
Type, fuel supply	diesel
Type, cooling system	Water-cooled tropical radiator
Fluid	Water with rust and scale inhibitor

2.1.3 Performance Requirements

The engine-generator unit shall be capable of the following performance under the design conditions above:

- Minimum continuous standby/k:W rating as indicated on the drawings
- For the following conditions:
  - Frequency, Hz: 50
  - Power factor: 0.8
  - Terminal voltage: 415Y/240 Volts, 3-phase, 4-wire unless otherwise specified
  - Maximum engine speed, rpm: 1500
  - Units offered at ratings in excess of their published ratings are not acceptable.
  - The set shall be capable of 110% load for one hour under the previously stated conditions at the rated speed .without over heating of the engine or alternator and without mechanical or electrical troubles.

2.2 ENGINE-GENERA TOR UNIT

2.2.1 Engine

The engine shall conform to the following requirements:

- Cylinder arrangement V-type
- Aspiration Turbo-charged or turbo-charged and after cooled
- Cycle 4
- Cooling Tropical radiator
- The engine shall have a net kilo Watt rating at least equal to actual requirements at specified continuous power rating and at the specified conditions.

The engine shall be equipped with the following:

- Engine speed shall be an electronic governor for isochronous regulation from no load to full load alternator output. Belt driven or velocity governors are not acceptable.

- Fuel system as specified and suitable for operation with specified fuel.

- Oil and coolant drains each piped to edge of skid with shutoff valve or cap.

- Pressure lubrication system including a positive displacement oil pump, pressure regulating valve, manual pre lube pump and electric pre lube pump, full flow filter, oil cooler, level indicator or dipstick, and lubrication system as specified.

- Combustion air system as specified.

- Stainless steel flexible connections for all piping connections to the unit.

- Exhaust system as specified.

- Cooling system as specified.

- Starting system as specified.

- All field piping connections to the engine generator set, including oil drain lines, shall be terminated with a flange. Flanges other than ANSI B16.5, Class 150, raised face shall be furnished with companion flanges.

2.2.2 Alternator

The engine-generator unit alternator shall be a 4 or 6 pole, revolving field design with temperature compensated solid-state voltage regulator, brushless rotating rectifier exciter system and drip proof construction with amortisseur windings. The stator shall be two bearing alternator. Only insulated bearings shall be used to prevent ground shaft currents. Alternators shall be designed for service in severe heating environment. The rotor shall be driven through a semi flexible driving flange to ensure permanent alignment.

Frequency regulation under varying loads from no load to 100% load shall be 5% (isochronous with electronic governor). The random frequency variation shall not exceed ±0.5% of its mean value for constant loads from no load to full load. Voltage regulation shall be within plus or minus one (1)% under load from no load to 100% load, and for constant loads from no load to 100% load shall not exceed ± 1% of its mean value. The momentary voltage drop shall not exceed 25 percent without starter coils dropping out or stalling the engine at any time when applying or starting the specified loads. Recovery to stable operation shall occur within 2 seconds.

The alternator shall have Class H insulation as defined by NEMA MG 1-1.65 and temperature rise shall be within NEMA MGl-22.40 definition at rated condition.

The combined generator, exciter, and regulator efficiency at full load shall be 95.0 percent or better.

Generator leads shall be brought out to bushings mounted m a rigidly supported, dust tight, oversize terminal box.

2.2.3 Lubrication System

Pressure system with gear driven oil pump, sump capacity sized to the engine displacement requirements. The system shall be protected by at least one full flow replaceable spin-in cartridge type oil filter.

The engine shall be furnished with an oil level regulator and a flowmeter. The level regulator shall be float operated and shall be installed in such a position that it wil lmaintain a constant crankcase oil level as recommended by the engine manufacturer. The level regulator shall visually indicate the oil level. The flowmeter shall be a positive displacement type and shall indicate the oil delivered to the engine by the level regulator. The meter accuracy shall be within one percent of indicated flow. The meter shall have a counter with a totalizing register indicating up to full capacity liters in one (1) liter increments. Oil shall be supplied by gravity to the flowmeter and level regulator from the oil supply tank. Provisions shall be furnished for bypassing the flowmeter and level regulator for filling the engine crankcase from the oil supply tank during oil changes.

A dial type differential pressure gauge shall be furnished with each engine oil filter. The gauge shall be mounted on the filter housing and shall indicate when servicing of the filter elements is required. The filter shall be mounted on the engine skid.

2.2.4 Combustion Air Filtration System

An air filtration system shall be furnished to provide clean combustion air to the engine. The filtration system shall include a dry type air cleaner, and all access ones and appurtenances specified, or otherwise required for a complete properly operating installation.

The air cleaner shall be heavy duty with a minimum of 17 tubular replaceable fiberglass filter elements installed in a vertical position. The air cleaner shall be self-supporting, use a high intake position with an integrated pre filter setting chamber and shall be suitable for the future engine operating condition and performance with a pressure drop of no more than 50 mm water column at

the future combustion airflow rate. The filter shall include an access hatch for easy servicing of filter elements. The filter shall be of steel construction.

Piping from the air filter to the engine is specified in another section.

2.2.5 Fuel System

The engine-generator unit shall be furnished with a complete fuel system, including but not limited to engine driven fuel pump, duplex type strainers, shutoff valves, check valves, engine supply and return lines, and flexible connections, all as part of the package. All items shall be suitable for the specified fuel.

The diesel fuel valve train for engine shall include a fail safe spring loaded DC power operated valve for shutoff of the fuel supply with engine shutdown. The valve shall be located upstream of the flexible connection in the fuel line and shall be activated from the engine oil pressure sensor. The valve shall open on engine start initiation.

All parts of the fuel system shall be installed in full compliance with OSHA Standard 1910.106 Flammable and Combustible Liquids.

The engine shall be suitable for running on diesel oil as described below:

Specific gravity at 60F distillation (P.P. 123/40)	0.834
IBM	219 C
10%	250 C
50%	276 C
90%	314 C
F.E.P.	342 C
Flash Point PME	189 C
Sulphur	1.1%
Calorific Value BTU/lb. Gross Carbon Residue	
19750 0.01/wt Diesel Index	62
Viscosity Redwood Seconds at 100F	34

2.2.6 Day Tank

The engine shall be provided with a separate self-supporting or integral day tank. The day tank shall be provided with connections for fuel supply line, fuel return line, fuel overflow line, local fuel fill port, gauge, vent line, drain line, and float switch assembly for control. A fuel return line cooler shall be provided as recommended by the manufacturer and assembler. The temperature of the fuel returning to the day tank shall be below the flash point of the fuel. A temperature-sensing device shall be installed in the fuel supply line. Each engine-generator set provided with weatherproof enclosures shall have its day tank mounted within the enclosure. The fuel fill line shall be accessible without opening the enclosure.

The day tank to supply fuel to the engine for an uninterrupted of minimum of 8 hour period at 100 percent rated load without being refilled, plus any fuel which may be returned to the main fuel storage tank. The calculation of the capacity of the day tank shall incorporate the requirement to stop the supply of fuel into the day tank at 90 percent of the ultimate volume of the tank.

Drain Line: The day tank drain line shall be accessible and equipped with a shut-off valve. Self- supporting day tank shall be arranged to allow drainage into a 305 mm tall bucket. The local fuel fill port on the day tank shall be provided with a screw-on cap.

Fuel Level Controls: The day tank shall have a magnetic float switch assembly to perform the following functions:

- Start the supply of fuel into the day tank when the fuel level is at the "Low" level mark, 75 percent of the total tank capacity.
- Stop the supply of fuel into the day tank when the fuel level is at 90 percent of the total tank capacity.
- Activate the "Overfill Fuel Level" alarm at 95 percent of the total tank volume.

- Activate the automatic fuel supply shut-off fail safe spring loaded DC operated solonide valve located on the fill line of the day tank and shut down the fuel pump which supplies fuel to the day tank at 95 percent of the total tank volume. The flow of fuel shall be stopped before any fuel can be forced into the fuel overflow line.

2.2.7 Main Fuel Storage Fuel Tank

The Contractor shall supply and install a cylindrical diesel oil storage tank with a capacity to operate the associated diesel generator set continuously on full load for 10 days, unless otherwise specified in the Project Documentation.

The tank shall be welded mild steel construction suitably protected from corrosion in accordance with BS 2594 and shall be installed in the location indicated on the drawings.

The storage tank shall be complete with pipes, fittings, feed lines, vents, etc. The tank shall be of the approved type located outside the diesel engine room. The tank shall be provided with 600 mm inspection manhole with cover, 50 mm filling pipe with cooped filling terminal, 50 mm air vent pipe with screen outlets, isolating valve, valved drain etc.

Electronic fuel indicator with an audio/visual alarm shall be provided for main fuel storage tank.

Also the storage tank and its accessories must comply with the Pakistan Regulations for generator installation.

2.2.8 Diesel Oil Pumping Set

Provide packages type fuel oil pumping and straining set with a capacity of four Times the total fuel consumption of the engine at full load.

Pump sets shall be factory assembled, piped, wired and tested. Pump shall be activated automatically by a switch in the day tank.

Piping shall be complete to suction, discharge and return line connections. Provide gate valves and unions arranged to permit removal of pump while the system is in operation. Install check valves and relief valves on pump outlet and Gate valves prior to pressure gauges.

Suction strainer shall be flanged connection type, one piece, cast iron body, and ASTM A48 class 30, with 1.2 mm perforation brass baskets.

Oil pump shall be factory assembled on a structural steel channel beam base to include pump, motor, flexible coupling and guards. Pump shall be suitable for diesel oil.

Suitable manually operated fuel pump shall also be provided.

2.2.9 Exhaust System

The engine-generator installation shall include a critical exhaust silencer, exhaust piping, expansion joints, stainless steel rain cap, hangers, and accessories as required for a complete operating system. Exhaust piping and insulation shall be terminated with a single pipe flange connection.

Hangs and supports shall be provided for the silencer and exhaust piping such that essentially no load is transmitted to the engine exhaust connection.

The exhaust silencer shall be a chamber type, all welded steel construction, with suitable bracket supports for vertical or horizontal mounting. The silencer shall be reinforced to be able to withstand a horizontal force of not less than 2224 N at the inlet connection. The silencer size shall be such that the silencer produces half the maximum allowable back pressure at future operating conditions with inlet and outlet flanged connections. The silencer shall be suitable for critical type silencing.

The silencer shall meet the following requirements:

Mid band Frequency, Hz	31.5	63	125	250	500	1 K	2K	4 K	8 K
Attenuation, dB	11.5	27	37.5	6.5	31	27	27	28	30

Noise attenuation required are 55 dB (A) at one meter from air intake and outlet louvers.

Expansion joints shall be furnished in the engine exhaust piping as indicated on the construction drawings. The expansion joint in the horizontal exhaust piping shall be the double bellows type fabricated of stainless steel one-piece construction with welded ends. The expansion joint shall be designed for 50 mm lateral offset, 38 mm axial compression.

The expansion joint in the vertical riser immediately above the engine exhaust connection shall be bellows type, fabricated of all stainless steel with a flange on one end and a butt weld connection on the other end and shall be designed for 6 mm lateral offset, and vibration isolation.

A stainless steel rain cap shall be furnished and installed on the exhaust stack to prevent the entry of dust and rain.

Insulation: Insulation for exhaust silencer and all interior exhaust piping is to be 100 mm thick Calcium silicate molded block type of rigid hydrous calcium silicate with thermal conductivity of 0.060 W/M-K. Outer covering shall be aluminum jacket, 0.4 mm inches thick, and type 3003 or 5005 alloys with 4 mm corrugations. Jacket shall have a factory applied vapor barrier on the inside with aluminum straps over transverse joints. Adjacent section corrugations shall overlap.

2.2.10 Starting System and Control Power

The engine-generator unit shall include an electric motor start system. The electric start system shall include starting motors, 24 V DC Volt battery pack with rack and cables, and battery charger. The unit shall be arranged for manual starting, stopping, and transfer of load. The load shall be transferred to the diesel unit when it has attained rated frequency and voltage. The engine shall be capable of starting solely from the heat of compression. Intake and exhaust valves shall be heat- resisting alloy steel with high tungsten-chrome alloy steel exhaust valve seat inserts.

Electric starting shall be accomplished by an engine-mounted, solenoid shift electric starter, capable of withstanding four consecutive continuous cranking periods of ten seconds duration each.

The engine starting control equipment shall be arranged to disconnect the battery charger to prevent it from being over-loaded during starting. The starter motor shall be of adequate power of its duty.

Batteries: Batteries for starting shall be of the nickel cadmium type, 24 V, heavy duty diesel starting type and of sufficient capacity to provide continuous cranking of 1.5 minute duration without recharging. Batteries should have sufficient capacity to provide three successive starts.

The batteries shall be filled with electrolyte and installed on proper racks with cables and clamp. A hydrometer shall be supplied with the batteries.

The batteries should be designed for diesel engine cranking service, and of a capacity as recommended by the battery manufacturer for cranking the engine furnished, for the necessary break-away current as required and the spinning current for four consecutive starts of 10 seconds of cranking on each start, or for 60 seconds of continuous cranking without being recharged and with the ambient temperature (both engine and battery) of 0°C. The batteries shall be mounted in an insulated, protective enclosure on a floor or skid mounted battery rack and suitable cables shall be provided.

Battery Charger: The battery charger shall be static type enclosed in an adequately ventilated sheet steel case and incorporated within the control panel with its associated instruments and controls mounted on front of panel.

The charger shall be complete with all necessary relays, cut-outs, controls switches and instruments for automatic charging of batteries. The charger shall automatically control the charging rate to suit state of battery thus charging at high rate following a period of use of battery and, when battery nearly fully charged, reverting to trickle charging automatically.

An ammeter and voltmeter in the control panel shall indicate the state of the battery and its charging rate.

2.2.11 Cooling System: shall include

Radiator: Built-in type with sufficient capacity to dissipate the total joules per hour rejected by the engine cooling system at 110% full load.

Blower Fan: To have sufficient pressure to circulate required quantity of air for engine cooling. The fan shall be provided with a suitable guard. DIG room inside temperature should not exceed 56°C.

Jacket Water Heaters: To be provided on engine to facilitate quick starting under low ambient conditions.

The Cooling System: Shall be capable of keeping the temperature of cooling water at safe limits at all conditions of load required in the specifications. Maximum temperature of cooling water after 10 hours of continuous running at full load at worst Pakistan climatic conditions shall not exceed the maximum temperature limits of the diesel engine.

The cooling system shall include an engine shaft driven circulating water pump. The water jacket of the engine cylinder shall be so constructed that the water in the jacket can be drained completely.

The Radiator Finned Tubes: Shall have a common inlet and common outlet headers.

Drain Valve and Filling Valve: Shall be provided to the radiator for flushing and quick filling.

Cooling Water Piping: Complete with all necessary supports, control valves, flanges and fittings, thermometers, pressure gauges, relays, etc.., shall be supplied and installed to form a complete engine water cooling line. Piping shall be as of BS 1387.

Water Pump Discharge Valve: Shall preferably be a globe valve, the other valves shall be (sluice) gate valve.

2.2.12 Control Panel: The engine shall be furnished with a control panel mounted on the package baseplate.

The control panel shall have adequate clearance from the engine for engine maintenance without moving the control panel.

The control panel shall be fabricated from not less than 2 mm steel. The panel shall be equipped with an approximately full-size gasketed door with chromium-plated or stainless steel three-point latch and piano type hinges. The panel shall be reinforced as required to support the control devices. The finished panel shall be thoroughly cleaned and given a rust-inhibiting primer coat inside and out. The panel shall be given not less than two finish coats of enamel or lacquer of a color selected from paint samples which shall be furnished to the Consultant.

The control panel shall include at least, but not be limited to, the following:

- Engine oil pressure gauge
- Engine oil temperature gauge
- Jacket water temperature gauge
- Jacket water pressure gauge
- Combustion air pressure gauge
- Fuel pressure gauge
- Running time meter
- Voltage adjustment rheostat (plus or minus 5 percent)
- Emergency stop push button
- Lubricant oil pressure gauge
- Exhaust gas temperature gauge
- Exhaust turbo-blower pressure gauge
- Engine RPM
- System DC volt
- Generator AC volt

- Generator AC amp.
- Generator frequency

Eight system diagnostic codes.

The system diagnostic codes shall be designed to entrance the system protection and to allow for trouble shooting by untrained personnel.

These signals shall be:

- Loss of engine speed
- Invalid engine control switch
- Internal circuit fault
- Loss of coolant temperature
- Loss of data sending unit
- Unscheduled engine shutdown
- Invalid programming switch position
- Loss of failure of program setting

All gauges shall have metric scales with ranges approximately twice the normal gauge reading.

Nameplates shall have white letters not less than 5 mm high on black Bakelite, and shall read in English.

The following Control Systems shall be included:

- Generator over speed monitoring
- Generator under frequency protection
- Generator under voltage protection
- Generator over voltage protection
- Generator reverse power protection
- Overload monitoring (100% load, load reduction)
- Generator winding protection
- Generator bearing protection
- Generator cooling air output temperature protection
- Engine control switch
- Ammeter -voltmeter phase selector
- Emergency stop
- Indicator/display test switch
- Voltage adjust potentiometer

Pressure and Temperature Switches: Pressure and temperature switches shall be NEMA Type 4, with adjustable range and differential. Required switches shall be as follows:

- A separate pressure switch shall be furnished and installed for the following:

    - Lube oil pressure - low alarm
    - Lube oil pressure - low shutdown
    - Pressure switches shall have normally open SPST contact to make on falling pressure.

- A separate temperature switch shall be furnished and installed for the following (for each engine):

    - Jacket water temperature -low alarm.
    - Jacket water temperature - high alarm.
    - Jacket water temperature - high shutdown
    - Lube oil temperature - high alarm.
    - Lube oil temperature - high shutdown.

Temperature switches shall be complete with capillary tubes, bulbs, well unions, and normally open SPST contact to make on rising temperature for high temperature trips and to make on falling temperature for low temperature trip.

The remote-mounted liquid level indicators for the fuel day tanks and lube oil tanks shall be mounted near the oil transfer pump assembly.

Thermometers: Thermometers shall be liquid filled industrial type and shall be furnished and installed on the engine or piping to indicate inlet and outlet temperatures of the jacket water and lubricating oil. All thermometers are to be installed in thermo wells to permit their removal and replacement without the loss of liquid from the system.

Thermometers shall have metric (centigrade) scales with ranges equal to approximately twice the normal reading.

2.3 ACCESSORIES

2.3.1 Heaters: Automatic thermostatically controlled heaters rated 240 Volts, single phase shall be provided to maintain 40°C jacket water and lubricating oil temperatures.

2.3.2 Base: The engine generator unit shall be mounted on a heavy skid type base. The unit shall be capable of being moved with disassembly. The unit shall be bolted to a concrete pad.

2.3.3 Customer Interface Module: A Customer Interface Module (CIM) shall be provided to decode serial link data from the Electronic Control Panel and translate alarm, fault, and status conditions to a set of relay contacts. Contacts shall represent conditions of

- Engine diagnostic fault system not in automatic alarm
- High coolant temperature alarm
- Low coolant temperature alarm
- High coolant temperature fault/shut down
- Over crank fault/shut down
- Over speed fault/shut down

Loss of serial data link to the CIM shall cause all relays to energize every two seconds.

Relays shall be individually fused, with single-pole, double-throw, and gold plated dry contents. Systems shall be capable of reliable operation 1000 feet from the engine.

2.3.4 Customer Communication Module

The Customer Communications Module (CCM) shall provide bi-directional communication between BMS and the generator set Electronic Control Panels. Necessary outputs shall be available for BMS to control and monitor the points as listed below. CCM output shall be compatible for either direct connection or connection via a Hayes compatible modem. The module shall include a digital display to indicate the status of communications and fault conditions. The adapter shall be microprocessor based 100% solid state. It shall operate in -40°C to 70°C ambient and be suitable for switchgear or similar mounting. The CCM shall allow BMS to:

Control

- Engine start/ stop
- Fault conditions reset
- Idle/rated speed switch for electronic governors
- Circuit breaker shunt trip
- Cool down
- Timer override

Monitor

- Coolant temperature
- Speed
- Service hours
- Generator three-phase voltage and current
- Frequency
- Battery voltage
- Position of engine control switch
- All alarms
- Shutdowns

- Engine control panel relays
- Three customer inputs
- Diagnostic codes

Alarm Module

- One (1) Alarm module with four (4) alarm lamps, push to test, high coolant temperature, low coolant temperature, and low fuel level.
- One (1) alarm horn
- One (1) horn silencer switch

2.4 SOURCE QUALITY CONTROL

2.4.1 Shop Tests

The manufacturer shall shop test the engine-generator set to determine whether the equipment conforms to the specified requirements for load capacity and starting duty. The engine-generator shall be shop tested in accordance with IEEE 115 with its respective generator control panel. Tests for the generator shall be sufficient to assure that the unit will operate successfully and meet its guarantees and shall include, but not be limited to, the following:

- Insulation resistance of all windings
- Polarity of field coils
- High potential on all windings
- Open circuit saturation
- Regulation (with regulator)
- Voltage and current balance Test

neutral grounding resistor for:

- Current transformer polarity and ratio
- Resistor continuity and resistance
- Ground resistance at point of connection to resistor

Testing Procedures: The procedure for the shop test of the diesel engine shall follow the Diesel Engine Manufacturers Association's standard practice, and shall also include at least, but not be limited to, the following:

Preparation: Prior to all starts during initial tests and all starts after new running parts have been installed, the engine shall be connected to a separately driven lubricating oil pump and filtered oil circulated through all the engine channels. The engine shall be thoroughly inspected for oil leaks.

The engine shall be pre lubricated for a sufficient period of time to ensure adequate lubrication. The fuel

system shall be thoroughly flushed with clean shop fuel.

The engine jacket water shall be treated with suitable chemicals, to ensure water that is free of scale-forming and corrosive characteristics. Softening engine jacket water is not sufficient treatment. A chemical corrosion inhibitor, which does not contain chromates, shall be added in amounts as recommended by the vendor. The engine shall be tested with its closed cooling system.

The engine shall be tested with the governor intended for permanent use on the engine. Air filter

or cleaner shall be used for the supply of combustion air during all testing.

The engine shall be given a suitable wearing-in run at reduced speed, after which it shall be brought up to its full rated speed, and load applied in increments and at time as recommended by the manufacturer. Before recording any readings, all operating temperatures and pressures shall have become stabilized and be within the recommended limits for good operation.

Prior to the above eight-hour test run, the engine shall be wiped clean so that any oil leaks, etc., may be readily located. Any leaks which develop shall be properly corrected and the engine given a check run at full load to assure that all required deficiencies have been properly corrected.

Testing: After the wearing-in run, the engine-generator set shall be given a heat run for at least the time indicated at the following loads, and performance readings taken and recorded at 15 minute intervals starting after running 15 minutes at the new load rating.

One hour at 25 percent of full load rating required for the engine. One hour at 50 percent of full load rating required for the engine. One hour at 75 percent of full load rating required for the engine. Four hours at 100 percent of full load rating required for the engine. The following items shall be monitored:

- AC voltage
- AC line current
- Exciter field voltage
- Exciter field current
- Output frequency
- Kilowatt output
- Temperature rise
- Engine lube oil temperature and pressure
- Engine coolant temperature and pressure
- Engine fuel consumption rate
- Engine exhaust gas temperature

Acceptance Tests: The factory acceptance test shall also include the following:

- Start cycle test
- Adjustment and calibration of fuel control and governing modules for generator output frequency regulation and transient response
- Speed transient test
- Testing and calibration of all malfunction and safety devices and circuitry
- Testing of all control and logic circuitry
- AC metering calibration check

Clean-up: After completion of all testing, the following is required:

- All filters and strainers shall be thoroughly cleaned and disposable elements replaced with new units
- All entrapped water shall be drained, and proper protection applied, to prevent the entry of water during shipment or a long period in storage
- The engine shall be given proper treatment for its protection for a long period of storage
- All field connections shall be sealed

PART 3 EXECUTION

3.1 INSTALLATION

Equipment and accessories installed under this section shall be assembled, erected, and placed in proper operating condition in full conformity with specifications, Engineer / Project Managering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by the Engineer / Project Manager.

The complete engine-generator unit shall be grouted in place on a level concrete pad. Anchor bolts shall be supplied by the generator unit manufacturer.

3.2 FIELD QUALITY CONTROL

3.2.1 Field Supervision and Tests

The Contractor shall include a minimum of three 8 hour working days allowance for the services of a competent manufacturer's technical representative to check the installation, make all necessary adjustments and, in the presence of the Engineer / Project Manager, perform acceptance tests on the engine generator unit to determine whether the equipment conforms to specified requirements for load capacity and starting duty.

As part of the field test, each of the automatic shutdown devices shall be made to be operated and the respective values recorded at which the devices actually stopped the engine. Any adjustments
required shall be made in the devices to make the operating values correspond to those recommended by the

engine manufacturer.

Before running the field test, submit a copy of the proposed log sheet on which shall be recorded the load and all corresponding temperatures and pressures as well as the total quantity of fuel consumed during the test. The test shall consist of operations under a load bank at the specified power rating for four continuous hours.

Readings shall be taken and recorded at 15-minute intervals over the four hour test period.

The Contractor shall furnish the fuel, lubricants, load bank, instruments and all other devices necessary for the tests.

3.3 GROUNDING

Provide equipment grounding connections for diesel engine - as shown on the drawing details of grounding refer to section.

MEDIUM VOLTAGE POWER FACTOR CORRECTION EQUIPMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of Contract including General Conditions, Conditions of Particular Application and Division- I Specification Section, apply to this section.

1.2 SUMMARY

This section specifies capacitor-type power factor correction equipment for use in electrical power systems rated 600 Volts and less.

1.3 REFERENCE STANDARDS

The design, manufacture, installation practice of plant equipment as a part of main medium tension panel shall be in accordance with one or more of relevant publications of the following standards:

BS 88	Cartridge Fuses for Voltage up to 1000 Vac
BS 1650	Capacitors for Connection to Power Frequency Systems
BSEN 60949	Control Gear for Voltage up to 1000 Vac

1.4 STANDARD PRODUCTS

Material and equipment to be provided by the manufacturer shall be essentially the standard cataloged products.

Standard catalogue items and IEC (or NEMA) sizes, ratings, capacities and voltages shall be given preference.

Products and manufacturer shall be nationally "listed", "labeled" and "approved" from local concerned authority.

1.5 SUBMITTALS

Submit the following according to Conditions of Contract and Division 1 Specifications:

1.5.1 Product Data: For products specified, include data on features, components, ratings and performance.

Include dimensioned plan, elevation views of enclosure and details of control panels. Show

access and working space requirements.

1.5.2 Three (3) complete original sets of operation and maintenance manuals.

Each set shall include:

- Lists of spare parts for 3 years and replacement to be stored at the site for ready access.
- Detailed Operating instruction covering operation under both normal and abnormal conditions.
- Detailed installation construction manuals

1.6 EXTRA MATERIALS

Furnish extra materials suitable for interconnection, commissioning and operation matching all products installed and identified with labels describing contents.

1.7 SUBSTITUTION OF MATERIALS AND METHODS

In case of any proposed deviation or alternatives, provide sufficient data to allow evaluation of proposed offer.

1.8 SAFETY SIGNS

All access panels to the electrical equipment shall have appropriate warning labels.

1.9 WARRANTY AND PRODUCT QUALITY

Two (2) years warranty after the date of Substantial Completion, for the power factor correction equipment shall be provided, for the materials and manufacturing quality control.

Contractor shall agree to repair or replace the equipment that does not comply with the requirements or fails in work.

PART 2 PRODUCTS

2.1 GENERAL DESCRIPTION

The system shall consist of a power factor correction unit(s) installed in its own enclosure to correct the power factor within range 0.9 lagging to unity as required by the design. IP 43, for indoor installation, and shall be an integral part of Medium voltage panel board. System includes a separately mounted current transformer sensing current in the power circuit being corrected and providing input to the system controls. Capacitor shall be of the dry type and shall be capable of withstanding twice its rated voltage for 10 seconds at rated frequency between terminals and container. Capacitor shall also withstand 3 kV for 10 seconds, capacitor losses shall be less than
0.5 W/KVAR.

2.2 SYSTEMCONFIGURATION

The basic types of power factor correction equipment used to incorporate the capacitor cells may include:

- Automatic Systems: System includes integrally mounted, factory wired major components incorporating:

  - Individual capacitors shall be self-healing utilizing polypropylene as a dielectric with vacuum deposited conductors on the polypropylene as electrode.

  - Each three (3) phase capacitor shall be furnished with an approved pressure sensitive interrupter. The interrupter shall disconnect all three (3) phases at the same time to maintain a balanced circuit.

  - Capacitors shall be contained in hermetically sealed metal cans to prevent atmospheric contaminants from shortening the useful life.

  - Dielectric material shall be low loss, less than 0.5 Watts per KVAR.

  - Dry cells encapsulation medium shall be a thermoplastic material which allows out gassing to engage the pressure interrupter.

  - Terminal bushings shall withstand 10 KVAC to ground and be rated 30 kV or greater.

  - Nominal design life of individual capacitor cells shall be 10 years.

  - Individual capacitor cells shall be covered by a five (5) year warranty.

  - All capacitor cells shall have threaded terminals for wire connection.

  - To reduce line transients on system no stage shall switch more than 20 KVAR and no capacitor cell shall exceed 50.0 KVAR.

  - Multiple fused capacitor banks dry metallized dielectric, self-healing type.

- Multiple contactors that connect capacitor banks selectively to the output circuit. Contactors should be 660 V rated for the repetitive high-inrush-switching duty presented by the capacitor loading, and should be of the fast opening and closing type.

- Solid-state microprocessor-based controls that switch the banks on and off to suit the amount of power factor correction needed as load conditions change in the distribution system served.

- Discharge resistors to discharge safely and automatically the stored energy in the capacitors. Discharge shall be within 1 minute after disconnection from the supply. Resistor shall be chosen to ensure 20 years minimum life.

- Potential transformer needed for the under voltage relay.

- Under voltage relay that interrupts capacitor switching for power supply interruption longer than 15 ms.

- "Advance" and "Retard" pushbuttons on the control panel shall permit manual sequencing of capacitor switching.

- On-off switch.

- Knob to adjust range 0.75 P.F to 1.0 P.F inductive

- Current transformer shall measure the overall current of loads and capacitors mounted on the incoming of the main switchgear and interconnected to the control switching.

- Air-core Type inductors coil mechanically braced to withstand shortcircuit current (S.C.C.) and installed in capacitor circuit may be used to limit switching surges within Contactor ratings.

- Indicating lights LEDs to designate energized capacitor banks.

- Power factor meter.

- Blown fuse indicators, three (3) "push-to-test" blown fuse piolet lights, one per phase, door mounted to indicate a blown fuse condition.

- Main circuit breakers

- Fuses to provide for major, fault protection, line fuses shall be provided on all three (3) phases of each switched stage and fixed bank.

Line fuses shall be current limiting, recognized Class T type or equivalent, minimum interrupting ratings shall be 200 000 Amps for fuses of30 Amps and above.

Fuses shall be designed for capacitor applications and shall be rated not less than 200% capacitor current rating.

- The equipment must comply with BS 800 with respect to Electrical Interface

- All power and control cables used within the capacitor bank enclosure must be in accordance with BS 6231 Type BK.

2.3 FAULT CURRENT CONSIDERATIONS

Air-Core Type inductors and power bus work in the power factor correction units shall withstand the mechanical forces that occur when large short-circuit currents flow.

These currents shall be limited by the appropriate protective means, and the bracing of these components shall withstand symmetrical short-circuit current (S.C.C.) of the system.

The switching device should be sized to exceed the capacitor nominal current as follows:

- Moulded Case Breakers 150%

The switching of capacitor units on each section of switchgear must be controlled by a single relay. The

relay shall:

- Have stage indication
- Be fitted with hand/off/auto controls for each capacitor unit
- Have a time delay between the switching of stages
- Be capable of switching all fitted capacitor units and have provision for switching at least one additional capacitor unit
- Be fitted within the capacitor bank enclosure
- Have provision to switch all capacitors out of circuit when the essential alternator is operating, by operation of a remote relay contact.

Switching contractors must have a minimum duty category AC4 to BS EN 60947 and a minimum current rating of 1.3 x the current consumed by the capacitor bank (See BS 1650).

The wire sizes shall match the switching devices rating.

2.4 PERFORMANCE REQUIREMENTS

The controls shall continuously sense the power factor on the circuit being corrected and when it differs from the target settings for more than 10 seconds, system shall bring the corrected circuit power factor closer to the target setting.

Only one capacitor bank shall be switched at a time.

2.5 WITHSTANDING TRANSIENTS

The construction of the system should give excellent withstanding capability to current transients resulting from frequent switching of the stages of a multi stage capacitor bank.

PART 3 EXECUTION

3.1 INSPECTION

Examine conditions under which centralized automatic power factor capacitor assemblies are to be installed. Notify Engineer / Project Manager in writing of conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

Install centralized automatic power factor capacitor assemblies as indicated in accordance with manufacturer's written instruction, requirements of applicable standards, NECA's "standard of Installation", or equal and in accordance with recognized industry practices to ensure that installation complies with requirements and serves intended function.

Coordinate as necessary to interface installation of centralized automatic power factor capacitor assemblies with other work.

Mount the switchboard assembly on flush steel aligning channels elevated above floor level by a concrete pad and as noted on Drawings. Provide aligning shims to achieve level installation where channels cannot be provided.

Ensure that centralized automatic power factor capacitor assemblies are shipped in sections which will be fitted through the available structures and openings available.

Bond together the centralized automatic power factor capacitor assemblies structure, sections and all conduits terminating at the same with a 120 mm sq. bare copper earth (ground) cable, and connect to the switchboard earth (ground) bus and to the earthing (grounding) grid as required. Provide conduits terminating at centralized automatic power factor capacitor assemblies with earthing (grounding) Wedges of the required size.

Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors.

Provide 6.35 mm minimum thick x 60 cm wide insulation mat in front of centralized automatic power factor capacitor assemblies and rear of freestanding equipment and extend 30 cm beyond ends.

Provide protective covering during construction.

Touch-up marred or scratched surfaces to match original finish.

Provide control fuses, with five spare fuses for each rating. Adjust operating mechanism for free mechanical movement. The following documentation shall be provided detailing:

- Type test certificate
- Routine test certificate
- Maintenance requirements
- Fault diagnosis
- Part list with part numbers and recommended spares
- Commissioning instructions

3.3 FIELD QUALITY CONTROL

Upon completion of installation of equipment and after circuitry has been energized, test equipment to demonstrate compliance with requirements. When possible, field correct malfunctioning units, then retest to demonstrate compliance.

Prior to energization of switchboards and centralized automatic power factor capacitor assemblies:

- Perform insulating resistance test on each pole, phase-to-phase and phase-to-earth for one (1) minute. Minimum test voltage to be 1000 Volts D.C. with a minimum resistance of 100 mega ohms.

- Check centralized automatic power factor capacitor assemblies for continuity and for short circuits.

- Notify Engineer / Project Manager of any abnormalities.

After assemblies are energized, demonstrate functioning in accordance with manufacturers requirements.

3.4 MAINTENANCE

All maintenance and inspection on the capacitor assembly shall be done with the system disconnect device in the open position.

Maintenance and inspections (before handing over of the installation) should be limited to 15 minutes or less so not to affect utility billing.

An annual inspection of the capacitor cell (before the handing over of the installation) shall be done to identify failing capacitor cells (a bulged cover is the symptom to watch for).

HIGH VOLTAGE OIL DISTRIBUTION TRANSFORMER

PART 1 GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General Conditions, Conditions of Particular Application and Division-1 Specification Sections, apply to work of this Section.

1.2 DESCRIPTION OF WORK

This section covers the work of distribution transformers as required by the Contract.

The Contractor is responsible to obtain the approval before delivering manufacturer for the type, voltage, losses, etc. from electrical distribution company. Any additional requirements shall be considered without any extra cost to the Contract.

1.3 REFERENCE STANDARDS

Except as modified herein, the equipment shall be designed, manufactured and tested in accordance with IEC Standard publication No. 76, Parts 1 to 5 inclusive, latest edition.

The oil shall conform to the relevant IEC Standard No. 296/1969 and Amendment1.

1.4 SUBMITTALS

Submit the following in accordance with Conditions of the Contract and Division- I Specification Sections:
- Materials list and manufacturer's data
- Shop drawings and wiring diagram of transformers
- Rooms layout with all equipment inside
- Certificates of compliance
- Spare parts data
- Materials and equipment manuals
- Post-installation test procedures
- Final test report

1.5 TESTING

1.5.1 The following tests shall be performed in the presence of the Consultant or his representative:

- Resistance measurements of all windings on rated voltage connection of each transformer and at extreme taps
- Ratio tests on rated voltage connection and on all tap connections
- Polarity or phase relation tests on the rated voltage connection
- Short circuit, impedance and load loss at rated current and rated frequency on the rated voltage connection
- Insulation resistance test between windings and between windings and earth
- Induced over voltage withstand test
- Accessories test
- Excitation loss at rated voltage
- Excitation current at rated voltage
- Audible sound level tests
- Oil dielectric test.

Prior to shipment the assembled transformer shall be liquid-filled and pressure tested for at least 8 hours at the maximum operating pressure for detecting the presence of leaks.

A certificate for the following type tests shall be submitted:

- Impulse voltage test
- Measurement of maximum temperature rise of oil and windings

1.6 DELIVERY, STORAGE AND HANDLING

Transformers (with bushings installed) shall be crated, as required. All pipe connections shall be provided with sealing devices and valves. Auxiliary devices shall be designed for easy installation on Site and shall be packed and shipped separately.

Store transformers protected from weather, and so condensation will not form on or in transformers components. Provide temporary heaters in accordance with manufacturer's recommendations to prevent condensation.

Handling shall be in accordance with manufacturer's instructions. Use factory installed lifting provisions.

1.7 RELATED SECTIONS

The following sections include requirements which relate to the work of this section:

- Basic Electrical Requirements
- High-voltage Cables
- Grounding

PART 2 PRODUCTS

2.1 OIL TRANSFORMERS

2.1.1 General

Materials and equipment shall be new and completely assembled, wired and tested at the factory. Distribution transformers shall be designed for 3-phase, 50 Hz continuous operation. Insulating oil shall be high-quality mineral oil and shall contain an inhibitor to extend its oxidation life. Rating and stipulated capacity shall be continuous Site-rated capacity under all encountered environmental and climatic conditions.

2.1.2 Characteristics

Distribution transformers shall be oil-immersed hermitically sealed without conservator, natural air- cooled. Insulating liquid shall be oil. Copper conductors shall be used for primary and secondary voltage windings.

Winding temperature rise by resistance shall not exceed 60°C and oil temperature rise shall not exceed 55°C.

Taps shall be provided on high voltage winding with two (2) 2.5% above and four (4) 2.5% below. Distribution transformers shall be equipped with externally operated off load tap changer suitable for de-energized operation. Tap changer shall be gang-operated and be capable of withstanding full transformer short-circuit current without damage. Tap changer shall have at any tap position a position indicator visible from base level.

Permissible overload capacity without undue heating shall be 20% for 1-1Yz hours.

Primary voltage 11 kV as shown on Drawings, 50 Hz, secondary voltage 450/240 Volt; ambient temperature 55°C.

For the windings with rated voltage 11 kV, the basic impulse withstand voltage shall be 75 kV (peak).

The vector group for the transformer shall be m general Dyn 11 or as indicated on Drawings.

2.1.3 Terminations

High voltage terminations shall be complete with cable glands as necessary. Medium voltage termination shall be suitable for feeder busways or cables as shown on the drawings.

High and Medium voltage bushings shall be of highest quality glazed porcelain

2.1.4 Core

Distribution transformer's core shall be built up from grain-oriented stress relieved cold-rolled silicon sheet-steel laminations, insulated on both sides.

2.1.5 Windings

Windings shall be constructed of copper conductors with low losses as per electrical company requirements for each rating insulated with high dielectric strength tapes having very good temperature stability and be firmly braced so as not to be loosen due to short circuits.

The insulation of windings shall be Class "H" insulation and shall consist of materials or combination of materials such as mica, glass, porcelain, quartz and asbestos with or without organic binder. Other materials may be included if tests prove their capability of operating.

2.1.6 Static Shield

A static shield shall be applied where needed to distribute impulse voltage uniformly throughout the winding and prevent undue concentration of electrical stresses in tum insulation and coil section insulation.

2.1.7 Tank and Base

Transformer tank shall incorporate cooling fins. Final finish shall take the form of sand blasting to bare metal, followed by at least two coats of suitable primer and two final coats, medium grey colour or any other color recommended by the supplier.

Transformer tank shall be welded steel construction, suitable for vacuum filling (300 mm vacuum) oil and able to withstand all stresses during transport and operation including full short circuit.

Gasketted joints for tank and cover, bushings and other bolted attachments shall be so designed that gaskets shall not deteriorate due to weathering.

Transformer base shall be designed to permit skidding in directions parallel to either centerline.

2.1.8 Standard Accessories

Each distribution transformer shall be equipped with the following accessories:

- Magnetic oil level gauge with alarm contacts; one (1) normally open and one(1) normally closed (NO, NC).
- Dial-type thermometer with maximum indicating points and alarm contacts (2NO, 2NC).
- Combination drain and lower filter valve and oil sampling valve.
- Upper filter valve and vacuum pump connection.
- Facilities for lifting core and coil assembly from tank without draining oil from transformer.
- Lifting lugs for complete transformer.
- Skid base with jacking and pulling provisions.
- Two grounding pads on diagonally opposed sides for the tank base with bolt type cable clamp adjustable for copper ground cables ranging from 95 mm sq. to 240 mm sq. for tank grounding. One of the pads shall be located at the side where the secondary neutral bushing is mounted.
- Fill hole fitted with plug.
- Bi-directional rollers DIN42561
- Diagrammatic weatherproof stainless steel engraved or etched nameplate. The nameplate shall show full rating of transformer, voltage and tap ratios, impedance, weight, gallon of oil, operational pressure, withstand pressure, vector diagram, etc. and shall bear a connection diagram showing studs, tap changers and other parts. Nameplate shall be in English.
- Explosion diaphragms, to relieve sudden pressure from severe internal fault and sudden pressure protective relay (DgPT2) or equivalent.
- In addition to items listed hereinbefore, provide relaying and protection as manufacturer's standard practice.
- Buchholz relay

PART 3 EXECUTION

3.1 INSPECTION

Inspect each transformer and related accessories for damage, defects and completeness before installing. Inspect previously installed related work and verify that it is ready for installing instruments and equipment.

3.2 PREPARATION

Transformer room shall contain no water, soil piping or ventilation ductwork.

Provide a sump pit of sufficient size to retain the liquid capacity of the transformer. The floor shall be sloped to drain any transformer seepage to the sump pit. Curb retention will also be considered.

Ventilation shall be automatically controlled in accordance with the transformer manufacturer's recommendations and/or national and local codes.

Ensure that installation areas are clean and that construction operations are completed prior to installing equipment. Maintain the areas in a broom-clean condition during installation operations.

3.3 ELECTRICAL WORK

Perform all interconnecting wiring and grounding as indicated, specified and required including cables, conductors, terminals, connectors, wire markers, conduits, conduit fittings, supports, hardware and all other required materials. Provide electrical materials and complete required electrical installations in accordance with the requirements specified in Specification.

3.4 INSTALLATION SUPERVISION

Furnish the service of an approved Engineer / Project Manager, at no additional cost to the Client, specially trained and experienced in the installation of the equipment to: (1) supervise the installation in accordance with the approved material and equipment manuals and (2) inspect, check and adjust as necessary until all troubles or defects are corrected and the installation and operation are acceptable.

3.5 SYSTEM VALIDATION

Provide the services of approved trained and field experienced s, at no additional cost to the Client. This is to validate each system and verify that each system is operational and performing its intended function within system tolerances as specified hereinafter and detailed in the approved post installation test procedures. Validate each system by simulating inputs.

Simulate malfunctions to sound alarms. Check all systems thoroughly for correct operation. Test equipment for this function shall be furnished by the Contractor.

Immediately correct all defects and malfunctions disclosed by tests. Use new parts and materials as required and approved and retest. Provide a report certifying completion and validation of each system.

HIGH VOLTAGE SWITCHGEAR

PART 1 GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General Conditions, Conditions of Particular Application and Division-1 Specification Sections, apply to this Section.

1.2 DESCRIPTION OF WORK

This section covers 11 KV metal clad switchgear as required by the Contract and shall include the following items:

- Circuit Breakers
- Metering and Relay Panels
- Auxiliary Equipment

The high voltage switchboard is fed through two independent feeders via switchgear unit. The load shall be normally shared on these two feeders, however, each feeder can carry the total load whenever troubleshooting exists for the other one.

1.3 REFERENCE STANDARDS

Except as modified herein, the equipment shall be designed, manufactured and tested in accordance with VDE 0670, Part 6 (5/1976) and IEC publication 298 and other relevant Codes and Standards listed in Section.

1.4 SUBMITTALS

Submit the following in accordance with Conditions of the Contract and Division-I Specification Sections:

1.4.1 Product Data

Materials list and manufacturer's data Certificate of Compliance

1.4.2 Shop Drawings

Shop drawings and schematic diagrams including time-current characteristic curves of protective devices plotted on logarithmic transparencies for relaying coordination study application. Also include installation instruction, and wiring diagrams to facilitate reassembly of switchgear which divided into shipping sections

Rooms layout diagrams and general arrangement showing dimensions and weights

Single line diagram for the complete high voltage network indicating earthing interlocking scheme.

1.4.3 Operation and Maintenance

Spare parts list for normal operation and maintenance for 3 year recommended by manufacturer

3 complete sets of operation and maintenance manual for each panel and its internal component (i.e. relays, bus bars, metering, etc.)

1.4.4 Tests

Post-installation test procedure Final test report

1.5 TESTING

The Contractor shall carryout the following test in presence of Engineer / Project Manager and Client's Representative, Schedule of Tests to be submitted to the Engineer / Project Manager at least one week before test start for his review and approval.

1.5.1 Factory Tests

All components shall be thoroughly inspected and factory tested to ensure alignment and adequacy of all functions.

1.5.2 Field Tests

The Contractor shall prepare test procedures for all field tests which should include, but not limited to the following tests:

- Earthing system should be completed and satisfactory tested before start any life test.
- Tightening torque, check for all bus-bars joints assembled on site as well as measuring each joint resistance to minimize the voltage drop through the busbar.
- Primary injection test for power bus-bar after being assembled on site.
- Primary injection test for all current transformers
- Secondary injection test for all protection relays to verify each one characteristic curve.
- Phasing check for all incoming and outgoing feeders.
- Insulation resistance test and transformation ratio check for potential transformers.
- Check of pulse polarity for current transformers.
- Dielectric (Hi-pot) test of complete assembled switchgear

1.5.3 Test Certificate

Submit for the Engineer / Project Manager approval all field test results, test results shall not be accepted if:

- Not witnessed by the Engineer / Project Manager
- Not performed according to the approved test forms and procedures
- The results are less than the min. accepted value by the Reference Standards and/or Specifications.

1.6 DELIVERY, STORAGE AND HANDLING

Shipments shall be securely packed for delivery with a waterproofed type providing protection against excessive heat, humidity, water or damage. When material must be bundled due to excessive size, each bundle shall have a metal tag securely tied on with heavy gauge wire. Purchaser's markings shall be die stamped on the tag.

Equipment, relays and other components with moving or fragile parts shall be properly blocked, tied or packed to prevent damage.

Any component shipped separately shall be clearly marked with description use and installation instructions.

All components that must be disassembled for shipment shall be properly match-marked and provided with dowel pins or bolts (if required) to ensure realignment in the field.

All packages shall be marked with equipment tag number for identification when shipped and when received at Site.

Sections shall be grouped in not more than 5 sections per crate.

Each shipping unit shall be equipped with shipping angles or lifting lugs for handling by crane.

1.7 RELATED SECTIONS

The following sections include requirements which relate to this section. General

Electrical Requirements
High Voltage Cables

PART 2 PRODUCTS

2.1 GENERAL

Materials and equipment shall be new and completely assembled, wired and tested at the factory requiring only field installation and connection of power and control circuits to place the equipment in service.

Switchgear and auxiliaries shall be designed for 11 KV, 3-phase, 50 Hz, power supply.

Switchgear shall be installed inside an enclosure with all feeder and control wiring entering the switchgear from below.

Switchgear line up shall contain all equipment indicated in the single line diagram, Drawings and in Specification or as required by the manufacturer's standard practices.

Arrange for continuous integrated mimic bus on front of switchgear line up in single line diagram format, using symbols consistent with Drawings to produce a concise visual conception of the principle switchgear components and connections. To represent the bus and components, use metallic strips fixed to panels with countersunk corrosion resistant screws.

All ratings shown on single line diagrams are the required operational equipment ratings. It shall be the Contractor's responsibility to ensure that equipment furnished satisfies the ratings shown.

The Contractor shall assume all responsibility for mechanical and electrical coordination of equipment and devices required by Drawings and Specifications.

Interrupting capacities and short circuit ratings shall be as shown on Drawings.

The minimum rating for the integrated mam medium voltage (11 kV) switchgear assembly shall be as follows:

Voltage	11 kV, 3-phase, grounded wye
Short Circuit-Interrupting	50 kA, 3 phase symmetrical at 11 kV
Short Time Current (r.m.s.)	50 kA for 1 second
Peak Making Current	75 KA

Rates shall be referred to withstand short circuit for 1 second.

2.2 SWITCHGEAR

2.2.1 Apparatus

The switchgear assembly shall be metal clad type, consists of the following units and as shown on Drawings:
- SF6 circuit breaker cubicles for incoming and outgoing
- Bus riser unit
- Bus Coupler SF6 circuit breaker
- Accessories, metering, relays, etc. as indicated on single line diagrams and other Drawings. The

switchgear shall be of the indoor true metal-clad type according to IEC 60298 standard.

The circuit-breaker, current transformer and H.V. cable connection, bus bar, M.V. devices shall be arranged inside four different compartments

Each compartment shall be fully segregated by metallic partitions which must be permanently electrically bonded together to a common copper earthed conductor for the entire switchgear. Conductors.

Passage between different compartments shall be via insulating bushings (flowerboxes) in order to allow for electrical connection between circuit-breaker and cable compartment and electrical connection between circuit-breaker and bus bar compartment.
The flower-box bushings will also act to provide accurate positioning of the withdrawable circuit breaker contacts without adjustment.

All auxiliary equipment, transition sections and other necessary components required for complete installation and proper operation, although not specifically listed herein, shall be furnished and included in the switchgear assembly.

Protection shall be as shown on Drawings, required by Specifications and in accordance with manufacturer's standard practice.

All non-segregated phase bus ducting, together with all of the necessary components required for complete installation and proper operation, shall be furnished. The switchgear shall consist of individual cells, each cell housing one circuit breaker mounted on a horizontal with draw able truck self rolling on the floor.

The switchgear shall allow future extension from both ends. Preference shall be given to the switchboard with minimum width to allow any future extension within the same room.

According to IEC requirements, the circuit-breaker compartment shall be separated from both cable and bus bar compartments by two permanently earthed upper and lower metallic shutters to give safety against electrical shocks. Non metallic shutters will be rejected.

Shutters shall be operated by a positive drive mechanism linked to the circuit-breaker truck position. Mechanisms that use gravity fall of the shutters will be rejected.

When shutters are closed, they shall be automatically and mechanically locked in position.

Upper and lower shutters must be differently color coded such that cable side shutter can be differentiated from bus bar side shutter.

The metallic shutters must be equipped with padlocking facilities to enable locking of the two shutters in the closed position.

The design of the switchgear shall not facilitate manual handling of the shutters by the operating staff even if the circuit breaker is removed.

It is a must that the command of all necessary devices for operation must be done from the front of the panel in particular:
- Closing and opening of the circuit-breaker.
- Closing and opening of the earthing-switch.
- Metering, control and protection relays

The withdrawable circuit-breaker truck shall have three distinguishable positions,
- Connected-Position: The circuit breaker is engaged to main circuit
- Test-Position: The circuit breaker is disengaged from main circuit but can be electrically tested for proper operation
- Disconnected-Position: The circuit breaker is totally disconnected from main and control circuits

Each position shall be clearly visible from a distance not less than 5 meters.

When the circuit-breaker truck is either in "test" or "disconnected" position, the breaker should be out the front of the switchboard and the metallic shutters shall be closed.

The switchgear degree of protection shall be IP 3X according to IEC-60529.

The switchgear shall be designed in such a way to prevent access to any live part during service, as well as during maintenance operation.

The switchboard shall be mounted on appropriate civil Engineer / Project Managering iron rails.

2.2.2 Cable Incoming Feeders

Where incoming power feed is shown as cables, solderless pressure-type lugs, with stress cones as required, shall be provided for the termination of shielded power cables whose sizes and type shall be determined in coordination with power supply company. Lugs, bolts, washers and ancillaries shall be furnished by the switchgear manufacturer for type and size of cables installed.

The Contractor shall make such coordination.

Sufficient space shall be provided in the cable incoming compartment for glands for number and size of cables as determined by supply Company.

2.2.3 Outgoing Circuit

Outgoing circuits shall be cable-installed in trenches and shall exit the switchgear from underneath.

Sufficient space shall be provided in cable outgoing compartments for glands and number and size of cables as shown on one line diagram.

A means of exiting the switchgear from underneath shall be provided for cables.

2.2.4 Switchgear Enclosure and Structure

All enclosure doors and panels shall be provided with neoprene or equivalent gaskets and shall be tightly assembled. Removable sheet metal bottom gland plates of thickness not less than 3 mm shall be in all cubicles. All ventilation openings shall be covered with 6 mm steel mesh provided with dust proof filter.

Removable panels and doors shall be fastened as per manufacturer's standard. All hardware and fasteners shall be steel with a heavy coating of zinc or chrome or manufacturer's equivalent.

Each cubicle shall include an integral steel frame suitable for installation on a concrete or steel floor.

All structures and enclosures shall be thoroughly cleaned to remove dust, mill scale and dirt and painted inside and outside with manufacturer's standard color. No lead pigment paint shall be used.

Any approved modifications to the manufacturer's standard enclosure for the purpose of compliance with Specification shall be factory assembled by the manufacturer.

The entire switchgear assembly shall be tropic proofed.

2.2.5 Bus Work

The main bus shall be horizontal, 98% conductivity, electrolytic, copper, of full capacity for the entire length of the switchgear assembly; have provision to maintain firm contact at bolted joints and have provisions for extension on either end. All bolted joints shall be silver plated.

Bus shall be enclosed to prevent accidental contact and prevent propagation of arcing from one cubicle to the next. The main bus shall have flame-retardant insulation.

Bus support insulators shall be track resistant and have the highest quality cast resin. The main bus shall be sized to carry the continuous current indicated on Drawings, withstand 55°C temperature rise above 55°C ambient temperature and be braced for the RMS symmetrical short circuit current indicated.

Copper ground bus, of sufficient size to support cable lugs, shall be rigidly bolted to the lower part of each cubicle frame. The ground bus shall be continuous for the entire length of each shipping section. Provisions shall be made to join all the ends of the ground busses together for all shipping sections to form a continuous full length bus when the switchgear line up is completely assembled in the field. The end of the ground bus in end cubicles of the switchgear line up shall be drilled and provided with pressure-type solderless lugs for use with 16 mm sq. through 240 mm sq., stranded, bare, copper, ground cable

2.2.6 Circuit Breakers

Circuit breakers shall be SF6 type; they shall not need any special maintenance or refilling with SF6 during their whole life time (i.e. to be of the sealed pressure system according to IEC 60056 appendix EE).

In order to insure high electrical endurance the circuit breaker must have two sets of internal contacts, one set acting as primary contacts and a second set acting as arcing contacts.

All circuit breakers of the same type and rating shall be interchangeable. However circuit breakers of different ratings must not be allowed to be inserted in the position of another circuit breaker that has a higher rating.

To achieve maximum safety for operating personnel, the circuit breaker must be equipped with a safety membrane, which upon failure of the breaker shall rupture to release the hot gases in the inside direction of the cubicle.

Built-in interlocks shall prevent any mishandling and provision for key locking shall be made. It shall

be impossible to:
- Insert or withdraw the circuit breaker when it is in a closed position
- Close the circuit breaker unless it is located in service or test position
- Insert the circuit-breaker truck into the cubicle without connecting the MV control plug
- Disconnection of the MV control plug while the circuit-breaker truck is in the Connected-position

The life expectancy shall be at least 25 years. The circuit breaker enclosures shall be made of molded epoxy resin casing.

For maximum safety, should the SF6 gas falls to zero relative pressure the breaker must still be able to break at least for one time 60% of its rated short circuit current. The manufacturer must be able to prove this by providing suitable type testing certificates

Periodic mechanism lubrication shall require at the most not less than every 5000 cycles or five years.

The design of circuit breaker mechanism shall enable checking the degree of wear of arcing contacts without opening the breaker poles.

Circuit breakers shall be equipped with an electrical spring stored energy operating mechanism, including at least:
- One electrical motor, recharging the mechanism as soon as the breaker is closed or opened
- One anti-pumping relay to prevent the closing the breaker if the closing coil being fed continuously while the opening coil is energized.
- One shunt trip opening coil
- One closing coil

Circuit breakers shall be fitted with a mechanical operation counter.

On the front plate of the circuit breaker, indication and control devices shall be provided as follows:
- Mechanical indication of the position of the circuit breaker, positively driven in both open and close positions.
- Mechanical indication of the state of the motor charged spring, this shall clearly show whether the spring is charged or not.
- Provision shall be made for local manual tripping and closing of the breaker and at the front of the cubicle, a plate shall bear all the indicating and control devices necessary to carry service operations.
- Local manual spring release.
- Emergency hand operated local spring charging device.

The circuit breaker shall be equipped with a 2 NO and 2 NC of auxiliary contacts. They shall be positively driven in both positions and to be mounted in such a way as to facilitate maintenance and inspection.

The circuit breaker shall be equipped with SF6 pressure switch. Should the SF6 pressure falls below a standard manufacturer set pressure value, the pressure switch will ensure circuit breaker is tripped and blocked in OPEN position.

Each basic circuit breaker unit shall consist of a re-strike free, withdrawable SF6 circuit breaker 630 A which shall be a 120 VAC motor operated charging mechanism.

The circuit breaker shall be electrically and mechanically trip free.

Circuit breaker shall be rated at 500 MVA at 11kV rating nominal 3-phase class with a normal continuous current rating as sown on Drawings bus. Breaker shall be rated at least 40 kA RMS symmetrical at 11 KV and shall have a closing and latching capability of 60 kA. Rates shall be referred to withstand short circuit for one (1) second. Operating cycle shall be open, 15-second time delay, close/open, (0-15 sees-CO). Automatic reclosure shall not be required.

2.2.7 Instrument Transformers and Control Switches

Instrument transformers shall be sized for burden requirements of connected meters with accuracy Class as follows:

- Current Transformers (CT's): Class 0.5 for metering and 1.0 for protection 10 ratio as shown on the Drawings.
- Potential Transformers (PT's): Metering- Class 1

All potential transformers shall be provided with current limiting fuses. Voltage rating for the secondary winding shall be of ratios:

$$\frac{12000}{\sqrt{3}} \;/\; \frac{415}{\sqrt{3}} \;/\; \frac{240}{\sqrt{3}}$$

for metering and protection. The thermal rating of the transformers shall be sufficient to provide the total current required to operate the burdens on the secondaries without exceeding the rating of transformer as indicated on nameplate. PT's (1 per phase) shall be installed either as a unit drawout assembly or with an isolating switch in a separate compartment so that the transformers, primary fuses and secondary circuits may be inspected and tested in a completely de-energized condition.

CT's shall have mechanical and thermal rating equal to the rating of the circuit breaker and LBS. Secondary rating shall be 5 amperes and primary ratings shall be as shown on one-line diagram. Transformer shall be capable of carrying 120 percent of rated current for one hour. Ground current sensing transformers shall have a one ampere secondary current.

All instrument transformers (current and voltage) must be installed in the cable compartment.

In the event of primary fuse blow-out of the potential transformer it shall be possible to replace the primary fuses without interrupting the switchgear accordingly the potential transformers must be movable to allow for the replacement of fuses.

Incoming cells should have their movable instrument transformers located at the incoming cable compartment

2.2.8 Earthing switch

Each incoming or outgoing cell must be equipped with integral earthing switch.

The earthing switch shall be located in the cable compartment while it should be operated from the front of the cubicle.

To prevent human error, the position of the earthing switch must be easily seen from both the front and the back of the switchgear by means of mechanical indicators.

Mechanical interlocks shall be provided to avoid any wrong operation such as:

- Closing of earthing switch if the breaker is not totally withdrawn outside its cubicle (disconnected position)
- Inserting of a breaker if the earthing switch is in a closed position

Padlocking facilities shall be fitted to enable the earthing switch to be locked in both positions "closed" and "open". The position of the integral earthing switch shall be clearly visible from the front of the switchboard as well as from behind to prevent mistakes during maintenance works.

The position of the earthing switch should be positively driven (i.e. to be directly linked to the earthing blades and not to the operating handle) such that in case of mismatch between the earthing switch operating handle and the position of the earthing blades the indicator will only reflect the actual position of the earthing blades

The Earthing switch operating handle shall have a direct acting mechanism such that the handle shall never break in the event that the earthing switch blade are stuck in a certain position. (switchgears utilizing mechanisms having gears or weak links will be rejected)

Special notes for Incoming Cells:
- Each incoming cell shall be equipped with one capacitor divider per phase fitted at the incoming cable connection point.
- Each capacitor divider shall be connected to a neon indicator lamp located at the front side of the panel (one lamp per phase).
- A facility for external avometer connection shall be provided at the neon indicator lamp holder to directly measure the output voltage of each capacitor divider directly to test the operation of the neon lamps.

2.2.9 Wiring

All switchgear control wiring shall be as per-manufacturer's standard. Switchgear wire shall be rated 90°C, flame resistant.

All wiring shall be neatly and compactly arranged and cross section area not less than 1.5 mm sq.

All terminals, auxiliary devices, internal wiring troughs, and miscellaneous materials necessary for a complete installation shall be provided.

All wires and terminals shall be marked with permanent wire markers corresponding to Drawings.

Wiring and interconnection diagrams between cubicles, compartments and sections and between shipping sections of the switchgear assembly shall be provided.

Wiring terminal blocks shall be extra heavy duty phenolic type, or equal, rated at least 600 V AC with solderless tubular clamp type contacts for power circuits. Locking spade tongue crimp connectors shall be used for instrument and control circuits. Provide 20 percent spare terminals.

Protection for control circuits shall be by circuit breakers, with the exception of 11 KV potential transformer primaries which shall be protected with current limiting fuses.

Indicating lights shall be installed as shown on Drawings and required by IEC. All indicating lights shall be "Press-to-Test" type.

2.2.10 Measuring and Recording Devices

Measuring instruments shall be flush type and of suitable dimensions. They shall be of the precision industrial type of approved make and fine finish. Their accuracy shall not be affected by variation of ambient temperature. The Contractor shall guarantee their degree of accuracy and submit official test certificates for all measuring and recording instruments as shown on Drawings. Scale range shall be as shown and as required for accurate actual load conditions.
Approval shall be made after reviewal of complete manufacturer's detailed information which shall be submitted by the Contractor.

All meters must be digital with LCD display and ready for future connection to building management system.

2.2.11 Digital Protection Devices

Protection must be insured by a fully microprocessor based digital relay. The protection functions must be as shown on the drawings.

The protection relay must be equipped with LCD display with back-light.

The protection relay must allow easy configuration to its settings by use of interface software (the software must be supplied).

It should be easy to configure the outputs to be of latching type or self reset as per requirements of local electrical utility company.

All relays within the switchgear must be connected together to form a logic selectivity scheme (as well as zone-selective-interlocking).

Any relay installed on a feeder circuit that may act as incoming or outgoing must have two tables of settings so that the appropriate table of setting may be activated depending on direction of flow of energy (incoming or outgoing)

All relays must have an internal watchdog protection to detect internal failure of the relay circuitry.

In case that shunt trip release method is specified then the protection relay must have a trip circuit supervision function.

Protection relays must show on their screen English messages indicating of fault, reason for trip and value at which the protection trip was initiated.

The protection relay must have trip value accumulation function so that it can be easily to statistically verify the state of the circuit breaker contacts depending on the accumulated value of interrupted currents seen by the breaker.

Protection relays must be able to be connected to 1 or 5 Amp current transformer Secondary.

2.3 ACCESSORIES

Furnish without any cost to the contract. The following in addition to all standard accessories:
- Additional hand cranking lever per switchgear line up.
- One high-voltage hot line detector with hot stick handle.

All indicating lamps used in the switchboards should be semi-conductor LED diodes. Use of neon or incandescent indicating lamps is not acceptable.

All indicating lamps and pushbuttons should be chromated metallic base and body.

2.4 SPARES

Provide the following spares in addition to those previously specified:
- One (1) set of potential transformer current limiting type fuses for each potential transformer installation.
- Ten (10) carton of indicating lamps.

Spare parts for 3 years of operation and maintenance recommended by manufacturer. The list shall be provided for approval during the bidding stage.

PART 3 EXECUTION

3.1 INSPECTION

Inspect each switchgear assembly and related accessories for damage, defects, completeness and ensure that all devices are in correct operating condition before installing. Inspect previously installed related work and verify that it is ready for installation of instruments and equipment.

3.2 PREPARATION

Ensure that installation areas are clean and that construction operations are completed prior to installing equipment. Maintain areas in a broom-clean condition during installation operations. The area or enclosure in which the switchgear is to be located shall be continuously clean. Assure that all energized areas are locked to prevent access by unauthorized personnel.

3.3 ELECTRICAL WORK

The Contractor shall perform all interconnecting wiring and grounding as indicated, specified and required and shall include cables, conduit fittings, supports, hardware and all other required materials. Provide the electrical materials and complete all required electrical installations in accordance with the requirements specified in Specification and as shown on Drawings and one line diagrams. For bus bars joints assembled on site and after completing the required tests, apply joint insulation for each joint the material and method of application must be provided and/or as recommended by manufacturer.

3.4 LABELING

Identify components as required by codes and manufacturer's standards and according to General Electrical Requirements Section.

3.5 INSTALLATION SUPERVISION

Furnish the service, at no additional cost to the Client, of an approved Engineer / Project Manager especially trained and experienced not less than 10 years in the installation of equipment to: (1) supervise the installation in accordance with the approved material and equipment manuals and (2) inspect, check, adjust as necessary in accordance with Specifications until all trouble or defects are corrected and the installation and operation are acceptable.

3.6 SYSTEM VALIDATION

Prepare a Post Installation Test Procedure and submit for approval. These procedures must include all tests and commissioning required by the manufacturer as specified above.

Provide the services, at no additional cost to the Client, of trained and field experienced approved Engineer / Project Manager(s) to validate each switchgear system to verify that each system is operational and performing its intended function as specified and detailed in the approved Post-Installation Test Procedures. Validate each system by simulating inputs. Switchgear assembly shall be given conditional test to assure correct polarity connections between transformers (current and/or potential) and protective relays.

Simulate malfunctions to sound alarms. Check all systems thoroughly for correct operation. Test equipment for this function shall be furnished by the Contractor.

Immediately correct all defects and malfunctions disclosed by tests. Use new parts and materials as required and approved and retest. Provide a final test report certifying completion and validation of each system.

AUTOMATIC TRANSFER SWITCHES

PART 1 GENERAL

1.1 SCOPE

This section covers the furnishing, the installing, and the placing in operation of the Automatic Transfer Switch.

1.2 REFERENCES

1.2.1 Governing Standards

Except as modified or supplemented herein, all equipment and materials required in this section including their installation shall conform to the applicable requirements of the following standards. Standards current at the time of tender shall be used.

National Electrical Manufacturers Association NEMA No.

ICS 1	Industrial Controls and Systems
ICS 2	Industrial Control Devices, Controllers and Assemblies ICS
4	Terminal Blocks for Industrial Use
ICS 6	Enclosures for Industrial Control and Systems

National Fire Protection Association NFPA No.

70	National Electrical Code
99	Standards for Health Care Facilities
110	Emergency and Standby Power Systems

Underwriters Laboratories, Inc. UL No. 1008
Automatic Transfer Switches

1.3 QUALITY ASSURANCE

1.3.1 Installer's Qualifications

The Contractor shall submit data showing that he has successfully installed systems of the same type and design as specified herein, or that the Contractor has a firm contractual agreement with a subcontractor having not less than ten years' experience in the design and installations of such system. Data shall include names and location of at least two installation he or his referenced subcontractors has installed such systems. The references shall indicate type and design of each system and certification that each systems has performed satisfactorily in the manner intended for not less than three years.

1.3.2 Client's Acceptance and Contractor's Responsibility

The Client's acceptance of the Contractor's working drawings shall not relieve the Contractor from responsibility for errors, omissions, or deficiencies in the work The Contractor shall verify actual conditions in the field and shall take all measurements necessary for proper installation of this work.

1.4 SUBMITTALS

Submit the following in accordance with the requirements set forth at the Conditions of Contract.

1.4.1 Drawings and Data

One line diagram of ATS assembly and elementary or schematic and wiring diagram of the unit in plastic lamination permanently secured to the inside of the front enclosure door. An interface equipment connection diagram showing all conduits and wiring between the ATS all other related equipment. The one-line diagram shall show interlocking provisions and cautionary notes, if any.

It shall also general arrangement and complete dimensional layout of the equipment.

Above drawings shall show components description, technical ratings of equipment and materials.

1.4.2 Certificates

Test certificates shall be executed and submitted prior to final inspection and acceptance in accordance with the requirements of NEMNIEC standards. The certified tests reports shall show date, time and duration of the overload, endurance and temperature tests, and that the unit under test was not de-energized during the test sequence. Three certified copies of each test certificate shall be submitted to the Employer/ Engineer / Project Manager.

1.4.3 Test Plan

Test plan and test procedures for the acceptance tests. The test plan and test procedures shall explain in detail, step-by-step actions and expected results to demonstrate compliance with the requirements specified. The procedure shall also explain methods for simulating the necessary conditions of operation to demonstrate system performance.

1.4.4 Acceptance Tests

Test reports in booklet form showing all field tests are performed to adjust each component and to prove compliance with the specified performance criteria, upon completion and testing of the installed system. The reports shall include the manufacturer, model number, and serial number of test equipment used in each test. Each report shall indicate the final position of controls and operating mode of the System

1.4.5 Operations and Maintenance Manuals/Charts and Spare Parts Data

Complete operations and maintenance manuals/charts including spare parts data and wiring diagrams of all equipment furnished under this section.

1.5 DELIVERY, STORAGE AND HANDLING

1.5.1 Storage

Supplementing the storage requirements described in General Equipment Stipulations the manufacturer shall acknowledge storage conditions at the time of submitting his Tender. The equipment may not be operational within 90 days after manufacture, and the manufacturer shall crate and prepare the equipment for export transportation and long-term storage. Precautionary measures for prolonged storage shall be provided by the manufacturer at the factory. The Contractor shall be responsible for storage and maintenance of the protective measures as recommended and instructed by the manufacturer while stored at the storage site.

In addition to the protection specified for prolonged storage, the packaging of spare parts shall be prepared for export packing and shall be suitable for long-term storage in a damp location. Each spare item shall be packed separately and shall be completely identified on the outside of the container.

Instructions for the servicing of equipment while in long-term or prolonged storage shall accompany each item of equipment. An enclosed instruction with each package shall be noted on the exterior of the package and shall be in the English languages.

1.5.2 Verification of Dimensions

The Contractor shall become familiar with the details of the work and working conditions, shall verify dimensions in the field, and shall advise the Employer/ Engineer / Project Manager of any discrepancies before performing the work.

1.5.3 Warranty

The Maintenance Period for the equipment and appurtenances shall begin when the performance test on the equipment and appurtenances has been successfully completed and preliminary accepted as stipulated in the Conditions of Contract.

1.5.4 Spare Parts

All lists of all spare parts required for adjustment, operation, and maintenance of the equipment for a period of three years from the date of the certificate of completion shall be provided in accordance with the requirements of General Equipment Stipulations.

1.6 INSTRUCTIONS AND TRAINING ON OPERATION AND MAINTENANCE

Contractor shall provide instructions and training for the staff to be assigned in the operation and maintenance of the equipment specified under this section. Training and instructions shall be in accordance with the requirements set forth at the Conditions of Contract.

PART 2 PRODUCTS

2.1 AUTOMATIC TRANSFER SWITCH (ATS)

ATS shall be double throw, electrically operated, mechanically held, fully protected, complete with voltage sensing relay. ATS is mechanically held and electrically operated by a single solenoid mechanism energized from the source to which the load is to be transferred. ATS shall be suitable for use in emergency or standby systems described in NFPA 70. ATS shall be UL listed or any other European Standard, and test reports are approved as being equivalent of test results and certified test reports as those determined and reported by UL or any other European Standard. ATS withstand symmetrical short circuit RMS is 50 kA except that the ATS shall not be equipped with either overload or fault current protective devices and shall be designed and manufactured to prevent stops in an intermediate or neutral position during transfer by the use of electrical actuators and stored-energy mechanisms.

Automatic Transfer Switch (ATS) shall have a continuous phase or main current rating equal to or exceed the rating shown but, in no case, less than 125 percent of the full load rating of the emergency power source, 415 Volts, 4P, 50 Hz and 50 kA symmetrical minimum interrupting capacity, or as shown on the drawings. No circuit breaks system shall be allowed.

2.1.1 Override Time Delay

Time delay to override monitored source deviation shall be adjustable from 0.5 to 6 seconds and factory set at 1 second. The device shall detect and respond to a sustained voltage drop of 30 percent of nominal voltage between any two of the normal supply conductors, and initiate transfer action to the emergency source and start the engine-driven generator set after the set time period. The pickup voltage shall be adjustable between 90 to 100 percent of nominal and factory set 90 percent. The dropout voltage shall be adjustable from 65 to 70 percent of the pickup value, and factory set at 70 percent of nominal voltage.

2.1.2 Transfer Time Delay

Time delay before transfer to the emergency power source shall be adjustable from 0.2 to 120 seconds and factory set at 10 seconds. The device shall monitor the frequency and voltage of the emergency power source and transfer when frequency and voltage is stabilized at or above 90 percent of rated values. The pickup voltage shall be adjustable from 85 to 100 percent of nominal, and factory set at 90 percent. The pickup frequency shall be adjustable from 90 to 100 percent of nominal and factory set at 90 percent.

2.1.3 Return Time Delay

Time delay before return transfer to the normal power source shall be adjustable from 2 to 30 minutes and factory set at 30 minutes. The time delay shall be automatically defeated upon loss or sustained under voltage of the emergency power source, provided that the normal supply has been restored.

2.1.4 Auxiliary Contacts

Two normally opened and two normally closed auxiliary switches shall operate when the transfer switch is connected with the normal power source, and two normally opened and two normally closed switches shall operate when the transfer switch is connected with the emergency power source.

2.1.5 Control Panel

The transfer switch shall be equipped with a microprocessor based control panel. This panel will perform the operational and display functions of the transfer switch. The panel digital display shall be accessible without opening the door of enclosure and can be connected to BMS system via serial or parallel ports to transfer all data by implementing Ion, back net, modulus protocol.

2.1.6 Supplemental Features

The ATS shall also be furnished with the following:

- Engine start contact
- Pilot lights to indicate switch positions
- Alternate source monitor
- Test switch
- Close differential protection
- Three-position selector switch "STOP", "TEST", "Automatic"

2.1.7 Motor Starter Control

Under voltage and timing relays, including any auxiliary relays required, shall be installed in the ATS enclosure to provide an adequate number and type of properly rated contacts to control the operation of remote motor controllers or starters shown. Devices and wiring in an external to the ATS shall cause motors to be de-energized for an adjustable period of time before the operation of the ATS in either direction and, subsequently, to cause motors connected to the ATS load bus to be energized immediately after transfer at time intervals shown. The time range shall be approximately from 1 to 15 seconds and factory set at 3 or 5 seconds.

2.1.8 Operator

A manual operator, conforming to the applicable provisions of UL 1008, shall be provided to permit manual operation of the ATS without opening the ATS enclosure, and incorporate features to prevent operation by other than authorized and qualified personnel. The ATS shall be designed for use of the manual operator under no load conditions in the usual instances, but with the capability of operation under load conditions when necessary.

2.1.9 Override Switch

The override switch shall by-pass automatic transfer controls so the transfer switch will transfer and remain connected with the emergency power source, regardless of the conditions of the normal power source. If the emergency source fails and the normal source is available, the transfer switch shall automatically retransfer to the normal source.

2.1.10 Green Indicating Lights

A green indicating light shall supervise the normal power source and shall have a nameplate engraved NORMAL.

2.1.11 Red Indicating Lights

A red indicating light shall supervise the emergency power source and shall have a nameplate engraved EMERGENCY.

2.2 ENCLOSURE

ATS and accessories shall be in a wall mounted, free-standing or floor-mounted IP 43, Type 1, smooth sheet metal enclosure constructed in accordance with UL 1008. Intake vent shall be screened and filtered. Exhaust vents shall be screened. Gauge of the metal shall be not less than 2 mm. Doors shall have suitable hinges, locking handle latch, and gasketed jambs. Enclosure shall be equipped with at least two approved size and type of grounding lugs or bar for the purpose of grounding the enclosure using at least 16 mm sq. copper conductors to the facility ground system. A thermostatically controlled heater shall also be provided within the enclosure to prevent condensation over the temperature range stipulated in paragraph SERVICE CONDITIONS. Factory wiring within the enclosure and the Contractor's field wiring terminating within the

enclosure shall comply with NFPA 70. If wiring is not color coded, wires shall be permanently tagged near the terminal at each end with the wire number shown on approved detail drawings. Terminal blocks shall conform to NEMA ICS 4. Terminal facilities shall be suitably arranged for entrance of external conductors from the top or bottom of the enclosure or from the top and bottom, as shown. Main switch terminals, including the neutral terminal, shall be of the pressure type and suitable for the termination of the external copper conductors shown. Extension of bars can be connected to the terminal to accept the conductors.

2.2.1 Construction

Enclosure shall be constructed for convenient removal and replacement of contacts, coils, springs and control devices from the front without the disconnection of external power conductors or the removal or disassembly of major components. Enclosure housing of ATS shall be constructed to protect personnel from energized components.

2.2.2 Finishing

Painting required for surfaces not otherwise specified and finish painting of items only primed at the factory shall be as manufacturer's recommendations

2.3 TESTING

2.3.1 Laboratory Testing

Testing shall be completed on the ATS to be supplied under these specifications, or shall have been completed on a previous, randomly selected standard production ATS unit having the same model number and capacity as the ATS specified. Endurance and temperature tests shall be conducted in that sequence and within the shortest practicable period of time on the same ATS without de-energization of that ATS under test. The test sequence for the ATS listed below shall be followed. No deviation will be granted that is less stringent. Approval will not be granted to deviate from the endurance and temperature test sequence.

- General
- Normal Operation
- Overvoltage
- Under voltage
- Endurance
- Temperature rise
- Dielectric Voltage - Withstand
- Contact Opening
- Dielectric Voltage - Withstand (Repeated)
- Withstand
- Instrumentation and Calibration of High Capacity Circuits
- Closings
- Dielectric Voltage - Withstand (Repeated)
- Strength of Insulating Base and Support

2.3.2 Factory Testing

In addition to other factory tests, each completely assembled ATS unit shall be subjected to dielectric and operational tests, and withstand tests.

Withstand Test

In Excess of UL 1008 Requirements: The ATS shall be tested and rated to withstand an available fault or short-circuit current of 30 KA symmetrical minimum interrupting capacity, or as shown on the drawings.

Dielectric Tests:

Tests shall be performed in accordance with NEMA ICS 1. Wiring of each control panel shall be subjected to voltage surge tests as stipulated in IEEE C37.90. 1. Impulse withstand rating tests shall be performed in accordance with the requirements of NEMA ICS 1.

Operational Tests:

Tests shall be performed and shall demonstrate that the operational sequence of each ATS unit conforms to the requirements of the specifications with regard to operating transfer time, voltage, frequency, and timing intervals.

PART 3 EXECUTION

3.1 INSTALLATION

The ATS shall be installed as indicated and in accordance with approved manufacturer's instructions.

3.2 OPERATIONAL TESTING

Following completion of the installation of each of the ATS, the Contractor shall perform operational tests in accordance with the written instructions of the manufacturer after having made proper adjustments and settings to demonstrate that each of the ATS functions satisfactorily and as specified. The Contractor shall advise the Employer/ Engineer / Project Manager not less than 5 work days prior to the scheduled date or dates for operational testing, and shall provide certified field test reports to the Employer/ Engineer / Project Manager within 2 calendar weeks following successful completion of the operational tests. The test reports shall describe all adjustments and settings made and all operational tests performed.

MEDIUM VOLTAGE SWITCHBOARDS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

Drawings and General Provisions of the Contract, including General Conditions, Conditions of Particular Application and Division-1 Specification Sections, apply to work of this Section.

1.2 DESCRIPTION

This section covers medium voltage metal enclosed switchgear as indicated on the Drawings and required by the Contract and shall include the following items:

- Switchboard
- Distribution Boards
- Branch Circuit Panel-boards

1.3 RELATED SECTIONS

The following sections of work contain requirements that relate to this Section: General

Electrical Requirements
Grounding and Bonding Automatic
Transfer Switches Enclosed Bus
Assemblies

1.4 SUBMITTALS

Submit the following in accordance with the Conditions of the Contract and Division-1 Specification Sections.

1.4.1 Materials Lists, Manufacturer's Data and Descriptive Literature

- Shop drawings, schematic and wiring diagrams
- Room Layout diagrams and general arrangement showing dimensions and weights
- Certificates of compliance
- Spare parts list recommended by the manufacturer for normal operation and maintenance of 3 years
- Material and equipment manuals
- complete original sets of manufacturer operation and maintenance manuals for each board
- Provide thermal stress limitation checks for all breakers and cables as per manufacturer's data
- Short circuit and voltage drop calculations
- Provide full discrimination and relay coordination studies for all breakers as per manufacturer's data according to the requirements shown on the single line diagrams
- Standard and optional factory tests
- Post-installation test procedure
- Final test reports
- Load balance

1.4.2 Equipment Data/Shop Drawings

The equipment data to be provided by the Contractor prior to ordering any material covered by this Section shall include but not be limited to:

Complete technical data on circuit breakers, contactors and other switchgear protection and switching devices, including data on operating characteristics, compliance to standards, dimensions and weights and detailed description of operating mechanism.

Complete technical data on instrument transformers protective and auxiliary relays, measuring instruments, including manufacturer's catalogue operating characteristics

- operating curves with detailed description.
- Complete technical data on the construction of switchboards with busbars, equipment plug in arrangement, access doors, provision for expansion including detailed descriptive manufacturer's catalogues.
- Complete technical data on miscellaneous items including indicating lamps, control and instrument wiring, outgoing and incoming power terminals and wiring labels, locks grouting, bracing, etc.

1.4.3 Contractor's Shop/Construction Drawings

The Contractor's shop/ construction drawings for installations covered by this Section shall include but not be limited to:

- Plans, front, rear and side elevations, with indication of all face-mounted equipment exact dimensions and weights.
- Drawings of arrangement of equipment inside the board.
- One line schematic diagram of circuits.
- Control circuit diagram, showing all auxiliary contacts remote control, if any, and remote indication.
- Indication of arrangement of main incoming feeders and outgoing feeders (bus-bars or cables).

1.5 REFERENCE STANDARDS

The following standards are referred to in this Section:

BS 88, BS EN 60127	Cartridge fuses
BS142	Electrical protective relays
BS 159, BS EN 60439-2	Busbar and connection
BS7354, BS EN 60439, BS EN 6094	Electrical power switchgear
BS 7626, IEC 185	Current transformers
BS4794, Pt. 2 IEC 337-2	Control devices
BS37, Pt.l	Electricity meters general
BS89, IEC 51	Direct acting indicating electrical measuring instruments
BS 5685, IEC 521	Electric meters
BS EN 60529, IEC 529	Degree of protection of enclosures BS
4752, IEC 157-1, BS EN 60439	Switchgear and control gear
BS EN 60947-3, IEC 408	Air break switches
BS EN 60947-4, IEC-1 & 1A	Contractors
BS 5472, BS EN 60439	Low voltage switchgear and control gear
BS 6231 PVC	Insulated cable for switchgear
BS EN 60439, IEC 439	Factory built assemblies LV

1.6 DELIVERY, STORAGE AND HANDLING

Shipments shall be securely packed for delivery and transit, protected against excessive heat and humidity and waterproofed for protection against water damage. When material must be bundled due to excessive size each bundle shall have a tag, made of metal, securely tied on with heavy gauge wire. Purchaser's markings shall be die-stamped on the tag.

Equipment, relays, and other components with moving or fragile parts shall be properly blocked, tied or packed to prevent damage.

Any component shipped separately shall be clearly marked with description, use and installation instructions.

All packages shall be marked with equipment tag number for identification when shipped and when received at site.

Sections to be grouped in not more than 3 sections per crate.

Each shipping unit shall be equipped with shipping angles or lifting lugs for handling by crane

PART 2 PRODUCTS

2.1 GENERAL

Materials and equipment shall be new and completely assembled, wired and tested at the factory requiring only field installation and connection of power and control circuits to place the equipment in service, except for multi-unit switchgear which could be divided into shipping section after being completed and tested at the factory.

Manufacturer design and arrangement details of the equipment shall be subject to the prior approval of the Engineer / Project Manager.

Switchgear and auxiliaries shall be designed for continuous operation at 415/240 volt, 3-phase, 5 wire, 50 Hz, solidly grounded neutral power supply. Ambient conditions shall be as specified by "General Electrical Requirements".

Switchgear with an incoming circuit breaker rated above 1000 Amp shall be metal enclosed, form (4) types as per BS EN 60439 or IEC-439, complete with stationary structure, have complete bussing and front access apparatus described herein.

Unless otherwise specified in the project documents, main switchboards for general purpose indoor uses, shall be constructed to comply with form (2) Types as per BS EN 60439.

Provide a dead hanged front panel behind the door of a distribution board, to allow safe operation. This front panel shall carry the required tags of equipment to show function of each breaker inside or any push-button, etc.

The Contractor shall make sure that the space for each switchboard is available in accordance with the requirements for the installation and operation and maintenance of the equipment as specified and supplied by the Manufacturer, and as per IEC 364, 439. Any inaccuracy at the Site shall be corrected as required and directed by the Consultant, and at no extra charge to the Client.

Ratings are shown on the one-line diagrams and the panel details and should be checked based on the actual loads at no extra cost to the Client.

The switchgear shall contain equipment with ratings as indicated on the one line diagram, panel details, and in this Specification.

All equipment designated as "spare" shall be fully equipped with all of the necessary items required to make the equipment operable by connecting to the outgoing power and control leads.

Switchgear shall have additional “space" for at least 20% of its outgoings for future extension. Equipment shall have a blank front cover and shall be equipped with horizontal and/or vertical bussing complete with the necessary screens required and circuit breaker cassette for the future addition of a circuit breaker suitable or a combination of breakers within the space factor limits.

Approved barriers between adjacent sections of switchboard shall be provided.

Switchgear shall be suitable for future extension on both ends. Unequipped space units will be furnished only as required to balance the switchgear assembly.

All ratings shown on the one line diagrams are the required operational equipment ratings at the ambient temperature. It shall be the Contractor's responsibility to ensure that the equipment furnished satisfy the ratings shown without any extra cost to the Client.

The Contractor shall assume all responsibility for mechanical and electrical coordination of equipment and devices required by the Drawings and Specifications.

Interrupting capacities and short circuit ratings shown on the Drawings are for guidance only, Contractor shall submit calculation for actual levels to the Engineer / Project Manager for approval.

The prospected short circuit current (Isc) value indicated at each bus-bar on drawings shall represent the maximum 3-phase symmetrical r.m.s. kA, and it is the rating that all switchboard components (i.e. bus, bars, bolts, circuit breakers, etc. shall withstand.

Buses shall be 99.8% electrolytic copper of sufficient size to limit temperature rise to 45°C or an additional derating would be necessary.

Crowded bus-bar arrangement to fit maximum possible number of branch circuit breakers in a distribution board, shall not be accepted.

Stacking of circuit breakers inside the switchboard shall be in accordance to original manufacturer design tables in accordance with temperature rise type tests.

Any switchboard column housing a number of circuit breakers summing more than 3000Amp of name-plate ratings should be fitted with a top heat extraction fan and a bottom ventilating louver fitted with a front filter to maintain the switchboard protection degree.

The phase arrangement on 3-phases buses shall be R.S.T from front to back, left to right, or top to bottom from the front of the switchboard.

All switchboard components shall be of the same manufacturer and must be tested according to IEC standards. The assembly must be type tested and fully coordinated. All design must be in accordance to temperature-rise type test.

All switchboard doors shall have a key lock and indicating lamp for ON/OFFREADY, in addition to the necessary equipment for security identification.

All indicating lamps used in the switchboards should be semi-conductor LED diodes. Use of neon or incandescent indicating lamps is not acceptable.

All indicating lamps and pushbuttons should be chromated metallic base and body.

All panel access doors shall be provided with a master key for maintenance and operation.

The panel shall be designed to permit continuous operation of all components mounted therein with panel ambient temperatures of up to 55°C for indoor installation and 60°C for outdoor installation.

2.2 SWITCHGEAR

2.2.1 Apparatus

All auxiliary equipment, transition sections, bus duct, and other necessary components required for complete installation and proper operation, under TN-S distribution system, although not specifically listed herein, shall be furnished and included in the switchgear assembly.

All circuit breakers of the same type and rating shall be completely interchangeable between compartments and between units at different locations on the site. All doors, panels and cubicles in general, shall be sealed with neoprene or equivalent gaskets. Enclosure shall be dust and vermin proof. Provide a directory of circuits on inside cable compartment.

Fuses (if applicable) shall be of the same manufacturer, dual elements current limiting type. Overload relays

shall be of the anti-single phasing type.

Bolted covers on compartments incorporating live connections shall bear a suitable warning label.

All live conductors behind doors should be protected against accidental contact by use of transparent plexi-glass sheet marked with an electrical shock warning label.

Fuses or miniature circuit breakers shall be provided so that relays, controls and instruments may be isolated whilst other essential circuits are kept energized.

Accordingly the control circuit should be divided into two separate circuits (indicators circuit) and (circuit breakers control circuit).

Supply of any control shall be via a suitably sized control transformer (at least three times the VA rating of all connected devices). Control circuits which are fed directly from the busbar will not be

accepted. The control transformer shall be protected at its primary and secondary sides by HRC fuses of suitable size.

2.2.2 Main Bus

The main bus shall be made of 99.8% pure copper and shall be continuous current ratings as indicated on the Drawings or shall be of equal rating to the maximum setting of the protective device on the incoming side whichever is greater.

The bus-bars and all its shall be fully rated and extend with the same size along the entire length of the switchgear assembly.

All horizontal bussing shall have provisions for future extension on either end

All main bus connections shall be tight and tin plated, corrosion-free and with sufficient bolts to withstand the symmetrical fault currents indicated on the Drawings.

The bus-bar supports shall be formed of high strength, low moisture absorbing, high impact material with ample creep age distance between busbars. Bus-bars shall be braced to withstand the symmetrical fault currents indicated. All busbar bracing materials should be of a non-magnetic material.

All bus-bars and tap connections shall be connected in such a manner that initial contact pressure remains substantially undiminished at bus temperatures ranging from indicated rated ambient to rated full load temperatures, to maintain minimum contact resistance for the full service life of the equipment.

2.2.3 Vertical Bus

All vertical bus-bars shall be of same material of main bus and shall have sufficient capacity to supply all installed circuit breakers and each vertical section shall have full height and depth, fire stop barriers of approved fire resistant material.

Vertical bus compartment shall be completely enclosed and isolated from other components.

All vertical bus connections shall be tight, corrosion free and be able to withstand the symmetrical fault currents indicated.

2.2.4 Neutral Bus

Neutral buses shall be sized for the same capacity of the main bus and shall be of copper.

The neutral bus shall be separate and isolated from the ground bus and completely insulated from ground. A removable bus link shall be provided for grounding the neutral bus as shown on Drawings.

All neutral bus connections shall be tight and corrosion free.

2.2.5 Ground Bus

A solid copper ground bus shall extend along the full length of the switchgear and rigidly bolted to the switchgear lower part compartments, frame and all sections of structure.

The ground bus shall be sized at least 50% of the main or vertical bus or 300 mm sq. whichever is greater.

2.3 INCOMING SUPPLY AND OUTGOING CIRCUITS

2.3.1 Source

Incoming supply shall be 415 volts, 3-phase, 5 wire, 50 Hz, with symmetrical fault current level available at the incoming line terminals as indicated on Drawings.

The connections from the incoming line terminals to the main bus shall have the same capacity as the main horizontal bus.

Connections to the switchgear shall be by bus-way system, cables in conduit or on cable trays as indicated on Drawings.

In case of bus-way connection then the bus way should be manufactured by the same manufacturer of the circuit breakers so that a coordination table between the main circuit breakers and the bus way can be present.

If the incoming power supply is shown as cables a removable metallic gland plate with thickness of not less than 5 mm shall be fixed to the top or bottom or both sides of the panel depending on the direction of the cables. A nonferrous material must be used in case of single core conductors. Pressure lugs shall be provided for the termination of cables, whose sizes are as shown on the one line diagrams.

2.3.2 Outgoing Circuit by Cables

All outgoing feeder sizes shown on Drawings are considered a minimum and the Contractor shall adjust without any additional cost to conform to the IEC-364 Regulations after final equipment selection, same gland plates mentioned above will be applicable.

2.4 CIRCUIT BREAKERS

Main incoming and bus tie circuit breakers for main switchboard shall be four-pole, single-throw, withdrawable air-type or molded case circuit breaker four (4) pole and continuous current ratings as shown on the one-line diagram and wiring schedules.

All breakers above or equal to 1600A must be air-type.

As a general rule All breakers above 1600A must be electrically motorized unless otherwise indicated on drawings.

Unless otherwise indicated all incoming and coupler breakers must be withdrawable air type.

All automatic source change over (ATS) schemes must have mechanical interlocks in addition to electrical interlocks.

Three (3) phase outgoing circuit breakers shall be molded case, miniature circuit breakers or combined with residual current devices four (4) pole as shown in the single line diagram or in panel schedules.

All four (4) pole circuit breakers must have neutral protection accordingly their trip units should be able to sense the current on all four (4) poles. The trip unit should allow a separate setting for the neutral pole to select one of three settings (neutral unprotected), (neutral protected at 50% phase current) and (neutral protected at 100% of phase current)

Circuit breakers shall be selected in line with this specification at the point of application in accordance with the drawings, allocated spaces and the "Regulations" as applicable and shall be suitably graded for 720 volt line service.

Circuit breakers serving as generator incoming must be fitted with a generator class trip unit capable of achieving low settings suitable to generator applications.

Circuit breakers shall be totally enclosed in a molded case construction of approved manufacturer and shall be provided with a front operated handle mechanism for manual operation of the main contacts, in addition to the automatic operation under overload current conditions. Multi-pole breakers shall have a single-handle mechanism for simultaneous operation of all poles. Number of poles and its protection type shall be suitable for TN-S grounding system.

Each pole of the circuit-breaker shall have an inverse-time delay over current protection for small overloads and an instantaneous magnetic overcurrent trip element for operation under short circuit conditions. All poles shall be constructed to open, trip or close simultaneously.

Circuit breakers shall be provided with quick-make, quick break switching mechanism and positive trip-free operation so that contacts cannot be held closed against excess currents under manual or automatic operation. Contacts shall be non-welding silver alloy and shall be adequately protected with effective arc-quenching devices.

The service short-circuit breaking capacity of the circuit breaker which is 100% of ultimate short current shall be in accordance with IEC 947-2 and shall be equal to the same value of short circuit level (I.e) indicated on Drawings. Switchboard and components withstanding rating shall be equal to this short circuit level also.

The miniature circuit breakers shall be rated 10 kA breaking capacity as minimum unless otherwise specified, with terminals capacity up to 25 mm sq.

All miniature circuit breakers should have protection shoulders against accidental contact with their terminals.

Frame sizes (or continuous current ratings) indicated shall be the minimum accepted ratings based on a fully-rated interrupting duty (non-current-limiting) as shown on the drawings. The trip current rating (amps) indicates the nominal rating at which the thermal overload element operates.

When tripped by either the thermal or magnetic elements, the handle shall automatically assume a position midway between ON and OFF positions which clearly indicates a "TRIPPED" position.

All poles shall be constructed so as to open, close or trip simultaneously. Non-interchangeable trip breakers shall have their covers sealed and breakers with interchangeable trips shall have the trip unit sealed to prevent tampering.

Circuit breakers of 100 Amp frame size and larger shall have interchangeable over current thermal-trip units and adjustable instantaneous trips unless otherwise indicated on the drawings.

Thermal over current trips shall be ambient-temperature compensated to allow for an ambient temperature at the breaker higher than at the protected circuit or device.

Combination of circuit breakers and ground fault circuit interrupters shall be used wherever specified with a fault indicator lamp. It shall be instantaneous trip with a10 mA, 30 mA and 100 mA sensitivity setting unless otherwise indicated.

All circuit breakers shall be derated according to climatic conditions and operating temperature as per manufacturer standards.

All main circuit breakers to be provided with 4 auxiliary contacts 2 N.O. and 2 N.C. for connection with BMS system.

All circuit breakers with ratings above 1000 A (one thousand) should have a built in ammeter on their trip units

2.4.1 Air Circuit Breakers

To IEC 947-2 or BS EN 60947-2, suitable for triple pole service and shall have breaking capacity of 50 kA symmetrical for 3 seconds at 415 Volts.

The Air Circuit Breakers (the conventional type and not moulded case circuit breaker) shall be 500 V, 50 Hz, triple pole with neutral link for incoming and outgoing ACB or four poles for bus tie ACB only with ratings as shown on the Drawings. They shall be air break, trip free, draw-out type with mechanical and electrical ON/OFF indicators.
Where air circuit breakers are to be electrically operated by automatic motor wound spring mechanism, a standby manual operating handle shall be provided for operating the circuit breaker in case of power or motor failure.

The air circuit breaker shall be provided with over current, short circuit and earth fault protection having the following characteristics:

- Adjustable long time delay current setting (50% - 150%) with varied tripping time
- Adjustable short time delay current setting (400% - 1000%) with variable tripping time

- Instantaneous tripping for heavier over current adjustable from 400% - 1600% of base current
- Adjustable earth fault trip current setting (20% - 60%) with variable tripping time

The circuit breaker shall have three position on the draw-out mechanism, namely service position where all main and auxiliary contacts are made, test position where main contacts are open but auxiliary contacts are closed and isolated position where all contacts are open. An indicator shall clearly show these positions and provisions shall be made for locking the breakers in any position. ON/OFF indicator shall be provided.

Mechanical Interlocks shall be provided to prevent withdrawing or inserting of the breaker when it is "ON". Any attempt to do so shall trip the breaker automatically.

The withdrawable part of the circuit breaker shall be effectively connected to earth through scraping contacts that shall make before and break after the main and auxiliary contacts.

The moving contacts comprising the main and arcing contacts shall be of the spring loaded, self aligning type. The arc contacts shall be arranged to make before and break after the main contacts.

Each ACB shall be included but not limited with following components and accessories:

- Auxiliary Contacts
- Arc Chutes
- Folding Extension Rail
- Charging Handle
- Open and Close Push-buttons
- Over Current Trip Indicator
- Key Lock on Trip Button
- Spring Charge Condition Indicator
- Breaker Position Indicator
- Making Current Release
- Automatic Shutters for the BIB Terminal
- Carriage for Every Size of ACB exceeding 25 KG in Weight
- Operation Counter
- Shunt Trip Mechanism

The Man Incoming Circuit Breakers shall be provided with cable terminal boxes to suit the incoming cables from the transformer/source supply.

Circuit breakers shall be tropicalised to operate continuously in an ambient temperature of 55°C and high relative humidity.

Type test certificate for each size of circuit breakers and MCCB from an internationally recognized testing authority acceptable to the Engineer / Project Manager shall be provided.

2.4.2 Moulded Case Circuit Breakers

Shall have a combination of thermal and magnetic tripping giving an inverse time delay protection against sustained overloads and instantaneous tripping under heavy overloads and short circuits. Unless otherwise stated in the particular specification or drawings, MCCB shall have a minimum short circuit rating of 25 kA.

Breakers shall have a quick make, quick break over center switching mechanism that is mechanically trip free from the handle so that contacts con not be held closed against short circuits and abnormal current.

Tripping due to overload or short circuits shall be clearly indicated by the handle assuming a position mid-way between the manual ON and OFF position.

Latch surfaces shall be polished.

Poles shall be constructed to open, close and trip simultaneously. Ampere ratings shall be clearly visible.

Breakers shall be completely enclosed in a moulded case to IEC No. 157-1A, suitable for installation inside switchboard.

Non-interchangeable trip breakers shall have the trip unit sealed.

Breakers with earth leakage relay protection shall be provided with shunt trips.

Frame sized shall be as per manufacturer's standard size and as approved by the Engineer / Project Manager.

The magnetic trip shall be adjustable type for rating 200 Amp. and above, with 8 settings from 1.5 to 10 times the rated current of the circuit breaker.

2.4.3 Miniature Circuit Breakers

These shall be type C for general purpose uses, suitable for the load they feed, and shall have short circuit of 9 kA, unless specified otherwise in the Project Documentation.

They shall be fault rated so that fuse backup protection is not required. They shall be rated in accordance with BS EN 60898, IECG 898.

They shall include the following minimum features:
- Magnetic and thermal trip elements
- Trip-free mechanisms

Locking of facilities with detachable proprietary brackets and clearly marked ratings

2.4.4 MCB/ELCB

Combined MCB/ELCB units shall be provided for final circuits supplying socket outlets, water heaters and water pumps.

The units shall have a trip sensitivity of30 mA.

2.4.5 Earth Leakage Circuit Breakers (ELCB)

Current operated earth leakage circuit breakers shall provide accident protection by interrupting dangerous contact with voltage which may be present in faulty electrical equipment as a result of frame faults, insufficient insulation or misuse.

The ELCB shall also provide a high degree of protection against earth leakage, fires and electric shock and can withstand at least 9 kA or as specified in the Project Documentation. The breakers shall generally comply with BS 4293, 1983 and the recommended specification CEE 227 of the IEC on Rules for the approval of electric equipment.

The breaker shall consist of a core balance transformer, a tripping coil with contact assembly, main supply contacts, ON/OFF switch, a test button and a trip free mechanism all enclosed in a robust body of all insulated material.

Degree of Protection against earth leakage throughout the electrical installation shall be as indicated on the Drawings. Unless otherwise indicated, ELCB shall have 30 rnA trip settings.

The breaker protecting and or power circuits shall be mounted in the panel board enclosure.

2.4.6 Overload Relays

Thermal overload relays shall be used for motors ratings up to and including 11 kW, giving protection against:

- Over current unbalance
- Single phase
- Earth fault

Solid-state electronic protection relays shall be used for motors rated above 11 kW, having the following protection features:

- Overload
- Over current
- Single phase
- Earth fault
- Under-voltage
- Over-voltage
- Plus, if required, digital indication of:
    - Relay settings
    - % of FLC that the motor is taking
    - Continuous monitoring of thermal capacity of motor
    - Thermal capacity used during start of motor
    - If tripped, how much time before restart to take place
    - Stall or short circuit trip
    - Earth fault trip
    - Starting

Documentary evidence must be produced showing the current/time characteristics of each overload at its setting (hot/cold for the thermal overload) overlaid on the motor manufacturers thermal stability time/current characteristics for comparison. Consideration must be given as to the requested method of starting (DOL, star delta, etc.).

2.4.7 Fuses

Fuses shall be the High Breaking Capacity (HBC) type to BS 88.

The fuse shall either include a suitable fuse carrier or it shall be capable of isolation. If the fuse carrier is included it shall be such that when it is being withdrawn normally or when it is completely withdrawn the operator is completely protected from accidental contact with any live metal of its fuse link fuse contacts and fixed contacts.

If the fuse is capable of isolation it shall be interlocked with the switch that isolation is complete before the fuse enclosure can be opened further. The switch shall be prevented from closing while the fuse-cover is open.

2.4.8 Fuse Switches

To be metal clad, unless otherwise specified in the particular specification, with front operated handles interlocked with enclosure door to prevent opening the door with the switch in the "ON" position.

Switch shall have the door with "ON/OFF" indication and means of pad locking in the "OFF" position.

Fuse Switch and Switch Fuses:

- To BS EN 60967-3
- Fuses: to BS 88 bolted type, class Ql, 415 V and switches certified for AC-23A duty, unless specified otherwise in the Project Documentation, rating as indicated in the Project Documentation
- Fused switch carriages: withdrawable type
- Fuse switch: ASTA certified to 50 kA, or as otherwise indicated on the drawings

2.4.9 Isolating Switches

Isolating switches shall be:

Same design as fuse switches and switch-fuses, with solid copper links in place of fuses. Single

pole and neutral, or triple pole and neutral, as indicated. Rating, as indicated.

2.4.10 Stop Lock-off Push Buttons

Stop lock-off buttons for motors shall be mushroom headed red stay-put type with automatic latching, the units having to be key operated to be released.

Push buttons shall be housed in a surface mounting weatherproof enclosure to IP 65. Push

buttons shall be UV stabilized.

2.4.11 Control Relays/Auxiliary Relays/Interposing Relays

Relays shall be suitable for operation on nominal 240 or 110 V AC supply or in special cases

24 V AC or DC (i.e. low voltage application), as per the Project Documentation. Relays shall be suitable for operation at plus 10% and minus 25% of their nominal rated voltage. Relays and contractors shall be selected for category AC 3 duty.

Relays shall be of the plug-in type only complete with plastic cover and shall be fitted with normally open/ normally closed or changeover contact combinations as necessary.

The contact material shall be suitable for their specific application and the Contractor must supply this information during the mobilization period.

Mixed voltages must not be used on the different output contacts of a particular relay. If necessary additional relays shall be used.

Coils shall be vacuum impregnated or guaranteed suitable for the local climatic conditions.

Terminations to the relay bases shall be of the front connected screw clamp type. The relay mounting panel shall be drilled and tapped to accept future spare bases.

Relays shall be secured to their bases by retaining bar or clip to prevent malfunction due to the relay loosened in its base.

Care shall be taken to ensure that relay contacts and associated wiring are suitably fuse protected.

AC operated relays shall have a neon indicator mounted within their clear covers which shall be connected directly across the relay coil to indicate when supply is connected. These indicators shall be easily seen when the relay compartment door is opened.

Relays having different contact configurations or different coil voltage shall under no circumstances be interchangeable.

A permanent means of identification shall be affixed to both relay and base in line with the circuit diagram reference.

Where remote supply voltages are used then care shall be taken to ensure that all relays and any other equipment involved (terminals fuses, etc.) are completely shrouded and where possible segregated. A warning label engraved in English shall be fitted onto or adjacent to any such equipment. Similarly where voltages exceeding 55 V to earth are employed in relay compartments or non door-interlocked sections then shrouding segregation and warning labels shall be applied.

2.4.12 Protection Relays

Protection relays shall comply with BS 142.
Secondary injection shall be easily possible by means of purpose made voltage and/or current plug-in type test terminal blocks which automatically open circuit or short circuit the integral voltage transformers or current transformers respectively and provide termination's for the test supply. Disconnection of any permanent wiring will not be acceptable.

2.4.13 Alarm System

Auxiliary relays and auxiliary contacts and circuits breakers shall be provided as necessary and if indicated to transmit alarm signals to remote control buildings.

Alarms shall be as indicated on the Contract Drawings and shall be selected from:

2.5 PANELBOARDS

Panelboards shall be factory assembled and type-tested, surface or flush mounted, as shown on the Drawings and shall be dead front, circuit breaker type with copper buses.

The panelboards shall be provided with main lugs, main breaker and number of breakers as shown on the Drawings or panel schedule detail.

The panel boards should be manufactured by the same manufacturer of the circuit breakers and must be designed in accordance with design guides based on results obtained from temperature rise type-test.

The panelboard enclosures shall be dustproof for indoor or dustproof and waterproof for outdoor installation, unless otherwise indicated on Drawings.

The enclosures shall be provided with hinged covers and locks. All locks shall be keyed alike.

Access to circuit breakers inside the panelboards should be restricted by use of dead front plates which shall be of code gage sheet steel. Fronts shall be furnished with adjustable trim clamps for securing the front to the box.

Each row of circuit breakers must have its own front plate, panel boards utilizing one front plates for more than one row will not be accepted.

Circuit breakers frame sizes shall be as indicated on the drawings. Panels shall be for operation on voltage, number of phases, and number of wires as shown on Drawings. Multiple phase circuit breakers shall be of the common trip type having a single operating handle.

Each panelboard shall be equipped with full size neutral bus and ground bus of the same length and cross-section as the neutral bus. The ground bus shall be bonded to the enclosure.

Panels of 415/240 Volt shall have circuit breakers with an interrupting rating as shown on the single-line diagrams and on Drawings.

A directory holder with protective covering shall be provided on the inside of each door. The directory card shall provide a space at least 6 mm and 75 mm long for each branch circuit. The card shall be completely typed to identify each connected and spare circuit, and shall be bilingual, English.

All circuit breakers used must be as specified in the switchgear section 2.4 above.

All panel boards equipped with circuit breakers feeding single phase circuits must be protected against the neutral conductor loss or disconnection so that to avoid feeding line to line voltage to single phase loads.

All panel boards directly feeding sensitive electronic circuits or communication networks must be protected with transient voltage surge suppressor (TVSS) to be installed at the main circuit breaker.

2.6 DISTRIBUTION BOARD FOR OUTDOOR LIGHTING

When the photoelectric lighting control and timer unit switches on the triple pole contactor, the outgoing phase lighting circuits shall be energized.

- Lighting Distribution Board: Shall contain the following:
  - One main circuit breaker
  - One triple pole lighting, ACI air-type contactor designed to withstand lamp load inrush current and to carry full rated current on a continuous basis. It shall be AC operated. A manual override switch shall be also provided and connected

- Outgoing Circuit Breakers: The triple pole AC contactor shall be actuated by means of a photo-electric lighting control unit mounted externally and a timer module

- Photo-Electric Lighting Control Units: The distribution/control board shall be controlled to switch on and off the outdoor lighting as a function of the ambient daylight intensity by means of a photoelectric lighting control unit. The unit shall be facing north nearest to distribution/control board and shall be connected to it by means of finely stranded copper conductor flexible wires having 2 x 2.5 mm sq. cross sectional area and PVC insulation. Control unit shall be adjusted to respond between 5 and 1000 lux and its response shall be delayed by 2 minutes to prevent operation on momentary changes in daylight intensity. An additional programmable timer shall be set to de-energize and energize the contactor in selected periods of time.
- Selection switch and push buttons

2.7 MOTOR CONTROL CENTERS

General: Provide the metal enclosed motor control centers as indicated, specified and required.

The motor control centers shall be switchboard type construction as described for M.V. cubicle switchboards excepts as modified herein.

The motor control centers shall be front access only.

Shipment shall be made in sections to facilitate field handling, and the shipped sections shall be joined together to form a complete back-to-wall or back-to-back unit assembly as indicated.

The motor control centers shall be free-standing or wall-mounted, as indicated in the Project Drawings.

Construction: Vertical sections shall contain adequate space for connecting the incoming power supply circuits, outgoing branch circuits, motor circuits and control circuits to terminals, horizontal and vertical power bus bars, horizontal earth bus, circuit breakers, magnetic starters, contractors, control stations, pilot lights, timers, terminals, transformers, panels, relays, ammeters, voltmeters, meter switches, earth leakage protection, space heaters, thermostats, fans, vents, screens, filters and switches.

The vertical sections shall be fabricated from heavy gauge steel (minimum thickness of 1.5 mm), with uniform surfaces.

Unless otherwise indicated, the standard section shall be 800 mm wide (600 mm for equipment and components, 200 mm for vertical wire way) by 600 mm deep.

Holes shall be provided in the structural base of each section for anchor bolts.

Sections shall contain wire ways, brackets, supports, plates, trims, barriers, gaskets, doors, base channels, lifting angles and hardware. Horizontal wire ways (top and bottom) shall extend through the width of each section.

Wire way openings shall be provided between sections with closing plates on the end sections. Each vertical section shall contain its own individual full height vertical wire way separated from the vertical bus by a metal barrier, and also separated from the individual control units by the side pan of the control unit.

Wire ties shall be furnished in the vertical wire ways to group and securely hold the conductors in place.

A separate cover shall be provided on the vertical wire way.

Control units shall be isolated from one another by horizontal steel barriers. Front to rear bracing shall not interfere with the cable entrance areas.

Hinged doors shall be equipped with screwdriver operated quarter turn latches that catch automatically when the door is pushed closed. Large doors shall be equipped with additional latches.

Provision shall be included to add a vertical section on either end of the line up in the future.

The power supply compartment shall be sized to accommodate the incoming power conductors. The compartment shall be located at the top or bottom of the vertical section as shown on the Drawings. The power compartment shall be covered by a hinged door and shall be held closed with quarter turn pawl type latches.

Bus bars shall be provided for the power and earth systems. When shown on the Drawings, provide full length full capacity and insulated neutral bus and cable connectors. Bus joints shall be connected with bolts, nuts and spring washers. The main horizontal power bus shall be located in the center or near the top of each section, jointed together to form a continuous bus for the full length of the motor control center. The horizontal power bus shall be copper and the current rating shall be as shown on the Drawings. The vertical power buses shall be copper full height and rated for the section total load. The minimum current rating for the vertical power buses shall be 300 amperes or as specified in the Project Documentation. Small openings in the vertical barriers shall permit the plug-on control unit contacts to pass through and engage with the vertical bus bars. Unused plug-on openings in the vertical barriers shall be equipped with plastic snap-in closing plugs.

2.8 INSTRUMENTATION AND CONTROLS

Instruments: The Measuring Instruments shall include ammeters, voltmeters, kWh meters, selector switches and associated accessories as indicated on the Drawings and described herein as follows:

- Ammeter, Voltmeter and Power Factor Meter r:

  - The measuring instruments shall be moving iron vane type, flush pattern with dust and moisture proof enclosure. Anti-glare glass front, anti-parallax scales and whit faces with black numerals and marking shall be used. All instruments shall be long scale 240 degree with full load indicating approximately at 180°
  - The dial size shall be 10 x 10 cm2
  - Accuracy shall be one percent of full scale valves
  - Moving elements shall be provided with zero adjustments located at face of dial
  - The ammeter shall be capable of withstanding twice of rated current for 10 minutes and overload sustained under fault conditions without damage or loss of accuracy
  - Voltmeter shall have a measuring range from 0 to 500 V and shall withstand twice the rated full scale voltage for 1.0 minute without damage
  - Three ammeters or a single ammeter with selector switch shall be provided to read the current of each phase, as indicated on the Drawings
  - The voltmeter selector switch shall be of the rotary type with cam operated contractor and shall have (7) positions off, R-Y, Y-B, R-B, R-N, Y-N, B-N
  - Single and poly phase power factor meters with associated current and potential transformers shall be provided as required and specified herein
  - Ammeters shall have maximum demand pointers

Current Transformers: Current transformers shall be of the bar primary type, air cooled and suitably insulated. The current transformers shall be of Class X accuracy for restricted earth fault protection and Class 1 accuracy for metering purposes, as stipulated in the K-Electric Regulations.

Current transformers shall be rated not less than 5 VA and shall have thermal kWh meters.

The kWh meters shall be suitable for operation of 415/240 Volt, 3 phase, 4 wire, 50 Hz, and shall conform to BS 37 Pat 1 and BS 5685.

The meters shall be dust-proof and vermin proof, protected from corrosion due to high humidity and compensated against the effect of temperature up to 55°C.

The meters shall maintain their accuracy over many years service under Pakistan climatic conditions. The counter shall be of the cycle meter type with six figures, the lowest figure being unit. Pointer type counters are not acceptable.

The meter cover and cases shall be of metal.

Meters shall not have less than 5 mm diameter terminal holes and shall operated through three current transformers and the counter of the meter should be calibrated to read the primary kWh. The current transformers shall be selected from the standard sized stipulation in K-Electric Regulations.

All meters shall be handed over the K-Electric for calibration prior to final installation and connection.

Restricted Earth Fault Protection: Restricted earth fault protection shall be provided for main switchboards in accordance with the K-Electric Regulations.

Anti-condensation Heaters: Anti-condensation heaters shall be provided inside each compartment in strategic positions. These shall be controlled by an internally mounted humidistat and an external overriding ON/AUTO switch Heaters shall be of sufficient size to maintain the air temperature inside compartment at least 10°C above the outside ambient.

2.9 TRANSIENT OVER VOLTAGE

Transient over voltage suppressor - shall be provided at the incoming supply side of main medium voltage panel, as shown on the drawings. The contractor should select the proper type which recommended by the supplier and submit to the Engineer / Project Manager for approval supported by calculations.

2.10 FACTORY TESTING

The switchgear shall be factory assembled and tested before shipping. Test reports shall be furnished by the Contractor.

All components shall be thoroughly inspected and tested to ensure alignment and adequacy of all functions.

PART 3 EXECUTION

3.1 INSPECTION

Inspect each switchgear assembly and related accessories for damage, defects, completeness and correct operation before installing. Inspect previously installed related work and verify that it is ready for installation of instruments and equipment.

3.2 PREPARATION

Ensure that installation areas are clean and that construction operations are completed prior to installing equipment. Maintain the areas in a broom-clean condition during installation operations.

3.3 ELECTRICAL WORK

The Contractor shall perform all interconnecting wiring and grounding as indicated, specified and required and shall include cables, conductors, terminals, connectors, wire markers, conduits, conduit fittings, supports, hardware and all other required materials.

Provide the electrical materials and complete all the required electrical installations in accordance with the requirements and as required by Drawings.

3.4 MOUNTING

The switchboards and panelboards (both surface and flush types) shall be installed so that the height of the top edge will not exceed 1.80 m from the finished floor. Directories shall be typewritten in English to indicate load served by each circuit, and shall be mounted in a holder behind protective coating. Contractor shall follow manufacturer's installation instructions.

For free stand panelboard either steel or concrete base should be made without any extra cost to Client.

Contractor shall submit to the Engineer / Project Manager for approval, an elevation mounting detail and plan for each distribution board specially those mounted inside vertical service ducts, also showing cable risers and racking to a scale of 1:10 or 1:50 before installation.

3.5 INSTALLATION SUPERVISION

Furnish the service of Engineer / Project Manager especially trained and experienced in the installation of the equipment to (1) supervise the installation in accordance with the approved material and equipment manuals and (2) inspect, check, adjust as necessary in accordance with the Specifications herein, until the installation and operation are acceptable. Include all costs for services in the Contract Price.

3.6 FIELD TESTING

Contractor shall prepare in full details and submit for approval, post installation, test procedures attached with test forms for all M.V. panels. Switchgear installations shall be tested in accordance with BS 116, BS 162, BS 861, BS 3185 orBS 3659 as applicable (or corresponding IEC) for the type of equipment.

The tests shall be both electrical and mechanical to demonstrate satisfactory operation. Where protection relays or adjustable over current trips are incorporated, primary/secondary injection tests shall be carried out to demonstrate the correct setting of the protection device and its satisfactory operation. Test certificates shall be issued by the Contractor when primary injection tests are carried out.

Switchgear and Motor Control Center: The whole of the switchgear and control center shall be tested as integral units based on the completeness of the circuits in the final manufactured form within the manufacturer's works. Witnessed tests shall comprise Routine Tests in accordance with BS 5496 Part 1 and BS 5424 Part 1, together with the following:

- Primary injection tests to ensure correct ratio and polarity of CT's and to demonstrate the correct operation of current operated protection relays and direct acting coils over their full range of settings.

- Operation and through current stability tests on balanced earth fault protection relays by primary current injection.

Correct operation of sequencing and control circuits indications and alarms at normal operating voltages by operation of local control switches and simulation of operation of remote control circuits and all protection devices.

- Circuit breakers shall be subject to routine tests together with checking of all mechanical and electrical interlocks.
- Type test certificates and performance test data for identical panel types shall be made available.
- Measure phase-to-phaseand phase-to-ground insulations to meet manufacturer's specified minimum resistance
- Check electrical continuity of circuits and for short circuits.
- Coordinate tests with tests of generator and run them concurrently.
- Demonstrate interlocking and operational functions for at least 3 times.

3.7 SYSTEM VALIDATION

Provide the services of trained and field experienced Engineer / Project Manager(s) to validate each switchgear system to verify that each system is operational and performing its intended function as specified and detailed in the approved Post-Installation Test Procedures. Validate each system by simulating inputs.

Immediately correct any and all defects and malfunctions disclosed by tests. Use new parts and materials as required and approved and retest. Provide a report certifying completion of validation of each system.

3.8 IDENTIFICATION PLATES

Identify components as required by codes and manufacturer's standards and according to Section General Electrical Requirements.

LIGHTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of Contract including General Conditions, Conditions of Particular Application and Division- I Specification Sections, apply to work of this Section.

1.2 DESCRIPTION OF WORK

This section covers partially the work of indoor lighting and ancillary fittings and the work of outdoor lighting as required by the Contract and includes the following items:

- Lighting Fittings (Luminaires)
- Ballasts
- Lamps
- Lighting Switches

Indoor lighting and ancillary fittings of service areas in all project locations are covered under this section. Extent of lighting work and ancillary fittings covered by this section are indicated on Drawings.

1.3 REFERENCE STANDARDS

The following standards are referred to in this Part:

BS 800 Limits and Methods of Measurement of Radio Interference Characteristics of Household Electrical Appliances, Portable Tools and Similar Electrical Apparatus

BS 3677	High Pressure Mercury Vapor Lamps
BS 4533	Luminaires
BS 5225	Photometric Data for Luminaires
BS 60400	Lamp Holder for Tubular Fluorescent Lamps and Starter Holders BS
EN 60081	Tubular Fluorescent Lamps for General Lighting Service
BS EN 60238	Edison Screw Lamp Holder
BS EN 60529	Degrees of Protection Provided by Enclosures EN
60662	(IEC 662), High Pressure Sodium Vapor Lamps
EN 60947-1	General Rules for Low Voltage Switch Gear and Control Gear EN
61167	Metal Halid Lamps

1.4 SUBMITTALS

Submit the following in accordance with Conditions of the Contract, Division-1 Specification Sections:

1.4.1 Submit 3 Complete Sets of: Original catalogs showing all luminaires technical specifications

Material lists and equipment data.

Shop drawings including fastening details of luminaires, ballasts, etc.

Wiring schedules for each lighting panel considering the phase load balance.

1.4.2 Detail shop drawings are coordinated with all other trades (architectural, HVAC, fire alarm, fire fighting, etc.) using scale 1:50. These drawings shall identify, but not limited to, the following:

Wiring connections between lighting fixtures, switches, home runs up to the panel board The circuit

reference, wiring size, conduit size and run, junction boxes
- The supply source type (normal, emergency)
- The switching device tag number
- Mounting details
- Photometric data

1.4.3 Certificates of Compliance: A compliance sheets must be provided for each type of lighting fixtures. These sheets must indicate the percentage of compliance and deviations from each item in the specification.

1.4.4 Spare Parts List to be as Follows: 2% of total quantity of each light fitting, this quantity shall not be less than two fitting of each type.

Additional diffusers for 2% of the total quantity of each type of light fitting. 10% spare lamps of each wattage of different types.

5% of the total quantity of ballasts of each type and size of fluorescent lamp 5% of
the total quantity of starter.
2% of total of control gear for discharge lamps.
1% of lamp holder of total quantity of each type but not less than two numbers.

1.4.5 Samples of the Specified Products

1.4.6 Final Test Report

1.4.7 Instruction sheet provides five sets of instruction sheets covering operation and maintenance for each type of furnished fitting.

1.5 DELIVERY, STORAGE AND HANDLING

Materials and products shall be securely packed for delivery, with waterproofed type providing protection against excessive heat, humidity and water damages.

Great care shall be taken in storing luminaires on Site to prevent unnecessary damage by stacking too many luminaires, causing disfiguration of the canopies. The Contractor shall be responsible for any damage to the luminaires and shall replace any damaged luminaires free of charge.

PART 2 PRODUCTS

2.1 GENERAL

Provide all new lighting fittings, wall brackets, lamps, poles, auxiliary lighting units and other fixtures and materials, including proper space, and complete the interior and exterior lighting installations as shown on Drawings, specified and required.

Equipment shall have the manufacturer's corrosion resistant finish. Lighting equipment shall be completely fabricated, assembled, wired, checked and tested at the factory.

Luminaires have been selected to provide the illumination levels in accordance with Lighting Handbook, IES. If the space envelope and/or furniture layout of any facility is changed from Drawings, the Contractor shall adjust the lighting layout for that space to maintain these standards. The list of illuminance levels as in Appendix A of this section.

All luminaries shall be manufactured to BS 4533 with an appropriate IP classification to BS EN 60529.

All luminaries supplied by the Contractor shall be photo metrically tested.

The Contractors shall produce upon request, the photometric data for any luminaire specified or supplied.

All luminaries shall be provided with a lamp compatible with the control gear used.

Luminaries shall not be suspended by their flexible ford. A separate means of suspension shall be provided.

All flexible cords shall be anchored at both ends such that the cord is free from strain.
Any plastics used in the luminaire shall be light and UV stable and shall be suitable for their application.

All sheet steel components shall be suitably pre-treated and electrostatically spray-painted using acrylic polyester or epoxy powders.

Non-compatible materials shall not be used in contact with each other.

Louvers shall be restrained to prevent them from failing out of the body of the luminaire under normal conditions and when relamping. Metal louvers shall be earthed to the body of the luminaire or the earth terminal.

Diffusers shall be restrained to prevent them from falling out of the body of the luminaries under normal conditions and when relamping.

Luminaries fitted with high frequency or electronic control gear shall be disconnected before the circuit is tested for insulation resistance.

All luminaries designed for internal use shall be constructed to IP 20 and be Class 1 unless otherwise stated.

All luminaries designed for external use shall be constructed to minimum classification of IP 54 and be Class 1 unless otherwise indicated.

Fused terminal blocks shall be fitted and be of sufficient capacity for the wiring involved. Each terminal shall be capable of accommodating two

2.5 mm sq. conductors.

Connector strip terminals shall have a current rating not less than the rating of the circuit protective device and shall be encapsulated in self-extinguishing grade polyethylene.

Where connector strips are provided in boxes behind heat producing appliances, porcelain connectors shall be used where temperature in excess of 70°C are likely.

Conductors shall be clamped between metal surfaces such that no screws make direct contact with the conductor. The metal used in construction of the connector shall be at least 85°C copper alloy such that good conductivity and electrolytic compatibility are maintained at all times.

All light fittings shall be provided with an earthing terminal which shall be connected to the earth continuity lead of the final sub-circuit.

The earthing of all pendant or semi-pendant fittings shall be by a separate core in the connecting flex or cable securely bonding the earth terminal on the fitting to the glanded joint of interconnecting cables. In no case shall pendant chains or conduit support tubes be used as a means of earthing.

2.2 LIGHTING FITTINGS, GENERAL

Fluorescent, and incandescent lighting equipment shall be surface, recessed and pendant types as indicated in schedules and individual lighting fittings specifications. Lighting fittings shall be complete including all the required components, ballasts, lamps, wiring, hardware, fasteners suspensions and supports.

Wiring: Connection to the main circuit wiring shall be 3-wire of a minimum core size of 3 mm sq., earthing shall be connected. The wiring from ceiling rose shall be heat resisting.

The Contractor shall not order any lighting fitting until final approval of the type, color and surface finish has been given by the Engineer / Project Manager.

Lamps: Lamps shall be furnished and installed in all luminaries covered under the Contract. Lamps used for

temporary lighting services shall not be utilized in the final use in fixture units.
Lamps for permanent installation shall not be placed in the fixtures until so directed by the Consultant, and this shall be accomplished directly before the building areas are ready for occupancy by the Client.

Lumen output lamps shall be in accordance with BS EN 5225.

Generally, high output, low consumption, tri-phosphorus lamps shall be used, unless otherwise indicated.

2.3 HIGH INTENSITY DISCHARGE LUMINAIRES

High Intensity Discharge (HID) fixtures shall be fabricated from heavy gauge steel with metal parts joined together to form rigid housings or be assembled with cast aluminum. Housing, if not specified otherwise.

2.3.1 HID Ballasts: Indoor-outdoor type ballast shall be provided for the HID fixtures. The ballast shall be for single lamp, 240 V, 50 Hz and wattage as specified, and utilize modified constant wattage circuiting.

2.3.2 HID Lamps: HID lamps shall be:

Metal halide. Initial light output shall be approximately 80 to 100 lumens per Watt (in accordance with BS EN 61167).

Wattage as indicated in the schedule of luminaries.

2.4 FLUORESCENT LUMINAIRES

Fluorescent luminaires shall comply with BS 4533 for Class I ordinary, indoor normal atmospheres A gasket

shall be fitted between the diffuser and the body to form an effective seal.

Unless otherwise stated fluorescent tubes of the size, Watt and color detailed in the schedules shall be supplied with each laminar.

All cables shall be secured within the laminar body to prevent loose lengths from touching hot surfaces or becoming trapped beneath cover plates. Cable clips or cleats shall be captive and if secured by adhesive, shall not loosen by age.

Control gear shall have power factor correction to achieve a minimum p.f. of 0.9 lagging.

The control gear enclosure shall be designed to limit the maximum temperature of the ballast to its stated rated temperature.

Wiring within the fixture and for connection with the branch circuit wiring shall not be less than 15 mm sq. for 240 Volts application. Insulation shall be silicone rubber for lower temperatures.

Aluminum reflectors and louvers shall be made of high purity aluminum (99.9% minimum) with low or very low iridescence. The anodic film shall have a minimum thickness of 2. 5 microns.

Louvers and reflectors shall be packed separately from the luminaire body and protected against damage.

Louvers shall not be installed using bare hands. Any louvers found with finger, palm marks or builders dirt and dust shall be removed and cleaned using a high pressure hose with Kodak 600 dirt emulsifier or a similar method approved by the louver manufacturer. Louvers shall not be wiped clean.

Diffusers shall be made of UV stabilized acrylic or light stabilized polycarbonate injection molded or equal and approved.

The diffusers shall not support combustion and shall be self-extinguishing. Lamps of dimming circuits shall be of the same color temperatures and color appearance.
To maintain a constant appearance, all lamps on dimming circuits shall be changed at the same time.

2.3.1 **Electronic Ballasts:** Solid-state, high frequency full-light-output, energy-saving type compatible with energy-saving lamps. Conform to FCC Regulations Part 15, Sub-part J for electromagnetic

interference. Conform to IEEE C 62.41, "Guide for Surge voltages in Medium-voltage AC Power Circuits", Category A, for resistance to voltage surges for normal and common modes for dimmable type 0-10 Volt technology shall be applied as follows:

Minimum Power Factor: Minimum Operating Frequency:

Third Harmonic Content of Ballast Current:

Normal Ballasts: Ballasts shall be completely enclosed inside steel casting and have a corrosion resistance finish. All ballasts shall be of high power factor complying with BS 2818. Ballast shall have lowest sound level and case temperature rise rating power factor capacitor to be added to improve the power factor.

Fluorescent Lamps: Shall be 26 mm slim tube energy saving type with natural white, medium bi- pin, type. Compact fluorescent shall be as indicated in fixture.

- Tubular fluorescent lamp, to BS EN 60081. Lengths/ diameters as indicated in the Project Documentation.
- Tube color: cool white, unless otherwise indicated.
- Color temperature: 6500 k, cool day light
- Fittings shall comply with BS 800, for suppressing radio frequency interference.

2.5 INCANDESCENT LUMINAIRES

Incandescent luminaires shall have, unless otherwise stated, porcelain enameled formed sheet steel housing or die-cast aluminum housings. Fixtures shall include both open and closed types. Fixtures shall accommodate screw shell base of specified size.

Luminaries for incandescent light sources shall be designed to accommodate the specified lamp.

Where the specified lamp is either unsuitable for the luminaire or the construction of the luminaire is liable to affect the life of the specified lamp, alternatives shall be offered to the Engineer / Project Manager.

Care shall be taken in handling quartz envelope lamps, where the lamps should not be handled directly. Where this does occur, the lamp should be cleaned using a soft cloth moistened with white spirit.

Luminaries using Medium voltage Tungsten Halogen lamps shall each be supplied complete with its own transformer unless otherwise stated.

Wire wound transformers shall be rated at 240/11.8 V and comply with IEC 742, Class II and be insulated to Class H of IEC standards.

Transformers shall be protected against overload and short-circuiting.

Where multi point transformers are specified, voltage regulation shall be a maximum of 6% and each luminaire shall be wired separately.

Final connections with luminaries shall be carried out using silicon rubber sheathed cables.

Where medium voltage tungsten halogen lamps are to be dimmed, the dimmer shall be of the hard fired type suitable for inductive loads.

Transformers used in dimmed circuits shall be down rated as recommended by the manufacturer.

Electronic transformers shall be designed to IEC 742 and 34C/Comex (pk) 8 and 14 with RFI suppression to a minimum standard of IEC 0875 and shall comply with the EMC directive.

Electronic transformers shall have short circuit and overload protection. Electronic

transformers shall contain a soft start circuit and be self-regulating.

Electronic transformers used in dimmed circuits shall be suitable for dimming. The dimmer shall be compatible with the transformer and be recommended by the transformer manufacturer.

When installed in ceiling voids, the transformer shall be properly supported to avoid the transmission of vibrations.

Transformers shall be located away from high temperature parts of the lamp and lurninaire or any other heat radiating surface in the void.

Lamp holders in dichroic or capsule luminaries shall be easily accessible for re-lamping.

Lamp holders for Tungsten Halogen lamps shall be of the best quality with ceramic bases suitable for the currents and temperatures achieved during constant use.

Springs and other metal parts in the lamp holder assembly shall not deteriorate during use, such that poor contact arcing, welding or slackness can occur.

Dichoic and Sealed Medium Voltage Tungsten Halogen Lamps: Where sealed Medium voltage lamps are used the luminaire shall be designed to cope with the increased temperature.

Where dichroic lamps are used the internal wiring shall cope with the increased temperature. All lamps

shall be of the captive type and supplied with a GU 5.3 base.

Capsule Medium Voltage Lamps: Capsule lamps shall not be installed using bare hands. Where

capsule lamps are used the envelope shall be made of quartz glass.

Where capsule lamps are used a protective glass shall be incorporated into the luminaire design. Mains

Voltage Tungsten Halogen Lamps:

Luminaries-design to accommodate double-ended mains voltage Tungsten Halogen lamps shall be designed to ensure that a minimum bulb wall temperature of 250°C and a maximum pinch point temperature of 350°C are achieved.

2.6 LAMPS

2.6.1 General: Lamps shall be of wattage and types as shown on the Drawings. Lamps shall be furnished and installed in all lighting fixtures supplied.

2.6.2 Fluorescent Lamps:

Lamps shall have bi-pin bases and a minimum approximate rated life of 12 000 hours.

Unless otherwise indicated on the Drawings all fluorescent lamps shall have the color rendering index (84) and equal to "TL" D 36 W (26 mm diameter) and "TL" D 18 W (26 mm diameter) or T5 14 W.

2.6.3 Incandescent Lamps: Incandescent lamps 200 Watts and below shall be inside frosted type.

Lamps shall be for operation at 240 Volts with a minimum approximate rated life of 1000 hours.

Lamps shall have an E.S. screw base for lamps up to 200 Watts and a G.E.C. screw base for lamps 300 Watts and larger.

Lamps shall be for operation at 240 Volts with a minimum approximate rated life of 1000 hours.

Lamps shall have an E.S. screw base for lamps up to 200 Watts and a G.E.C. screw base for lamps 300 Watts and larger

2.6.4 High Pressure Mercury Lamps: Lamps shall have the following characteristics:

Nominal Wattage	Minimum Lumen Output After 100 Burning Hours
125	6300 Lumen
250	13000 Lumen

Lifetime 8 000 hours.

2.6.5 Compact Fluorescent Lamps: Luminaries containing compact fluorescent lamps shall be designed to ensure the correct working conditions for the lamps.

All compact fluorescent luminaries shall be supplied with low loss control gear and single pulse electronic starters.

Compact fluorescent lamps shall be suitable for operation with either conventional or high frequency ballasts.

2.6.6 Emergency Lighting System: Exit signs shall be manufactured to meet the appropriate requirements of the following standards:

BS 4533	General Requirements and Tests BS
4533	Luminaires for Emergency Lighting
BS 5225	Method of Photometric Measurement of Battery Operated Emergency Lighting Luminaires
BS 7671	Requirements for Electrical Installations
BS EN 60529	Degrees of Protection Provided by Enclosures (IP Code) ISO
9000	Quality Management and Assurance Standards
OGEWC	Pakistan General Electricity and Water Corporation Regulations. Each

sign shall be internally illuminated by two separate systems of lighting.

The housing shall be designed to maintain an internal ambient temperature below that of the lowest temperature rating of any piece of equipment installed therein.

The supplier's manufacturing facility shall be certified to ISO 9000 or equivalent.

Battery units, luminaries and accessories shall be warranted for a minimum of 5 years by the manufacturer. The battery shall have minimum 10 years useful life.

2.7 OUTDOOR LIGHTING

2.7.1 **General:** Outdoor lighting systems shall be suitable for the climatic conditions in Site area as per Drawings.

Outdoor lighting panel's subject to be controlled through photocell and timer operated Contactors

2.7.2 Lighting Columns, Luminaires and Floodlights

Description: This work shall consist of supplying, installing and putting into satisfactory operation lighting columns complete with luminaires, brackets, wiring, distribution equipment, control gear and associated materials located as detailed on the Drawings.

Lighting Columns: Lighting columns shall be of the height specified and be of multisided section tapered type, made of steel.

General, unless otherwise specifically indicated, column walls shall have a minimum thickness of 4 mm and the overall diameter of the column at its base shall be sufficient to accept the cable termination and control equipment.
The column tops shall be designed to receive the approved luminaire or group of projectors to form an aesthetic homogeneous assembly.

The Contractor shall calculate the column section thickness of steel etc., so that the column once installed and fully equipped shall be able to withstand a wind of 100 km/hr blowing in the most unfavorable direction. The effect of the luminaire/projector head, which shall be assumed as not less than a resistance of 25 kg/luminaire plus any special bracketing should be taken into account. Appropriate reinforcement shall be provided where needed to increase the strength.

The fatigue of the steel shall in no case exceed half of the elasticity limit, taking into account the dynamic stresses due to vibrations.

A synthetic rubber gasket fitted into the frame shall ensure the tightness. The structural support of the gasket shall be designed to protect the latter from direct sunlight.

The refractor-frame assembly shall be hinged to the body and maintained in place with stainless steel fixing spring clips, a neoprene gasket shall ensure a very thorough dust tightness. Removal of the refractor frame assembly from the hinge shall be possible without tools.

The lamp socket shall be made of high grade porcelain, mounted in a die-cast U-shaped support bracket allowing the socket to be moved into at least three different axial positions and three different vertical positions to adjust the lamp at focal point. A locking system shall prevent loosening of the lamp.

Special precautions shall be given to the choice of materials which shall be able to support without damage or ageing or alteration in its structural or physical properties, severe climatic conditions (tropical climate); in addition to the heat emitted by the lamp. Utilization of aluminum is imposed, polyester, plastics and other similar organic materials are not acceptable.

A suitable terminal block shall be provided to allow connection of the supply cables and shall be clearly marked. Special arrangements shall be taken to facilitate maintenance, quick replacement of and easy disconnection of individual components.

The exposed metallic parts of the luminaires shall be factory finished, stove enameled with a suitable corrosion resisting paint capable of resisting the heat emitted by the lamp during continuous operation, even if necessary under full sunlight conditions. Color to be agreed with the Engineer / Project Manager.

The luminaire shall be firmly fixed on top of the pole so that no rotation or falling of the luminaires may occur even if the pole is subjected to impact.

The column manufacturer shall verify that the size of the concrete foundations as shown on the Drawings are suitable for the conditions specified and the nature of the foundation soil. Supporting calculations shall be submitted to the Engineer / Project Manager and the location and level of the foundations checked by the column manufacturer before the foundation concrete is poured.

Columns shall be provided with one weatherproof access door positioned at the base, sized to insert and service the supply cable terminations and switchgear. The door shall be flush fitting with a retaining mechanism and a positive locking arrangement having a removable hexagonal key. Appropriate reinforcement shall be provided in the column at the door openings. Just positioned to each door shall be fitted nun-hygroscopic baseboard shall be fixed to the inside of the column by means of purpose made welded brackets. A stainless steel earthing stud shall be welded inside the pole near the lower access door and shall be complete with stainless steel washers and nuts.

Finishing: All welds shall be smooth and spatter removed. The interior and exterior surface of the columns shall be cleaned by pickling or blasting and shall be free of any grease trace.

All components of the column shall be hot dipped galvanized after completion of the fabrication. No further touching up finishing or modifications shall be carried out after galvanizing. The minimum thickness of zinc coating shall be 500 g/sq. m on both the inside and outside faces of the column. The galvanizing shall be carried out by total immersion in a bath of molten zinc.

Distribution Equipment

Shall be mounted on the baseboards of the columns. Mounted on the baseboards on the columns shall be the switchgear comprising a Single Pole Miniature Circuit Breaker wire in wire out type sized as follows:

One (1) luminaire - 16 Ampere Single Pole Miniature Circuit Breaker Two

(2) Luminaires - 2 c 16 Ampere Single Pole Miniature Circuit Breaker.

The breakers shall be calibrated at 50 °C. The incoming side of the breakers with separate neutral assembly shall be capable of accepting 2 x 25 sq. m copper conductors or as shown on the Drawing. The breakers shall have a current interrupting capacity of 6000 Amperes.

Flood Lighting: The luminaires shall be duel and watertight, specially designed to house lamps and accessories. The complete assembly shall be dust, watertight and bugtight.

The luminaire shall be made of extruded or fabricated or pressure diecast aluminum alloy of the corrosion resistant type. The exterior shall be totally of the corrosion resistant type. The exterior shall be totally smooth. The copper content shall be less than 0.05 percent to prevent intercrystalline corrosion.

The mirror reflectors shall be of high purity, glazed and anodized aluminum (99.9 percent) rigidly fixed to the body and easily replaceable.

Control equipment shall be mounted within each luminaire, the lamp and control gear shall be mounted, in two different and isolated compartments.

Constructional Requirements: The columns shall be installed on the concrete bases as detailed on the Drawings. Holding down and plumb adjusting nuts, washers shall be stainless steel. Suitable quantities of steel plate templates shall be provided for setting out and checking the location of the holding down bolts during concreting of the bases.

The erection of the lighting columns along the access roads shall be such that the luminaires are located on a line parallel to the theoretically and vertically must be secured to the satisfaction of the Engineer / Project Manager.

The luminaire/projector heads shall be mounted at the top of the columns upon the Manufacturer's purpose made bracket appropriate to the number of luminaire/projectors on the column. The angle of inclination of the access road luminaires shall be in accordance with the Manufacturer's recommendations and shall be set at 90 degrees to the longitudinal axis road.

PART 3 EXECUTION

3.1 GENERAL

Provide all equipment installations and wiring installations including connections as indicated, specified and required. Assure proper fits for all equipment and materials within the spaces shown on Drawings.

3.2 INSPECTION

Inspect each assembly and related accessories for damage, defects and completeness prior to installation.

3.3 INSTALLATION

Where a conduit wiring system is specified for the wiring to totally enclose lighting fittings such as bulkhead fittings etc., and the wiring passes through the fittings or the fittings are mounted directly to a conduit box housing, the circuit wiring shall be carried out in silicone rubber insulated cable enclosed in a separate conduit.

Under no circumstances shall totally enclosed lighting fittings be mounted on conduit boxes housing PVC wiring.

Adequate spacing shall be left between wall and bracket-mounted lighting bulbs.

The fixed wiring to a fitting shall terminate adjacent to the fitting in a conduit box. Final connection to the fitting being carried out silicon rubber insulated pull through flexible conduit.

Final connections between fixed wiring systems and lighting fittings shall in all cases be carried out in heat resisting flexible cables.

Under no circumstances shall cables insulated with general purpose PVC be used for final connections to any lighting fittings.

The flexible cables used for final connections shall be type selected for temperature duty and current/mass supported in accordance with IEC Regulations, except that no cable shall be less than 2.5 mm sq. cross section.

Multi-core sheathed flexible cables pulled through on a conduit or trunking shall be secured to the respective termination by means of a cable gland, screwed into the conduit spout.

3.4 INSTALLATION SUPERVISION

Provide the services of a trained and experienced supervision to perform the following duties:

- Supervise the installation
- Inspect and correct all installations
- Prepare and submit the final test report for all lighting systems

3.5 LIGHTING FITTINGS

Install all the interior lighting fittings and appurtenances as specified and as shown on Drawings.

3.6 WIRING

Provide complete wiring installations for interior and exterior lighting units, switches, convenience outlets and grounding as indicated, required and specified.

3.6.1 Materials: Unplasticized polyvinyl chloride (UPVC) duct with size as shown on the Drawing, of non-sparking type and suitable for direct burial in the ground. Minimum tensile strength shall be 500 kg/sq m impact strength and shall be 5 kg/sq m.

3.7 Civil Works for Road Lighting and Electrical Installation.

3.7.1 Description: The work specified in this section covers the General Civil Works for the road lighting electrical installation as detailed on the Drawings and in the bill of quantities.

Concrete shall conform to the relevant requirements of Section. Covers for manholes shall be cast iron and of the heavy duty concrete infill type to take a slow moving wheel load of 11.5 tons.

3.7.2 Construction Requirements

Concrete Foundation Block for Columns and Street Lighting Pillers: The excavation for construction of the foundation shall be in soil of any nature, including rock or demolition of old structure. In case the foundation is located in a backfill, the backfill shall have been perfectly compacted at the time of the backfill, before the excavation is executed, otherwise the case shall be reported to the Engineer / Project Manager for a decision.

Pouring concrete and reinforcement shall be according to Concrete Section.

The position of the anchor/fixing bolts and the level of the top surface shall be exactly determined and adjusted. UPVC conduits of sizes as shown on the Drawings shall be installed in the foundation for incoming and outgoing feeder lines.
Cable Manholes or Handholes: The cable manhole or handholes shall be made of concrete with sulphate resisting cement of the same specification as indicated for the foundation of the columns. Walls and roof slab shall be shuttered. Reinforcement shall be provided as indicated on the civil Drawings.

Underground Duct System: The Contractor shall supply and install the underground ducts, construct the cable pits indicated on the Engineer / Project Manager's drawings or as required on site for installation of the cables.

The Contractor shall be responsible for all excavation, draining trenches, forming of duct assembly and protective concrete envelope, backfilling, removal of excess earth and restoring finished grade to its original conditions.

In cases where ducts are installed across a finished road surface or hard shoulder, particular attention must be paid when making good to the road surface to ensure conformity to the existing

wearing course and the accordance of differential settlement. The material used must conform to a similar specification to that used in the original construction.

Ducts shall be made of high impact resistance, acid resistance and alkali proof, UPVC conducts, of sizes as noted on the Engineer / Project Manager's Drawings. Each section of the duct shall have one end tapered in. The joined part shall be equal or longer than 80 mm in length. The junction shall be waterproof and sandproof

A 3mm galvanized steel wire, shall be left inside empty ducts to allow for the future pulling of cables. The steel wire shall be cut at the length of one meter outside the duct head into the manhole and securely fixed to a wooden block so that the wire shall not be lost inside the duct.

The end of each duct shall then be sealed by means of placing in wooden end hungs so as to ensure that it remains clean until needed by the contractor installing the cables. Ducts shall be installed inside a trench in close cluster, under sidewalks and paved areas.

Ducts shall be backfilled with a properly compacted excavation material. Under roads, ducts shall be in banks, encased in concrete, with at least five em coverage in all directions.

Ducts ending in cable manholes shall be neatly cut and reamed, and shall finish short of the internal wall face, and a smooth bell mouth entry formed by application of cement.

The duct runs shall be inspected in the pressure of the Engineer / Project Manager before and after concreting by pulling a steel mandrel of other approved device, of a diameter equal to 75 percent of the inside diameter of the duct and 500 mm long. The mandrel shall pass through the entire run of the ducts, from one end or the other, without binding. All ducts which will not allow the mandrel to be pulled through, shall be pulled through, shall be repaired or replaced to the satisfaction of the Engineer / Project Manager at no additional cost to the Client.

CLOSED CIRCUIT TELEVISION SYSTEM (CCTV)

PART 1 GENERAL

1.1 RELATED DOCUMENTS

Drawings and General Provisions of the Contract, apply to work of this Section.

1.2 DESCRIPTION OF WORK

The CCTV system shall be used for security surveillance having color video cameras, as indicated on the drawings:

The CCTV System shall cover parks, entrances, and food street area.

Locations of video cameras shall be at positions, which makes them cover the intended fields of vision.

1.3 REFERENCE CODES AND STANDARDS

All works shall be performed in strict accordance with the drawings, specifications and stipulations of the National Fire Protection Association (NFPA), International Electrical Commission (IEC), the Underwriters Laboratory (UL) listing or other equivalent international standards.

Equipment and installations shall comply with the latest revision of the current provisions of the following codes and standards:

- Standards of local authorities having jurisdiction
- Electrical Component Standard: Provide work complying with applicable requirements of NFPA 70 "National Electrical Code"
- CCIR Compliance: Comply with the relevant CCIR standards or approved equal
- UL Compliance: Comply with requirements of UL 50 and UL 486A or other equivalent standards

IEC Compliance: Comply with applicable requirement standards pertaining to system and wiring

1.4 SUBMITTALS

System Contractor shall submit the following in accordance with Conditions of the Contract and Division- I Specification Sections:

1.4.1 General: System Contractor shall submit the necessary complete sets of documentation indicating type, size, rating, style, catalog number, manufacturers names, photographs and/or catalog data sheets for all items to ensure compliance with Specifications. This documentation shall be subject to the approval of the Engineer / Project Manager and no equipment shall be ordered without his approval for all equipment and devices, which are shown on Drawings, Schedules and in Bill of Quantities.

1.4.2 Shop Drawings: System Contractor shall Provide shop drawings showing equipment and device locations and connecting wiring of entire CCTV system, including riser diagrams. Shop drawings shall include the following:

- Complete one-line riser diagram(s) showing all equipment and the size, type and number of all conductors including signal strengths and cable loss
- Pin to pin connection diagram
- Provide installation instructions and installation manuals
- Complete description and data for all system components
- Complete sequence of operations and functions of the system
- Complete system-wiring diagrams for components and interfaces to equipment provided by others

1.5 QUALITY ASSURANCE

1.5.1 Manufacturer Qualifications: Manufacturing firms of the CCTV shall be regularly engaged in manufacturing of CCTV system of type, size and characteristics similar to those required for the

project and whose products have been in satisfactory service in similar projects for not less than five (5) years.

1.5.2 Installer Qualifications: Engage an experienced installer who is a factory authorized sales and service representative to perform the work of this section.

The installer firm shall have at least five (5) years of successful installation experience of CCTV systems similar to that required for the project.

1.5.3 Training: Equipment's manufacturer and his authorized, local representative shall provide, in depth, equipment service and programming on site training to selected Client's personnel for two weeks

1.6 DELIVERY, STORAGE AND HANDLING

System Contractor shall deliver products in factory containers. Store in clean, dry, closed space in original containers. Protect products from fumes. Handle very carefully to avoid shocks or damage.

1.7 AS-BUILT DRAWINGS

During the construction of the system, the System Contractor shall put in writing all his remarks, during the progress of work, concerning any suggested alterations from the shop drawings in wiring routes, locations of equipment or devices which arise from coordination between the system and other activities.

No execution of alterations shall be allowed before receiving written approval from the main contractor.

All alterations shall be registered and filled by system contractors.

A complete as-built draft set of drawings and equipment schedules shall be prepared 15 days after completion of work by System Contractor for approval of the main contractor.

The draft as-built shall include all previously approved alterations.

1.8 SPARE PARTS

The system shall have the following spare parts:

- No. of 1 fixed cameras c/w lens and power supply.

PART 2 PRODUCTS

2.1 GENERAL

The closed circuit television system CCTV shall be used for security surveillance using color video cameras.

Display of captured pictures shall be through TV monitors, one of them shall displays (4) pictures, others shall display one camera each at 14" screen for close monitoring of a selected camera.

All monitors and control equipment shall be rack, console mounted.

Cameras shall be of two types, fixed and movable dome cameras, which shall be controlled remotely for pan, tilt, zoom, focus, and camera ON/OFF.

The management and control of the system shall be fully digital. All the CCTV equipment shall be matching and operating all together as one system.

The CCTV systems shall allow for future extension in number of cameras and monitors. Sensitivity of cameras shall fit for clear reproduction of pictures in maximum and minimum light intensity conditions of each location.

Transmission of video signals and digital command signals shall be amplified whenever required if distances exceeding the manufacturer limits, taking into consideration losses in the cable network. The monitoring and control stations of the CCTV System shall include:

- Color video cameras
- 14 inch monitor for viewing (4) cameras simultaneously
- 14 inch monitors
- 4 input duplex multiplexer
- Control and selection equipment (video matrix)
- Key boards controller
- Video and control signal transmission cabling and accessories
- Time laps videocassette recorder and related equipment.
- Racks and consoles.

All the components of the system shall be cross-matched by System Contractor and appropriate for operation as an integrated system. Video signals shall be transmitted using low-loss coaxial cables, and cables for data transmission shall be recommended by the system manufacturer. Cables shall be in complete coordination with equipment manufacturer specifications. Matching between the different components shall be secured.

2.2 SYSTEM OPERATION

The CCTV system shall display live color video pictures for security and operations surveillance in areas indicated in drawings

The operator may record scenes from any camera for periods up to 24 hours per day for 30 days, and shall retrieve recordings of any past time using time search technique. It is also possible to select specific camera at specific time to be displayed on the close monitoring screen.

The operator of the control room shall have the facility to select, observe, control and record any of the working cameras.

All cameras shall be equipped with back light compensation (BLC), automatic bright light limiter and light intensity control (CCD auto-iris or CCD with auto iris-lens). All cameras shall be 12/24 AC operated and supplied through special Power Supply.

Lens for fixed cameras shall be selected varifocal and auto iris to provide the required field of vision according to location as indicated on the Drawings.

The System Contractor shall be responsible for selecting the fixing location and adjust the lens variables for best results.

Lens for dome cameras shall be motorized zoom lens.

Dome cameras shall have 30 presetting positions, every position shall be selected to cover specific area, door, etc. Security man can select and preset position of any camera by a code. When a preset position is selected, the selected camera shall pan, tilt and change the zoom to observe the pre-selected view.

Monitoring stations of the system shall be supplied from the project secured source to ensure uninterrupted operation in case of supply failure.

Video signals transmitted through cables shall be amplified, if necessary in cases of long reaches to provide the necessary clear and stable pictures at the monitors.

Output signals from cameras, loss in cables and gain of the amplifiers, if necessary, are all of the responsibility of the System Contractor so as to be in accordance with the manufacturer standards, and shall match the signal strength requirements for the monitoring equipment. The transmission equipment to overcome attenuation in cables shall provide sufficient strength of video and data signals.

2.3 EQUIPMENT AND MATERIALS

2.3.1 Fixed CCTV Cameras: Color CCTV cameras, AC operated and supplied through special AC adapter, equipped for C/CS lens mount, having interline transfer 1/3 inch CCD solid state images.

The cameras shall have the following minimum characteristics:

Image device sensor	CCD Type 1/3 inch color
TV standard	PAL
Resolution	480 TV lines (Horizontal)
Sensitivity	0.5 lux or better
Video out	Composite video (CVBS) 1 volt P.P. at 75/0HM (balanced)
Digital signal processing	Included
Synchronization	AC line lock with phase adjustment
Shuttering control	Included
Automatic gain control	AGC 15 dB Auto or Selectable Signal
to noise ratio	*SIN* min 48 dB (AGC oft Lens mount
Lens mount	C/CS
Camera mounting	Top Bottom
Back light compensation	Include in the camera
Gama correction	Adjustable
Connection for auto iris	Direct drive for auto iris lens
Power supply	24/12 VAC 50 Hz
Ambient conditions	-5 o to 55C 0, > 90 % RH

The camera lens shall have the following minimum characteristics:

Format Size	1/3 inch
Mount	CS
Focal Length	Variable 3.5 8mm
Iris	Auto iris video/DC based on the camera

2.3.2 Outdoor Fixed CCTV Camera Housing: Wall I ceiling security housing shall house the camera and all attached accessories of the cameras including the lens. The housing shall be enclosed in an environmental housing.

The cameras housing shall provide full protection for environmental conditions (dust, sun, rain, temperature, etc.) and shall include sun hood and shall house all attached accessories of the cameras including the lens.

Housing shall not cause any loss in quality or sensitivity of pictures The camera housing shall have the following minimum characteristics:

- Power supply for the housing and for the camera
- Heater
- Blower
- Sunshield option in cases of sunny areas
- Tamper proof with locking system

2.3.3 Outdoor Movable CCTV Cameras (Dome type): Color CCTV cameras, AC operated and supplied through special AC adapter, built in pan, tilt, zoom, focus and camera ON/OFF facility, having interline transfer 1/4 inch CCD solid-state imager and internal synchronization. The cameras shall communicate digitally with the system. The cameras shall have auto-iris function, responding to high intensity and white balance function

For out door use. The camera shall be enclosed in an environmental housing.

The cameras housing shall provide full protection for environmental conditions (dust, sun, rain, temperature, etc.) and shall house all attached accessories of the cameras including the lens.

Housing shall not cause any loss in quality or sensitivity of pictures. Cameras shall be equipped with digital remote control modules to operate pan, tilt, and zoom functions from the control rooms. The cameras housing shall have the following minimum characteristics:

- Power supply for the housing and for the camera
- Tamper proof with locking system

The contractor to cover the required field of vision in different areas shall confirm focal length of lens. Zoom lens shall include motorized zoom mechanism for silent operation.

The cameras shall have the following minimum characteristics

Image device sensor	CCD Type 1/4 inch color
TV standard	PAL
Resolution	480 TV lines (Horizontal)
30 preset positions	
Sensitivity	2 lux or better
Video out	Composite video (CVBS) 1 Volt at 75 OHM
Digital signal processing	Included
Synchronization	AC Line lock internal/external
Shuttering control speed	Auto and manual 1/1.5-1/30,000
Automatic gain control	AGC Auto or Off
Signal to noise ratio	Min 48db
Back light compensation	Adjustable
Iris control	Automatic with Manual facility
White balance	Automatic with Manual facility
Focal length	Optical13.78 – 67.1 mm, F1.6
Auto focus	
Zoom	18x Optical
Zoom speed	3.5 sec max for complete span
Power supply	12/24 VAC 50 HZ
Panning	360 Complete rotation
Pan speed	300°/Sec fixed and Variable
Tilt speed	120°/Sec fixed and Variable
Preset facility	upto 30 preset position
Preset accuracy	0.3² or Better
Data control	Using RS 422 or 485 With Control cable or using Data over video cable technique.
Alarm facility	Min (3) Alarm individual inputs
Output facility	Min (1) relay out put
Ambient conditions	-5 o to 55° , > 90 % RH
Mirror type dome cover	

The system contractor is responsible to cover the required field of vision in different areas, he shall confirm focal length of lens. Zoom lens shall include motorized zoom Mechanism for silent operation.

2.3.4 17" Monitor: CCIR color monitors for CCTV remote observation having 14-inch screen to display high-resolution reproduction.

Monitors shall be equipped with picture controls, such as brightness, contrast, vertical and horizontal hold, color, etc.

Monitors shall have automatic vertical and horizontal synchronization and shall accept composite signals received from the cameras.

Monitors shall be matching the other constituent of the CCTV system. The monitor shall be equipped with on-screen display of cameras identifier code or number of video loss warning.

The monitor shall have the minimum characteristics:

TV standard	CCIR/PAL CVBS
Screen size	17- inch
Resolution	600 TV horizontal lines
Video input	CVBS 75 OHl\.1 BNC connector 1VPP
Loop-through	Video input- high impedance
Degaussing	Including
Power supply	240 VAC 50 HZ

2.3.5 Quad Camera Multiplexer: Multiplexer shall be used to display captured image from group of cameras on the same monitor. Multiplexer can divide screen to 1, 2, 4 sections to display required cameras.

Can display a selected camera or multiplexed group of cameras.
- PAL system
- Help screens guide the operator through the setup process.

- Video loss listing based on the number of connected cameras. Multiplexer shall have the following features 4 channel, Duplex
- Power supply : 240 VI 50 Hz
- Synchronization: Full time-based correction.
- Color system PAL.
- Digital Memory:720 H x 576 V.
- AGC: Automatic or manually adjust for each video input.
- Video Input Level: 0.5 Vp-p to 2.0 Vp-p composite video signal.
- Inputs Cameras: 4 inputs; 8 BNC connectors .Automatic looping termination BNC.

2.3.6 Video Selection Matrix: Video selection matrix with capacity as mentioned in the drawings, shall be used to select any of the cameras connected to it for display on a single picture TV monitor. The matrix shall be micro-processor based control.

Matrix shall be modular system consists of enclosures housing video input cards, video output cards, loop through cards, control cards, etc..

The video selection matrix shall leave the following characteristics.

- Ability to select any input signal (camera) to be routed to any output monitor. One-

line videotext to write camera number and its location (min 20 characters).

- Display for indication of camera number, time/date information and other operating indications min 20 characters.
- Switching the cameras into the monitor out in a manual or a sequential manner.
- Alarm inputs min 6 alarm points.
- Self-system internal diagnostic.
- Password protected in a partitioning manner.
- Multiple of control key boards - up to 4 key boards.
- Each camera shall have alarm title.
- The camera control (PTZ) uses RS 422 & via the video signal cable.
- The capacity shall be as mentioned in the drawings and to be expandable for future extension.
- All inputs shall be loop through.
- Video inputs and outputs shall be PAL standard.
- Video band width: 15 M Hz.
- Adjacent input cross talk: 50 dB.
- Bluer & heater
- Power supply 240 VAC 50 Hz.

2.3.7 Time-Lapse Video Recorders: CCTV systems shall have videocassette recorders in the security room. Video recording shall use time-lapse VCR recorders having the capability of recording continuous and time-lapse modes, which when selected shall record scenes at intervals so as to extend the duration of recording on the standard VHS tapes.

Time lapse VCR shall have the following characteristics:

- Continuous and 10 time-lapse modes up to 960 hours recording on a single standard tape VHS and super VHS
- Built in time data and camera code are recorded
- Automatic search for specific camera and time
- Cascading capability
- Field-by-field playback capability
- Built-in memory battery
- Alarm search
- Alarm listing
- No. of min 6 automatic record programs
- Tape end warning
- Built-in video head cleaning
- On!off automatic rewind
- Video standard CCIR 625 lines, 50 fields/sec PAL-color signal
- Resolution 400 horizontal lines
- Signal to noise ratio SIN 50 dB
- Power supply 240 VAC /50 Hz

2.3.8 Power Supply for CCTV Cameras: Each CCTV camera shall be fed with low volt AC using dedicated 240 /LV AC - 50 Hz adapter power supply.

The power supply shall include 240 /LV AC - 50 Hz /low AC filtered, stabilized and protected against short circuit and overload. Full isolation between the mains and AC shall be provided.

Coordinate the features of materials and equipment so that they form an integrated system. Match

components and interconnections for optimum future performance.

The system shall be supplied from the emergency source to msure continuation of service.

Racks and Consoles: The racks and consoles system shall be capable of supporting all equipment which specified before.

The console shall be comprised of floor mounted bases consisting of three main parts, upper part, bottom part and the middle part.

The work surface stand shall be wood or any non metal material.

The upper part shall have from 10" to 15" tilt towards the operator for the equipment placed in the top,

The upper part shall be provided with removable equipment finishing masks or surrounds cut to the size of the face of the mounted equipment.

Cables shall be able to pass through the completion width of the console without any obstruction. All

modules shall be constructed of a steel super structure framework with side panels.

The console shall be complete with cooling fans, power strips, wire ways brackets, shelves and drawers, blank plates and all other related accessories.

The system Contractor shall provide sets of scaled drawings for each console assembly showing the location of all the specified equipment in isometric view in addition to a plant (top) and front views

The size of the console shall fit the control room area. All cables and connections should be labeled.

2.3.9 CCTV Cable Network

CCTV wiring shall be installed inside PVC and steel conduits according to situation. Routs running inside walls, ceilings and under floors shall be in PVC. Exposed routs shall run in steel conduits, cable trays etc. (false ceilings, etc).

The network shall use single, multi pair, coaxial etc cables in compliance with the requirements of the equipment manufacturers.

Transmission of video and control signals between the different equipment of the system shall be done through a cable network of appropriate characteristics. System contractor shall do coordination between the network and the equipment taking into consideration to provide the right connectors and network accessories. All cables and wiring shall be installed to be rodent proof.

The network shall cover the cable network for the central control and monitoring equipment and cameras in the site.

This network shall include coaxial, control and supply cables interconnecting the different components together. This shall include distribution boxes to accommodate incoming cables, splitters to distribute coaxial cables to the two matrix selection keyboard and all other necessary equipment and devices according to the manufacturer requirements.

- Coaxial cables, connectors and accessories for video transmission
- Twisted pair, shielded cables for data and command signals transmission
- Power supply and earth wires

System contractor shall be responsible to calculate signal levels in each cable which shall be in close coordination and conformity with the requirements of the provided equipment.

System contractor shall pay Special attention to interference and cross modulation in cable runs with other wiring.

Line amplifiers shall be avoided as far as possible in long cable runs.

The coaxial cable network shall include coaxial connectors matching the equipment and coaxial cable accessories.

The System contractor is responsible to provide coaxial cable schedule including the following information:
- Impedance (ohm)
- Capacitance (pf/m)
- Attenuation dB/100 m
- Insulation
- Propagation delay
- DC resistance
- Shield
- Physical data

Twisted Pair Cables: Command and data communication shall be done using twisted pair shielded cable having the necessary bandwidth to suite the transmitted data. The System contractor shall assure that the characteristics shall be fully coordinated and in conformity with the requirements of the system.

PART 3 EXECUTION

3.1 PULLING CABLES

System contractor shall not exceed manufacturer's recommended pulling tensions, shall not install bruised, kinked, scored, deformed, or abraded cable, not splice cable between indicated termination, tap, or junction points. Remove and discard cable where damaged during installation and replace it with new cable.

System contractor shall Make final connection to equipment in the presence of the equipment manufacturer's representative.

3.2 INSTALLATION

Installation of the Control and Monitoring Equipment: The System contractor shall cover the following:

- Installation of the racks and consoles which enclose the equipment
- Internal signal, power, and control wiring

Adjustment, testing and putting into operation of the equipment, and other related equipment such as TV cameras and wiring to achieve the specified performance.

3.3 CLEANING

System contractor shall clean all system components including camera housing windows, lens, and monitor screens. Use methods and materials recommended by manufacturer

3.4 ADJUSTMENT

Occupancy Adjustments: When requested within 1 year of date of Substantial Completion, System contractor shall provide on-site assistance in adjusting the system to suit actual occupied conditions and provide up till 2 requested adjustment periods at the site for this purpose without additional cost.

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SPECIFICATIONS - SPECIAL PROVISIONS

1. DESCRIPTION OF PROJECT

1.1. General

The Employer, Sindh Integrated Health & Population Program is intending to rehab 15 THQs across Sindh.

2. THE SITE

2.1. Site of Works

The Site of the Works is the area for construction lying within the right-of-way lines, boundaries and limits shown on the Drawing and any such additional areas adjacent thereto as may be designated by the Engineer / Project Manager from time to time for the construction to be performed under the Contract.

3. WORK UNDER THE CONTRACT

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

4. GENERAL RULES OF SPECIFICATIONS

a) Specification or as Specified

"Specification" or "as specified" refers to the specifications outlined in these Documents and where no specifications are available for any work or where the same are found not applicable then the relevant applicable AASHTO, ASTM or BSS specifications or equivalent standards shall apply in the same order.

Any item for which no specifications are outlined but which are identified on drawings, shall be completed according to the standards as per AASHTO / ASTM / BSS, these include items that may be added in the future. The Engineer / Project Manager may supplement such specifications during the progress of work. All materials and processes used for these items shall be subjected to standard testing and, if found below the pertinent AASHTO / ASTM / BSS standards, shall be removed from the site immediately at Contractor's expense.

b) Standards and Codes

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

c) Materials and Processes

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

d) Equivalent Materials, Processes, etc.

Where specific materials, processes, etc. are specified and the same are not available other alternative materials and processes which ensure an equal or higher quality than those specified will be accepted subject to the Employer / Employer's Representative's prior review and written approval. Differences between the those specified and the proposed alternatives must be fully described in writing by the Contractor and submitted to the Employer / Employer's Representative at least 30 days prior to the date when the Contractor desires the Employer / Employer's Representative's approval who may give such approval after determining that the alternative proposed ensures equal or higher quality.

e) Approved, Directed, Instructed

Approved, directed, instructed means the approval, etc. of the Employer / Employer's Representative unless otherwise stated.

f) Alternatives

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

g) Catalogues / Standards / Manufacturer's Instructions, etc.

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

h) Applicability

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

5. DRAWINGS

5.1. Bidding Drawings

Tender Drawings issued with the Tender Documents, called the Tender Drawings, show scope of the work to be performed by the Contractor. The Drawings are generally in sufficient detail so as to be used as a basis for construction, fabrication and for placing orders for materials subject to corrections based on the future issue of supplementary Drawings as provided under Sub-Clause 5.2 hereof.

5.2. Construction Drawings, Supplementary Drawings

After award of Contract, the Contractor shall carry out "Joint Survey" at Site of Works in pursuance to Sub-Clause 6.4, Specifications - Special Provisions. The Contractor shall submit to the Engineer "Joint Survey", duly signed, dated and stamped by the representatives of the Employer, Consultant and Contractor.

Simultaneously, the Contractor shall submit to the Engineer / Project Manager detailed "Work Programme" in terms of the Conditions of Contract.

After receipt of "Joint Survey" and "Work Programme" from the Contractor, the Engineer / Project Manager will start issuing Construction Drawings to the Contractor. The Engineer / Project Manager shall have authority to issue to the Contractor, from time to time, such Supplementary Drawings and instructions as shall be necessary for the purpose of the proper and adequate execution and completion of the Works and the remedying of any defects therein. The Contractor shall follow these Drawings.

The Contractor shall give notice to the Engineer / Project Manager regarding the part of the Drawings which in his opinion contain discrepancies or are not clear. The Engineer shall issue necessary clarifications or Supplementary Drawings in greater details as required to execute the Works. These Supplementary Drawings showing changes from the Bid Drawings, in the opinion of the Contractor, shall be reviewed by the Engineer / Project Manager for his determination of adjustment of the Contract Price under the Conditions of Contract.

5.3. Definition of Term Drawings

The term Drawings as used in the Specifications means the Drawings referred in Clauses 5.1 and 5.2 hereof.

5.4. Checking of Drawings

The Contractor shall check all Drawings carefully as soon as practicable after receipt thereof, and shall promptly notify the Engineer / Project Manager of any errors discovered.

5.5. Copies of Drawings

Drawings will be issued to the Contractor as described below.

a). Bidding Drawings

One (1) set of the Tender Drawings will be issued to the Contractor alongwith Tender Documents. Additional sets will be provided at cost of reproduction upon written request of the Contractor.

b). Construction Drawings / Supplementary Drawings

One (1) print of each Construction Drawings / Supplementary Drawing will be issued to the Contractor free of charge. Additional sets will be provided at cost of reproduction upon written request of the Contractor.

5.6. Drawings to be Furnished by the Contractor / As-Built Drawings

The Contractor shall submit to the Engineer / Project Manager for review of such drawings as required under the Contract, sufficiently in advance of the work intended to be executed.

The Contractor shall, at all times, keep on Site a separate set of prints on which all significant changes between the work shown on the Drawings and that which is actually constructed, shall be noted neatly, accurately and promptly as the work progresses. The Subcontractor(s) for plumbing, mechanical and electrical shall, at all times, keep on Site, a separate set of prints of the drawings (showing their parts of the Works) on which all significant changes between the work shown on the Drawings and that which is actually constructed, shall be noted neatly, accurately and promptly as the work progresses. Such drawings shall show the exact physical location and configuration of the works as actually installed.

The Contractor shall, within fourteen (14) days of issuance Taking-Over Certificate for whole of the Works, furnish to the Engineer for his approval two (2) copies of such marked up drawings. One (1) copy of each of the marked up drawings approved by the Engineer / Project Manager shall be returned to the Contractor by the Engineer and these shall be used for the preparation of the As - Built Drawings.

The Contractor shall furnish to the Engineer / Project Manager six (6) complete sets of all As -Built Drawings as well as AutoCAD soft copy within thirty (30) days of receipt of drawings stated above, from the Engineer.

5.7. Shop Drawings & Design

The Contractor to prepare and provide detailed shop drawings & design, for all the required items as per the instructions of the Employer/ Engineer and as mentioned in Bidding documents and drawings including but not limited to Architectural, Structural, Road works, Hard & Soft Landscaping, Electrical, Water Supply, Drainage, ICT or any related electro-mechanical works apart from Bar-bending schedule, etc. All drawings should be prepared based on the rules, regulation and requirements of the concerned departments and should be prepared electronically on latest venison of AutoCAD, hard copies along with soft copies on CD's shall be submitted for the approval of Engineer as per the Nos. required in Scope of Work.

6. SETTING OUT OF WORK AND SURVEY

6.1. Reference Points, Lines

The Contractor shall establish bench marks and / or reference line at the Site in accordance with the instructions of the Engineer / Project Manager. The Contractor shall set out its work from these bench marks and / or lines.

6.2. Verification

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

6.3. Survey Instruments

The Contractor shall maintain at the Site the requisite surveying instruments in perfect working conditions for the use of the Engineer's / Project Manager's Representative to check levels and lines of the work at all times. These instruments shall include (but not limited to) One Total Station, Adequate nos. of Levels, theodolites, Tapes, etc.

6.4. No work without Joint Survey

The Contractor shall not start the excavation and / or embankment works until the Joint Survey has been done to establish the existing ground levels.

6.5. Soil & Water Investigation

The Contractor should carry out his own soil & water investigation to see the soil & water conditions and its bearing capacity and the cost to be included in the Bid Price.

6.5.1 Digital Submittals of Soil Investigation

All reports and drawings shall be submitted in digital form (CD or similar) within 30 days of Issuance of Commencement Letter, as follows:

a) The Contractor shall provide on recordable CD media an identical reproducible copy of the report. This shall be in a PDF format to be directly readable as a single file.

b) The Contractor shall provide in digital format all relevant information in an editable Excel spreadsheet form able to be directly convertible in "KEY AGS3". The format spreadsheet will be made available from the Engineer.

The Contractor should make himself aware of the following software to ensure the relevant information and content is provided.

- KEY AGS 97
- HOLEBASE 3
- KEYHOLE 5
- KEYHOLE VETRA

The Contractor shall provide in editable format the following in CD media:

- *.doc (WinWord) All report text.
- *.jpeg All borehole records.
- *.jpeg All laboratory test data sheets and results.
- *.jpeg All core photography
- *.dwg (AutoCAD V14) Miscellaneous report drawings

6.5.2 Submission of Water Quality Report

The Contractor must submit all water quality parameter for selection of suitable RO Plant.

7. APPROVAL OF MATERIALS AND PLANT

7.1. Quality of Materials

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

7.2. Submission of Samples and Data

As soon as practicable after award of Contract, the Contractor shall submit for the approval of the Engineer / Project Manager drawings, catalogues, diagrams and other descriptive data for all mechanical, electrical, architectural and such other materials and plant designated by the Engineer, which the Contractor proposes for use under this Contract. For certain materials and plant, data may be required to be submitted in accordance with a detail form furnished by the Engineer / Project Manager. Samples of materials (2 sets) shall be submitted by the Contractor to the Engineer / Project Manager at Contractor's cost for approval sufficiently in advance of the materials intended to be incorporated in the Works.

7.3. Testing

Testing, except as otherwise specified herein, shall be performed by a testing agency as proposed by the Contractor and approved by the Engineer / Project Manager, at no extra cost to the Employer. The Engineer / Project Manager may require all testing to be carried out under his supervision only.

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

The Contractor shall keep a complete record of all quality tests programme performed on Site.

7.4. Testing Laboratory Certificates

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

7.5. Inspection

All material and Plant furnished and all work performed under this Contract will be subject to inspection by the Engineer / Project Manager at all times and in all states of completion both off-Site and on-Site. The Contractor shall furnish promptly without additional charge, all facilities, labour and materials reasonably needed for performing such inspection and testing as may be required by the Engineer / Project Manager.

7.6. Approved Sample at Site

The Contractor shall, at all times, keep on the Site approved samples. All such samples shall be made available to the Engineer / Project Manager as and when required.

7.7. Survey Teams And Instruments

The contractor shall provide necessary surveying staff and surveying equipment to the Engineer / Project Manager for conducting necessary survey work in connection with checking or establishing line, level, control and quantification of different items of work.

The Contractor shall maintain survey equipment for the use of the Engineer / Project Manager. All survey equipment shall be maintained throughout the Contract period.

a) Expendable Material

The Contractor shall provide adequate supplies of expendable materials, i.e. pencils, rubbers and inks, drawing papers, level books, field books, pegs, brushes and paints as required by the Engineer.

7.8. Establishment of Field Laboratory

The Contractor shall establish a Site laboratory for the purpose of necessary testing. The laboratory equipment shall remain the Contractor's property at all times.

The operation of the lab shall be under the control of Resident Engineer / Material Engineer of the Consultant.

8. CONSTRUCTION SCHEDULE

8.1. Submittal Date

The programme to be submitted by the shall be submitted in the form of a detailed schedule based on a computerized network analysis covering all construction activities indicating critical activities with critical path, resource scheduling for Contractor's Equipment, material and labour, within the period. All the milestone shall be clearly identified.

8.2. Requirements

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

Each summary or detailed schedule shall consist of a bar chart and a time-scaled network. The scheduled start and finish times for all activities on the bar chart shall agree with those on the network. All inter-relationships and inter-dependencies between structures shall be clearly indicated on the schedules.

The network shall show the order and interdependence of activities planned by the Contractor and shall be time-scaled according to calendar dates.

8.3. Monthly Reports

Each month, the Contractor shall submit a report consisting of:

- Copies of the bar charts for the current phase with both actual progress and scheduled progress shown.
- Network analysis tabulations as in Sub-Clause 8.2 above, reflecting actual start and finish dates where applicable.
- A narrative report discussing any significant deviations from the schedule and, if necessary, explaining the steps proposed to be taken to maintain the approved schedule.

9. SITE OFFICE AND TEMPORARY FACILITIES TO BE PROVIDED BY THE CONTRACTOR

9.1 Contractor's Office, Facilities etc.

The Contractor shall establish and maintain a Site office. The Contractor shall provide all facilities in connection with the execution, completion, of the Works, remedying defects therein and maintenance of the utilities services. The facilities shall, not be limited to, the Contractor's Site Office, labour camps, workyard and storage areas, temporary water supply, waste water disposal, temporary electricity, medical unit, temporary roads, fire protection and firefighting equipment etc.

The Contractor shall be solely responsible for arranging the facilities.

The Contractor shall arrange his labour camp, work yard, storage area, site office within the area available at the Site.

9.2 Sign Board

The Contractor shall erect and maintain at the Site in a location to be approved by the Engineer / Project Manager, 3 Sign Boards 4.45M height and 2 M wide for writing the name of Work, name of Employer, name of Consultants, name of Contractor and Project Cost. The notice board shall comprise of the following;

- Frame of 3" dia GI Pipe properly painted as per the direction of the Consultants/ Engineer and as per drawing.
- 2 Nos. Posts of 3" dia GI Pipe 4.45M above ground and 1M below ground embedded in 1:2:4 CC 2'x2'x4' with proper arrangements of anchorage and brasses. Pipes painted with anti-rust as directed by the Engineer.
- 4 Nos. Steel Sheets 0.6M high and 2M wide fixed on both sides with 50mm gap between each. The background of plates is of white color whereas the writing would be black or red color (as approved by the Engineer / Project Manager)
- White imported 3M sheet used as background. The color of monogram would be, green, red or black etc. (as approved by the Engineer / Project Manager).

- Alphabets of appropriate size as approved by the Engineer in 3M reflective sheet in blue/ black color.

The Contractor shall maintain the display of the notice boards at his own cost throughout the length of the project.

9.3 Site Office Facilities for Project Manager's Team

The Contractor shall provide the following facilities on each lot within 30 days from the signing of agreement:

a). The Contractor shall provide furnished, equipped and serviced temporary PM Team's site offices adequately furnished including but not limited to all costs of Electricity, water supply, sewerage, janitorial services, provision of stationery/consumable/supplies (as per the requirement) and 01 No. tea boy (including tea making items) as directed by the Engineer / Project Manager.

b). The Contractor shall also provide, operate and maintain transport facility for ARE office 03 Nos. vehicle Changan Karavan (Air-Conditioned) on monthly rental basis with fuel (upto a maximum of 400 litres per month) and drivers. The vehicle is for the exclusive use of the PM team to meet their transportation needs and the contractor shall be wholly responsible for furnishing at all times above said facilities. The Contractor shall also provide and maintain 10 Nos. 70cc Motor Bikes Honda, SuperPower or equivalent along with 100 litres fuel for each

c). 06 Nos. HP, Dell or equivalent Laptop (for each office), 13 Generation (or higher) Intel Core i7 Processors, 16GB RAM, One TB SSD, Giga bit Ethernet LAN along with genuine/ licensed Microsoft Windows 10 operating system and Microsoft Office Professional Edition latest version alongwith 256 GB USB 3.0 Flash Drive.

d). Bachelor's accommodation for core PM Team staff.

e). 3 Nos. HP LaserJet black & white Printer DN 1200 x 1200 DPI A3 size.

In case of non-provision of above facilities, the Employer / Engineer / Project Manager shall deduct from any money due / becoming due to the Contractor by the Employer appropriate amount till these facilities are provided satisfactorily to the Engineer / Project Manager.

Cost of all above facilities are deemed to be included in the Contract Price and no additional payment shall be made by the Employer to the Contractor under any circumstances.

10. SAFETY

10.1 Accident Prevention, Protective Equipment

The Contractor shall comply and enforce compliance by all his Subcontractors with the highest standards of safety and accident prevention in compliance with all applicable laws, ordinance and statutory provisions. Where overhead work is being carried out, warning signs shall be installed at ground level clearly warning of the overhead work.

All warning signs shall be in two languages, English and Urdu, and shall at all times be maintained in a clean and legible condition, to the satisfaction of the Engineer / Project Manager. Trash shall be removed at frequent intervals to the satisfaction of the Engineer / Project Manager.

11. The quoted rates shall be inclusive of all lead and lift.

12. The Contractor's rates shall include all incidental charges in connection with the work such as the cost of removing trees, shrubs, grass, etc., which interfere with the execution of the work as well as the cost of Natural Ground Compaction (NGC) which will be carried out by the Contractor upto the satisfaction of the Engineer / Project Manager prior to the earthwork.

13. No alterations or additions shall be made by the Contractor in the Bill of Quantities and rates must be filled in ink or typed out both in figures and words clearly and legibly in the columns provided in the schedule of quantities. All corrections must be initialed by the contractors. Any bid which does not comply with this condition will be liable to be summarily rejected and not taken into account when preparing comparative statement.

14. Materials obtained from excavations will be the property of the Employer. Serviceable materials are to be stacked in places pointed out by Engineer / Project Manager. The Contractor undertakes to have the site clean and free from rubbish to the satisfaction of the Engineer / Project Manager. All surplus materials, rubbish, etc., will be removed to places to be fixed by the Engineer / Project Manager and nothing extra will be paid for this.

15. On completion of the work or earlier as directed by the Engineer / Project Manager, the Contractor shall remove all temporary structure (Godowns, site offices, etc.), erected by him at the site of work. He shall fill tanks dug out by him at site, remove all debris and other materials like surplus sand, stone ballast, rubbish, etc.; and in short, shall leave the site in a neat and tidy condition.

16. The contractors in the course of their works should understand that all material (e.g. , stone and other materials) obtained in the work or dismantling, excavation, etc., will be considered as Employer's property and issued to the contractors (if they require the same for their own use) at rates approved by the Engineer / Project Manager. If the materials are not required by them they will be disposed off in the interest of Employer.

17. The contractor shall inspect the site of works and acquaint himself with the nature and requirements of the work, facilities of access for materials, removal of rubbish, cost of carriage, nature of strata, etc., before submitting his Bid.

18. The contractor shall have to make temporary approach roads, etc., at his own cost to facilitate movement of materials, such approach roads shall be aligned in a manner approved by the Engineer / Project Manager.

19. The contractor shall have to make proper arrangements for road crossing barriers during working hours in the day time as well as in the night when danger lights will have to be provided on either ends at his own cost and no extra cost will be paid. Sufficient barricades and red lights will be provided by the Contractor where required to avoid the chances of accidents. In case an accident occurs for failure on the part of the contractor, he shall be entirely responsible for the consequences.

20. The Contractor shall have to make arrangements for diversions for traffic wherever necessary and shall have to provide diversion and caution boards as per directions of the Engineer at his own cost for which no extra cost will be paid. The diversion shall be watered and consolidated as per directions of the Engineer / Project Manager.

21. No material shall be removed from the site without the written permission of the Engineer / Project Manager.

22. Dewatering including shoring wherever so required for any foundation area, pumping, bailing out water, drainage of water within plot areas if any shall be deemed to have been included in the rates quoted by the tenderers and no extra payment will be made.

23. The rates shall be deemed inclusive of such incidental charges.

24. The Contractors shall execute all works at their own cost for diversion of water away from the plot as per site requirements to have full satisfaction of Engineer / Project Manager and no additional payment will be made on this account.

25. The Engineer / Project Manager reserves the right to select all materials and the type, grade, heating capacity and quantity of proportion of any or all materials as required for a particular work. The decision of Engineer / Project Manager in this respect shall be final and binding on the Contractor. The rejects on materials must be carted at his own cost. If the rejected materials are not removed within one month of its rejection the materials will become the property of the Employer or will be removed at Contractors cost.

26. ATTENDANCE AT MEETINGS

The Contractor shall attend and shall cause his Sub-Contractors to attend any or all meetings when called by the Employer or the Engineer / Project Manager or his Representative to discuss progress of the work and other matters related to the work and the Contract, without any compensation from the Employer.

a). The Contractor shall bear all expenses of the Employer and his agents and representatives and the Engineer / Project Manager, his agents and representatives if requested by the Contractor for any meetings, instructions and approvals away from the Site.

b). The proceedings of the meetings shall be recorded by the Engineer / Project Manager which shall be circulated to all the participants including those of the Contractor. All decisions taken in the meetings shall be binding on the Contractor and shall form part of the Contract.

27. DOCUMENTS NOT TO BE ALTERED OR MUTILATED

No alteration or mutilation (other than filling in all the blanks intended to be filled in) shall be made in the form of Bid or in any of the documents attached to it. Any comments which it is desired to make shall not be placed on any of the documents attached hereto, but shall take the form of a separate statement which shall be as brief as possible and referenced to items, clauses and pages of the annexed documents.

Such statements shall not qualify the acceptance of the Bid based upon a proposed change or changes in the annexed documents, nor shall be binding upon the Employer in any way in making the award. Alterations of already written prices must be signed in the place of alteration by the Bidder or his legally authorised representative.

28. PERSONAL LIABILITY OF PUBLIC OFFICIALS OR ENGINEER

In carrying out any of the provisions of these specifications or in exercising any power of authority granted to them by or within the scope of the Contract, there shall be no liability upon the Employer or his authorized representatives or the Engineer / Project Manager or his authorized representatives their personally or in their official capacity, it being understood that in all matters they act solely as agents and representatives of the Employer.

29. PROTECTION OF EXISTING SERVICES

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

The Contractor shall take full responsibility for safety of existing service lines, utilities and utility structures uncovered or encountered during excavation and construction operations.

The Contractor shall promptly correct all such damage to original condition at no additional expense to the Employer.

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

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

30. COORDINATION OF WORK AT SITE

The Contractor shall take cognizance that during the execution of the project, other contractors may be working concurrently in the vicinity.

All works of his responsibility shall be coordinated by the Contractor so as to give the necessary facilities to other contractors or their workmen or any other employees, who execute or supervise any work on the Site.

The Contractor shall ensure that the necessary safety precautions will be observed and interferences shall be avoided especially for the works executed side-by-side by different contractors.

Due consideration must be given to permit access to sections of the work as required by other contractors for the execution of their works. With a view to coordinate the works, the Employer's Representative may from time to time direct the order of the work to be carried out.

31. ACCESS AND EXISTING ROADS

If the Contractor finds it necessary or elects to use existing roads, the Contractor shall make all necessary arrangements and obtain all permits from the relevant departments for travel over and use of such roads. The Contractor shall observe all rules regulations of the concerned department regarding the use of said roads. The cost of maintaining all necessary safety measures and temporary structures and making any necessary repairs, replacements or similar operations and all or any other costs required by reason of his use of such roads shall be borne by the Contractor and the Contractor shall save harmless and indemnify the Employer in respect of all claims, demands proceedings, damages, costs, charges and expenses whatsoever arising out of or in relation to any such operation or interference.

32. FIRST AID FACILITIES

The Contractor shall provide and maintain adequate First Aid Facilities at all times, convenient to the Site to the approval of the Employer.

33. HEALTH, SAFETY & ENVIRONMENT (HSE)

33.1 HEALTH & SAFETY

33.1.1 General

The HSE goal is to ensure that a proactive HSE culture is implemented throughout the lifecycle of the project which will ultimately help project proponent / Contractors to achieve ZERO lost time and no loss to environment incidents during the entire project.

Some of the below illustrated objectives shall be made part of the objectives:

- Lost Time Injury Frequency (LTIF)
- Number of Weekly HSE audits / inspections submissions
- Number of HSE awareness campaign in the operation
- Recording of UAUC / STOP cards per months by staff / management
- Number of emergency drills per month
- Incur zero vehicle related incident
- Incur no damage to environment

The Contractor shall submit detailed Health and Safety Plan for the Engineer's approval before start of Works at site and shall strictly comply with all requirements of safety regulations currently in force. Contractor should put in place a Health Safety and Environment (HSE) management system, covering all aspects of HSE including but not limited to hazard identification; identifying roles and responsibilities; reporting and documentation requirements; emergency response and safety procedure complying with local safety regulation requirements and best industrial practices.

The Contractor shall appoint a site safety officer to the approval of the Engineer and shall take all reasonable precautions to prevent accidents to the Contractor's workforce and to the public by providing, inter alia, proper ladders for access, adequate temporary covers to manholes, fencing around excavations, hard hats for use in designated areas and notices clearly indicating "hard-hat" areas, warning lights and general illumination of hazardous areas.

The need for adequate protection to the general public in the vicinity of all excavations, open trenches, deep water and other potentially dangerous areas of the Works is stressed. Suitable warning signs shall be installed as required by the appropriate authority or Engineer. Contractor shall display visible / prominent safety signs, markings at all work sites in English / Urdu and Pashto languages. Work sites shall be properly barricaded with reflecting barrier tapes.

The Contractor shall provide and maintain on the Site suitable Life Saving and First Aid Equipment including stretchers for transporting injured persons.

All possible precautions shall be taken to provide for the safe storage of petroleum, explosives, gas bottles, and all other dangerous goods. All hazardous materials shall be stored in locked compounds. Permits shall be obtained for the storage of locked compounds. Permits shall be obtained for the storage of such materials wherever this is required by the relevant authorities, and the Contractor will be deemed to have included all costs in his Tender for the provision of necessary storage and handling requirements.

Contractor shall avoid working at height activities where ever possible; however in some cases this will not be possible. In such cases a specific risk assessment shall be carried out. All personnel working at height shall be experienced and where required shall have received the necessary training. Additional task specific PPE and equipment like safety harness, etc shall be provided for the activity. Proper certified scaffolding equipment shall be used and trained / certified scaffolders to be engaged for the activity.

Procedure of scaffolding and excavation activities shall be prepared by the Contractor. All the excavated sites shall be properly barricaded and loose materials shall be piled away from the excavation. Proper shoring shall be carried out by the Contractor during the excavation.

The Contractor shall conform to the regulations of the controlling authority in force at the site with respect to the precautions to be taken against fire hazards.

The Contractor shall ensure that all Works is carried out by trained and competent personnel under the supervision of responsible persons experienced in the particular aspect of the work concerned.

The Contractor shall supply his personnel with adequate safe working, aids, such as helmets, life jackets, safety harnesses, goggles, gloves, face masks etc. Such protection must be worn when appropriate.

A detailed record of all accidents shall be kept by the Contractor in a format to be agreed by the Engineer / Project Manager and he will be provided with a copy of all such reports.

In the event that the Contractor's safety arrangements and precautions are not to the satisfaction of the Engineer / Project Manager, he shall be instructed to cease work on the Works or particular section of the Works until such time as he improves such arrangements and precautions to the satisfaction of the Engineer / Project Manager.

33.1.2 HSE Requirements

HSE requirements to be applied by the Contractor during all phases of the works. Contractor shall abide by all HSE obligations defined in his HSE Plan. It is Contractor‘s obligation to ensure that the applicable laws relating to HSE are respected, complied with and monitored during the entire performance of the works. This shall include:

- Meeting the specified HSE Standards / requirements as referred to herein
- Performing the works in accordance with good engineering practice, established available industry practices for HSE performance alongwith environmental requirements of federal and provincial governments.

The primary purpose of these requirements is preventing any accidents and incidents which may injure employees, damage property, or damage the environment at the project sites. Contractor shall comply and ensure compliance by any of its subcontractor with all applicable laws relating to HSE throughout the performance of the works.

Contractor shall be responsible for obtaining any HSE permits, approvals, consents and authorizations from the relevant governmental authorities to the extent required for the works. Contractor shall prepare a list of all the relevant authorizations and consents and shall submit this to the Engineer / Project Manager together with an action plan and a schedule for obtaining the relevant permits and consents.

Contractor shall be fully responsible for the HSE performance, in accordance with HSE requirements, of its subcontractors. Therefore Contractor shall ensure that subcontractor's selection process takes into account previous HSE performance and capability to manage the risks inherent to its activities in-house and at the site, worksites and anywhere else where works are performed. Contractor shall ensure that its subcontractors fully comply with the HSE requirements. Should a subcontractor not comply with the HSE rules and standards set-up during the performance of the work, Contractor shall immediately assist its subcontractor to take corrective actions.

Contractor shall ensure provision of standard PPE's for all the staff working at site as per good engineering practices and shall ensure that subcontractors do the same. Suitable PPE shall be reviewed regularly according to risk evaluations. Contractor shall ensure its

and its subcontractors employees understand the need for PPE and are provided with instruction as necessary in its use.

It shall be the responsibility of Contractor to ensure that all incidents are investigated, reported to the Engineer / Project Manager in a format as agreed between both parties. The Contractor management team shall initiate and participate in the investigation and shall ensure that any lessons learnt from the investigation are implemented at site. Site employee shall immediately report all incidents to his supervisor. The relevant supervisor shall then report the incident to the site management team. All near miss incidents must also be reported. The Contractor shall ensure that the correct incident investigation procedure is followed. A preliminary report shall be drawn up and submitted within 24 hours of the incident.

All the equipment, machinery (including heavy) and material brought at site by the Contractor shall be first inspected by the Contractor supervisor and if necessitated by the Engineer's / Project Manager's representative before its usage. The inspection should be documented in the form of checklist and proper record shall be maintained.

Additionally, an inspection schedule shall be developed on site for all equipment by the Contractor in order to ensure that all equipment is in proper and working condition with all safety guards in place. List includes vehicles, excavators, dumper, lifting equipment, access equipment, scaffolding, safety harnesses, safety nets, electrical tools, etc. Maintenance schedule shall be prepared by the Contractor and implemented accordingly.

The Contractor shall also ensure that

- All vehicle / equipment operators are competent and licensed
- Powered tools and equipment are only used by operatives trained in their use,
- Tools and equipment have been inspected prior to use onsite, including hired tools and equipment.
- Inspection shall always be carried out by a competent person.
- For portable electrical tools this will be by a qualified electrician.
- Equipment is individually numbered, labeled and registered.
- Copies of inspection and test records are provided to the Engineer when required.

Contractor shall ensure the use of good maintenance practices around the site, worksites and anywhere else where works are performed including:

- Work areas shall be maintained in a neat and orderly manner.
- Trash, spills, etc. shall be cleaned up as soon as possible.
- Aisles, emergency exits, and controls must be kept free of materials and obstructions at all times.
- All wastes are to be properly and safely disposed of.

33.1.3 HSE Plan

Contractor shall issue an HSE plan within Thirty (30) days of the award of contract. The HSE Plan shall address the method of Contractor compliance with the obligations and requirements of the HSE requirements, and all HSE matters specific to the works. Other specific issues which, shall be addressed in the HSE Plan are:

- HSE Policy
- HSE organization and resources.
- Works specific procedures and organization including emergency response arrangements.
- Safe operating procedures, addressing as a minimum the requirements of the HSE Management Plan.
- Works audit and review plan.
- Compliance with applicable laws and Gov. Sindh HSE requirements.
- All other matters in relation to HSE in accordance with good engineering practice.

- Contractor shall implement and comply with the HSE Plan and the specific obligations and requirements set out there in during the course of the works

33.1.4 HSE Meetings

All meetings on site shall begin with a HSE item (talk) covering general issues and specific issues that require action.

These meetings shall include, but not be limited to:

- On site Kick-off Meeting.
- Daily co-ordination meetings.
- Weekly HSE meetings.
- Weekly Progress Meetings.

Specific additional meetings may be held when operations with increased risks or the follow up of incidents & near misses etc. necessitate.

In addition the Contractor shall conduct regular internal HSE meetings involving all the staff. Atleast frequency of meeting shall be on fortnightly basis.

Contractor senior management staff visits shall be undertaken and arranged to show commitment of top management towards HSE implementation. The management during the visit shall conduct HSE audit / walk around of project sites and discuss about the importance of HSE. A staff incentive scheme for promotion of HSE culture shall also be undertaken by the Contractor. Record of Management HSE visit shall be document and maintained at site.

Following monthly HS statistics shall be provided to the Engineer / Project Manager by the Contractor:

- Number of employees
- Man-hours
- Number and details of incidents
- Number and details of STOP cards
- Number and details of safety drills
- Number and types of trainings given

33.1.5 Payment of Work

The Contractor shall implement all HSE requirements and guidelines (in addition to above) as provided by the site Engineer during the execution of the works.

No payment shall be made for the works involved within the scope of this section of specification unless provided for otherwise under the Bill of Quantities.

The cost thereof shall be deemed to have been included in the quoted unit rate of other items of the Bills of Quantities.

In case of failure of the contractor to comply with all or any provision(s) of this clause the damage(s) caused shall be attributable towards the Contractor, and the Engineer / Project Manager shall assess the amount of such damage(s) which shall be deducted from the monies due or to become due to the Contractor. However, the said amount may be reimbursed to the Contractor on rectification of all damage caused and subsequent certification by the Engineer / Project Manager that the said damage has been rectified by the Contractor at his own cost as per the requirements specified herein above.

33.2 Environmental Protection Measures

33.2.1 Soil Disposal

a. Utilize surplus soil for raising the ground-level and waterworks sites;
b. Utilize surplus soil in other construction activities implemented by government departments;
c. Provide waste soil to local people for filling up low laying areas;
d. Remove the top soil for a depth of 0.3 m (1 feet) and stock separately;
e. Surplus soil may be used within the site or on demand it may be provided to local farmers.

33.2.2 Water accumulation

a. Avoid scheduling of excavation work during the monsoon months;
b. Complete excavation and refill before onset of monsoon;
c. In unavoidable circumstances, protect open trenches from entry of rain water by raising earthen bunds with excavated soil and ensure that drains are not blocked with excavated soil.

33.2.3 Air Quality

a. Cover or damp down by water spray on the excavated mounds of soil to control dust generation;
b. Apply water prior to leveling or any other earth moving activity to keep the soil moist throughout the process;
c. Bring the material (aggregate) as and when required;
d. Ensure speedy completion of work – trench excavation, laying of pipe and refilling, to remove surplus soil as soon as possible;
e. Use tarpaulins to cover loose material that is transported to and from the site by truck.
f. In case of surplus soil is provided for other departments or private persons, it will be the responsibility of contractor to ensure that it proper handling, transport & utilization;
g. Use tarpaulins to cover loose material/soil that is transported to and from the site by truck;
h. Control dust generation while unloading the loose material (particularly aggregate) at the site by sprinkling water and unloading inside the barricaded area;
i. Clean wheels and undercarriage of haul trucks prior to leaving construction site
j. Stabilize surface soils where loaders, support equipment and vehicles will operate by using water and maintain surface soils in a stabilized condition where loaders, support equipment and vehicles will operate;
k. Don't allow access in the work area except workers to limit soil disturbance and prevent access by fencing.

33.2.4 Noise

a. Provide prior information to the local public about the work schedule
b. Do not conduct noise generating activities in the night;
c. Ensure that there are no old and sensitive buildings that may be in risk due to use pneumatic drills;
d. Employ manual methods, where required;
e. Use PPE to protect from noise.

33.2.5 Fuel and oil spills

a. Vehicles will only be washed in designated areas;
b. All fuel and oil storage areas will have a concrete pad underneath to prevent soil contamination in case of leaks or spills;
c. All fuel tanks will be properly marked to highlight their contents;

d. Fuel and oil storage areas will have secondary containment in the form of concrete or brick masonry bunds. The volume of the containment area should be 10% more than the total volume of fuel stored;
e. The soil contaminated from minor and moderate spills will be removed and burnt in the burn pit.

33.2.6 Cutting of trees

a. No trees shall be cut/pruned for construction of canal;
b. Only remove trees if it cannot be avoided at WTP site;
c. Plant and maintain two trees for every one removed.

33.2.7 Improper mining

a Ensure that construction materials (sand, aggregate and gravel) are obtained from licensed quarries.

33.2.8 Infrastructure damages

a. Identify the services to be affected in each zone;
b. Coordinate with respective agencies in shifting those infrastructure;
c. Provide prior public information about the likely disruption of services;
d. Provide alternate arrangements for services like water supply in the event of disruption beyond reasonable time, for instance, through tankers.

33.2.9 Health & Safety

a. Consulting the government authorities to identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills for cutting roads;
b. Excluding the public from the site - enclose the construction area, provide warning/sign boards;
c. Ensuring that all workers are provided with and use appropriate Personal Protective Equipment (helmet, hand gloves, boots, masks etc.);
d. Report accident and maintain records.

33.2.10 Economic benefits

a. Identify the services to be affected in each zone and notify the respective agencies (electricity, telephone, etc.) about the construction work and if there is any need for shifting;
b. Coordinate with respective agencies and provide prior information to public about the disruption in services during construction; this can be announced via mass communication systems like local/vernacular newspapers;
c. Provide alternative arrangement for disrupted services
d. During construction, the water supply service will be affected. In case of water supply being affected for more than a day, alternative water supply may be provided through mobile tankers;
e. Careful planning of transportation (material and waste) routes in coordination with the Traffic Police to avoid sensitive areas as far as possible, including narrow streets, congested roads, and other important area;
f. Scheduling the transportation of waste to avoid peak traffic periods.

34. EMPLOYER AND ENGINEER / PROJECT MANAGER NOT PERSONALLY LIABLE

No member or officer of the Government or the Employer or the Employer's Representative or the Engineer / Project Manager or his representatives or any one of their respective staffs or their employees shall be in anyway personally bound or liable for the acts or obligations of the contractor under the contract or answerable for any default or omission in the observance or performance of any of the acts, matters or things which are herein, contained.

35. FINAL HAND-OVER

At the end of the Defect Liability Period stipulated in the contract, the Engineer / Project Manager on

application of the Contractor, shall decide the members of the final hand over committee and announce the same to the Contractor. The committee, after inspection of Work, if satisfied that there are no deficiencies or defects due to work of the Contractor shall certify the final hand-over, and the Employer will then issue a final Certificate of Completion of Work within thirty (30) calendar days thereafter.

36. PROGRESS PHOTOGRAPHS

The contractor shall furnish to the Employer and to the Engineer / Project Manager every two weeks at least six photographs to clearly show the progress of construction. The photographs shall be submitted in glossy prints 20 cm x 20 cm. Each print shall be marked on the back with the date and serial number. There shall be no writing, lettering or marking on the face of the photographs. The set of photographs of the Engineer should accompany respective negatives.

37. SITE ORDER BOOK

The Contractor shall maintain site order book {of triplicate leaves} at the Site, for taking down instructions of the Engineer / Project Manager and/ or the Employers, without any obligation and charges to the Employer / Engineer.

38. PROGRESS REPORT

The Contractor shall, during the execution of the work, submit to the Employer (3 copies) and ENGINEER / Project Manager (2 copies) so as to reach them in the first week of every calendar month, a report on the actual progress of the works attained by him during the preceding month fully supported with colour photographs of (5"x7") size, at least 15, depicting the complete stages of the works. Each photograph should be properly pasted on an A-4 size paper, indicating the location and other relevant information of the area photographed.

Project Management Unit (PMU)
Sindh Human Capital Investment: 1000 Days Integrated Health & Population Program
Health Department
Government of Sindh

BILL OF QUANTITIES

REHABILITATION AND UPGRADATION OF 15 THQ AT VARIOUS DISTRICT OF SINDH

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BILL OF QUANTITIES

GRAND SUMMARY

Employer : Sindh Integrated Health and Population Program

Name of Project : Rehabilitation & Upgradation of Taluka Head Quarter Hospital

Sub Head	Description	Amount Rs.
	THQ Building Cost for 15 Nos.	
1	Civil Works (THQ-Bldg)	
2	Electrification Works (THQ-Bldg)	
3	Plumbing Works (THQ-Bldg)	
4	External Development works	
5	Boundary Wall	
6	Environmental Social Management Plan (ESMP)	
7	Branding of Logo Designing, Theme and Sign Board	
8	Solar Panel System	
9	Solar Powered RO Plant for Daily 500 Bottles (of 19 Ltrs) per Day (03 Nos.)	
10	Ultra Filteration Plant (07 Nos.)	
	Total Amount of Civil + Infra Works+ External	
	Add SRB @ 5%	
	Grand Total Amount Rs.	
	Say	

(Rupees _____)

In Words

_____ _____

Contractor **Employer**

BILL OF QUANTITIES

Employer : Sindh Integrated Health and Population Program
Name of Project : Rehabilitation & Upgradation of Taluka Head Quarter Hospital

Sr. No.	Description	Qty	Unit	Rate (Rs)		Amount (Rs)
				In Figure	In Words	
	Dismantling / Demolition Work					
1	Scraping, Ordinary distemper, oil bound distemper or paint on walls/ceilings.	172,364	P.Sft			
2	Removing cement or lime plaster.	286,508	P.Sft.			
3	Dismantling glazed or encaustic tiles etc. (For tiles & marbles etc.,)	364,753	P.Sft			
4	Dismantling cement concrete plain 1: 2: 4:	127,050	P.Cft.			
5	Removing door with chowket.	815	Per No.			
6	Removing Window and sky light with chowkets.	28,508	Per No.			
7	Cracks repair on wall , col, beam stair etc. (Refer rehabilitation drawing item # 12).	231,342	P.Sft			
8	Providing Anti termite treatment by spraying/sprinkling/spreading Neptachler 0.5% Emulsion as an overall pre-construction treatment in slab type construction along external foundation trenches of the building over complete parimeter of the foundation trench etc, as per direction of Engineer Incharge.	179,324	P.Sft			
9	Applying floating coat of Hi Bond (Universal) as a bond coat or as an adhesive link between old & fresh concrete or plaster as directed by Engineer Incharge.	15,000	P.Sft			
10	Cement concrete plain including placing compacting, finishing and curing, comlete (including screening and washing at stone aggregate without shuttering. (Ratio. 1: 4 :8)	7,500	P.Cft			
	Screeding & Water Proofing					
11	Providing and laying 3" thick toping cement concrete (1:2:4) including surface finishing and dividing into panels: (CSR Sr.#16d/42)	508,199	P.Sft			
12	Providing and laying Two layers of polythene sheet (0.13 mm thick each) for water proofing as per specifiation and instructions of Engineer Incharge.	508,199	P.Sft			
13	2 coats of bitumen laid hot using 34 lbs (1.72 Kg/Sqm) per P.Sft over roof and blinded with sand at 1 Cft per % Sf	508,199	P.Sft			
14	Providing and laying thermopole (foamed polythene) sheet in horizontal and vertical expansion joints.(a) 2" (50mm)thick thermopore sheet	508,199	P.Sft			
	Plastering & Painting					
	Plaster					
15	Cement plaster 1:4, 1/2" thick.	286,508	P.Sft			
16	Cement plaster 1:4, 3/4" thick.	167,911	P.Sft			
	Paint					
17	Priming coat of chalk under distemper.	137,757	P.Sft			
18	Distempering. Three coats (1st coat over priming coat)	137,757	P.Sft			

Sr. No.	Description	Qty	Unit	Rate (Rs)		Amount (Rs)
				In Figure	In Words	
19	Preparing the surface and painting with matt finish I/c rubbing the surface with Bathy (silicon carbide rubbing brick) filling the voids with zink / chalk / plaster of paris mixture, applying first coat premix, making the surface smooth and then painting 3 coats with matt finish of approved make etc:	771,139	P.Sft			
20	Preparing the surface and painting with weather coat I/c rubbing the surface with rubbing brick / sand Paper, filling the voids with chalk / plaster of Paris and then painting with weather coat of approved make. (Three Coats)	167,911	P.Sft			
21	Providing and fixing Fire rated ACP cladding 4mm thick of approved manufacturer in metallic upto G80% sparkling approved colour & quality by the Engineer, on concrete / masonry structure or on steel frames. Including locally manufactured aluminium adjustable framing of 1 ½" x 1 ½" x 2mm thick double angles with nickel plated screws galvanized nuts bolts washers and aluminium rivets, including approved quality silicon sealent in ACP grooves, ACP to withstand the designed wind pressure, the ACP panels shall be adequately reinforced on the back with 2" x ¾" x 3mm thick aluminium pipes all as per manufacturer recommendations & specifications and approval by the Engineer. Complete in all respects. Work to be done by specialist Sub-contractor and Vendors with proper design to take up the work with complete structure analysis of the system. (Contractor is responsible to provide detailed shop drawings with calculations for approval before execution of work and no extra amount shall be paid in this regard)	81,323	P.Sft.			
22	Providing & applying, Special Anti-Bacterial & Anti Reflection wall paint (Three Coats) including cost of primer & Preparation of base. complete in all respect, at any height in any floor, as directed by the Engineer. In specified area. Cost of scaffolding, ladders and wooden planks for working is deemed to be including in the rates.	40,760	Sft.			
	Tiles/Marbles					
23	Providing & Laying Full Body Porcelain Tile in Flooring or Facing of Approved Design Set in Gray Cement Motor 1:2 or of 3/4" Thickness I/C Washing & Joints With White Cement Slurry Using Colour Pigment for matching complete as per Spacification. (5/16" thick) in approved size.					
a)	Porcelain Tiles Flooring	286,735	P.Sft			
b)	Porcelain Tiles Skirting/Dado	26,807	P.Sft			
24	Providing and Laying floors of approved coloured glazed tiles1/4" thick floor of approved color & size jointing in white cement and laid over 1:2 cement sand mortor 3/4" thick including grouting with matching color and finishing. (Glazed / Semi glazed / Matt Ceramic Tiles)					
a)	Ceramic Tiles For Flooring	28,646	P.Sft			
b)	Ceramic Tiles For Skirting/ Dado	109,434	P.Sft			
25	Providing and laying Anti-static epoxy floor coating in approved thickness including undercoat of primer, a net of carbon strips, consisting of a base, a filler and a hardener. Complete in all respects as per drawings, specifications and approval of the Engineer.	9,163	P.Sft			

Sr. No.	Description	Qty	Unit	Rate (Rs)		Amount (Rs)
				In Figure	In Words	
26	Providing and Laying Super Botisina, Crème, Badal or Black Marble 12"x12" / 12"x24" fine dressed on the surface without winding set in lime mortar 1:2 including rubbing and polishing of the joints.					
a)	One Piece Marble on Tread/Landing (1" thick)	11,336	P.Sft			
b)	Marble on Risers/ Skirting (3/4" thick)	2,912	P.Sft			
27	**False Celling** Providing & fixing plaster of paris ceiling border of 8"-10" width of specified design & thickness i/c fixing besides ceiling with nails/ screws with jetties.	344,300	P.Sft			
28	**Doors, Windows, Grill** Supplying & fixing in position iron /steel grill of 3/4" x 1/4" size flat iron of approved design including painting 3 coats etc. complete (weight not to be less than 3.7 Lbs./Sq . Foot of finished grill).	19,006	P.Sft.			
29	**Doors & Windows** First Class deodar wood wrought joinery in doors and windows etc. panelled or panelled or glazed or fully glazed fixed in position including chowkhat, holdfast, hinges, tower bolt rubber stop cleats /GI clamp, handles and chord with hooks etc. complete (excluding sliding bolts or lock). (a) 1¾" thick. Wooden Single / Double Shutter Swing Door/Sliding Door (with or without vision panel)	21,381	P.Sft			
30	**Architrave / Beading** Providing and fixing with sunk iron screws Wooden Architrave approved design / shape having width not less than 2-1/2 inches as directed by Engineer Incharge.	34,615	P.Rft			
31	**Door Lock** Providing and fixing approved quality mortice lock.	1,018	Each			
32	**Door Closer** Providing and fixing approved quality of door closer including fixing on door with screws and adjusting speed on required etc complete.	1,018	Each			
33	**Doors/Windows Polish** French polishing complete. On new works.	21,382	P.Sft			
34	**uPVC Door** Providing and fixing in position uPVC channels framing for Door of unplasticized poly vinyl chloride (uPVC) (Flush / Panelled Door) i/c handles stoppers looking arrangement, push bar etc complete Deluxe model etc complete as per direction of Engineer / Incharge.	49,446	P.Sft			
35	**Aluminium Window/ Ventilator** Supplying & fixing in position Aluminum channels framing for sliding windows & ventilators of made with 5 mm thick tinted glass glazing (Belgium) & Aluminum fly screen i/c handles stoppers & locking arrangement etc. complete. (a) Deluxe model (White or other approved color) (For Sliding/Openable Windows & Ventilators)	19,549	P.Sft.			
36	Providing and fixing stainless steel nickle coated stair case railing of 3-1/2' 'consisting of horizontal 2-1/2"x2-1/2" at bottom and 1-1/2"x1-1/2' 'vertical tube 12" center to center and 3" steel tube with round ball as directed by engineer / incharge	2,291	Per Rft.			

Sr. No.	Description	Qty	Unit	Rate (Rs)		Amount (Rs)
				In Figure	In Words	
37	Scraping, brushing and removing old paint from metal surface.	7,500	P.Sft			
38	Painting guard bars, gates of iron bars, gratings, railing (including) standards, braces etc.) and similar open works					
a)	First Coat	7,500	P.Sft			
b)	2nd Coat	7,500	P.Sft			
39	P/FGraniteStrips(5"x1"x1") thick fixed over stair steps of required width set in cement sand mortar1:2 in gray cement 1"thick in/c washing and filling etc complete.	1,019	P.Sft.			
					Total Amount of Civil Works Rs.	

(Rupees

In Words

_____ _____

Contractor **Employer**

BILL OF QUANTITIES

Employer : Sindh Integrated Health and Population Program
Name of Project : Rehabilitation & Upgradation of Taluka Head Quarter Hospital

Sr. No.	Description	Qty	Unit	Rate (Rs)		Amount (Rs)
				In Figure	In Words	
1	Wiring for light or fan point with 3/.029 PVC insulated wire in 20mm (3/4") PVC conduit recessed in the wall or column as required. (S.I.No. 124, Page No. 15).	4,730	Per Point			
2	Wiring for plug point with 3/.029 PVC insulated wire in 20mm (3/4") PVC conduit recessed in the wall or column as required. (S.I.No126,Page No. 15).	2,098	Per Point			
3	Wiring for call bell point with 3/.029 PVC insulated wire in 20mm (3/4") PVC conduit recessed in the wall or column as required .(S.I.No. 128, Page No. 15).	778	Per Point			
4	Providing and laying (Main or sub Main)PVC insulated with size 2-7/.029 copper conductor in 3/4" dia PVC conduit recessed in the wall or column as required. (S.I.No. 10 Page No. 2).	70,210	Rft			
5	Providing and laying (Main or sub Main)PVC insulated with size 2-7/.036 copper conductor in 3/4" dia PVC conduit recessed in the wall or column as required. (S.I.No. 11 Page No. 2).	60,023	Rft			
8	Providing & fixing A.C/D.C Electric Ceiling fan 56" (good quality)	1,264	Each			
9	Providing & fixing Bakelite ceiling rose with two terminals. (S.I.No. 228, Page No. 33)	3,657	Each			
10	Providing & fixing earthing set (1'x1') copper plet i/c excavation of rock earth 12' depth or if water comes out i/c salt/choracale mixed with G.I pipe with nut bolt testing topping etc complete.	271	Job			
11	Providing & fixing Brass Battern holder	1,949	No.			
12	Providing & fixing A.C/D.C Electric False Ceiling Fan 18" (good quality)	828	No.			
12	Providing & fixing A.C/D.C Electric Wall Bracket fan 18" (good quality)	1,116	No.			
13	Providing and laying (Main or sub Main)PVC insulated with 4 - 7/052 (10mm2) copper conductor in 1 1/2" dia PVC conduit on surface.	10,977	Rft			
	ELECTRIFICATION NON SCHEDULE					
1	Providing and fixing switches or sockets as per following specification and requirements (5 Amp):	466	No.			
	a) one gange					
b)	two gange	629	No.			
c)	four gange	1,042	No.			
d)	six gange	1,072	No.			
e)	2 pin 5 AMP sockets for half point	1,967	No.			
f)	5 pin plug socket for multiple use 10-15 amp	3,499	No.			
g)	3 pin power plug socket 20 amp	1,048	No.			
2	Providing and fixing of Ding Dong Bell with fixing acessories	778	No.			

Sr. No.	Description	Qty	Unit	Rate (Rs)		Amount (Rs)
				In Figure	In Words	
3	Providing and fixing of PVC pipe for cable laying or crossing or as extension pipe to feed another floor. Including cutting of wall making hole or cutting floor and making the surface good. Complete as required. PVC 1" dia (25mm).	29,218	Rm			
4	Providing and fixing of G.I pipe for cable laying or crossing or as extension pipe to feed an other floor. Including cutting of wall making hole or cutting floor and making the surface good. Complete as required.: G.I 1" dia (25mm)	5,763	Rm			
5	P/F Exhaust Fan 10" to 12" sweep with wall clamp Metal Body/Plastic Body pak/Royal/Millat/Imported i/c necessary electric connection etc, complete.	409	No.			
6	Providing & fixing Energy Saver 24 Watts approved quality etc, complete (Phillips).	3,911	No.			
7	Providing and fixing as per following specifications and requirements, powder coated box,door/ wall mountain with locking arrangement a) DP-50 AMP 6KA 01 No b) copper bus bars (50amp) 3no c) MCB (for room) (2-6 amp) 8no (2spare) d) MCB (15amp) (for RO/ washroom) e) MCB (10amp) (for water pump)	138	job			
8	Providing and fixing as per following specifications and requirements, powder coated box,door/ wall mountain with locking arrangement a) MCB (15amp) 01no b) MCB (10amp) 01no c) MCB (2-6 amp) 06 no (1 spare) d) Set of copper busbars 50 Amp 04 no.s	156	Job			
9	Providing and fixing sweet water pump motor set 1 hp monoblock/donkey pump complete with foundation pad and fixing aseccories as per approval of Engineer Incharge	120	Job			
10	Providing & fixing of fan hooks with all accessories	1,296	Each			
11	Providing and fixing of pvc pipe including specials 1" dia to be burried in the ground by excavation/cutting katcha floor and making surface good complete as required.	5,669	RM			
12	P/F LED Surface Mounted panel light 24 watts, 220/240 volts, round or Square, approved type, Standard Supply and fixing.	3,493	Each			
13	P/F LED Flood Security Light, 30 Watts, 220-240 Volts, approved type “Standard”, complete supply and fixing.	489	Each			

Sr. No.	Description	Qty	Unit	Rate (Rs)		Amount (Rs)
				In Figure	In Words	
14	P/F Fan electric, AC, Exhaust, metal body with copper winding 25 cm & 30 cm, 220/230 V, with shutter, Metal duly enamel painted, “Standard” supply and fixing.	279	Each			
					Total Amount Electrical Works Rs.	

(Rupees _____)
In Words

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Contractor **Employer**

BILL OF QUANTITIES

Employer : Sindh Integrated Health and Population Program
Name of Project : Rehabilitation & Upgradation of Taluka Head Quarter Hospital

Sr. No.	Description	Qty	Unit	Rate (Rs)		Amount (Rs)
				In Figure	In Words	
1	Providing & fixing 1/2" dia, lead connection complete with a 1/2" dia brass stop cock, two brass nuts & lining jointed to lead pipe with plumber wiped solder joints 1/2" inches lead pipe to be of not less than 4lbs per lineal yard (S.I. No. 22/P-6).	3,272	Each			
2	Providing & fixing in position nylon connections complete with 1/2" dia brass stop cock with pair of brass nuts and lining joints to nylon connection (S.I. No. 23/P-6).	1,177	Each			
3	(b) S/Fixing concealed Tee stop cock of superior quality with c.p head 1/2" dia (S.I.No. 14(A)/P-18).	706	Each			
4	(b) S/Fixing long bib-cock of superior quality with c.p head 1/2" dia (S.I. No. 13(a)/P-19).	276	Each			
5	Providing and fixing orisa type white or color glazed earthen ware w.c pan with cost of low level plastic flush tank of 3 gallons capacity of approved quality i/c making requiste numbers of holes in walls , plinth & floor and making good in cement concrete 1:2:4 W.C pan orisa type 23" with plastic tank of low down 3 gallons C.I trap & C.I thumble (Superior Quality) With 4" dia. earthen ware trap and plastic thumble (S.No 3 / P-2)	232	Each			
6	Providing & fixing 24" x 18" lavatory basin in white glazed earthen ware complete with and including the cost of W.I or C.I cantilever brackets 6 inches built into wall, painted white in to two coats after a primary coat of red lead paint , a pair of 1/2" dia rubber plug & chrome plate brass chain 1-1/4" dia malloable iron or c.p brass traps malloable iron or brass unions and making requiste number of holes in wall plinth & floor for pipe connection and making good in cement concrete 1:2:4 (Standard pattern) (S.No 8 / P-3)	232	Each			
7	Add extra for labour for providing and fixing of earthen ware pedestal white or coloured glazed (S.No 9 / P-3)	232	Each			
8	Supplying & fixing 6" x 4" earthen gully trap with 4" outlet complete with 4" thick 1:2:4 C.C for bed & 1/2 thick cement plaster (1:3) to the karb C.I grating 6" x 6" and C.I. cover and frame 12"x12" (inside) etc Complete (b) earthen ware glazed gully trap(a) (i) 6'x6"x4" (i) With C.I Cover and Frame(S.I. No. 1(i)/P-23.	220	Each			

Sr. No.	Description	Qty	Unit	Rate (Rs)		Amount (Rs)
				In Figure	In Words	
9	Construction manholes or inspection chamber for the required diameter of circular sewar and 3'-6" (1067 mm) depth with walls of B.B in cement sand mortar 1:3 cement plastered 1:3, 1/2" thick, inside of walls and 1" (25 mm) thick over benching and channel i/c fixing C.I manhole cover with frame of clear opening 1-1/2" x 1-1/2' (457x457mm) of 1.75 cwt (88.9 kg) embaded in plain C.C 1:2:4 and fixing 1" (25 mm) dia M.S steps 6" (150 mm) wide projecting 4" (102 mm) from the face of wall at 12" (305 mm) C/C duly Standard specification and drawing CSR PHE page 46	212	Each			
10	Supplying & fixing soap tray of made of plastic of superior quality and design with fine finishing with c.p screws etc complete (S.I. No.6/P-8).	328	Each			
11	Providing & fixing C.P muslim shower with double bib cock & ring pipe (S.I. No.19(a)/P-19).	232	Each			
12	Supplying & fixing ball valves (with unsoldered copper ball) 2" dia (S.I. No.8/P-18)	53	Each			
13	Constructing small wheel value chamber clear inside size 12" x 12" x 12" with walls of 9" thick of B.B cement mortar 1:3 over 4" thick cement concrete 1:3:6 cement plastered 1/2" thick 1:3 inside including supplying & fixing C.I light weight manhole cover with frame and locking arrangement of 12" x 12" clear opening etc complete (S.I. No.8/P-52).	53	Each			
	Plumbing Works Non Schedule Rates (B)					
1	Supply & fix UPVC (Dadex or Equivalent or approved by engineer incharge) fitting with 'Z' joint & rubber ring etc.					
a)	Elbow / Bend 110 mm or 4" dia	3,383	Each			
b)	Tee 110 mm dia	930	Each			
c)	Socket 110 mm dia	930	Each			
d)	UPVC Tee With Door 110 mm dia	930	Each			
2	Supply & fix UPVC (Dadex or Equivalent or approved by engineer incharge) fitting with 'Z' joint & rubber ring etc.					
a)	Elbow / Bend 75 mm or 3" dia	4,189	Each			
b)	Tee 75 mm dia	1,176	Each			
c)	Socket 75 mm dia	1,176	Each			
d)	UPVC Tee With Door 75 mm dia	1,176	Each			
3	Providing & laying PPR PN-20 (Dadex or approved by engineer incharge) pipe with all fittings i.e socket, bend tee, elbow where required.(for cold water pipe)					
a)	20mm (3/4") dia PPR	4,134	Rft			
b)	1 mm (1")	1,907	Rft			
4	Supply & fix UPVC Dadex or approved by engineer incharge vent cowel 110mm (4" dia) on top of vent	250	Each			
5	Supply & fix UPVC Dadex or approved by engineer incharge vent cowel 110mm (3" dia) on top of vent pipe.	250	Each			
6	Providing & fixing UPVC floor trap(DADEX or approved by engineer incharge) with 4" dia inlet and 4" dia outlet of the approved self cleaning design with a UPVC Grating with or without a vent arm i/c cost of making requisite number of holes in walls plinth and floor for pipe connectons and making good cement concrete 1:2:4.	793	Each			

Sr. No.	Description	Qty	Unit	Rate (Rs)		Amount (Rs)
				In Figure	In Words	
7	Providing UPVC pipe with collars class "B" and digging the trenches to required depth and fixing imposition i/c cutting, fitting & jointing with maxphalt composition & cement mortar 1:1 and testing with water pressure to a head of 4 feet above the top of the highest pipe and refilling with excavated staff.					
a)	8" dia RCC Pipe Class B	6,008	Rft			
8	Providing & laying Pipe insulation as per approved manufacturer, specifications & directions of the Engineer.	7,199	Rft			
					Total Amount Plumbing Works Rs.	

(Rupees

In Words

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Contractor **Employer**

BILL OF QUANTITIES

Employer : Sindh Integrated Health and Population Program
Name of Project : Rehabilitation & Upgradation of Taluka Head Quarter Hospital

Sr. No.	Description	Qty	Unit	Rate (Rs)		Amount (Rs)
				In Figure	In Words	
Civil Works (External development)						
1	Excavation in foundation of Building Bridges and other structures including dagbelling dressing, refilling around structrure with excavated earth Watering and ramming including all lead and lift In Ordinary and Hard Soil (Upto 1.5m depth)	455,384	P.Cft			
2	Filling, watering and ramming earth in under floors with surplus earth from foundation etc. lead up to one chain and lift upto 5 feet.with Surplus earth from foundation etc.	455,384	P.Cft			
3	Cement concrete plain including placing compacting, finishing and curing, comlete (including screening and washing at stone aggregate without shuttering. (Ratio. 1: 4 :8)	292	P.Cft			
4	Cement concrete plain including placing compacting, finishing and curing, complete (including screening and washing at stone aggregate without shuttering. Ratio 1:3:6	119,819	P.Cft.			
5	Providing & fixing cement paving blocks flooring having size of 197 x 97 x 80 (mm) of city / quddra / cobble shape with pigment, having strength b/w 5000 PSI to 8500 PSI i/c filling the joints with hill sand over a bed of 2" thick hill sand or stone dust and laying and compacting in specified manner / pattern and design etc complete.	74,668	P.Sft			
6	Providing & fixing cement paving blocks flooring having size of 197 x 97 x 60 (mm) of city / quddra / cobble shape with pigment, having strength b/w 5000 PSI to 8500 PSI i/c filling the joints with hill sand over a bed of 2" thick hill sand or stone dust and laying and compacting in specified manner / pattern and design etc complete.	190,369	P.Sft			
7	Providing & fixing Precast Edge Block 3750 PSI Industrial Made Size 6 inches thick x 12 inches long x 18 inches high including the cost of Cartage, excavation, form Work for haunching,1450 PSI lean concrete, 2250 PSI concrete for haunching, 1:4 cement sand mortor.	1,158	Rft			
8	Fabrication of heavy steel work with angles, tees, flat iron, round iron and sheet iron for making trusses, girders, tands etc. including cutting, tanks etc. including cutting, drilling rivetting, handling assembling and fixing including erection in position.	15,900	Kg.			
9	Painting guard bars, gates of iron bars, gratings, railing (including) standards, braces etc.) and similar open works					
a	First Coat	4,562	P.Sft			
b	2nd Coat	4,562	P.Sft			
10	Filling watering & ramming sweet earth excavated form out side lead upto10miles and lift upto 5ft. Including costof sweet earth.	142,782	P.Cft			

Sr. No.	Description	Qty	Unit	Rate (Rs)		Amount (Rs)
				In Figure	In Words	
11	Supplying Dacca grass Trufing slops of banks or lawns with grass side including ploughing laying,manuring,setting and watering (Turf got from within a distance of 5 miles maintenance for 45 days	190,369	P.Sft			
12	Providing, Laying uPVC pipes of Class 'D' fixing in trench i/c cutting, fitting and jointing with solvent cement i/c testing with water to a head of 122 meter or 400 ft.					
a)	2" dia	50	Rft.			
13	Providing, Laying uPVC pipes of Class 'B' fixing in trench i/c cutting, fitting and jointing with solvent cement i/c testing with water to a head of 61 meter or 200 ft.					
a)	80 mm (3" dia)	50	Rft.			
b)	100 mm (4" dia)	50	Rft.			
14	Providing C.I Manhole Cover & Frame i/c Cost of Material etc. (35kg p/sqft.) for external manholes & septic-tank otherwise indicated shall have as flow etc. (as per specification, or approved by / Engineer)					
a)	24"x24" size	800	Kgs			
15	Providing and fixing local manufacturers cast Iron covers, frames, excavation, CC wall internal plaster inlet outlet connection pipe.					
a)	12" x 12" size	300	Kgs			
16	Constructing manhole or inspection chamber for the required diameter of circular sewer and 3'-6" (1067 mm) depth with walls of B.B in cement sand mortar 1:3 cement plastered 1:3, 1/2" thick, inside of walls and 1" (25 mm) thick over benching and channel i/c fixing C.I manhole cover with frame of clear opening 1-1/2' x1 1/2' (457x457 mm) of 1.75 cwt. (88.9 kg) embaded in plain C.C 1:2:4 and fixing 1" (25 mm) dia M.S steps 6" (150 mm) wide projecting 4" (102 mm) from the face of wall at 12" (305 mm) C/C duly painted etc. Complete as per standard specification and drawing					
a)	2'x2'x3'-6"	6	Nos.			
17	Providing & fixing 6"x4" C.C. gully trap with 4" outlet complete with 4" thick 1:2:4 for bed & 1/2" thick cement plaster (1:3) to the karb, C.I. grating 6"x6" & C.I. cover and frame 12"x12" (inside etc. complete).					
a)	C.C. gully trap 6"x6"x4" C.I Cover and Frame	6	Nos.			
18	Providing and fixing of full way "Gate / ball valves" of bronze trim up to 3" dia with threaded ends and cast iron body bronze trim flanged ends for 100mm dia and above with all additional material required for a complete installation as described in the as shown on drawings and as per specification.					
c)	1" dia	4	Nos.			

Sr. No.	Description	Qty	Unit	Rate (Rs)		Amount (Rs)
				In Figure	In Words	
19	Providing and fixing a C.I. trap with 4" dia inlet and 4" dia outlet of the approved self cleaning design with a C.I. grating with or without a vent arm including cost of making requisite number of holes in walls, plinth & floor for pipe connection & making good in cement concrete 1:2:4.					
	4" dia	3	Nos.			
20	Centrifugal Pumping set, AC, electric motor driven, 400 volts, 3 phase, 50 cycles, 1HP, mounted on a common channel base, total head 20/25 Motor, efficiency I E-2, Insulation class'F', enclosure characteristics IP-55, supply and fixing.	1	Nos.			
				Total Amount of External Development Works (Rs.)		

(Rupees _____)
In Words

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Contractor **Employer**

BILL OF QUANTITIES

Employer : Sindh Integrated Health and Population Program
Name of Project : Rehabilitation & Upgradation of Taluka Head Quarter Hospital

Sr. No.	Description	Qty	Unit	Rate (Rs)		Amount (Rs)
				In Figure	In Words	
Civil Works (Boundary Wall)						
1	Dismantling cement concrete reinforced separating reinforced cement from concrete cleaning and straightening the same.	11,661	P.Cft.			
2	Excavation in foundation of Building Bridges and other structures including dagbelling dressing, refilling around structrure with excavated earth Watering and ramming including all lead and lift In Ordinary and Hard Soil (Upto 1.5m depth)	18,368	P.Cft.			
3	Filling, watering and ramming earth in under floors with surplus earth from foundation etc. lead up to one chain and lift upto 5 feet.with Surplus earth from foundation etc.	18,368	P.Cft.			
4	Providing Anti termite treatment by spraying/sprinkling/spreading Neptachler 0.5% Emulsion as an overall pre-construction treatment in slab type construction along external foundation trenches of the building over complete parimeter of the foundation trench etc, as per direction of Engineer Incharge.	4,592	P.Sft.			
5	Providing & laying Stone soling or Stone filling dry hand packed as filling in under floor, under foundation and behind retaining walls or in pitching and aprons.	3,030	P.Cft.			
6	Cement concrete plain including placing compacting, finishing and curing, comlete (including screening and washing at stone aggregate without shuttering. (Ratio. 1: 4 :8)	2,296	P.Cft.			
7	Erection and removal of centering for R.C.C or P.C.C works of Partal wood Vertical Floor	2,296	P.Sft.			
8	Reinforced cement concrete work including all labour and material except the cost of steel reinforcement and its labour for bending and binding which will be paid separately. This rate also includes all kinds of forms, moulds, lifting, centering, shuttering and curing. (including screening and washing of shingle.) a) RCC work in roof slab, beams, column, rafts, lintels and other structural members laid in situ or precast laid in position complete in all respects. (i) Ratio1:2:4 90 Lbs of cement, 2 Cft sand and 4 Cft shingle 1/8" to 3/4" gauge.	11,661	P.Cft			
9	Fabrication of deformed steel reinforcement for cement concrete including cutting, bending, laying in position, making joints and fastenings including cost of binding wire (also includes removeal of rust from bars.) a) Deformed bar (Grade-60)	34,979	P.Kg.			
10	Providing and laying Two layers of polythene sheet (0.13 mm thick each) for water proofing as per specifiation and instructions of Engineer Incharge.	3,517	P.Sft.			
11	Bitumen coating to plastered or cement concrete surface.	43,113	P.Sft.			

BILL OF QUANTITIES

Employer : Sindh Integrated Health and Population Program
Name of Project : Rehabilitation & Upgradation of Taluka Head Quarter Hospital

Sr. No.	Description	Qty	Unit	Rate (Rs)		Amount (Rs)
				In Figure	In Words	
12	Damp proof course with (cement sand and shingle concrete 1:2:4) including 2 coats of asphaltic mixture. (b) 2" thick	2,157	P.Sft.			
13	Pacca brickwork other than building including striking of joints upto 10ft. (3 meter) height. Cement sand mortar. 1:4	16,974	P.Cft			
14	Cement plaster 1:4, 3/4" thick.	362,275	P.Sft.			
15	Providing & fixing colour crete to wall surface to provide, durable crust and aesthetics having thickness upto 3/4" with specified colour having water, fire and temite resistance.	362,275	P.Sft.			
	Total Amount of Boundary Wall for 15 THQ. Or 10,500 Rft. (Rs.)					

(Rupees _____)
In Words

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Contractor **Employer**

BILL OF QUANTITIES

Employer : Sindh Integrated Health and Population Program
Name of Project : Rehabilitation & Upgradation of Taluka Head Quarter Hospital

Sr. No.	Description	Qty	Unit	Rate (Rs)		Amount (Rs)
				In Figure	In Words	
4 - Environmental Social Management Plan (ESMP)						
Trainings & Reporting						
1	Training workshops for PMO, CSC, Contractors & Others (labour) on different topics, HSE, PPES, GRM,SEA/SH/ etc	10	No.			
2	Consultations, Reporting & Communication	10	No.			
Environmental Monitoring						
3	Ambient Air Quality Monitoring (24 hrs.)	6	No.			
4	Noise Monitoring Meter (for PMO/ CSC)	1	No.			
5	Drinking Water Quality Monitoring, monthly during construction, conduct the water testing in presence of consultant representative with due protocols, form approved lab, and submission of water quality test report on every month.	10	No.			
6	Waste Water Quality Monitoring, Monthly during construction, conduct the water testing in presence of consultant representative with due protocols, form approved lab, and submission of water quality test report on every month.	10	No.			
Operational Expenses						
7	Personal Protective Equipment's including; ear muffs, safety shoes, masks, gloves, safety helmets, safety vests, warning tapes and safety signage	10	Month			
8	Divergence Equipment's including; water filled Barriers,SafetyCones,Hardbarricades(material), safety signage with reflective material.	10	Month			
9	Dusk masks, sanitizers and soaps (kit per head)	10	Month			
10	First aid box (2), quality first aid medicines containing antibiotics and other seasonal medicine for seasonal diseases, flue, fever and scabies etc. (09 months) and temperature gun/ infrared thermometers	10	Month			
11	Fire Fighting Equipment purchase and monthly refilling	10	Month			
12	Health & Hygiene including; provision of waste collection bins, cleaning of site and dormitory areas, use of disinfectants and solid waste management	10	Month			

Sr. No.	Description	Qty	Unit	Rate (Rs)		Amount (Rs)
				In Figure	In Words	
13	Careful removal of existing tress with minimal disturbance .replacement with the same species or approved native alternatives .supply and planting of healthy, disease-free saplings in prepared pits with soil amendments complete with all respect. Regular watering , maintenance (pruning, pest control, fertilization), and monitoring until maturity. submission of completion reports verifying healthy growth and survival	10	Nos			
Total Amount of ESMP for 1 No. Rs.						
Total Amount of ESMP for 15 Nos. Rs.						

(Rupees _____)
In Words

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Contractor **Employer**

BILL OF QUANTITIES

Employer : Sindh Integrated Health and Population Program
Name of Project : Rehabilitation & Upgradation of Taluka Head Quarter Hospital

Sr. No.	Description	Qty	Unit	Rate (Rs)		Amount (Rs)
				In Figure	In Words	
7 - Branding & Logo Designing						
1	Providing and installing wall-mounted branding and signboards for the Rural Health Center (RHC), featuring embossed logos of the World Bank, 1000 Days, and the Government of Sindh. The durable, weather-resistant signboard (10ft x 4ft or as per the directions and approval of the Engineer) is made of aluminum composite panels (ACP) with UV-resistant vinyl printing, displaying the RHC name (e.g., Rural Health Center – [Location Name]), a professional logo, a tagline ("Healthy Communities, Stronger Sindh"), and essential information in English, Urdu, and Sindhi. Installation ensures high visibility, nighttime lighting, and durability to withstand Sindh's harsh weather, executed as per the direction of the Engineer Incharge.	15	No.			
					Total Amount of Branding & Logo Designing (Rs.)	

(Rupees _____)
In Words

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Contractor **Employer**

BILL OF QUANTITIES

Employer : Sindh Integrated Health and Population Program
Name of Project : Rehabilitation & Upgradation of Taluka Head Quarter Hospital

Sr. No.	Description	Qty	Unit	Rate (Rs)		Amount (Rs)
				In Figure	In Words	
8 - HYBRID SOLAR SYSTEM						
	NOTE. **Supplying, installation at any height, testing and commissioning of the following items of work (unless specifically stated therwise) including all materials, labor, tools, plants, accessories, as required for proper completion of each item in all respect , as per drawings, approved shop drawings, specification, miscellaneous details and instructions of Engineer . including 12 months operation and maintenance with material after successful commissioning.**					
1	**Solar PV Modules** Providing, Installing, connecting, testing and commissioning of 580Watts Solar PV Modules, cell type Mono Crystalline N-Type, PV module efficiency 21% or higher. PV modules cells must be protected with IP65 compliance and must conform to the latest edition of IEC and other International Standards, with all accessories as required up to satisfaction of the Engineer. Contractor to provide shop drawings, technical brochures, calculations & samples for the approval of the Engineer.	1365	No's			
2	**Floor Mounted PV Structure** Providing, Installing, connecting, and commissioning of L2 Roof Mounted Aluminium structure for 50 KW Solar PV Modules with Civil Pads. The structure shall be designed to sustain the load of PV modules and sustain worst weather conditions complete with all material, accessories, with kerb block support as foundation and civil works as required upto the satisfaction of Engineer. Contractor to provide shop drawings, technical brochure, calculations & samples for the approval of the Engineer.	15	Job			
3	**DC Distribution Board with Breakers** Providing, Installing, testing and commissioning of DC distribution box for Solar PV arrays,with protection rating IP-55 dust and water proof complete with material and installation accessories. Contractor to provide shop drawings, technical brochures & samples for the approval of the Engineer. 1. 4 Pole 20 Amp, 1000 Volt DC Breaker (6 Nos.)	15	Each			

Sr. No.	Description	Qty	Unit	Rate (Rs)		Amount (Rs)
				In Figure	In Words	
4	**AC Distribution Board with Breakers (Incoming / Out Going)** Providing, Installing, testing and commissioning of AC distribution box for AC Incoming & Out going Supply , with protection rating IP-55 dust and water proof complete with Volt / Amp meter, CTs, LED Lights, Bus Bar etc complete in all respects upto the satisfactation of engineer.. Contractor to provide shop drawings, technical brochures & samples for the approval of the Engineer. a. 4 Pole 125 Amp, 415 Volt AC MCCB Breaker Adjustable (1 Nos - Incoming) b. 4 Pole 125 Amp, 415 Volt AC MCCB Breaker (2 Nos. Outgoing)	15	Each			
5	**Hybrid PV Inverter** Providing, Installing, testing and commissioning of MPPT IP - 66 or 65 Hybrid Inverter (including combiner box) for 50KW Solar PV arrays, 3 Phase AC output voltage 230/400V, 50Hz, efficiency 97% or higher, with islanding protection/reverse current protection, DC overvoltage protection, grid monitoring and AC/DC connectors for input/output voltages, input DC voltage ranging upto maximum DC volts from PV tree complete with all accessories as required for completion of job and up to satisfaction of the Engineer. Contractor to provide minimum 5 Years warranty certificates, shop drawings, technical brochures & samples for the approval of the Engineer.	15	Each			
6	**Lithium Battery (1 Hrs Battery Back-up @ 50KW Load)** Providing, installing, testing and commissioning of **48Volts, 100 Amp Lithium-ion Battery**, compatible with hybrid inverter and solar PV systems. The battery shall have a usable capacity suitable to support a continuous 10kW load, with cell balancing, overcharge, deep discharge, over-temperature, and short-circuit protection.	180	No's			
7	**Distribution Cables** Providing, laying, termination, testing and commissioning of single core DC Cable 6mm.sq tin coated double PVC from Solar PV Array to Inverter	7500	Meters			
8	Providing, laying, termination, testing and commissioning of AC Cable 4C - 50 mm.sq PVC/PVC 600cable from Inverter to distribution board inlduing Lux, sleeves etc complete in all respects.	900	Meters			
10	Providing, laying, termination, testing and commissioning of ECC Cable 35mm.sq PVC/PVC cable from Inverter to PV Array and ECP complete in all respects.	2250	Meters			
11	Providing, laying, termination, testing and commissioning of DC Cable 1C - 95mm.sq PVC/PVC cable from Inverter to Batteries complete in all respects.	675	Meters			

Sr. No.	Description	Qty	Unit	Rate (Rs)		Amount (Rs)
				In Figure	In Words	
	UPVC Conduit					
12	Providing and laying of 50mm Dia uPVC conduit for DC cable protection from PV modules to inverter and for cabling for lighting system complete with all accessories and materials required for completion of job, as directed by Engineer.	1125	Meters			
13	Providing and laying of 25mm Dia uPVC conduit for DC cable protection from PV modules to inverter and for cabling for lighting system complete with all accessories and materials required for completion of job, as directed by Engineer.	1500	Meters			
	Cable Trays					
14	Supply, installation of 16 SWG G.I. perforated M.S.galvanize sheet cable tray rectangular shaped as per dimensions and partitions given below, without cover, to be fixed horizontally by installing suitable cable tray supports fixed at every 1000 mm c/c made of M.S. angle 24"x4" mm, Hanger made of M.S. rods 16 mm dia, nuts bolts to carry cables, and where required to be fixed vertically by brawl bolts in the duct, including the cost of internal clamps in the tray to properly hold the cables, all necessary accessories, complete in all respects.					
	i) 300 mm wide 75mm deep	225	Meter			
15	Providing following material for earthing of solar system, as per WAPDA latest specification..					
a	Bare Stranded Copper Conductor (35mm2)					
b	Copper Lugs 35 mm2 G I Bolts					
c	3 meter Copper Rod	45	Sets			
d	Cement, Sand, Shingle, Crush					
e	Lime Salt, Coal, 1:2:3					
f	Water					
g	PVC pipes (3/4"), Bends & PG Clamps.					
				Total Amount of Solar System (Rs.)		

(Rupees _____)
In Words

_____ _____
Contractor **Employer**

BILL OF QUANTITIES

Employer : Sindh Integrated Health and Population Program
Name of Project : Rehabilitation & Upgradation of Taluka Head Quarter Hospital

Sr. No.	Description	Qty	Unit	Rate (Rs)		Amount (Rs)
				In Figure	In Words	
9 - Solar Powered RO Plant						
	NOTE. ***Supplying, installation at any height, testing and commissioning of the following items of work (unless specifically stated therwise) including all materials, labor, tools, plants, accessories, as required for proper completion of each item in all respect, as per drawings, approved shop drawings, specification, miscellaneous details and instructions of Engineer .***					
1	**R.O Plant**					
	Providing, installing, testing and commissioning of R.O Plant complete in all respects upto the satisfaction of Engineer.	4	Job.			
2	**Solar PV Modules**					
	Providing, Installing, connecting, testing and commissioning of >580Watts Solar PV Modules, cell type Mono Crystalline N-Type, PV module efficiency 21% or higher. PV modules cells must be protected with IP65 compliance and must conform to the latest edition of IEC and other International Standards, with all accessories as required up to satisfaction of the Engineer. Contractor to provide shop drawings, technical brochures, calculations & samples for the approval of the Engineer.	32	No's			
3	**Floor Mounted PV Structure**					
	Providing, Installing, connecting, and commissioning of L2 Roof Mounted Aluminium structure for 10 KW Solar PV Modules with Civil Pads. The structure shall be designed to sustain the load of PV modules and sustain worst weather conditions complete with all material, accessories, with kerb block support as foundation and civil works as required upto the satisfaction of Engineer. Contractor to provide shop drawings, technical brochure, calculations & samples for the approval of the Engineer.	4	Job			
4	**AC/DC Distribution Board with Breakers**					
	Providing, Installing, testing and commissioning of AC/DC disconnector box for Solar PV arrays,with protection rating IP-55 dust and water proof complete with material and installation accessories. Contractor to provide shop drawings, technical brochures & samples for the approval of the Engineer.	4	Each			

Sr. No.	Description	Qty	Unit	Rate (Rs)		Amount (Rs)
				In Figure	In Words	
5	**Hybrid PV Inverter**					
	Providing, Installing, testing and commissioning of MPPT Hybrid Inverter (including combiner box) for 6KW Solar PV arrays, 3 Phase AC output voltage 230/400V, 50Hz, efficiency 97% or higher, with islanding protection/reverse current protection, DC overvoltage protection, grid monitoring and AC/DC connectors for input/output voltages, input DC voltage ranging upto maximum DC volts from PV tree complete with all accessories as required for completion of job and up to satisfaction of the Engineer. Contractor to provide warranty certificates, shop drawings, technical brochures, calculations & samples for the approval of the Engineer.	4	Each			
6	**Distribution Cables**					
a)	Providing, laying, termination, testing and commissioning of single core DC Cable 6mm.sq tin coated double PVC from Solar PV Array to Inverter	160	Meters			
b)	Providing, laying, termination, testing and commissioning of AC Cable 4C - 6mm.sq PVC/PVC cable from Inverter to distribution board complete in all respects.	60	Meters			
c)	Providing, laying, termination, testing and commissioning of ECC Cable 4mm.sq PVC/PVC cable from Inverter to PV Array and ECP complete in all respects.	100	Meters			
d)	Providing, laying, termination, testing and commissioning of DC Cable 1C - 25mm.sq PVC/PVC cable from Inverter to Batteries complete in all respects.	40	Meters			
7	**uPVC/PVC Conduit**					
	Providing and laying of 2" Dia uPVC/PVC conduit for DC cable protection from PV modules to inverter and for cabling for lighting system complete with all accessories and materials required for completion of job, as directed by Engineer.	80	Meters			
8	**Earthing Electrodes**					
	Supply, installing, connecting, testing and commissioning of copper earth electrodes, 200mm dia 3000 mm in length, driven vertically in ground, including cost of test pits 300x300x300mm, internal plaster, 100mm thick RCC covered with lifting hooks complete with all accessories and materials required for completion of job as directed by Engineer and for approval of Net metering.	4	Each			
					Total Amount of Solar R.O Plant (Rs.)	

(Rupees _____)
In Words

_____ _____
Contractor **Employer**

BILL OF QUANTITIES

Employer : Sindh Integrated Health and Population Program

Name of Project : Rehabilitation & Upgradation of Taluka Head Quarter Hospital

Sr. No.	Description	Qty	Unit	Rate (Rs)		Amount (Rs)
				In Figure	In Words	
10- Hybrid Solar Power System for Ultra Filtration Plant.						
	NOTE. **Supplying, installation at any height, testing and commissioning of the following items of work (unless specifically stated therwise) including all materials, labor, tools, plants, accessories, as required for proper completion of each item in all respect , as per drawings, approved shop drawings, specification, miscellaneous details and instructions of Engineer . including 12 months operation and maintenance with material after successful commissioning.**					
1	**Solar PV Modules** Providing, Installing, connecting, testing and commissioning of 580Watts Solar PV Modules, cell type Mono Crystalline N-Type, PV module efficiency 21% or higher. PV modules cells must be protected with IP65 compliance and must conform to the latest edition of IEC and other International Standards, with all accessories as required up to satisfaction of the Engineer. Contractor to provide shop drawings, technical brochures, calculations & samples for the approval of the Engineer.	132	No's			
2	**Floor Mounted PV Structure** Providing, Installing, connecting, and commissioning of L2 Roof Mounted Aluminium structure for 7 KW Solar PV Modules with Civil Pads. The structure shall be designed to sustain the load of PV modules and sustain worst weather conditions complete with all material, accessories, with kerb block support as foundation and civil works as required upto the satisfaction of Engineer. Contractor to provide shop drawings, technical brochure, calculations & samples for the approval of the Engineer.	11	Job			
3	**AC/DC Distribution Board with Breakers** Providing, Installing, testing and commissioning of AC/DC disconnector box for Solar PV arrays,with protection rating IP-55 dust and water proof complete with material and installation accessories. Contractor to provide shop drawings, technical brochures & samples for the approval of the Engineer.	11	Each			

BILL OF QUANTITIES

Employer : Sindh Integrated Health and Population Program

Name of Project : Rehabilitation & Upgradation of Taluka Head Quarter Hospital

Sr. No.	Description	Qty	Unit	Rate (Rs)		Amount (Rs)
				In Figure	In Words	
4	**10KW Hybrid Inverter for Plant.** Providing, Installing, testing and commissioning of MPPT IP - 66 or 65 Hybrid Inverter (including combiner box) for 7KW Solar PV arrays, 3 Phase AC output voltage 230/400V, 50Hz, efficiency 97% or higher, with islanding protection/reverse current protection, DC overvoltage protection, grid monitoring and AC/DC connectors for input/output voltages, input DC voltage ranging upto maximum DC volts from PV tree complete with all accessories as required for completion of job and up to satisfaction of the Engineer. Contractor to provide minimum 5 Years warranty certificates, shop drawings, technical brochures & samples for the approval of the Engineer.	11	Each			
5	**Lithium Battery** Providing, installing, testing and commissioning of 5**kW Lithium-ion Battery**, compatible with hybrid inverter and solar PV systems. The battery shall have a usable capacity suitable to support a continuous 7kW load, with cell balancing, overcharge, deep discharge, over-temperature, and short-circuit protection.	11	No's			
6	**Distribution Cables** Providing, laying, termination, testing and commissioning of single core DC Cable 4mm.sq tin coated double PVC from Solar PV Array to Inverter	220	Meters			
7	Providing, laying, termination, testing and commissioning of AC Cable 4C - 6mm.sq PVC/PVC cable from Inverter to distribution board complete in all respects.	110	Meters			
8	Providing, laying, termination, testing and commissioning of ECC Cable 4mm.sq PVC/PVC cable from Inverter to PV Array and ECP complete in all respects.	220	Meters			
9	Providing, laying, termination, testing and commissioning of DC Cable 1C - 25mm.sq PVC/PVC cable from Inverter to Batteries complete in all respects.	110	Meters			
10	**UPVC Conduit** Providing and laying of 50mm Dia uPVC conduit for DC cable protection from PV modules to inverter and for cabling for lighting system complete with all accessories and materials required for completion of job, as directed by Engineer.	110	Meters			
11	**Earthing Electrodes** Supply, installing, connecting, testing and commissioning of copper earth electrodes, 200mm dia 3000 mm in length, driven vertically in ground, including cost of test pits 300x300x300mm, internal plaster, 100mm thick RCC covered with lifting hooks complete with all accessories and materials required for completion of job as directed by Engineer and for approval of Net metering.	11	Each			

BILL OF QUANTITIES

Employer : Sindh Integrated Health and Population Program

Name of Project : Rehabilitation & Upgradation of Taluka Head Quarter Hospital

Sr. No.	Description	Qty	Unit	Rate (Rs)		Amount (Rs)
				In Figure	In Words	
12	**Containerized UF Plant** Providing, Fixing , Testing and Commissioning of Containerized ultra filtration Plant, complete with high pressure pumps and motors upto the satisfaction of engineer and client. Contractor should submit the technical broucher for appoval before commencment of work.	11	Job			
13	**Bore Hole** Providing 8" dia bore hole 100 feet depth complete with 5" class C Pvc pipe "A" Quality, 1.5hp Submersible pump, 6mm electric wire 2 Core, silk rope including fitting items bend, bore plate, clamp etc complete in all respects upto the satisfaction of engineer and client.	11	Job			
14	**Water Dispenser** Providing, fixing, testing and commissioning of 20 Ltr water dispenser complete in all respects	11	Job			
					Total Amount Solar UF Plant (Rs.)	

(Rupees _____)

In Words

_____ _____

Contractor **Employer**

SINDH HUMAN CAPITAL INVESTMENT: 1000 DAYS INTEGRATED HEALTH & POPULATION PROGRAM

REHAB OF 15 TALUKA HOSPITALS AT VARIOUS DISTRICT OF SINDH

TENDER DRAWINGS

(VOLUME-IV)

SEPTEMBER 2025

CONSULTANTS:

OSMANI

Engineering - Architecture - Planning - Mapping - Technology

OSMANI & COMPANY (PVT.) LTD.

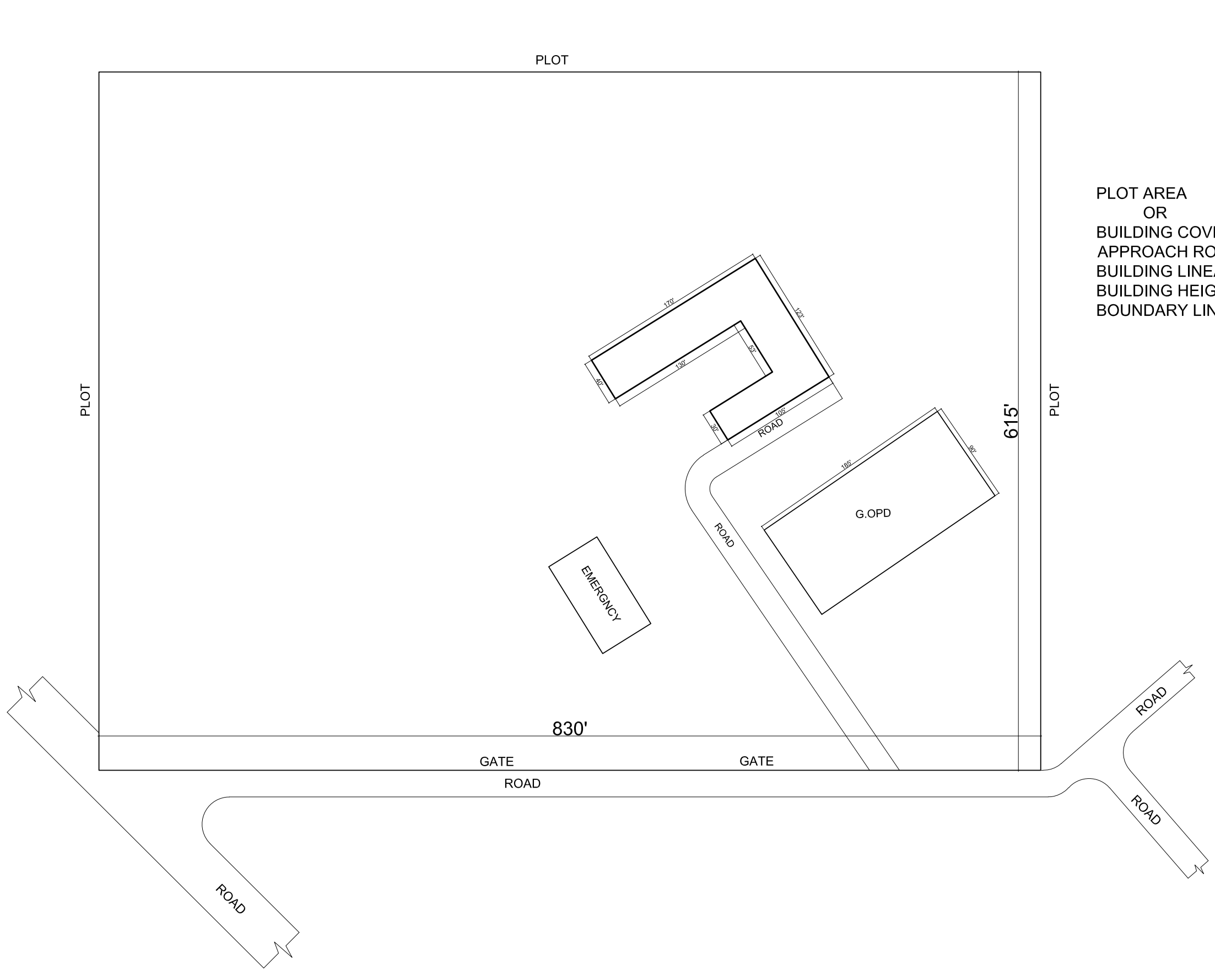
Consulting Engineers - Architects - Planners

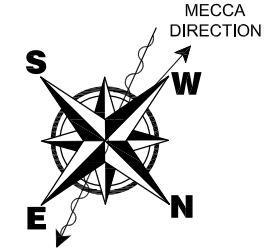
OSMANI HOUSE: 245/2-K, Block 6, PECHS, Karachi-75400, Pakistan

Tel. (92-21) 34536007-08, 34546541-42, Fax (92-21) 34534691

E-mail: ocl-khi@osmani.com, Website: www.osmani.com

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PLOT AREA	=	5,10,450 SFT.
OR	=	11.71 ACRES
BUILDING COVERED AREA	=	12,070 SFT.
APPROACH ROAD	=	9,950 SFT.
BUILDING LINEAR LENGTH	=	716'
BUILDING HEIGHT INCL. PLINTH	=	16'
BOUNDARY LINEAR LENGTH	=	2890'

Client:

Funded by: THE WORLD BANK IBRD • IDA

Project:

SINDH HUMAN CAPITAL INVESTMENT: 1000 DAYS INTEGRATED HEALTH & POPULATION PROGRAM

S. No	Date	Issuance	Checked	Issued
T0	JUNE 2025	ISSUED FOR TENDER (NOT FOR CONSTRUCTION)	FAISAL	KAMRAN

S. No	Date	Revisions	Drawn	Checked

Status of Drawings: TENDER DRAWING

Drawings Title: ARCHITCTURE DRAWINGS

Job Name: TALUKA HOSPITAL (DIGRI)

Drawings Title: EXTERNAL WORKS

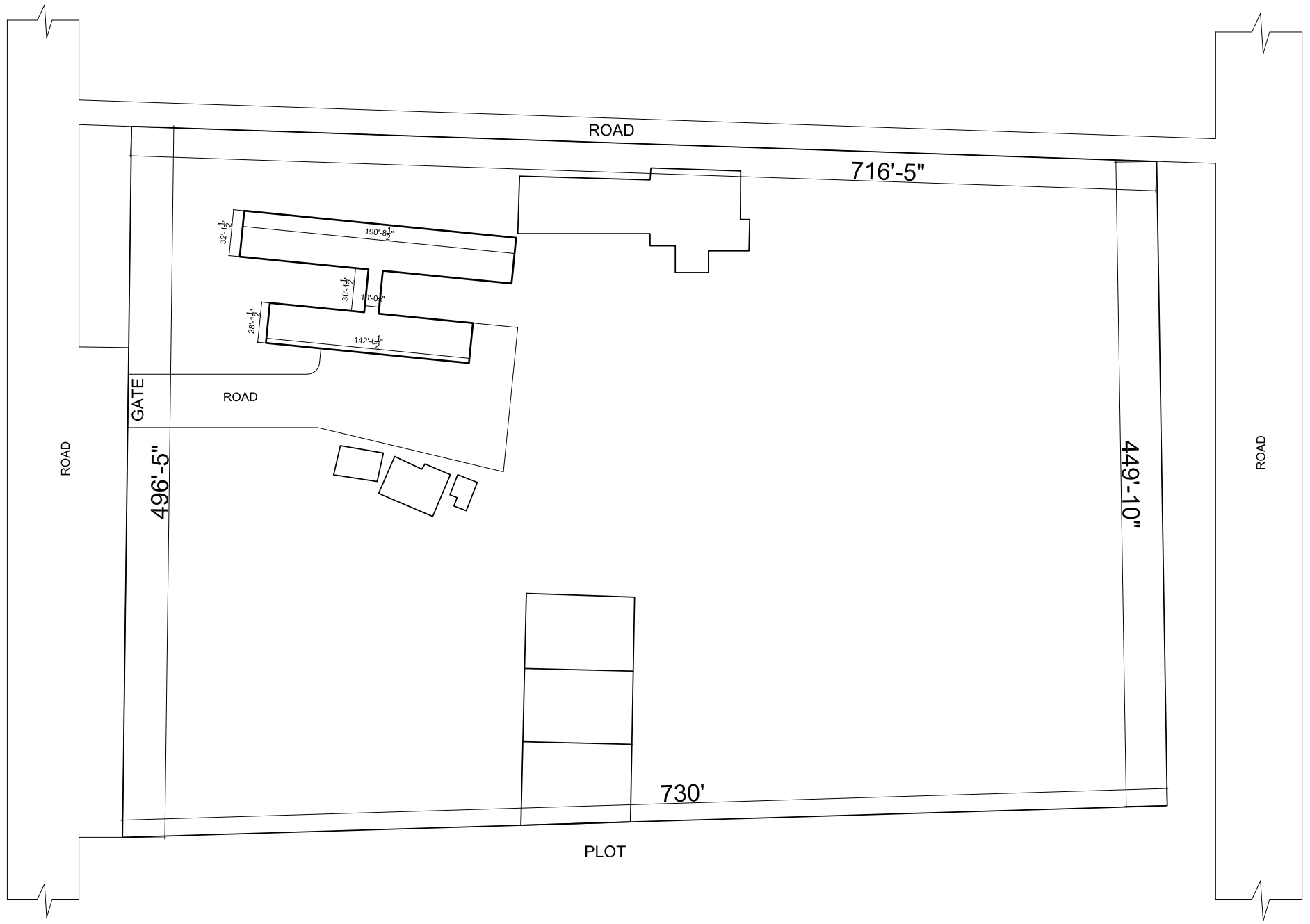
Caded By:	KAMRAN
Design by:	FARAZ
Checked by:	FAISAL
Coordinated By:	COLAJMAL
Approved By:	–
Electronic File Name	3720-1-4-1-1-A020P0-THQ

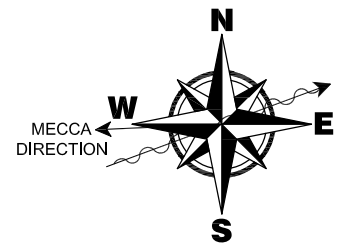
Dated: SEP.2025	Scale: N.T.S.	ctb File: OCL200
Plot No: –	Project No: 3720	
Rev No: T0	Dwg N0: A020	

Consultant:

OSMANI
Engineering - Architecture - Planning - Mapping - Technology
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Consulting Engineers - Architects - Planners
OSMANI HOUSE: 2452-K, Block 6, PECHS, Karachi-75400, Pakistan.
Tel. (92-21) 34536007-08, 34546541-42, Fax (92-21) 34534691,
E-mail: ocl-khi@osmani.com, Website: www.osmani.com
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User and Plot Date: Rizwan Ahmed - Tue, 21 Oct 2025 - 6:10pm





PLOT AREA	=	3,41,978 SFT.
OR	=	7.85 ACRES
BUILDING COVERED AREA	=	10,356 SFT.
APPROACH ROAD	=	14,440 SFT.
BUILDING LINEAR LENGTH	=	827'
BUILDING HEIGHT INCL. PLINTH	=	16'
BOUNDARY LINEAR LENGTH	=	2395'

Client:

Funded by: THE WORLD BANK IBRD • IDA

Project:

SINDH HUMAN CAPITAL INVESTMENT: 1000 DAYS INTEGRATED HEALTH & POPULATION PROGRAM

S. No	Date	Issuance	Checked	Issued
T0	JUNE 2025	ISSUED FOR TENDER (NOT FOR CONSTRUCTION)	FAISAL	KAMRAN

S. No	Date	Revisions	Drawn	Checked

Status of Drawings: TENDER DRAWING

Drawings Title: ARCHITCTURE DRAWINGS

Job Name: TALUKA HOSPITAL (GOLARCHI)

Drawings Title: EXTERNAL WORKS

Caded By:	KAMRAN
Design by:	FARAZ
Checked by:	FAISAL
Coordinated By:	COL.AJMAL
Approved By:	–
Electronic File Name	3720-1-4-1-1-1-A020P0-THQ

Dated:	Scale:	ctb File	
SEP.2025	N.T.S.	OCL200	
Plot No:	Project No:		
–	3720		
Rev No:	Dwg N0:		
T0	A020		

Consultant:

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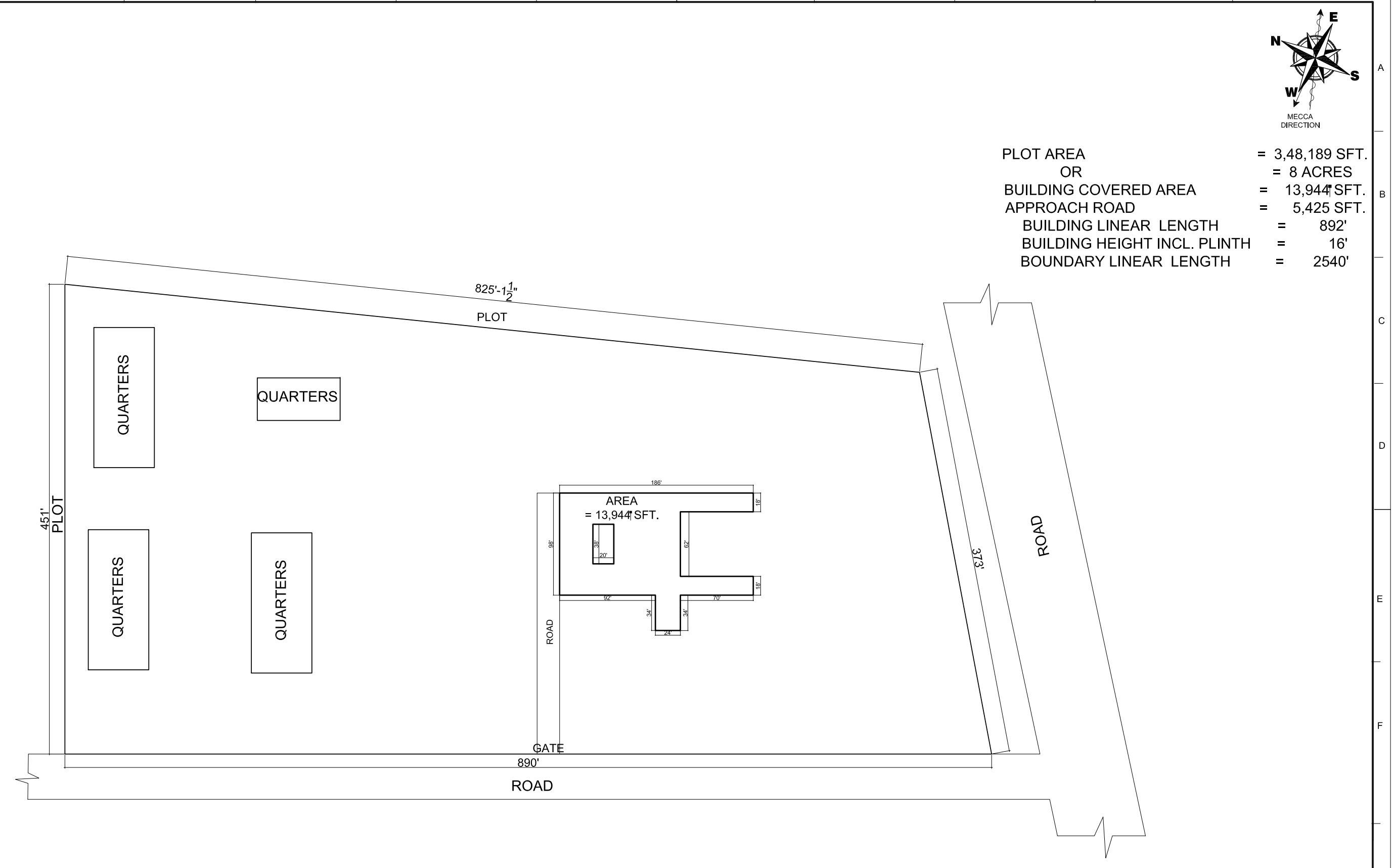
OSMANI & COMPANY (PVT.) LTD.

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Tel. (92-21) 34536007-08, 34546541-42, Fax (92-21) 34534691,
E-mail: ocl-khi@osmani.com, Website: www.osmani.com

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Drawing file path & name: \\storage-server\14 - In-Progress\3720-SHPP\01-Phase-1\Existing Buildings\RHC and THQ Rehab Works-21-10-2025\3720-1-4-1-1-1-A020P0-THQ.dwg
User and Plot Date: Rizwan Ahmed - Tue, 21 Oct 2025 - 12:52pm



Client:

Funded by: THE WORLD BANK IBRD • IDA

Project:

SINDH HUMAN CAPITAL INVESTMENT: 1000 DAYS INTEGRATED HEALTH & POPULATION PROGRAM

S. No	Date	Issuance	Checked	Issued
T0	JUNE 2025	ISSUED FOR TENDER (NOT FOR CONSTRUCTION)	FAISAL	KAMRAN

S. No	Date	Revisions	Drawn	Checked

Status of Drawings: TENDER DRAWING

Job Name: TALUKA HOSPITAL (KANDIARO)

Drawings Title: ARCHITCTURE DRAWINGS

Drawings Title: EXTERNAL WORKS

Caded By:	KAMRAN
Design by:	FARAZ
Checked by:	FAISAL
Coordinated By:	COL.AJMAL
Approved By:	–
Electronic File Name	3720-1-4-1-1-A020PO-THQ
Dated:	SEP.2025
Plot No:	–
Scale:	N.T.S.
ctb File	OCL200
Project No:	3720
Rev No:	T0
Dwg N0:	A020

Consultant:

OSMANI

Engineering - Architecture - Planning - Mapping - Technology

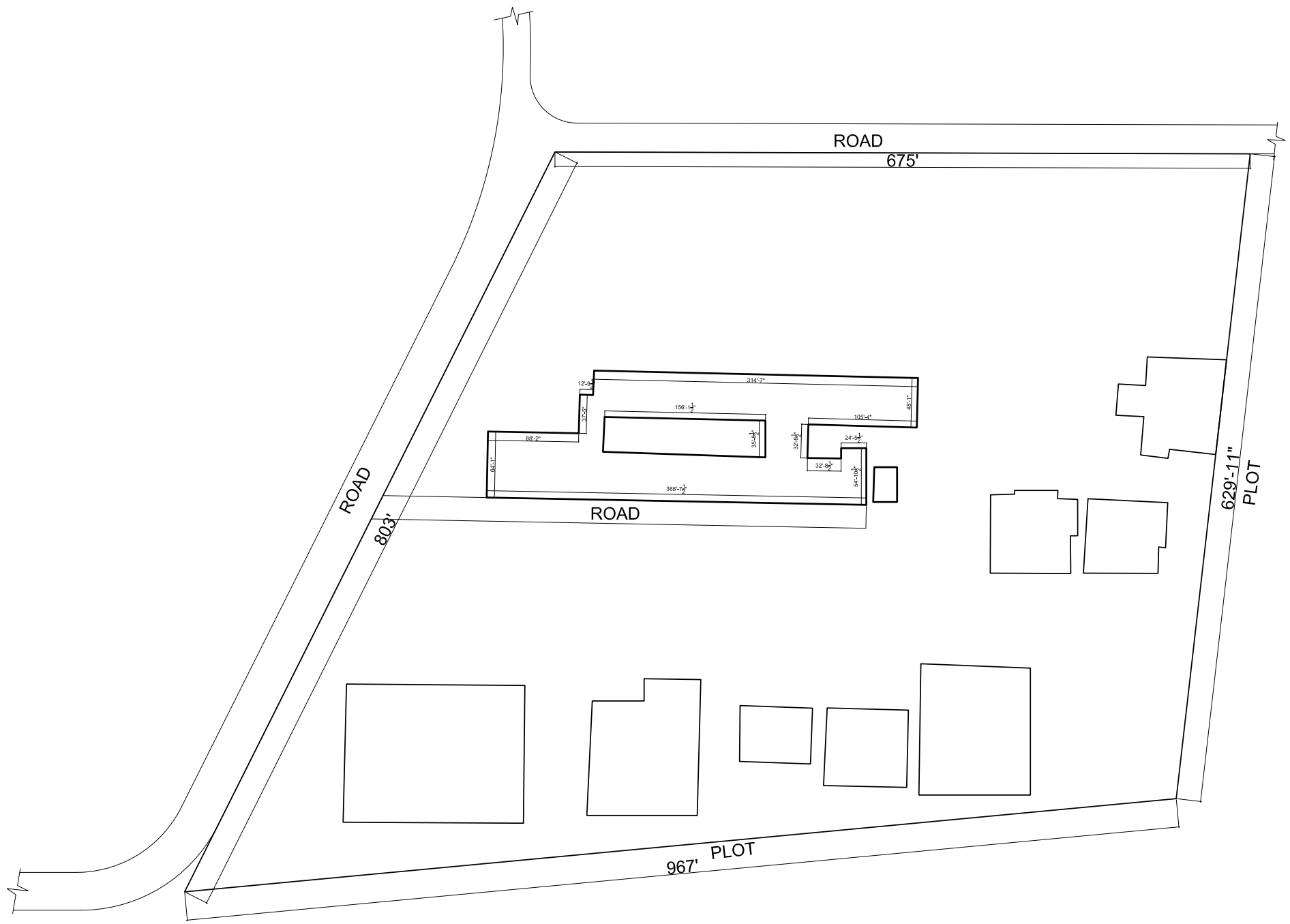
OSMANI & COMPANY (PVT.) LTD.

Consulting Engineers - Architects - Planners

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Tel. (92-21) 34536007-08, 34546541-42, Fax (92-21) 34534691,
E-mail: ocl-khi@osmani.com, Website: www.osmani.com

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User and Plot Date: Rizwan Ahmed - Tue, 21 Oct 2025 - 12:54pm



PLOT AREA	= 5,40,670 SFT.
OR	= 2.35 ACRES
BUILDING COVERED AREA	= 35,500 SFT.
APPROACH ROAD	= 10,840 SFT.
BUILDING LINEAR LENGTH	= 1600'
BUILDING HEIGHT INCL. PLINTH	= 16'
BOUNDARY LINEAR LENGTH	= 3075'

Client:

Funded by: THE WORLD BANK IBRD • IDA

Project:

SINDH HUMAN CAPITAL INVESTMENT: 1000 DAYS INTEGRATED HEALTH & POPULATION PROGRAM

S. No	Date	Issuance	Checked	Issued
T0	JUNE 2025	ISSUED FOR TENDER (NOT FOR CONSTRUCTION)	FAISAL	KAMRAN

S. No	Date	Revisions	Drawn	Checked

Status of Drawings: TENDER DRAWING

Job Name: TALUKA HOSPITAL (KOTDIJI)

Drawings Title: ARCHITCTURE DRAWINGS

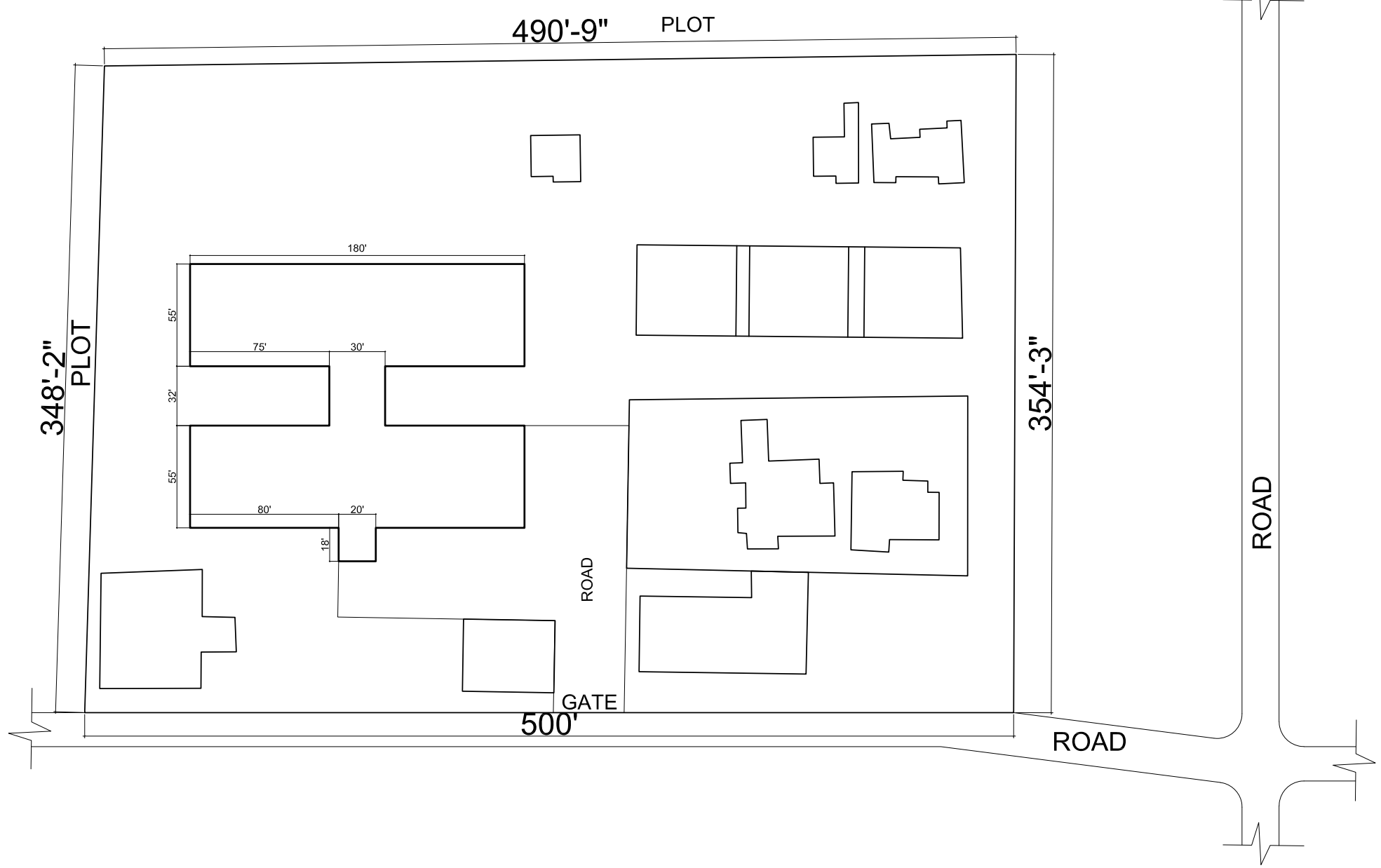
Drawings Title: EXTERNAL WORKS

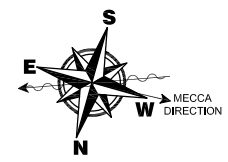
Caded By:	KAMRAN
Design by:	FARAZ
Checked by:	FAISAL
Coordinated By:	COL.AJMAL
Approved By:	–
Electronic File Name	3720-1-4-1-1-1-A020P0-THQ
Dated:	SEP.2025
Plot No:	–
Rev No:	T0
Scale:	N.T.S.
ctb File	OCL200
Project No:	3720
Dwg N0:	A020

Consultant:

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E-mail: cd-khi@osmani.com, Website: www.osmani.com
ISLAMABAD RAWALPINDI LAHORE FAISALABAD MULTAN QUETTA GWADAR
PAKISTAN PAKISTAN PAKISTAN PAKISTAN PAKISTAN PAKISTAN PAKISTAN

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User and Plot Date: Rizwan Ahmed - Tue, 21 Oct 2025 - 2:08pm





PLOT AREA	=	1,73,907 SFT.
OR	=	3.99 ACRES
BUILDING COVERED AREA	=	21,119 SFT.
APPROACH ROAD	=	12,230 SFT.
BUILDING LINEAR LENGTH	=	979'
BUILDING HEIGHT INCL. PLINTH	=	16'
BOUNDARY LINEAR LENGTH	=	1695'

Client:

Funded by: THE WORLD BANK

Project:

SINDH HUMAN CAPITAL INVESTMENT: 1000 DAYS INTEGRATED HEALTH & POPULATION PROGRAM

S. No	Date	Issuance	Checked	Issued
T0	JUNE 2025	ISSUED FOR TENDER (NOT FOR CONSTRUCTION)	FAISAL	KAMRAN

S. No	Date	Revisions	Drawn	Checked

Status of Drawings: TENDER DRAWING

Drawings Title: ARCHITCTURE DRAWINGS

Job Name: TALUKA HOSPITAL (KOT GHULAM MUHAMMAD)

Drawings Title: EXTERNAL WORKS

Caded By:	KAMRAN
Design by:	FARAZ
Checked by:	FAISAL
Coordinated By:	COL.AJMAL
Approved By:	–
Electronic File Name	3720-1-4-1-1-A020P0-THQ

Dated:	SEP.2025	Scale:	N.T.S.
ctb File	OCL200		
Plot No:	–	Project No:	3720
Rev No:	T0	Dwg N0:	A020

Consultant:

OSMANI

Engineering - Architecture - Planning - Mapping - Technology

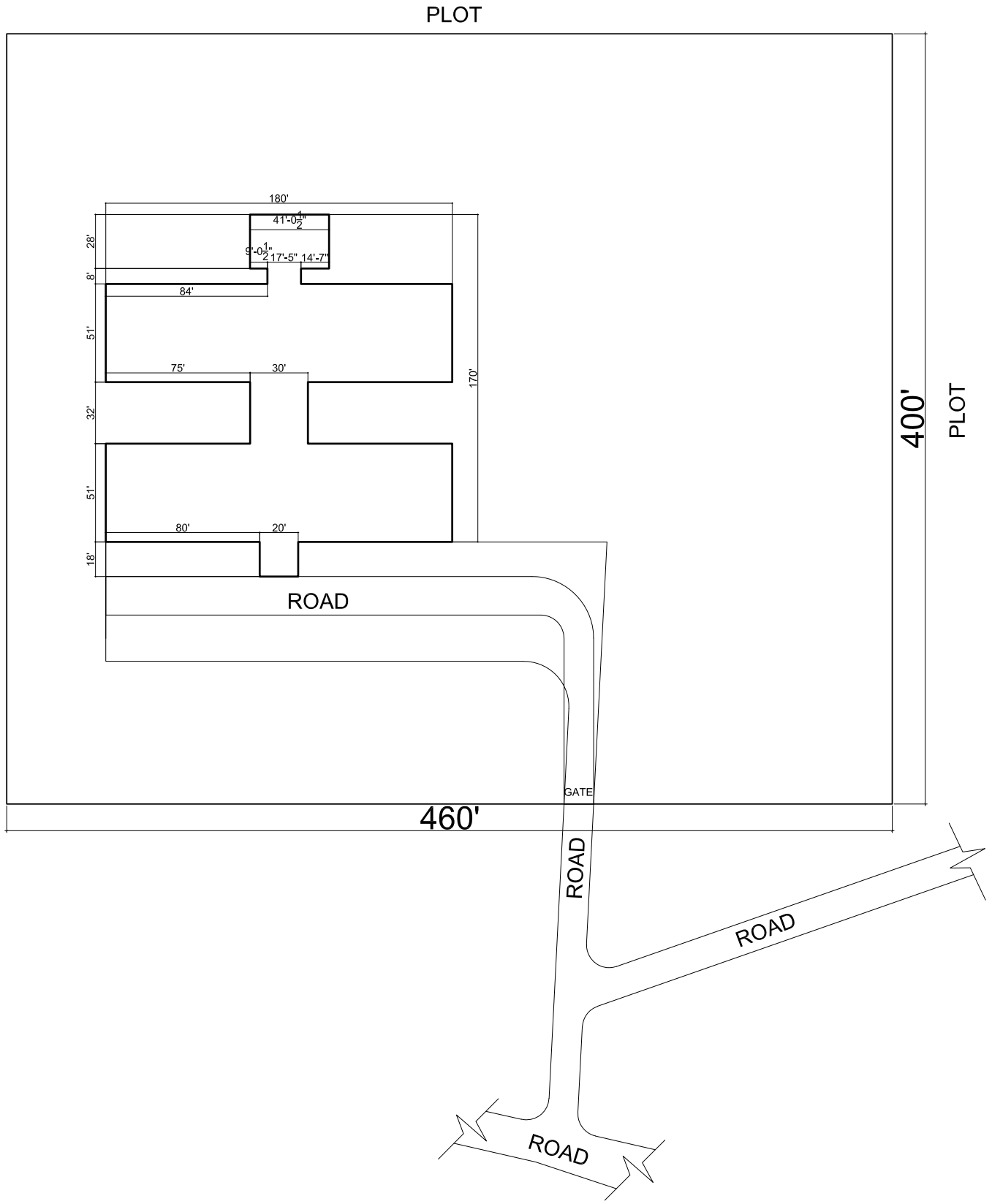
OSMANI & COMPANY (PVT.) LTD.

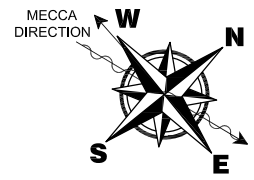
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User and Plot Date: Rizwan Ahmed - Tue, 21 Oct 2025 - 2:07pm





PLOT AREA	=	1,84,000 SFT.
OR	=	4.22 ACRES
BUILDING COVERED AREA	=	20,968 SFT.
APPROACH ROAD	=	16,970 SFT.
BUILDING LINEAR LENGTH	=	1085'
BUILDING HEIGHT INCL. PLINTH	=	16'
BOUNDARY LINEAR LENGTH	=	1720'

Client:

Funded by: THE WORLD BANK IBRD • IDA

Project:

SINDH HUMAN CAPITAL INVESTMENT: 1000 DAYS INTEGRATED HEALTH & POPULATION PROGRAM

S. No	Date	Issuance	Checked	Issued
T0	JUNE 2025	ISSUED FOR TENDER (NOT FOR CONSTRUCTION)	FAISAL	KAMRAN

S. No	Date	Revisions	Drawn	Checked

Status of Drawings: TENDER DRAWING

Drawings Title: ARCHITCTURE DRAWINGS

Job Name: TALUKA HOSPITAL (MANJHAND)

Drawings Title: EXTERNAL WORKS

Caded By:	KAMRAN
Design by:	FARAZ
Checked by:	FAISAL
Coordinated By:	COL.AJMAL
Approved By:	–
Electronic File Name	3720-1-4-1-1-A020P0-THQ

Dated:	Scale:	ctb File
SEP.2025	N.T.S. (ATCH)	OCL200
Plot No: –	Project No: 3720	
Rev No: T0	Dwg N0: A020	

Consultant:

OSMANI

Engineering - Architecture - Planning - Mapping - Technology

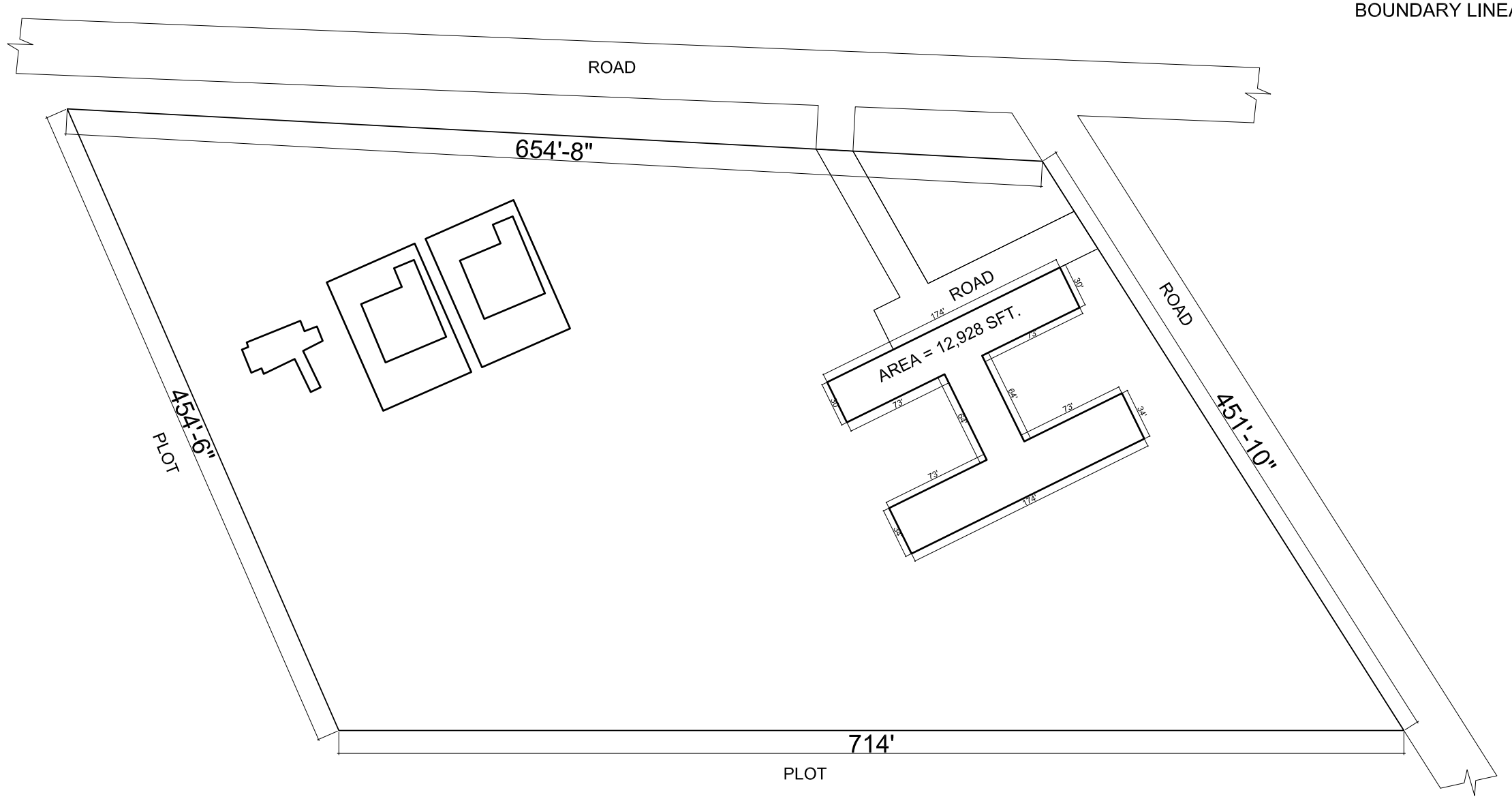
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User and Plot Date: Rizwan_Ahmed – Tue, 21 Oct 2025 – 2:08pm



N E W S

MECCA DIRECTION

PLOT AREA	=	2,69,070 SFT.
OR	=	6.17 ACRES
BUILDING COVERED AREA	=	12,928 SFT.
APPROACH ROAD	=	6,710 SFT.
BUILDING LINEAR LENGTH	=	896'
BUILDING HEIGHT INCL. PLINTH	=	16'
BOUNDARY LINEAR LENGTH	=	2275'

Client:

Funded by: THE WORLD BANK IBRD • IDA

Project:

SINDH HUMAN CAPITAL INVESTMENT: 1000 DAYS INTEGRATED HEALTH & POPULATION PROGRAM

S. No	Date	Issuance	Checked	Issued
T0	JUNE 2025	ISSUED FOR TENDER (NOT FOR CONSTRUCTION)	FAISAL	KAMRAN

S. No	Date	Revisions	Drawn	Checked

Status of Drawings: TENDER DRAWING

Drawings Title: ARCHITCTURE DRAWINGS

Job Name: TALUKA HOSPITAL (MIRPUR BATHORO)

Drawings Title: EXTERNAL WORKS

Caded By:	KAMRAN
Design by:	FARAZ
Checked by:	FAISAL
Coordinated By:	COL.AJMAL
Approved By:	--
Electronic File Name	3720-1-4-1-1-A020P0-THQ

Dated: SEP.2025	Scale: N.T.S. AT A1	ctb File OCL200
Plot No: -	Project No: 3720	
Rev No: T0	Dwg N0: A020	

Consultant:

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Engineering - Architecture - Planning - Mapping - Technology

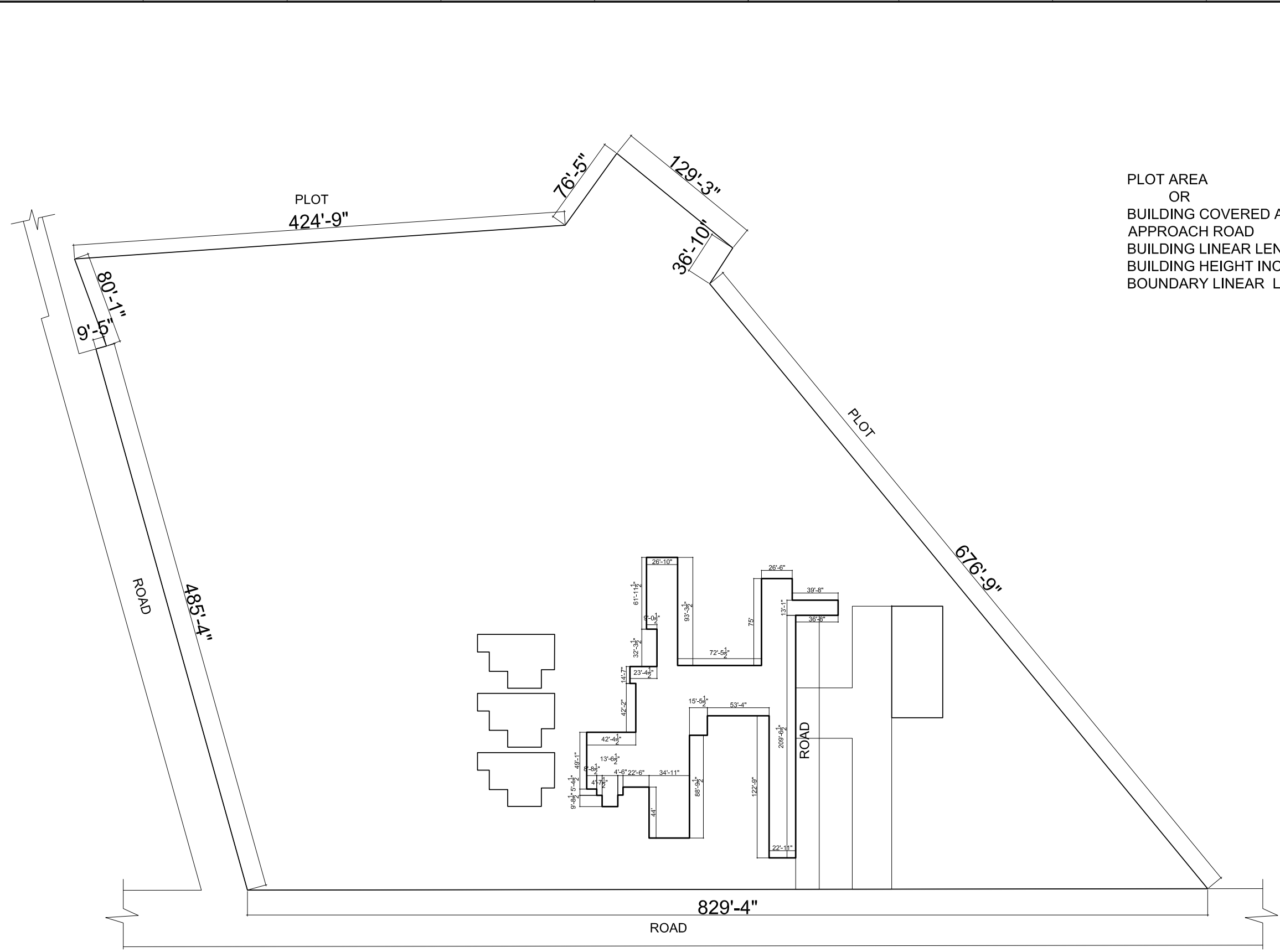
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User and Plot Date: Rizwan Ahmed - Tue, 21 Oct 2025 - 2:09pm



PLOT AREA	= 385140 SFT.
OR	= 8.84 ACRES
BUILDING COVERED AREA	= 20,702 SFT.
APPROACH ROAD	= 10,440 SFT.
BUILDING LINEAR LENGTH	= 1376'
BUILDING HEIGHT INCL. PLINTH	= 16'
BOUNDARY LINEAR LENGTH	= 2748'

Client:

Funded by: THE WORLD BANK IBRD • IDA

Project:

SINDH HUMAN CAPITAL INVESTMENT: 1000 DAYS INTEGRATED HEALTH & POPULATION PROGRAM

S. No	Date	Issuance	Checked	Issued
T0	JUNE 2025	ISSUED FOR TENDER (NOT FOR CONSTRUCTION)	FAISAL	KAMRAN

S. No	Date	Revisions	Drawn	Checked

Status of Drawings: TENDER DRAWING

Job Name: TALUKA HOSPITAL (MORO)

Drawings Title: ARCHITCTURE DRAWINGS

Drawings Title: EXTERNAL WORKS

Caded By:	KAMRAN
Design by:	FARAZ
Checked by:	FAISAL
Coordinated By:	COL.AJMAL
Approved By:	–
Electronic File Name	3720-1-4-1-1-A020P0-THQ
Dated:	SEP.2025
Scale:	N.T.S.
ctb File	OCL200
Plot No:	–
Project No:	3720
Rev No:	T0
Dwg N0:	A020

Consultant:

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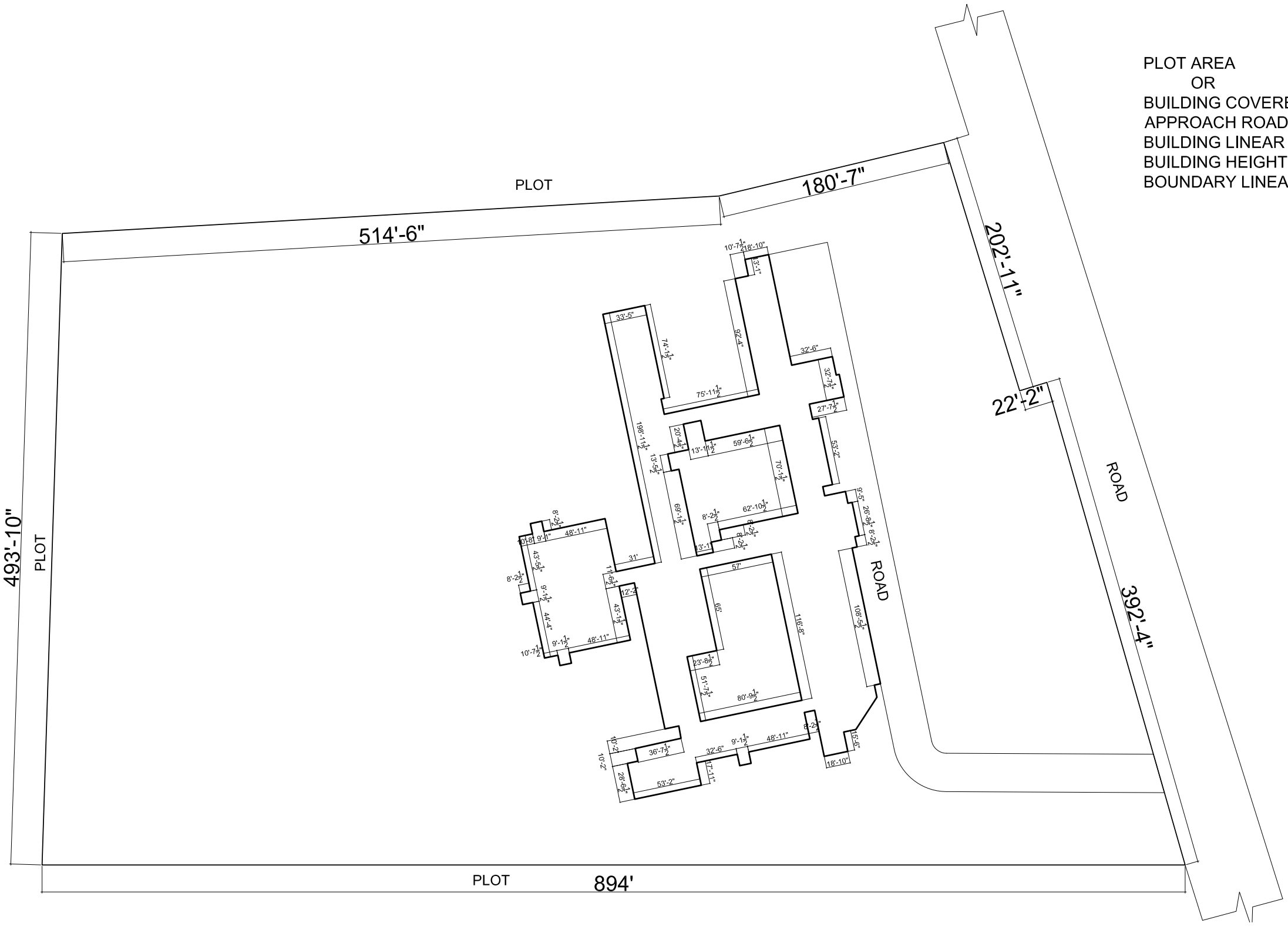
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User and Plot Date: Rizwan Ahmed - Tue, 21 Oct 2025 - 2:10pm



PLOT AREA	=	4,16,625 SFT.
OR	=	1.81 ACRES
BUILDING COVERED AREA	=	45,172 SFT.
APPROACH ROAD	=	19,189 SFT.
BUILDING LINEAR LENGTH	=	2730'
BUILDING HEIGHT INCL. PLINTH	=	16'
BOUNDARY LINEAR LENGTH	=	2700'

Client:

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Project:

SINDH HUMAN CAPITAL INVESTMENT: 1000 DAYS INTEGRATED HEALTH & POPULATION PROGRAM

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T0	JUNE 2025	ISSUED FOR TENDER (NOT FOR CONSTRUCTION)	FAISAL	KAMRAN

S. No	Date	Revisions	Drawn	Checked

Status of Drawings: TENDER DRAWING

Drawings Title: ARCHITCTURE DRAWINGS

Job Name: TALUKA HOSPITAL (SAKRAND)

Drawings Title: EXTERNAL WORKS

Caded By:	KAMRAN
Design by:	FARAZ
Checked by:	FAISAL
Coordinated By:	COL.AJMAL
Approved By:	--
Electronic File Name:	3720-1-4-1-1-1-A020P0-THQ

Dated:	SEP.2025	Scale:	N.T.S.
ctb File:	OCL200		
Plot No:	-	Project No:	3720
Rev No:	T0	Dwg N0:	A020

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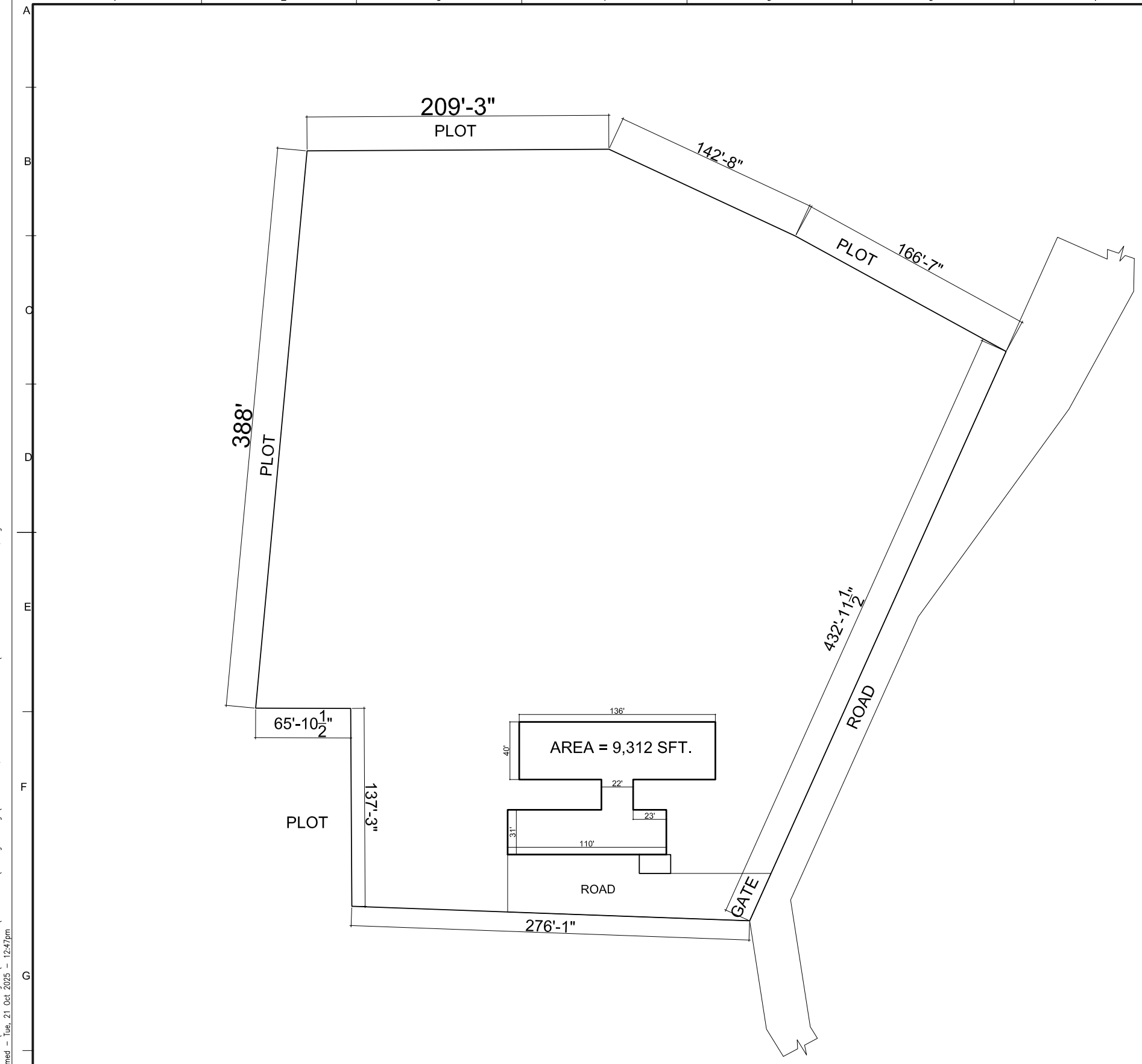
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User and Plot Date: Rizwan_Ahmed - Tue, 21 Oct 2025 - 2:10pm



PLOT AREA	=	2,06,570 SFT.
OR	=	4.74 ACRES
BUILDING COVERED AREA	=	9,312 SFT.
APPROACH ROAD	=	6,450 SFT.
BUILDING LINEAR LENGTH	=	632'
BUILDING HEIGHT INCL. PLINTH	=	16'
BOUNDARY LINEAR LENGTH	=	1820'

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User and Plot Date: Rizwan.Ahmed - Tue, 21 Oct 2025 - 12:47pm

Client:

Funded by: THE WORLD BANK

Project:
SINDH HUMAN CAPITAL INVESTMENT: 1000 DAYS INTEGRATED HEALTH & POPULATION PROGRAM

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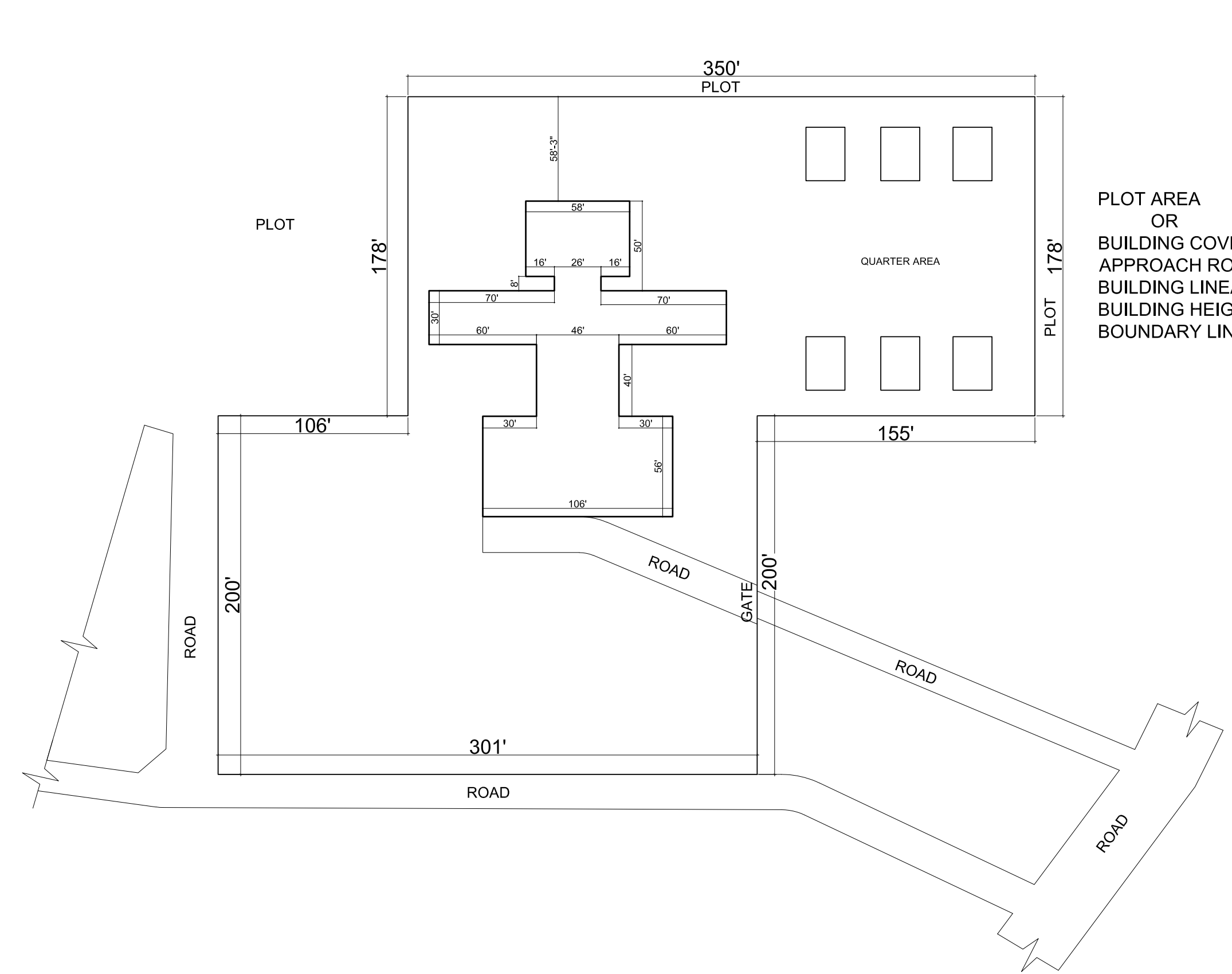
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Status of Drawings: TENDER DRAWING
Drawings Title: ARCHITCTURE DRAWINGS
Job Name: TALUKA HOSPITAL (TONDO BAGO)
Drawings Title: EXTERNAL WORKS

Caded By: KAMRAN
Design by: FARAZ
Checked by: FAISAL
Coordinated By: COL.AJMAL
Approved By: –
Electronic File Name: 3720-1-4-1-1-1-A020P0-THQ

Dated: SEP.2025 | Scale: N.T.S. | ctb File: OCL200.ctb
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PLOT AREA	=	1,22,500 SFT.
OR	=	2.81 ACRES
BUILDING COVERED AREA	=	15,400 SFT.
APPROACH ROAD	=	3,220 SFT.
BUILDING LINEAR LENGTH	=	868'
BUILDING HEIGHT INCL. PLINTH	=	16'
BOUNDARY LINEAR LENGTH	=	1668'

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S. No	Date	Revisions	Drawn	Checked

Status of Drawings: TENDER DRAWING

Drawings Title: ARCHITCTURE DRAWINGS

Job Name: TALUKA HOSPITAL (TANDO GHULAM HYDER)

Drawings Title: EXTERNAL WORKS

Caded By:	KAMRAN
Design by:	FARAZ
Checked by:	FAISAL
Coordinated By:	COL.AJMAL
Approved By:	–
Electronic File Name	3720-1-4-1-1-1-A020P0-THQ

Dated:	SEP.2025	Scale:	N.T.S.
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Project No:	3720		
Rev No:	T0	Dwg N0:	A020

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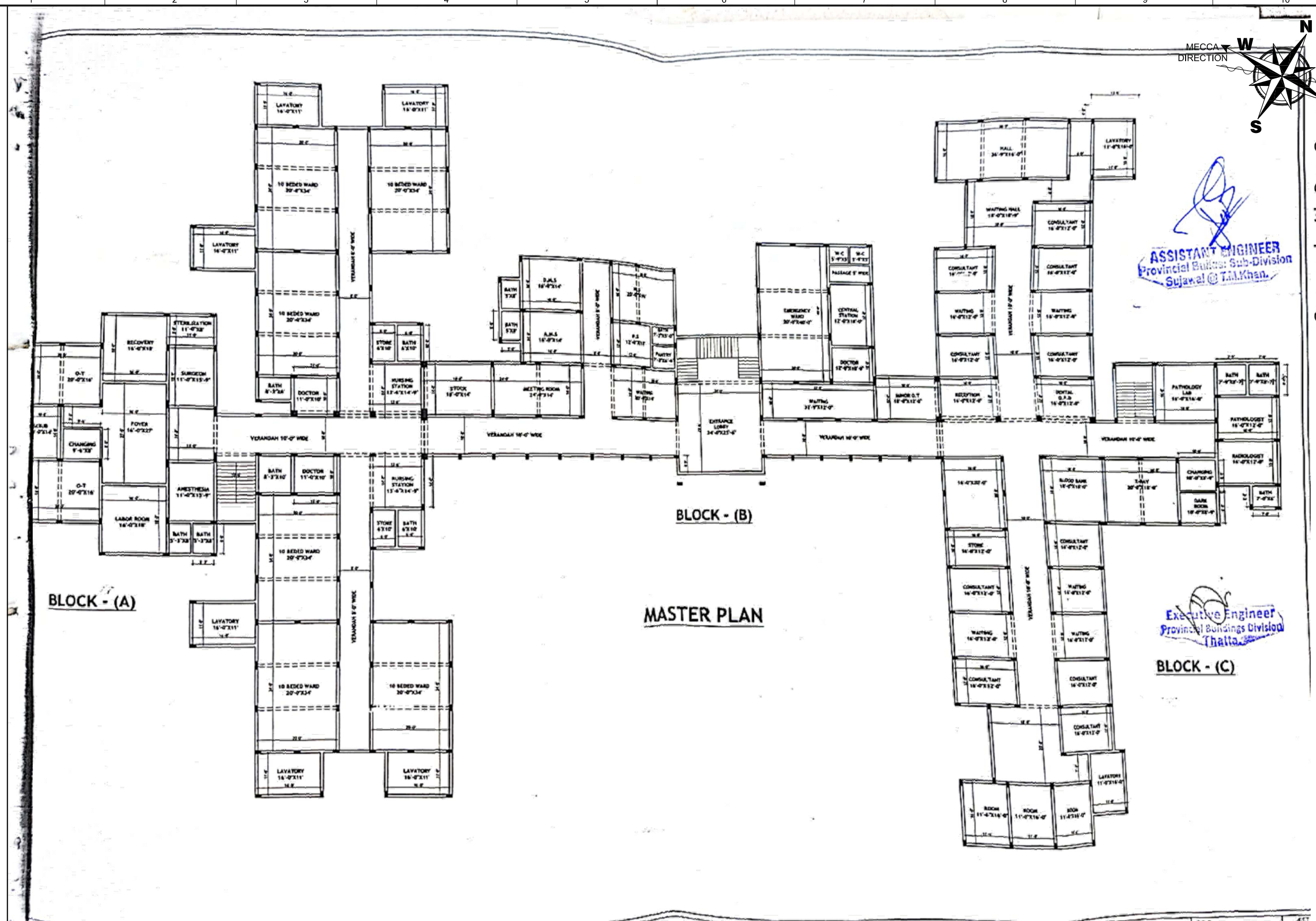
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ASSISTANT ENGINEER
Provincial Buildings Sub-Division
Sujawal @ T.M.Khan.

Executive Engineer
Provincial Buildings Division
Thatta

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Client:

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Status of Drawings: TENDER DRAWING

Drawings Title: ARCHITCTURE DRAWINGS

Job Name: TALUKA HOSPITAL (Type-1)

Drawings Title: GROUND FLOOR PLAN

Caded By:	KAMRAN
Design by:	FARAZ
Checked by:	FAISAL
Coordinated By:	COLAJMAL
Approved By:	--
Electronic File Name	3720-1-4-1-1-1-A100P0-THQ

Dated:	Scale:	ctb File
SEP.2025	N.T.S.	OCL200
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Plot No:	Project No:	
-	3720	
Rev No:	Dwg N0:	
T0	A100-1	

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MECCA DIRECTION

S W E N

ASSISTANT ENGINEER
Provincial B... Sub-Division
Sujawal © F.M.Khan.

Executive Engineer
Provincial Buildings Division
Thatta.

BATH 5'X8'
D.M.S 16'-0"X14'
BATH 5'X8'
A.M.S 16'-0"X14'
VERANDAH 8'-0" WIDE
M.S 20'-0"X16'
P.S 12'-0"X12'
BATH 7'-3"X5'-0"
PANTRY 7'-3"X6'-6"
W-C 5'-9"X5'
W-C 5'-9"X5'
PASSAGE 5' WIDE
EMERGENCY WARD 20'-0"X40'-0"
CENTRAL STATION 12'-0"X18'-0"
DOCTOR 12'-0"X10'-0"
STOCK 18'-0"X14'
MEETING ROOM 24'-0"X14'
WAITING 20'-0"X14'
ENTRANCE LOBBY 24'-0"X25'-6"
WAITING 32'-9"X12'-0"
MINOR O.T 18'-0"X12'-0"
VERANDAH 10'-0" WIDE
VERANDAH 10'-0" WIDE

Client:

Funded by: THE WORLD BANK IBRD • IDA

Project:

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S. No	Date	Revisions	Drawn	Checked

Status of Drawings: TENDER DRAWING

Job Name: TALUKA HOSPITAL (Type-2)

Drawings Title: ARCHITCTURE DRAWINGS

Drawings Title: GROUND FLOOR PLAN

Caded By:	KAMRAN
Design by:	FARAZ
Checked by:	FAISAL
Coordinated By:	COLAJMAL
Approved By:	–
Electronic File Name	3720-1-4-1-1-1-A100P0-THQ

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Plot No: – | Project No: 3720
Rev No: T0 | Dwg N0: A100-2

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ISLAMABAD RAWALPINDI LAHORE FAISALABAD MULTAN QUETTA GWADAR
PAKISTAN PAKISTAN PAKISTAN PAKISTAN PAKISTAN PAKISTAN PAKISTAN

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User and Plot Date Rizwan_Ahmed - Tue, 21 Oct 2025 - 2:40pm

Client:

Funded by: THE WORLD BANK

Project:
SINDH HUMAN CAPITAL INVESTMENT:
1000 DAYS INTEGRATED HEALTH & POPULATION PROGRAM

S. No	Date	Issuance
T0	JUNE 2025	ISSUED FOR TENDER (NOT FOR CONSTRUCTION)

Status of Drawings: TENDER DRAWING

Job Name: TALUKA HOSPITAL (Type-3)

Drawings Title: GROUND FLOOR PLAN

Revisions

S. No	Date

Drawings Title: ARCHITCTURE DRAWINGS

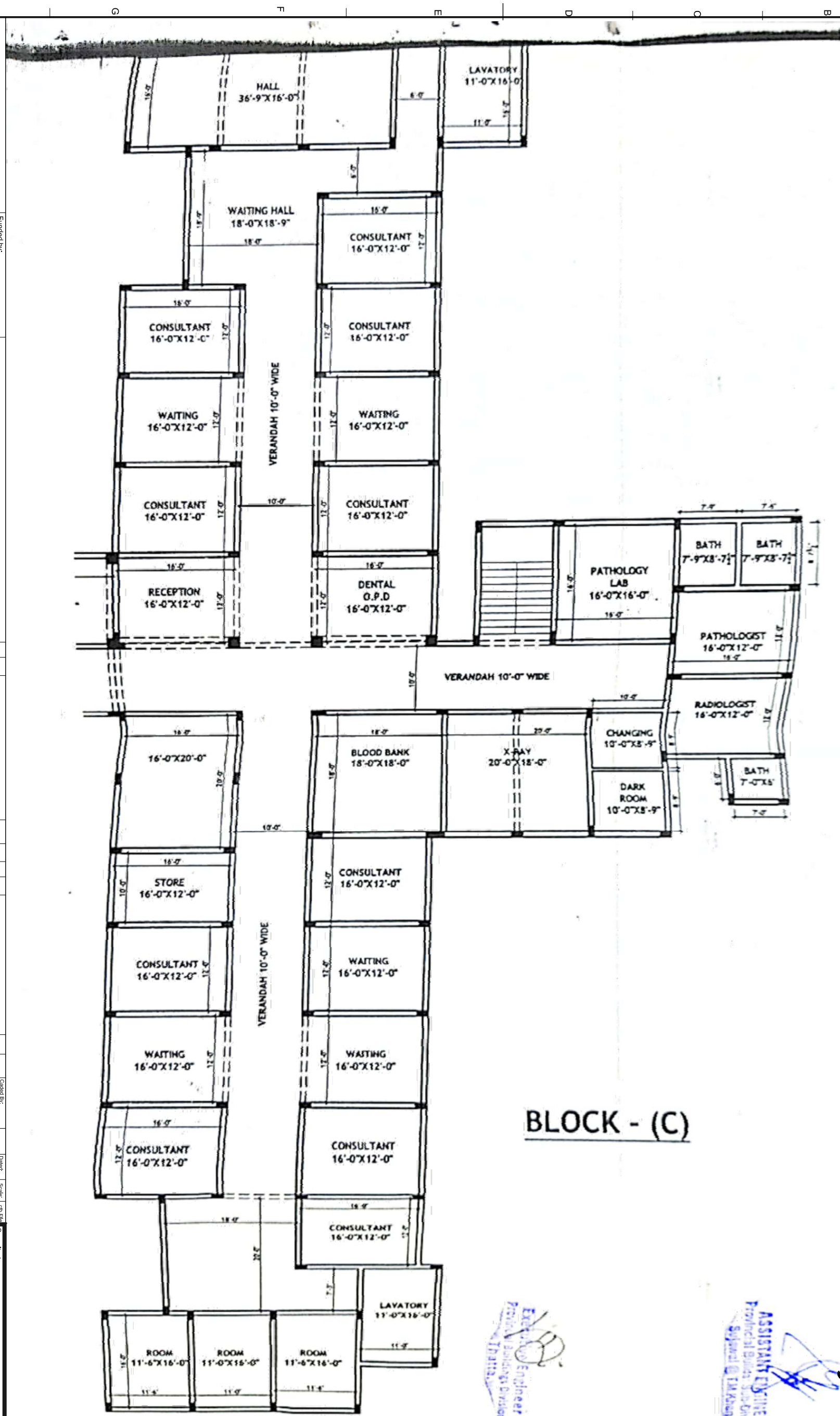
Drawn	Checked	Coordinated By:	Approved By:
		COLA/MAL	-

Cadad By: KAMRAN
Design by: FARAZ
Checked by: FAISAL
Coordinated By: COLA/MAL
Approved By: -
Electronic File Name: 3720-1-4-1-1-1-A100P0-THQ

Dated: SEP 2025
Plot No: -
Rev No: T0
Scale: N.T.S.
Project No: 3720
Dwg No: A100-3
ctb File: OCL200

Checked: FAISAL
Issued: KAMRAN

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BLOCK - (C)

MECCA DIRECTION

ASSISTANT EXECUTIVE ENGINEER
Provincial Buildings Sub-Division
Sujawal @ TM Khan

Executive Engineer
Provincial Buildings Division
Thatta

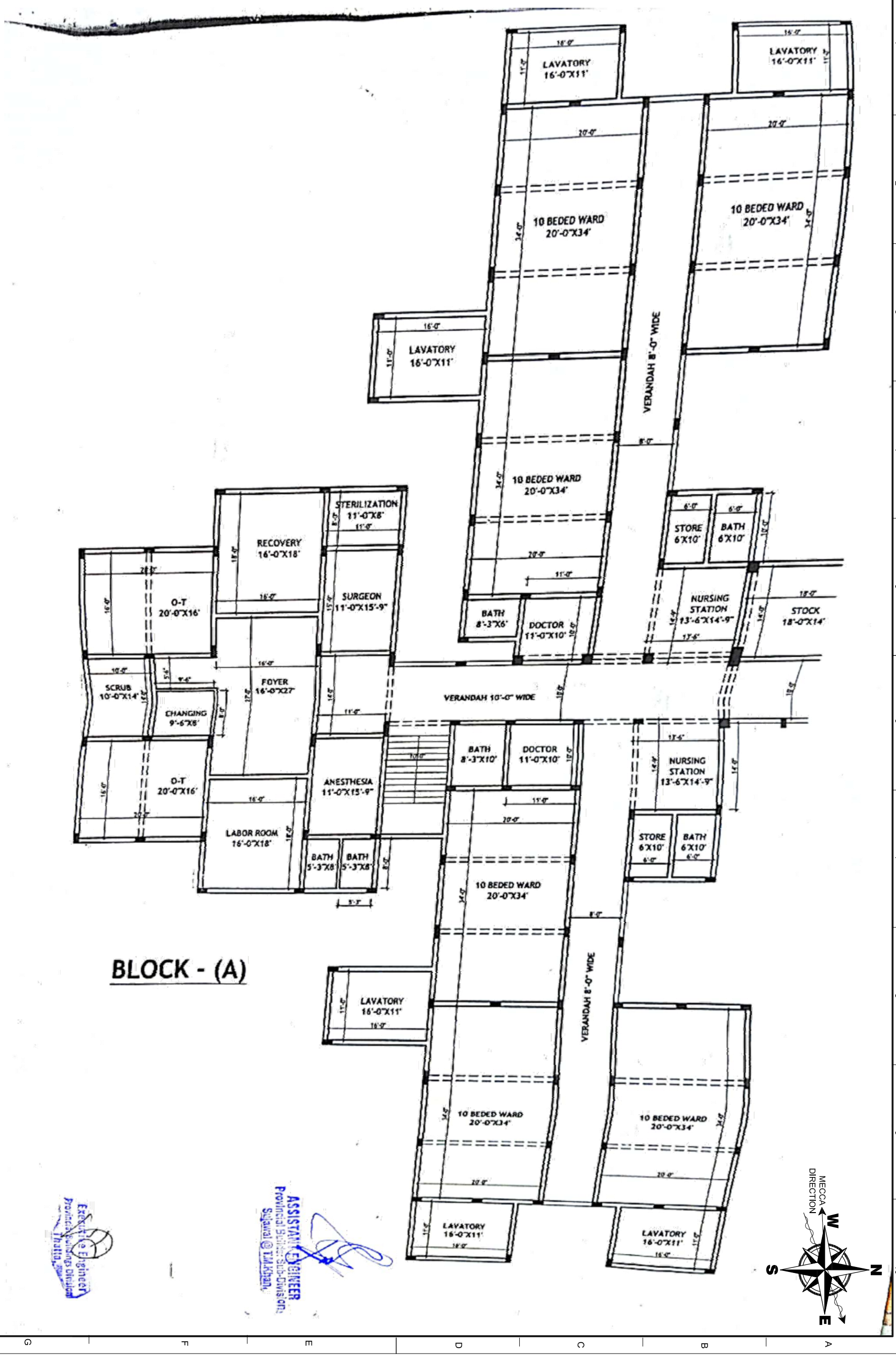
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User and Plot Date Rizwan_Ahmed - Tue, 21 Oct 2025 - 2:40pm

Client:

Funded by: THE WORLD BANK

Project:

SINDH HUMAN CAPITAL INVESTMENT:
1000 DAYS INTEGRATED HEALTH & POPULATION PROGRAM



BLOCK - (A)

ASSISTANT ENGINEER
Provincial Buildings Sub-Division
Sujawal @ Limkhan

Executive Engineer
Provincial Buildings Division
Thatta

Job Name:	TALUKA HOSPITAL (Type-4)
Status of Drawings:	TENDER DRAWING
Drawings Title:	GROUND FLOOR PLAN
Drawings Title:	ARCHITECTURE DRAWINGS

S. No	Date	Issuance
T0	JUNE 2025	ISSUED FOR TENDER (NOT FOR CONSTRUCTION)

Revisions					
S. No	Date	Checked	Issued	S. No	Date
		FAISAL	KAMRAN		

Cadd Operator:	KAMRAN
Design by:	FARAZ
Checked by:	FAISAL
Coordinated By:	COL.AJMAL
Approved By:	-
Electronic File Name:	3720-1-4-1-1-1-A100P0-THQ

Dated:	SEP-2025
Plot No:	-
Rev No:	T0

Scale:	N.T.S.
Project No:	3720
Dwg No:	A100-4
ctb File:	OCL200

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E-mail: och-khi@osmani.com, Website: www.osmani.com
ISLAMABAD PAKISTAN | KARACHI PAKISTAN | LAHORE PAKISTAN | GWADAR PAKISTAN

Sindh Integrated Health and Population Project-SIHPP
Health Department, Government of Sindh

Environmental and Social Management Plan (ESMP)

Rehabilitation of 15 Taluka Head Quarter Hospitals (THQs) in Sindh

September, 2025

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Acronyms

AIDS	Acquired Immunodeficiency Syndrome	**IFC**	**International Finance Corporation**
BHUs	Basic Health Units	**IPF**	Investment Project Financing
BOQs	Bill of Quantities	**ILO**	International labor organization
CBOs	Community Based Organizations	**LAA**	**Land Acquisition Act**
CSOs	Community Social organizations	**LHWs**	**Lady Health Workers**
CMW	Community Midwives	**LMP**	**Labor Management Plan**
COVID	Coronavirus disease	**MO**	**Medical Officer**
DHO	District Health Officers	**NGOs**	Non-governmental Organizations
DHQ	District Headquarter	**NOC**	No Objection Certificate
DOH	Department of Health	**OHS**	Occupational Health and Safety
EDSQA	Engineering, Design, Supervision & Quality Assurance	**PCEA**	Prohibition of Child Employment Act
EHS	Environment, Health, and Safety	**P&D**	Planning & Development
EIA	Environmental Impact Assessment	**PDMA**	Provincial Disaster Management Authority
EMR	Electronic Medical Record	**PDO**	Project Development Objective
EPI	Extended program immunization	**PKR**	Pakistani Rupee
ESCP	Environment and Social Commitment Plan	**PMU**	Project Management Unit
ESMF	Environmental and Social Management Framework	**PPE**	Personal Protective Equipment
ESMP	Environmental and Social Management Plan	**PPHI**	People Primary Health Initiatives
E&S	Environmental and Social Safeguard	**PSC**	Project Steering Committee
ESSs	Environment & Social Standards	**RHC**	Rural Healthcare Center
FGDs	Focused Group Discussions	**RMNCAH+N**	Reproductive, maternal, newborn, child, adolescent health and nutrition
FMO	Female Medical Officer	**SEA/SH**	Sexual Exploitation Abuse/ Sexual Harassment
GBV	Gender Based Violence	**SEP**	Stakeholder Engagement Plan
GDs	Government Dispensaries	**SEQS**	Sindh Environmental Quality Standards
GoP	Government of Pakistan	**SEPA**	Sindh Environmental Protection Agency
GoS	Government of Sindh	**SIHPP**	Sindh Integrated Health and Population Project
GRC	Grievance Redressal Committees	**SOP**	Standard Operating Procedure
GRM	Grievance Redress Mechanism	**SSSD**	Sindh Strategy for Sustainable Development
HCF	Health care facilities	**THQ**	Taluka Headquarter Hospital
HFL	High flood level	**TPV**	Third Party Validation
IEE	Initial environment examination	**WB**	World Bank

Executive Summary

The Government of Sindh (GoS) has launched the Sindh Integrated Human Capital: 1000 Days Program - Integrated Health and Population Project (SIHPP) with support from the World Bank (WB), implemented by Project Management unit (PMU), Health department, Government of Sindh (GoS) from 19th December 2022 to 30th June 2027, to reconstruct 12 Taluka Headquarter Hospitals (THQs) fully damaged during floods in Sindh. In line with the prevailing relevant national and provincial laws and regulations, and World Bank's Environmental and Social Standards (ESSs) of the Environmental and Social Framework policy, an environmental and social assessment of the subprojects have been carried out and the present Environmental and Social Management Plan (ESMP) has been prepared. This ESMP has been prepared based on the screening criteria provided in the ESMF and considering the environmental and social impacts from the implementation of subprojects.

This ESMP outlines rehabilitation activities for 15 THQs in Hyderabad, Mirpur Khas, Larkana, Sukkur and Shaheed Benazir Abad divisions, covering no land acquisition. Compensation may be provided if existing land use affects livelihoods or non-titled residences. E&S screening is completed for the 06 THQs, which serve populations of 30,000 to 25,000 around each THQ. The THQs, typically on 20,310 sq ft, will be rehabilitate within existing facilities. Upgrades rooms for doctors, X-ray, ultrasound, laboratory, labor, and more. Additional improvements will feature a hybrid solar system and water filtration plant.

The project sites across Sindh are located within valley plains, at elevations between 0 and 328 feet above sea level. The area features fertile alluvial soils of clay and sand, supporting extensive agriculture. It has a hot, dry, subtropical climate with annual rainfall of 5 – 10 inches and temperatures reaching up to 51.6°C. The natural vegetation was originally tropical thorn forest, dominated by Acacia species such as Phulai, Bubul, and Tali, along with Ber, Safaida, Poplar, Neem, and Kirir. No trees will be affected by the rehabilitation of the 15 THQs. Local fauna includes birds, snakes, and lizards, none of which will be impacted. There is a potential risk of water contamination from construction runoff, which will be mitigated through immediate cleanup of spills using best practices. Traffic around subproject sites is light, mainly involving motorcycles, rickshaws, and pedestrians. Construction noise is expected to stay within permissible limits, with minimal disruption from heavy vehicles on rural access roads.

A socio-economic survey and social impact assessment were conducted in January-February 2025 using questionnaires (baseline socio-economic survey forms) and stakeholder consultations. The Socio-Economic Survey covers 289 households and 1,548 individuals including; 829 males and 727 females. Extensive stakeholder engagements and focus group discussions were conducted across Sindh to gather public input, strengthen project design, and foster community ownership. Environmental and Social (E&S) baseline screenings of 15 Tehsil Headquarter Hospitals (THQs) in the divisions of Hyderabad, Mirpur Khas, Larkana, Sukkur, and Shaheed Benazirabad revealed a variety of environmental and social challenges. In Larkana, key issues included waterlogging, poor sanitation, and limited access to healthcare facilities. Sukkur faced seasonal flooding, lack of clean water, and inadequate infrastructure, while Shaheed Benazirabad experienced poor waste management and limited public transport. Similar concerns were noted in parts of Hyderabad and Mirpur Khas. Across these regions, the average household size is five and half, and the commonly spoken native languages include Sindhi, Balochi, Saraiki, and Punjabi. It has been identified that out of 189 households the family income is less than Rs. 37,000. It has been suggested that local unskilled labor should be hired during the construction and during operation phase of the project. The project is expected to generate direct and indirect employment. Common health issues include water borne diseases such as typhoid, malaria, and malnutrition, and limited access to urban healthcare facilities contributing to maternal mortality. Residents primarily rely on government health facilities for healthcare services.

Environment & Social field survey revealed that good mobile phone access and social media use (WhatsApp, Facebook) for the community. The screened 15 THQs, all are in functional conditional, while severely damaged due to the 2022 floods. All THQs have electricity, but frequent load shedding disrupts the power supply. The source of drinking water at health facilities is bores/groundwater, but the water quality has been changed after floods, told by local community, all 15 THQ's water quality was observed unfit to drink, as the taste of water is brackish. Sanitation was poorly maintained at all THQs. Waste management was also poor in all THQs. During the consultations the community highlighted the concerns such as lack of local job opportunities, privacy issues for women, health and safety risks during construction, road blockages from construction materials, and the absence of a complaint system. Health officials raised concerns about insufficient doctors, medicines, and medical equipment. Despite these concerns, officials acknowledged the project's potential benefits for local communities. Further consultations will continue throughout project implementation. Sub-project area screenings assessed the indirect impacts within a 200-meter radius of each THQ. No archaeological sites, cultural resources, graveyards, protected forests, or endangered species were identified near the sites.

The E&S screening determined a low to moderate environmental and social risk rating for the sub-projects. This rating reflects the projects' small scale, low risk activities, and site locations are not being in environmentally or socially sensitive areas. The identified risks are predictable and can be easily mitigated with appropriate measures.

The Environmental and Social Management Plan (ESMP) is based on primary and secondary data, analyzing environmental and social risks of sub-projects. It identifies mitigation measures for construction-related impacts, including health and safety risks, noise, air pollution, access issues, waste management, labor conditions, and the risk of Sexual Exploitation and Abuse/Sexual Harassment (SEA/SH). The ESMP outlines measures to address these risks, such as site supervision, awareness training, sanitation, emergency procedures, PPE provision, clean water, and waste management. The contractor must also develop site specific Contractor's Environmental and Social Management Plan (C-ESMP) for each THQ to ensure the site-specific mitigation measures. The C-ESMP plan must be approved by the Engineering Design Supervision Quality and Assurance (EDSQA) firm and PMU-SIHPP before the start of construction work. Monitoring will be carried out at three levels i.e. PMU's E&S specialists, the EDSQA team, and the contractor's E&S team. Contractor's team will submit monthly reports to PMU through EDSQA firm.

An approximate budget of PKR 4,858,000 per THQ has been allocated for the ESMP implementation, included in the Bill of Quantities (BOQ), the Construction Contractor, EDSQA, and PMU is responsible for implementation. The contractor must ensure that mitigation measures in the ESMP are followed, with costs included in the contract documents. Non-compliance will result in penalties. To ensure effective E&S compliance, trainings will be conducted to construction crew and local communities. ESMP, E&S policies, guidelines, procedures, codes of practices, World Bank Environmental and social Framework, Environmental Monitoring, land acquisition/land management, Conflict Management, Public Consultation, Participatory consultative techniques, etc. Community engagement activities involve residents around target THQs. Additionally, the information related to construction will also be disseminated among community people. Different sessions will be carried out to strengthen community engagement and grievance redress mechanisms (GRM) in the health sector, including advocacy and information campaigns. Health workers and residents will be sensitized to project activities and the GRM.

1. Introduction

The Government of Sindh (GoS), through Department of Health, is implementing "the Sindh Integrated Health and Population Project (SIHPP)"[1] with the support from the World Bank (WB). The project will be implemented in all 30 districts of Sindh. In line with the prevailing legislation in the Country (national/ provincial) and World Bank Environmental and Social Framework (ESF), an environmental and social assessment for one component (**Component 1: Improving RMNCAH+N services utilization and quality and support during public health emergencies**) of the Project has been carried out and the present Environmental and Social Management Plan (ESMP) has been prepared[2]. This ESMP has been prepared based on the screening criteria provided in the ESMF and considering the environmental and social impacts from the implementation of subproject. The department of Health Government of Sindh will be the implementing agency of the Project activities.

This project aims to rehabilitate and upgrade 15 Taluka Headquarter Hospitals (THQs) across five divisions of Sindh, excluding Karachi division. The Environmental and Social Management Plan (ESMP) specifically focuses on this subproject, which involves the rehabilitation of 15 flood-affected THQs. The distribution of THQs is as follows:

- Hyderabad division: 04 THQs (2 in Badin, 1 in Jamshoro, and 1 in Sujawal)
- Mirpur Khas division: 02 THQs in Mirpur Khas district
- Larkana division: 01 THQ in Kashmore district
- Shaheed Benazirabad division: 04 THQs (2 in Nausheroferoz and 2 in Shaheed Benazir Abad)
- Sukkur division: 03 THQs (1 each in Sukkur, Ghotki, and Khairpur districts).

1.1 Background

Pakistan experienced heavy monsoon rains between June and September, 2022. In Sindh, 23 of 30 districts are labelled as calamity-affected by the heavy monsoon and flooding since June 2022. In Sindh, 23 of 30 districts are labelled as calamity-affected by the heavy monsoon and flooding since June 2022. Preliminary assessments confirm more than 800 health facilities are partially damaged, and over 100 health facilities fully damaged.

Sindh shows higher levels of pregnancy-related deaths and maternal mortality rate compared to Punjab and Khyber Pakhtunkhwa. Although Sindh has made progress in improving maternal and child health outcomes, some gaps are evident. Furthermore, health facilities are either not easily accessible or not equipped to provide quality services. Quality of and patient satisfaction with public health services is low at 27 percent. The service utilization is worse with urban poor and people living in remote areas. The health facilities in these catchment areas lack adequate and trained human resources, medicines and medical equipment and have insufficient infrastructure for healthcare providers to practice minimum service delivery standards (MSDS) for quality care.

The proposed Project will contribute to "improved access to maternal and child health services" by focusing on reproductive, maternal, neonatal, child and adolescent health and nutrition services. It will

[1] Named as Project in this document and subproject refers to rehabilitation 15 THQs.
[2] This ESMP covers rehabilitation of 15 THQs, which is a part of Component-1 of the project.

also contribute to "reduced vulnerability for groups at risk" by ensuring that vulnerable groups in the remote and flood affected areas have increased access to health care services. The proposed project is also aligned with the Strategic Country Diagnostic's (SCD) priorities for supporting women´s socio-economic empowerment, improving the efficiency and equity of spending on poverty reduction and strengthening public governance.[3]

1.2 Objectives of ESMP

The objective of the ESMP is to assess the existing environmental and socioeconomic conditions, assess the potential environmental and social risks and impacts of the Project and propose mitigation measures consistent with the Environmental and Social Standards (ESSs) of the World Bank ESF and national requirements; specify appropriate roles and responsibilities, and outline the necessary reporting procedures, for managing and monitoring environmental and social issues related to the activities; identify the staffing requirements, as well as the training and capacity building measures, address mechanisms for public consultation and disclosure of project documents as well as redress of possible grievances, establish the budget requirements for implementation of the ESMP, provide guidelines for environmental and social management and aid decision makers to take informed decisions.

1.3 Approach and Methodology

1.3.1 Approach

The study is based on both primary and secondary data and information. The primary data includes data collected from field using Environmental and Social Screening Checklist and proformas (attached as **Annexure A**). The secondary data includes a review of relevant information from literature and published reports. Discussions were held with stakeholders including government officials and community representatives. The main purpose of this approach was to obtain an impartial impression of the people's perceptions about the proposed Project and its environmental and social impacts.

1.3.2 Methodology

The ESMP has been prepared employing the generally accepted standard methodology and accomplishing different but well integrated tasks. The key tasks include:

1. **Review of Project details,** to understand subproject activities, likely to cause environmental and social risks and impacts;

2. **Review of relevant legislations, policies, standards and guidelines** to determine the policy, legal and institutional environment for the subproject based on World bank ESF, national and provisional level;

3. **Primary data collection** for this purpose, environmental and social checklist and formats (attached as **Annexure B**) for socioeconomic conditions were developed for the collection of baseline information. Three teams, consisting of a Civil Engineer, Architect, and Environmental Engineer (for E&S survey), were deployed in the field from January to February 2025, covering the Hyderabad, Mirpur Khas, Sukkur, Larkana, and Shaheed Benazirabad Divisions.

4. **Review of secondary literature** to understand subproject area, sample E &S documents to guide this assessment; and different published development reports for taking stock of environmental and socioeconomic baseline conditions.

[3] SIHPP, PAD November 23, 2022

5. **Conducting consultation with key stakeholders** and potential beneficiary communities. During the field survey the team conducted community and intuitional consultations across three divisions. Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs) were held with locals (829 males and 727 females).

6. **Estimation of budget** to ensure the effective implementation of all the mitigation measures/ actions proposed in the ESMP.

1.4 Description of the Project

The proposed project development objective (PDO) is to improve utilization and quality of basic RMNCAH+N, for poor and vulnerable populations, especially women and children, in targeted areas.

1.4.1 Project components

The proposed Project has four (04) components[4]; the brief description of each component is given below:

Component 1: Improving RMNCAH+N services utilization and quality and support during public health emergencies this component has following three (03) subcomponents:

Subcomponent 1.1: Public Health Emergency Response to Combat Health Impact due to the Floods. This sub-component will support integrated outreach healthcare and reproductive health services through existing mobile health teams and the provision of additional fixed and/or mobile health units, delivery vans and ambulance services for referral and surveillance system, including labs. It will finance procurement of lifesaving medicines and essential medical equipment and supplies, including reproductive health kits, midwifery kits, newborn baby kits, safe delivery kits, dignity kits, family planning commodities to prevent unintended pregnancies, insecticide treated bed nets for vector control and nutrition services (i.e. SBCC counselling, growth monitoring and promotion, micronutrient supplementation and referral of acutely malnourished child to therapeutic centers). Referral facilities will be equipped with trained human resources and supporting equipment and supplies. It will also strengthen surveillance systems for disease outbreak detection and response, especially in the worst affected districts.

Subcomponent 1.2: Strengthening/Rehabilitating of the Health Facilities for Providing Preventive Care. Rehabilitation plans should integrate gender-sensitive features such as separate waiting areas, women-friendly toilets, breastfeeding/nursing spaces, and private consultation rooms to improve women's comfort and dignity in accessing services. It will support provision of minimum service delivery standard (MSDS), including GBV responses, for RMNCAH+N through (a) revitalization of an identified set of government dispensaries (GDs) in the catchment areas of the underserved and unserved populations of Sindh and other health facilities, including basic health units (BHUs), rural health centers (RHCs), tehsil headquarter hospitals (THQs) and district headquarter hospitals (DHQs), affected by the floods by including refurbishment of the health facilities, purchase of equipment including medicines and supplies, and ambulance services for referral; (b) recruitment and/or deployment of female health workers, specifically woman medical officers (WMO), community midwives (CMW), and community health workers (CHW); (c) effective structural and functional integration of health facility-based FP services and community-based services; (d) training of the healthcare providers on MSDS, GBV prevention and management, climate-induced disaster and epidemic response including disease surveillance and tele-health services for RMNCAH+N at places with access to the internet; and (e)

[4] Project Appraisal Document, 23 November 2022

establishment of a dynamic, integrated electronic medical records system linked to the Sindh District Health Information System (DHIS) and other key health databases, to track patient related data. This component will also include prevention programs, including health education, screening for hypertension and blood sugar, and vaccinations.

Sub-component 1.3: Strengthening of Referral Hospitals for Effective Delivery and Neonatal Care. It will support an identified set of THQ and DHQ hospitals to provide comprehensive obstetric and neonatal care through (a) purchase of equipment, medicines and supplies; (b) provision of blood storage units; and (c) training of the healthcare providers on MSDS and management of mothers and children referred by GDs.

Component 2: Strengthening Demand for RMNCAH+N Services, Including Women's Empowerment for Availing Health Services. This component will cover SBCC and related activities to encourage uptake of RMNCAH+N services using social marketing strategy and rebranding of GDs and their services package to create awareness. It will also include women's empowerment for exercising sexual and reproductive health rights. Social and behavior change activities will include extensive community outreach, involvement of community leaders to reach these GD catchment areas and the internally displaced population (IDP) due to flood. These activities will involve partnering with non-governmental organizations (NGOs), community-based organizations, and other private sector organizations.

Component 3: Project Management, Monitoring and Evaluation and Research. This component will support the strengthening of the DoH and its coordinating structures and agencies for the coordination and management of project activities, including financial management, procurement, Public Private Partnership (PPP) node and stakeholder engagement. This component would also support monitoring and evaluation (M&E) including third-party monitoring, rapid household surveys and surveys to measure quality of service delivery at health facilities.

Component 4: Contingency Emergency Response Component (CERC). In the event of an Eligible Crisis or Emergency, the project will contribute by providing immediate and effective response to said crisis or emergency.

This ESMP covers reconstruction of THQs, which is a part of Component-1 of the project.

1.4.2 Project Area

The proposed project of reconstruction of 15 THQs will be carried out in five divisions of Sindh (Hyderabad, Mirpur Khas, Larkana, Sukkur & Shaheed Benazir Abad), described below;

Hyderabad

Hyderabad Division is located in the Southern region of Sindh. It consists It comprises 9 Districts including Hyderabad, Tando Mohammad Khan, Sujawal, Tando Allah Yar, Thatta, Badin, Dadu, Matiari & Jamshoro. The division lies between 27° 19' 19.7614 N", 67°10'2.4916E" to 23° 57' 45.9356N" ,68°44'18.5378E", with an average altitude ranging from 160 to 0 meter above sea level.

Mirpur Khas Division

Mirpur Khas Division is situated in the South of Sindh and consist of three districts including Mirpurkhas, Tharparkar & Umerkot The division is located between 25°46' 53.8968N",68°54'27.6505E" to 24°23'30N", 71°8'58.3933E" with an altitude of around 137 to 15 meter above sea level.

Larkana Division

Larkana Division is located in the northwestern region of Sindh. It consists of five districts: Larkana, Qambar Shahdadkot, Shikarpur, Jacobabad, and Kashmore. The division lies between 27° 30' 0" to 28° 45' 0" North latitudes and 67° 15' 0" to 69° 40' 0" East longitudes, with an average altitude ranging from 50 to 100 meters (164 to 328 ft) above mean sea level. North: Baluchistan Province and Punjab Province, East: Sukkur Division, South: Dadu District and Shaheed Benazirabad Division, West: Baluchistan Province.

Sukkur Division

Sukkur Division is situated in the north of Sindh and serves as a key economic and transportation hub. It comprises Sukkur, Khairpur, and Ghotki districts. The division is located between 27° 00' 0" to 28° 30' 0" North latitudes and 68° 10' 0" to 70° 15' 0" East longitudes, with an altitude of around 67 meters (220 ft) above mean sea level. North: Punjab Province (Rahim Yar Khan District), East: India (Jaisalmer, Rajasthan), South: Shaheed Benazirabad Division, West: Larkana Division

Shaheed Benazirabad Division

Shaheed Benazirabad Division, formerly Nawabshah Division, is centrally located in Sindh. It consists of Shaheed Benazirabad, Sanghar, and Naushahro Feroze districts. The division lies between 25° 50' 0" to 27° 20' 0" North latitudes and 67° 30' 0" to 69° 00' 0" East longitudes, with an average altitude of 36 meters (118 ft) above mean sea level. North: Sukkur Division, East: India (Rajasthan), South: Hyderabad Division, West: Larkana Division

1.4.3 Construction Activities

All the civil works will be carried out on existing THQ's land. For the contract award, one main contractor will be engaged to handle all 15 THQs across five divisions: Hyderabad, Mirpur Khas, Larkana, Sukkur & Shaheed Benazir Abad. The list of 15 THQs are presented in **Annexure-C**. The duration of proposed subproject is 12 months. The subproject execution and procurement will follow World Bank approved procurement plan. The subproject activities consist of:

The rehabilitation of the Taluka Headquarter Hospital includes a wide range of civil, electrical, and mechanical works aimed at modernizing and expanding healthcare services. Key activities include the construction and renovation of male and female toilets, handicap-accessible washrooms, and dedicated toilets for nursing and medical staff to improve sanitation and accessibility. The project will also involve upgrading the main entrance, waiting halls, and wide corridors to enhance patient flow and comfort. Triage counters, reception and registration areas, and duty doctor rooms with attached toilets will be established to streamline emergency and outpatient services. Specialized rooms such as mobile and digital X-ray units, ultrasound, minor OT, autoclave and scrub areas, and clean/soiled utility rooms will be developed to support diagnostics and minor procedures. The plan includes construction of emergency wards, male wards with bed capacity, and nursing stations to improve inpatient care. Dedicated spaces for medical officers, pathologists, radiologists, and nutritionists will be established, alongside labs, blood bank, pharmacy, dental, and physiotherapy rooms. Additional facilities such as a health education training room, mortuary/post-mortem area, RO plant, CCTV/security room, and storage areas will be included to support hospital operations. Overall, these activities aim to ensure functional efficiency, hygiene, patient privacy, and an inclusive environment, contributing to the hospital's capacity to deliver safe and quality healthcare services.

Contractors will undertake the construction according to the approved project design details. The contractor will be procured through a competitive bidding process. Once the contract has been signed and the contractor has been given possession of the site, the contractor will be legally responsible for the

performance of the works in the manner required by the contract. Temporary facilities to be utilized by the contractor will also be established, including a site office, warehouse/stores, materials stockpiles, toilets, etc. The site layout, including technical details and locations of temporary facilities will be included in the Contractor's ESMP. The contractor will also carry out confirmatory Geo Tech investigations and requisite tests for determination of water quality.

1.4.4 Layout Design of the THQ

Contractors will undertake the construction according to the approved subproject design details of THQ is attached as **Annexure-D**. The subproject's design has been completed.

1.4.5 Structural design details of THQ

The table 1-1 shows the structural designs details of existing Taluka Headquarter Hospitals (THQ). Following design parameters will be followed in the construction: -

- All materials and workmanship shall confirm to the specifications of the contract documents. In absence of any specifications, all materials, tests and workmanship shall confirm to relevant ASTM, ACI/CODES and shall be subject to approval of the engineer-in-charge.
- Structural design is based on the ACI-318 & UBC-97. CODES
- All structural concrete shall confirm to American Concrete Institute (ACI) requirements
- Sulphate Resisting Cement (S.R.C) should be used for all R.C.C Works up to Plinth Level & OPC Ordinary Port Land Cement should be used above the Plinth Levels.
- All Reinforcing Steel shall be Deformed Bars confirming to ASTM-A615 Grade 60 having a minimum Yield Strength of 60,000 psi Finishing Schedule, Architectural Views, Structural Design along with Electrical and MEP Design are covered in the Detail Design Report (DDR).

Table 1-1: Design Details

SR	Type of Room/Building Part	Proposed Measurement/Dimensions (ft x ft)	AREA (Ft^2)
1.	Female Toilet	7.00 x 5.30	37.1
2.	Male Toilet	7.00x5.00	35
3.	Handicap Toilet	7.00x8.60	60.2
4.	Waiting and Entrance Hall	31.9x20.3	647.57
5.	Triage Counter	12.0x10.0	120
6.	Registration/ Reception	12.0x9.6	115.2
7.	Duty Doctor room with Toilet	21.6.0x15.0	324
8.	Mobile X-ray	12.9x8.9	114.81
9.	Emergency Ward	21.0x74.6	1566.6
10.	Autoclave	14.3X7.0	100.1
11.	Scrub	6.0x7.0	42
12.	Minor OT	21.0X18.0	378
13.	Nursing Lounge with Toilet	20.3x14.0	284.2
14.	Clean Utility	21.0x8.0	168
15.	Oxygen Cylinder	10.3x8.3	85.49
16.	Soiled utility	10.0x6.9	69
17.	Blood Sample	8.9x10.0	89
18.	Blood Bank	10.0x11.5	115

SR	Type of Room/Building Part	Proposed Measurement/Dimensions (ft x ft)	AREA (Ft^2)
19.	Medical Office	10.0x11.6	116
20.	Radiologist	10.9x11.6	126.44
21.	Entrance/Waiting	37.6x20.3	763.28
22.	Registration/reception	12.9x12.4	159.96
23.	Record Room	7.9x11.5	90.85
24.	Triage Room	20.9x11.6	242.44
25.	Nutritionist Room	10.0x11.6	116
26.	LHV Population	10.0x11.6	116
27.	Ultrasound Room	22.3x13.9	309.97
28.	WMO-1	14.0X10.0	140
29.	WMO-2	14.0X10.0	140
30.	Medical Checkups	14.0x9.3	130.2
31.	Orthopedic	14.0x10.9	152.6
32.	Dermatologist	14.0x10.0	140
33.	EPI Room	14.0x10.0	140
34.	Female Toilet	10.9x12.9	140.61
35.	Male Toilet	10.9x12.9	140.61
36.	Dental Room	21.0x19.6	411.6
37.	Surgical Checkups	14.0x10.0	140
38.	Play/feeding Area	14.0x10.0	140
39.	Physiotherapist Room	14.0x10.0	140
40.	Eye Checkup	14.0x10.0	140
41.	Pediatric	14.0x10.0	140
42.	Pharmacy	14.0x10.0	140
43.	Waiting Hall	22.0x63.0	1386
44.	Corridor	8.0x228.0	1824
45.	Pathology/laboratory	20.3x20.0	415
46.	Pathologist	10.0x10.9	109
47.	Report Delivery Counter	6.0x6.0	36
48.	Handicap Toilet	9.6x6.6	63.36
49.	Digital X ray	20.3x13.9	282.17
50.	Waiting Room	30.6x19.6	599.76
51.	Electrical	20.3x9.9	200.97
52.	Health Education Training	20.3x21.0	426.3
53.	Ultra Filtration/RO Plant Room	17.9x9.0	161.1
54.	Mortuary/Post Mortem	20.3x26.0	527.8
55.	CCTV & Security Room	14.9x19.0	283.1
56.	Male Nurse Toilet	8.6x10.0	86
57.	Female Nurse Toilet	8.6x10.0	86
58.	Female Doctor Toilet	8.6x4.10	35.26
59.	Male Doctor Toilet	8.6x4.10	35.26
60.	Male Ward (11 Beds)	63.0x25.4	1600.2
61.	Male Ward (10 Beds)	52.0x25.4	1320.8
62.	Nursing Station	10.3x11.0	113.3

SR	Type of Room/Building Part	Proposed Measurement/Dimensions (ft x ft)	AREA (Ft^2)
63.	Treatment	11.8x8.0	94.4
64.	Oxygen Cylinder	11.6x7.0	81.2
65.	Toilet	11.6x12.6	146.16
66.	Store	9.6x5.0	48
67.	Soiled Utility	9.6x5.0	48
68.	Duty Doctor	9.3x11.6	107.88
69.	Toilet	11.6x12.6	146.16
70.	Clean Utility	10.3x7.6	78.28
71.	Passage	25.0x11.0	300
72.	Waiting area	8x75	600
73.	Wide Corridor	12x25.9	310
		Total Carpet/Internal Area	**20,310**
		Total covered area	**29,700**

1.4.6 E & S Aspects during Rehabilitation

The following key Environment and Social (E & S) aspects will be considered in rehabilitation work, to minimize the E & S risks;

- The building rehabilitation plan incorporates energy-efficient LED lighting and solar panels to minimize the carbon footprint, complemented by maximizing natural light through skylights or large windows to reduce daytime electricity consumption.
- Interior spaces designed to be easily repurposed as healthcare needs evolve (e.g., wards convertible to consultation rooms or small surgery areas).
- Adequate water storage and filtration, systems to ensure a continuous supply of clean water, aligning with WB EHSG for HCFs.
- Sufficient and accessible sanitation facilities, including toilets for male/female patients, doctors (as given in table 1-1), and hand washing stations, along with clear signage, are incorporated to prevent contamination.
- Designated "yellow room" or dedicated area for the segregation and storage of infectious waste with secure, clearly marked containers for different waste types (sharps, infectious, chemical) to be used, in compliance with both local and international health and safety standards, including the World Bank EHS guidelines.
- Dust, noise, and air emissions control through water sprinkling, noise barriers, and use of well-maintained equipment.
- Safe handling and disposal of construction and biomedical waste in line with environmental regulations.
- Provision of Personal Protective Equipment (PPE) and enforcement of safety protocols for all workers.
- Minimizing community disturbances by scheduling high-impact activities during appropriate hours and maintaining cleanliness around the site.
- Non-discrimination in labor hiring, ensuring equal opportunity and fair treatment.
- Implementation of a Grievance Redress Mechanism (GRM**)** for workers and affected community members to report concerns.

- Gender-sensitive design features**,** including separate waiting areas and restrooms for male and female users.
- Resource efficiency measures**,** such as controlled use of water and electricity during construction activities.
- Occupational Health and Safety (OHS) training and daily toolbox talks for construction workers.
- Coordination with hospital management to avoid disruption of ongoing medical services during rehabilitation works.
- Protection of vulnerable groups**,** including persons with disabilities, by ensuring accessible pathways and facilities.

1.4.7 Construction Material

The following construction materials (Table 1-2), have been identified for use in the rehabilitation of the 15 Taluka Headquarter Hospitals (THQs).

Table 1-2: Estimated quantities of construction materials

Sr. No:	Construction Material	Estimated Quantity for a Typical site/THQ	Estimated Quantity for 15 THQ
1	Steel	5,027.00	75,405.00
2	Cement (OPC/SR)	6,418.11	96,271.66
3	Gravel	13,175.00	197,625.00
4	Earth/Soil	44,750.00	671,250.00
5	Masonry/Bricks	3,675.00	55,125.00
6	Coarse aggregate (Crush)	31,334.18	470,012.65
7	Fine aggregate (Sand)	59,413.27	891,199.02

1.4.8 Construction Material Source

The Contractor will identify the source in case of steel and cement; the Consultant will approve the brand. Similarly, for the Borrow Earth query site will be tested and the Consultant will communicate approval. All other items, such as bricks, gravel, and aggregate, will be first identified by the Contractor and subsequently the same will be tested and approved by the Consultant. Multiple locations and sources of material for each sub-project will be required, which will vary according to the availability and convenience of the Contractor, subject to confirmation of quality.

1.4.9 Material Stockpiling

A material stockpiling area will be built near the construction site within the THQ's premises at all sub-project sites. Stockpiling purposed by contractor and ensured by EDSQA firm for each site during the execution period. Materials will be stored in a secure location in the staging area to keep them safe from damage or theft and to provide easy access for workers. Construction equipment, such as bulldozers, mixers, and trucks, will be parked in a designated area, reducing congestion on the main construction site and ensuring that the equipment is secure and well-maintained. Temporary facilities for workers, such as changing rooms, toilets, and a break area, are also available in the staging area. The laydown area can be used for pre-fabrication activities, such as assembling prefabricated building components or preparing materials for installation, freeing up space on the main site for critical construction tasks.

A designated area within the staging zone can be used to store construction waste before it is hauled off for disposal to maintain cleanliness and a safe work environment on the main site. The size and layout of

the staging area will depend on the subproject's size and the availability of space near the site.

1.4.10 Contractor's Camps

A contractor's camp will be established on government land within each THQ's existing area, housing 35-40 workers. If land is unavailable, alternative accommodations, including rented houses, will be arranged. Preferably, the contractor will hire skilled and un-skilled labor, locally as well as outside. To ensure local engagement and community benefit, a minimum threshold of 80% of the workforce should be sourced from nearby areas, with the remaining 20% allowed to be brought in from outside if specific skills are not available locally. The distance between neighboring THQ is far away. Therefore, there is no possibility to accommodate the labors of two or more THQs/sites in a single camp. The contractor will be bound to provide facilities like dormitories, kitchen/washing/ bathing/latrine with septic tanks and medical checkups (including communicable disease related) to laborers. The health screening of laborers and workers will be conducted at the start of the subproject. The contractor will prepare workers' code of conduct and camp layout plans and get them approved by the EDSQA consultant and PMU for implementation at the site.

1.4.11 Machinery and Equipment

The construction work includes earthwork and concrete work. The contractors will directly manage all machinery and equipment/s. However, the actual number of equipment required on the typical site as per BOQs are as mentioned in below Table 1- 3.

Table 1-3: Requirement of Machineries and Equipment for a typical site.

S. No	Equipment Type and Characteristics	Minimum Number required for one THQ
1.	Dumpers	02
2.	Plate Compactor	02
3.	Concrete Mixer Power Driven	01
4.	Water Tankers	01
5.	Surveying Equipment set	01(Total Station+ level)
6.	Utility Installation Equipment	01
7.	Tractor Trolley	01
8.	Concrete lifting Machine	01-2
9.	Laboratory equipment set as per approval of client	01
10.	Generator 10KVA	01
11.	Concrete Batching	01
12.	Mobile Pump	01

1.4.12 Security Aspect

During the social survey, local community members said they had no issues with the contractor and project staff living in the area, storing materials, or carrying out their work. The contractor will also have

security guards at each site to ensure safety. If the security situation changes and extra measures are needed, the Security Management Plan will be fully enforced, including working with law enforcement and other relevant authorities to maintain order and protect people and property.

1.4.13 Water Requirements for construction activities

The contractor will bring water for construction work from groundwater boreholes (where needed, with the approval from relevant authority), municipal water supply through a water tanker, which should be less than 2000 TDS for construction purpose and for drinking purpose of labor the water should be less than 500 TDS. It will be ensured and approved by the Consultant after necessary testing of water. Overall water requirement for the construction activities and use of workforce is provided in below Table 1-4. The water estimation was done for entire construction period of 12 months using a standard procedure, given in a footnote below.

Table 1-4: Approximate Water Requirements[5]

S.No:	Activity	Estimated Quantity for a Typical site/THQ(Gallons)	Estimated Quantity for 15 THQs (Gallons)
1.	Concerting	42,360	635,393
2.	Curing	211,798	3,176,965
3.	Workforce	677,753	10,166,288

1.4.14 Source of Energy and requirements

The contractor will handle the energy supply by using the available electrical connection and, if needed, backup generators based on the site's requirements. All machinery and equipment will run on fuel. The estimated daily electricity demand for construction of the Taluka Headquarter Hospital (THQ) is around 15-20 kW. The contractor will manage resources efficiently to keep operations running smoothly while following safety and environmental guidelines.

1.4.15 Labor Requirement

The workforce required by the contractor during the execution of the sub-project will be around 35-40 skilled and unskilled laborers for each (one) THQ, for unskilled laborers, local people will be preferred, the ratio of laborers depends on the availability of workforce, approximately 80/20%. The Contractor will establish the camps for accommodating the outside labors, security guards and rest area during lunch break for all workforce.

[5] Domestic Water Quantity, Service Level and Health (Second Edition), WHO, ACI (American concrete Institute) Water cement ratio standard for concrete and ACI 308R-Guide to curing concrete.

1.4.16 Implementation Schedule

The contractor will complete the construction of 15 THQs on milestone basis as described in figure 1-1, that simultaneously construction progress will achieve as per given time schedule.



	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
Dismantling		3	5	7	9	11	13	15				
Civil & Structual Work			5	7	9	11	13	15				
Finishes and MEP				5	7	9	11	13	15			
Completion					5	7	9	11	13	15		

Figure 1-1: Implementation Schedule for reconstruction of 15 THQs

2. Policy, Legal and Administrative Framework

This section deals with the current legal and administrative framework required to prepare the ESMP of the proposed Project. Applicable WB Environmental and Social Standards (ESSs) and guidelines and Environmental and Social (E&S) Policies, laws, regulations laid out by the GoP, GoS have been duly discussed and the Project proponent will be required to adhere to these regulations throughout the course of the proposed Project.

2.1 Applicability of World Bank Environmental and Social Standards

The World Bank has defined specific ESSs, provided in the ESF, which are designed to avoid, minimize, reduce, or mitigate the adverse environmental and social risks and impacts of projects. These standards apply to projects supported through Investment Project Financing (IPF). A summary of the applicable ESSs and WB policies and their relevance to the proposed subproject is provided in Table 2-1.

Table 2-1: Applicable WB E & S Standards and their relevance

Environmental and Social Standard	Description	Relevance to the Project
ESS1 – Assessment and Management of Environmental and Social Risks and Impacts	This standard sets out the Client's responsibilities for assessing, managing, and monitoring environmental and social risks and impacts associated with each stage of a project supported by the Bank through IPF, in order to achieve environmental and social outcomes consistent with the ESF.	Relevant. Minor adverse environmental and social risk and impacts[6] are anticipated due to proposed construction/rehabilitation activities Relevant mitigation measures have been provided in this ESMP in line with ESS1 requirements.
ESS2 – Labor and Working Conditions	ESS2 recognizes the importance of employment creation and income generation in the pursuit of poverty reduction and inclusive economic growth. Borrowers can promote sound worker-management relationships and enhance the development benefits of a project by treating workers fairly and providing	Relevant. The proposed Project is expected to involve direct workers, contracted workers, primary supply workers. All the potential risks associated with labor and relevant mitigations measures have been provided in this ESMP. Additionally, a standalone Labor Management Procedures (LMP) has been prepared and approved on 22nd March 2024, Worker's code of

[6] Including but not limited to: air emissions, noise, dust generation caused by repair and construction activities and excavations and running of project vehicles on unpaved roads/tracks, especially in the desert areas, generation of waste (including solid, packaging material, construction waste, medical waste and related waste during ambulance maintenance services), occupational health and safety risks, and use of chemicals/solvents such as paints and varnishes. Other risks associated with the Project are related to the selection criteria of families, exclusion of disadvantaged and vulnerable groups, security and safety concerns for women, exposure to COVID-19, risk of counterfeit or expired medicines, data privacy, elite capture, GBV, forced labor, use of child labor etc.

Environmental and Social Standard	Description	Relevance to the Project
	safe working conditions. This standard applies to project workers, including full-time, part-time, temporary, seasonal, and migrant workers.	conduct and Workers GRM are also part of LMP, as per the requirements of ESS2 for the project.
ESS3 – Resource Efficiency and Pollution Prevention and Management	ESS3 establishes the requirements for resource efficiency and pollution management and prevention during the entire project lifecycle. The objectives of this standard are to enhance the sustainable use of resources, including energy, water, and raw materials. It also aims to promote favorable conditions for human health and the environment by minimizing pollution from project activities and minimize project related emissions and avoid or minimize generation of hazardous and non-hazardous waste.	Relevant. The adverse environmental and social risk and impacts are anticipated due to proposed construction and rehabilitation activities. It is expected that there would be an increased number of beneficiaries visiting and availing the services offered by the project. This may result in the increased use of resources such as water, electricity, and fuel for generators (alternate energy source). The risks and impacts associated with soil and water contamination are likely to occur due to inappropriate disposal wastes (including solid, packaging material, construction waste, medical waste and related waste during ambulance maintenance services). Resource efficiency and pollution prevention measures have been included in the ESMP to comply with requirements of ESS3.
ESS4 – Community Health and Safety	This standard recognizes that project activities, equipment, and infrastructure can increase community exposure to adverse risks and impacts. The objectives of ESS4 are to avoid or mitigate these adverse impacts on project-affected communities.	Relevant. Planned civil works may cause temporary disturbances to local communities due to traffic disruption, waste, exposure to hazardous material, noise, dust, spread of different transmittable and communicable diseases (HIV/AID, COVID-19, STD), conflicts with locals, fires risks at health care facilities, use of child labor and forced labor, road safety, GBV/SEA/SH etc. Applicable mitigation measures have been proposed in this ESMP for the community health and safety.
ESS5 – Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	ESS5 recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on project-affected communities and individuals. Project related land acquisition may cause physical displacement (relocation, loss of residential land, or loss of shelter), economic displacement (loss of land, assets, or access to assets leading to loss of	Not Relevant. Land acquisition is not expected for the sub-project, as all civil works in Component 1 involve Reconstruction of THQs which will take place within the existing boundaries of government healthcare facilities, on government owned land. Additionally, no any Voluntary Land Donation (VLD) is involved in this subproject.

Environmental and Social Standard	Description	Relevance to the Project
	livelihoods), or both. It aims to minimize or altogether avoid involuntary resettlement and provides guidance for responsible and equitable land acquisition.	Based on the site surveys, it is confirmed that there is no informal settlers in the selected THQs.
ESS6 – Biodiversity Conservation and Sustainable Management of Living Natural Resources	This standard recognizes biodiversity conservation and protection, and sustainable management of living natural resources. It gives importance to maintaining the core ecological functions of habitats and wildlife and promotes the sustainable management of primary production and harvesting of living natural resources. The objectives of this standard are to protect and conserve biodiversity and habitats, and avoid adverse impacts on biodiversity and habitats as a result of project activities.	Not Relevant. The implementation of subproject will not affect the 32 trees. No construction activity is planned to be carried out in or near the vicinity of any natural habitats and critical habitats (including protected areas or other sensitive habitats). Furthermore, 15 to 20 Trees will planted in each THQs. This ESMP include measures to reduce negative impacts on biodiversity and habitats.
ESS7 – Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities	This standard applies to distinct social and cultural groups identified in accordance with descriptions provided in ESS10. The objectives of the standard are to ensure that the development process adopts full respect for the rights, dignity, aspirations, identity, culture of traditional local communities, and to avoid adverse impacts on Indigenous Peoples while providing them with sustainable development benefits and opportunities in an accessible, culturally appropriate, and inclusive manner.	Not relevant
ESS8 – Cultural Heritage	ESS8 recognizes the importance of cultural heritage as a valuable source of scientific and historical information, as an economic and social asset for development, and as an integral part of people's cultural identity. This standard sets out measures to protect cultural heritage throughout the lifecycle of the project.	Not Relevant. The project is unlikely to have any impact on the physical cultural resources of the surrounding of each THQ, since the proposed activities will be carried out within the existing boundaries of the health care facilities (THQs). However, the procedures for handling chance finds have been prepared and made part of the ESMP.

Environmental and Social Standard	Description	Relevance to the Project
ESS9 – Financial Intermediaries	ESS9 recognizes that strong domestic capital and financial markets, and access to finance are important for economic development, growth, and poverty reduction. The objectives of ESS9 are to set out how to assess and manage the environmental and social risks and impacts associated with the project, and to promote good environmental and social management practices in the project's finances.	Not relevant. This standard is not relevant, as Financial Intermediaries will not be used.
ESS10 – Stakeholder Engagement and Disclosure	This standard recognizes the importance of open and transparent engagement between the Client and project stakeholders as an essential element of good international practice. The objectives of ESS10 are to establish a systematic approach to stakeholder engagement that will build and maintain constructive relationships, assess the level of stakeholder interest and support for the project, and to enable stakeholders' views to be taken into account in project design and E&S performance. It also provides guidance on promoting effective and inclusive stakeholder engagement throughout the life of the project.	Relevant. The project has prepared a separate Stakeholder Engagement Plan SEP in accordance with this ESS on 29 April 2024 and Grievance Redressal Mechanism-GRM on 28th November 2024. The SEP outlines the process and frequency of stakeholder engagement at all project stages, and also establishes the contours of an effective GRM. Both these systems will enable the affected parties to raise project related concerns and grievances for efficient and timely resolution.

2.2 Key National and Provincial Laws, Regulations and Policies

The summary of major relevant strategies, policies, acts and legislation from environmental and social perspective are provided in table 2-2.

Table 2-2: Main Environmental and Social Strategies / Policies Relevant to the Project

S No.	Policy/Strategy	Brief Coverage	Relevance to Project
1.	Sindh Labor Policy, 2018.	The Sindh Labor Policy is a framework developed by the Government of Sindh to protect workers' rights, ensure fair wages, promote safe working conditions, and improve social	The labor (skilled and unskilled) will be employed for construction and rehabilitation activities and for health services of the proposed project. The provision of this

S No.	Policy/Strategy	Brief Coverage	Relevance to Project
		security for workers in the province. It aims to align with national labor laws and international standards, addressing issues like child labor, discrimination, and the informal sector.	policy is applicable to all the labor employed. Additionally, LMP has been prepared as a part of this Project.
2.	Sindh Strategy for Sustainable Development, 2007	The Sindh Strategy for Sustainable Development (SSSD) proposed a ten-year sustainable development agenda for Sindh. The main focus of SSSD is to promote the sustainable use of natural resources. It targets to reduce poverty and enhance social development through the participation of the people of Sindh.	This strategy is applicable as the interventions under the proposed project deliver benefits to all, particularly the poor and the disadvantaged or vulnerable groups. The proposed Project is expected to demonstrate great sustainability after its completion. The E&S sustainable development measures such as tree plantation, resource conservation, economic development, provision of clean water etc. are considered in this ESMP.
3.	Sindh Drinking Water Policy, 2017	This policy is to provide safely managed drinking water whose supply is adequate, well maintained and sustainable; and to enhance public awareness about health, nutrition and hygiene related to safe drinking water. The basic objective of this policy is to introduce legislative measures and regulations to create an enabling framework for safely managed drinking water supply, regulation of water usage, extraction, treatment, transportation and distribution.	The proposed project will involve the use of water during the construction and rehabilitation activities and at operational level as well. The water conservation, water pollution control measures are provided in this ESMP and will be followed during implementation of the project.
4.	National Action Plan for COVID-19 Pakistan	Government of Pakistan has launched the National Action Plan for COVID-19 Pakistan to combat the challenge of prevailing viruses. These measures are mostly relating to the containment and awareness and capacity building.	This Action Plan for COVID-19 is applicable to the proposed subprojects. Necessary mitigation measures have been provided in this ESMP to manage this aspect.
5.	Sindh Environmental Protection Act, 2014	It is a fairly comprehensive legislation and provides a legislative framework for protection, conservation, rehabilitation and improvement of the environment. It contains concrete action plans and programs for the prevention of pollution and promotes sustainable development. Act has 11 parts with 37 Sections followed by sub-sections and clauses. Part VI is related to the environmental examinations and assessments while part X is related to the public participation.	The proposed Sub-Project is located in Sindh province, therefore, SEPA is primarily responsible for the enforcement of provisions. The proposed Project may look into the Sindh Environmental Protection Act, 2014 requirements.
6.	Sindh Environmental Protection Agency,	These regulations set out: • Key policy and procedural requirements for filing an EIA; • The purpose of Environmental Assessment (EA);	The proposed project is fall into environment Checklist category as per the SEPA regulations The PMU has submitted the Environment Checklist Report, which has

S No.	Policy/Strategy	Brief Coverage	Relevance to Project
	(Review of EC, IEE and EIA) Regulations, 2021	• The goals of sustainable development; • The requirement that EA be integrated with feasibility studies; • The jurisdiction of the Provincial EPA and Planning & Development (P&D) Departments; • The responsibilities of proponents; • Duties of responsible authorities; • Provides schedules of proposals that the project requires either EC, IEE or an EIA; • The environmental screening process of the projects under schedule I, II and III; and The procedure for the environmental approval for filing the case with the Sindh EPA for the granting of the NOC.	been approved, and SEPA has issued a No Objection Certificate for all health facilities under the Sindh Integrated Health and Population Project (SIHPP) at all thirty districts.
7.	Sindh Environmental Quality Standards, 2016	SEPA has formulated the SEQS as per Clause (g) of sub-section (1) of Section 6 of Sindh Environmental Protection Act 2014. The SEQS were promulgated in 2016 which includes standards for liquid effluent, industrial gaseous emissions, ambient air, drinking water quality, noise levels and standards for motor vehicle exhaust, diesel vehicle, and petrol vehicles.	The proposed Subproject is being implemented in Sindh therefore; it will conform to SEQS, 2016 during the proposed subproject. All the phases i.e. construction and operation. However, in case where WHO/IFC guidelines are more stringent than the SEQS, 2016, the Project will ensure compliance with stringent guidelines and standards.
8.	Guidelines for Environmental Assessment	The guidelines that are relevant to the proposed project are listed below: • Guidelines for the Preparation and Review of Environmental Reports, 1997; • Guidelines for Sensitive and Sensitive Areas, 1997; • Guidelines for Public Consultation, 1997; and Sectorial Guidelines for Environmental Reports, 1997.	These guidelines have been considered during the preparation of this report.
9.	Sindh Hospital Waste Management Rules,2014	HWM Rules 2014 envisage every hospital be responsible for both risk and non-risk waste's management, including the generation, handling, storage and disposal of all forms of waste, in accordance to Sindh environmental protection Act 2014	These Rules are applicable to the proposed subproject, and the risk and non-risk wastes generated during the implementation of the project need to be handled and disposed of in accordance with these Rules. This ESMP will respect the provision of this rules.
10.	Cutting of Trees (Prohibition) Act, 1992	The Act was enforced in 1992 to place restrictions on cutting of trees in order to restrain the unchecked trend of tree felling without replacement plantations.	This act may be applicable as the sub-project activities may involve tree cutting, replantation will be carried out where the tree cutting will be involved. This will be ensuring through Tree Plantation Plan, prepared as a part of this

S No.	Policy/Strategy	Brief Coverage	Relevance to Project
			ESMP five trees will be replanted in case of cutting of one tree.
11.	Sindh Cultural Heritage (Preservation) Act, 1994	This provincial act empowers the Government od Sindh to preserve and protect any premises or objects of archaeological, architectural, historical, cultural, or national interest in Sindh by declaring them protected.	The Subproject is unlikely to have any impact on the physical cultural resources of the Sindh Province, since the proposed activities will be carried out within the existing boundaries of the health care facilities (THQs) where no known cultural heritage sites are present. However, the procedures for handling chance finds has been prepared and made part of the ESMP, to handle any such situation during project implementation.
12.	Sindh Public Property Act, 2010	The act has been passed to avoid illegal encroachments and provide measures for removal of encroachment from public property and to retrieve possession.	The selected Health Facilities (THQs) reconstruction is carried out within the existing building area of Basic health unit. There is no encroachment. This law is not applicable for the proposed project.
13.	Sindh Factories (Amendment) Act, 2021	The Act deals with regulations related to project area workers and workplace Environment Health and Safety (EHS) requirements. The Factories Act also provides regulations with provision for general Health and Safety (H&S) of the workforce in their work area. Conditions are specified for clean workplace, toilets, waste handling, provision of drinking water quality, worker health and hygiene etc. The amendment 2021 is specifically related to the provision of safe transportation facilities to women workers, working hours and working periods of seasonal and whole year factories.	The proposed Sub-Project is expected to involve direct workers, contracted workers and primary supply workers. The proposed Project will respect the provision of this act during the implementation stage.
14.	The Sindh Occupational Safety and Health Act, 2017	The act makes provisions for occupational safety and health conditions at all workplaces in the province for the protection of workers during work. Under the Act, an Occupational Safety and Health Council will be established in Sindh with the secretary of Sindh government's Labor and Human Resources Department as its chairperson.	The proposed subproject is expected to involve direct workers, contracted workers and primary supply workers. The project may create some labor related risks and impacts, which include lack of compliance with relevant laws and regulations, unsafe working conditions, OHS risks, and GBV/SEA/SH risks. Necessary mitigation measures have been provided in this ESMP to manage these risks. Moreover, a separate LMP has been prepared as a part of this Project.
15.	The Sindh Transparency and	The purpose of this Act is to provide transparency and freedom of information to ensure that all citizens have better access to	The proposed subproject will provide information to the public and not compromise transparency under this Act.

S No.	Policy/Strategy	Brief Coverage	Relevance to Project
	Right to Information Act, 2016	public information, to make the government more accountable to citizens, to enforce the fundamental right to information in all matters of public importance, to ensure transparency in all Government matters.	
16.	The Protection against Harassment of Women at the Workplace Act, 2010	The Protection Against Harassment of Women at the Workplace Act (2010) refers to Sexual Harassment (SH) at the workplace.	This Act is applicable, as the proposed subproject may involve the hiring of female staff during the implementation.
17.	The Sindh Commission on the Status of Women Act, 2015	This Act exercise the powers to examine the policy, programs and other measures taken or to be taken by the Government for gender equality, women's empowerment, political participation, representation, assess, implementation and make suitable recommendations to the concerned authorities.	This Act applies to the proposed subproject, as it may involve hiring female staff during implementation and conducting consultations with relevant stakeholders identified in the SEP.
18.	Sindh Prohibition of Child Employment Act, 2017	The Prohibition of Child Employment Act (PCEA) 2017 disallows child labor in Sindh. The PCEA defines a child as a person who has not completed his/her fourteenth years of age, and an adolescent means a person who has completed fourteenth year of age but has not completed eighteenth years of his age. No child shall be employed or permitted to work in any establishment including construction, but an adolescent can be employed or permitted to work under strict guidelines provided in the PCEA and rules. An adolescent shall not be employed in any hazardous work included in the schedule to the PCEA.	The relevance of this act to the project is to prohibit child employment as per conditions mentioned in this Act. No person under the age of 14 will be employed in any project related work.
19.	Sindh Bonded Labor (Abolition) Act, 2015	The Act is gender sensitive; an anti-discrimination clause is added to each new proposed Law in accordance with International Labor Organization (ILO) requirement viz: "No discrimination shall be made on the basis of sex, religion, political affiliation, sect, color, caste, creed and ethnic background in considering and disposing of issues relating to the enforcement of this Act".	This Act is applicable as the proposed subproject may involve the numbers of staff/workers having different religion, political affiliation, sect, color, caste, creed and ethnic background.
20.	Land Acquisition Act (LAA), 1894 and Land Acquisition	The primary law for acquisition of land for public purposes in Pakistan is the "LAA, 1894" (hereinafter referred as the Act). The land acquired under the Act vests in the province and it is	Land acquisition is not expected for the project, as all civil works in Component 1 involve Reconstruction of THQs, which will take place within the existing boundaries of

S No.	Policy/Strategy	Brief Coverage	Relevance to Project
	(Sindh Amendment) Act, 2009	only thereafter that the province may transfer it to someone else. The Sindh Amendment 2009 of LAA 1894 specifically related to Section 16, Section 23, Section 24 and Section 28-A.	government healthcare facilities, on government owned land. Additionally, no voluntary land donation will be involved for these 15 THQs.
21.	National Disaster Management Act, 2010	National Disaster Management Act, 2010 was passed by Parliament of Pakistan in 2010. It requires the Project to integrate disaster risk reduction, ensure healthcare continuity during emergencies, build capacity for disaster response, and coordinate with the PDMA to align with disaster management plans.	This Act is applicable to the proposed subproject due to its location. The subproject as it involves reconstruction and rehabilitation of those health facilities which were affected in Sindh by the 2022 floods. The proposed subproject requires special consideration of flood disasters.
22.	Building Code of Pakistan, 2007	The provision of Building Code of Pakistan shall apply for engineering design of building-like structure and related components. The construction in violation of the building code shall be deemed as violation of professional engineering work.	These Codes are being used in structural design of associated structures constructed under this proposed project.
23.	The Sindh Minimum Wages Act, 2015	To provide the regulation of minimum rates of wages and various allowances for different categories of workers employed in certain industrial and commercial undertakings and establishments.	This Act is applicable to the project to ensure that the minimum wages (PKR 37,000 per month) and allowances are given to the project labor (skill and unskilled employed for the construction and rehabilitation activities and other staff involved during implementation of the proposed subproject.
24.	The Sindh Climate Change Policy 2022	This policy aims to create a resilient and environmentally friendly province by aligning with the National Climate Change Policy 2021 and the updated Nationally Determined Contributions (NDCs) of Pakistan.	The Sindh Climate Change Policy 2022 is relevant to the SIHPP as it promotes climate-resilient health systems, sustainable healthcare infrastructure, and disaster preparedness, aligning with Sindh's efforts to adapt to climate change and ensure long-term health resilience.
25.	Sindh Empowerment of Persons with Disabilities Act 2018	Sindh Empowerment of Persons with Disabilities act 2018 provides legal protection to disable persons in terms of Equality and non-discrimination of 'Persons with Disabilities", right to privacy, Ease of access and mobility, Protection from torture or cruel, inhuman or degrading treatment, Freedom from Exploitation, violence and Abuse, Equity in health and rehabilitation services, Skills Development and Equity in Employment and in any other disability discrimination.	The relevance of this act to the project is to protect the rights of disabled persons by providing special services for them during the implementation of project.

2.3 International Conventions/Agreements

As a member of several international organizations, Pakistan is a signatory to various environmental and social obligations. Therefore, the subproject will follow the covenants of such international obligations related to the environment and social, listed below:

- Stockholm Convention on Persistent Organic Pollutants, 2004.
- The Rio Declaration, 1992
- United Nations Framework Convention on Climate Change (UNFCCC), 1992;
- Kyoto Protocol, 1992;
- Convention on the Rights of the Child, 1989
- Convention on the Elimination of all Forms of Discrimination against Women, 1979.
- International Covenant on Civil and Political Rights, 1966
- International Covenant on Economic, Social and Cultural Rights, 1956.

Similarly, Pakistan has ratified 08 fundamental and 26 technical ILO conventions of which the following may relevant to the subproject.

- C138 - Minimum Age Convention, 1973 (No. 138);
- C111 - Discrimination (Employment and Occupation) Convention, 1958 (No. 111);
- C029 - Forced Labor Convention, 1930 (No. 29); and
- C001 - Hours of Work (Industry) Convention, 1919 (No. 1).

3. Environmental and Social Baseline Conditions

3.1 Background

This section of the report presents a broad picture of the existing environmental and social conditions of project in the Sindh province as the project interventions will be carried out in all districts of Sindh province. Available secondary data from published literature, district census reports, and other documents was used to develop the baseline profile. The project districts are shown in the Figure 3-1.

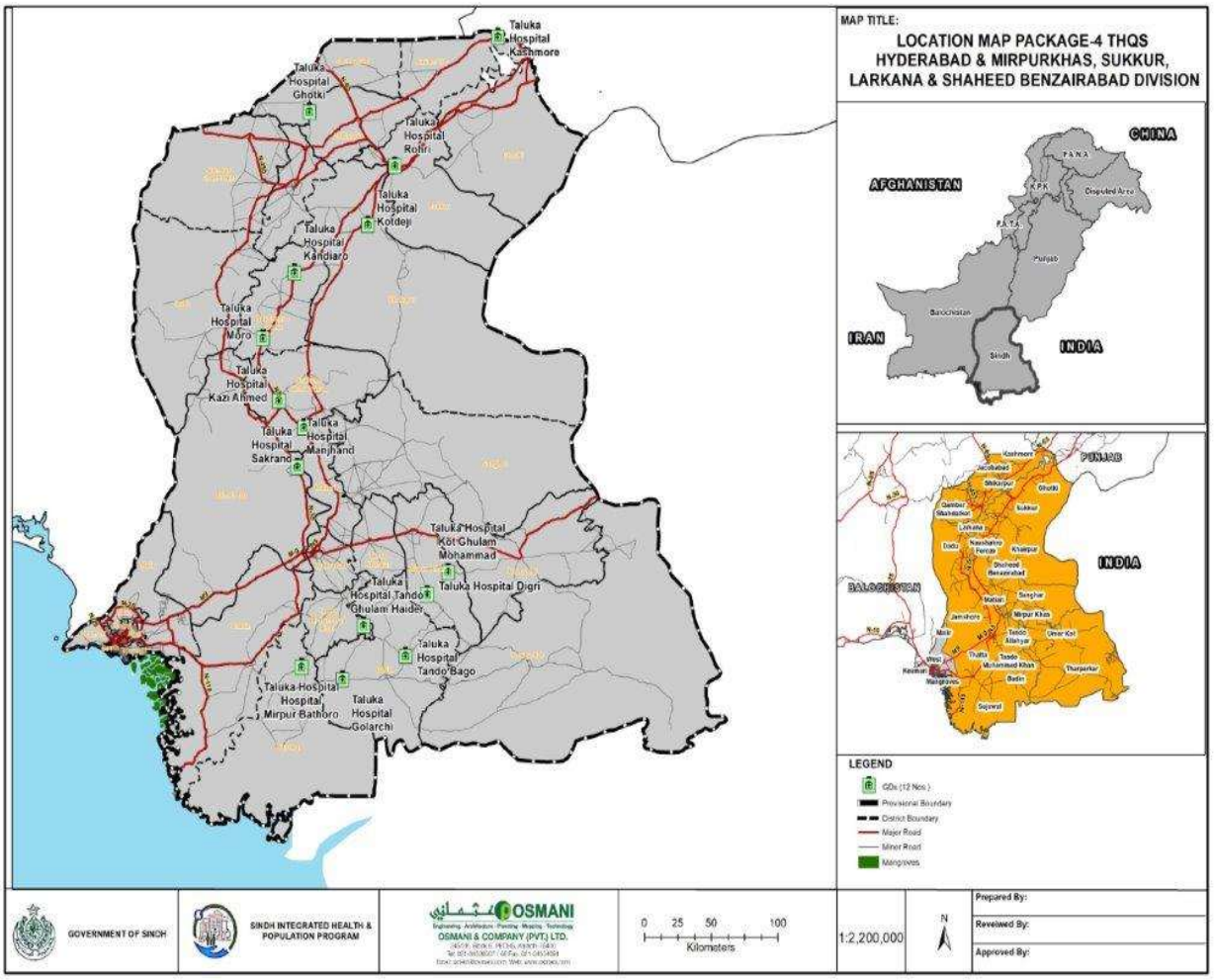


Figure 3-1: Map of Project Area (15 THQs)

3.2 Physical Environment

The physical environment of sub project area in Sindh[7], covering the divisions of Hyderabad, Mirpur Khas, Larkana, Sukkur, and Shaheed Benazirabad are largely arid to semi-arid, shaped by the Indus River, which is the main water source for agriculture and daily needs. The region experiences extreme summer temperatures, often exceeding 48°C, with low humidity. Sukkur hosts the Sukkur Barrage, a critical irrigation hub serving over 5 million acres. Larkana has fertile plains supporting crops like rice and sugarcane, though 25–30% of land suffers from waterlogging

[7] Pakistan Meteorological Department, 2023; Sindh Agriculture Department, 2022

and salinity. Shaheed Benazirabad and Hyderabad rely on extensive canal systems to sustain crops such as cotton, wheat, and vegetables, but face challenges from salinity and seasonal water shortages. Mirpur Khas is known for mangoes and sugarcane, supported by irrigation but increasingly affected by declining groundwater and rainfall variability.

Environmental screenings highlight the region's strong dependence on the Indus River, growing climate-related pressures, and increasing risks of land degradation. Local communities rely heavily on this water source for irrigation and other livelihood activities. The impacts of the 2022 floods were also evident, causing widespread damage to infrastructure, agricultural lands, and local livelihoods. Additionally, the screening identified potential environmental and social concerns related to water availability, declining quality, and competing demands between agricultural and non-agricultural uses.

3.3.1 Topography

Sindh Province can be divided into four parts, i.e., Kirthar range on the west, a central alluvial plain bisected by the Indus River in the middle, a desert belt in the east and an Indus delta in the south.

a) **Kirthar Range:** Kirthar Range is composed of three parallel tier of ridges which run in north south direction and vary in width from 20 to 50 km. The range consists of ascending series of ridges from east to west which are about 4000 to 5000 m high.

b) **Central Alluvial Plain:** The fertile central plain constitutes the valley of the Indus River. This plain is about 580 km long and about 51,800 square kilometers in area and gradually slopes downward from north to south.

c) **Eastern Desert Belt:** Eastern Desert belt includes low dunes and flats in the north, the Achhrro Thar (white sand desert) to the south and the Thar Desert in the south east. In the north it extends up to Bahawalpur division where it is called Cholistan.

d) **Indus Delta:** The distributaries of the Indus start spreading out near Thatta across the deltaic flood plain in the sea. The even surface is marked by a network of flowing and abandoned channels. A coastal strip 10 to 40 km wide, is flooded by high tide and contains some mangrove swamps.

3.3.2 Geology

The geology[8] of the Sindh, as it is located in southeastern Pakistan, features a diverse and geologically significant landscape shaped by millions of years of tectonic activity, sedimentation, and erosion. It lies within the Lower Indus Basin, a major sedimentary basin formed at the edge of the Indian tectonic plate, and includes formations ranging from the Mesozoic to the Quaternary periods. The western region is marked by the rugged Kirthar Range, composed of Jurassic to Eocene marine limestones, shales, and sandstones, while the central and eastern parts are dominated by the fertile alluvial plains of the Indus River, rich in clay, silt, and sand deposits. Coastal and deltaic sediments characterize the southern coastal belt, including the Indus Delta. Sindh is geologically rich in natural resources, hosting large reserves of coal in the Thar Desert, as well as oil and gas fields in the Indus Basin. Although it is not highly seismically active, areas near the Kirthar Hills and Karachi lie within moderate seismic zones. Overall, Sindh's geology plays a critical role in shaping its landscape, agriculture, water systems, and resource potential.

[8] Sindh Geology Department, 2023.

The geology of the selected 15 THQs across these divisions is characterized by fertile river plains and sedimentary rock formations, making the land ideal for agriculture. However, it remains susceptible to erosion and flooding due to the dynamic nature of the river.

3.3.3 Soil Morphology

The soil morphology[9] of Sindh is largely shaped by its arid to semi-arid climate, alluvial origins, and proximity to the Indus River and its tributaries. Most soils in the province are alluvial in nature, developed from riverine deposits over thousands of years, particularly in the central Indus plain. These soils are typically deep, fine-textured, and poorly structured, ranging from silty clay loam to clay, with low organic matter due to limited vegetation and rainfall. In the southern and coastal parts, soils often show salinity and sodicity issues due to high evaporation rates, shallow groundwater, and poor drainage, especially in deltaic and tidal zones. In contrast, the eastern Thar Desert region features sandy soils with low fertility and weak horizon development, while the western uplands near the Kirthar Range have shallow, stony soils formed on limestone and sandstone. Soil horizons across Sindh tend to be weakly developed, often lacking strong differentiation, but many exhibit calcareous layers or salt accumulations (calcic or natric horizons), reflecting long-term aridic processes. Overall, Sindh's soil morphology reveals a dynamic interplay of fluvial, aeolian, and climatic influences, posing both challenges and opportunities for agriculture and land management.

Through an environmental and social survey, soil testing was conducted at all sites. It was observed that silt and clay soils were encountered in boreholes during the field investigation. The soils at the barrage site are alluvial in nature, primarily consisting of silty clay, clay loam, and loam.

3.3.4 Surface and Groundwater

The major source of surface water in Sindh is the Indus River which flows south along the entire length of the country before draining into the Arabian Sea off the southern coast. Groundwater in Sindh is found along the left bank of the Indus River and majority of rural communities are dependent on it. In many parts of Sindh, groundwater exists in the form of thin freshwater lenses that overlie deeper saline groundwater. These areas are tapped by shallow tube wells and hand pumps, which provide important domestic water supplies.

Water quality of the project areas will not be impacted because the interventions are of limited scope and major civil works are not involved. Nevertheless, mitigation measures are proposed on this ESMP to avoid the minor chances of water pollution for unforeseen cases.

3.3.5 Land Use

Land use[10] in the Sindh province is predominantly agricultural, with irrigation from the Indus River supporting the cultivation of crops like rice, cotton, sugarcane, and wheat. Livestock farming, especially dairy and small ruminants, is also common. Urbanization is gradually increasing in cities, but agriculture remains the primary land use activity. As these regions continue to grow, managing land for both sustainable agriculture and urban development will be key for future planning. During the environmental and social baseline screening, it was observed that all 15 THQs are situated in close proximity to community settlements, within a distance of 200 meters.

[9] https://irrigation.sindh.gov.pk/public/?utm_source
[10] http://www.sindhagri.gos.pk

3.3.6 Air Quality and Noise

Air pollution poses a significant risk to human health in Sindh province. Outdoor air pollution in urban areas and household air pollution in rural areas cases of upper and lower respiratory infections in population and particularly in children. Air quality varies from rural to urban areas in Sindh province due to various contributing factors. However, the proposed project will not have any significant impact on both urban and rural air quality due to limited scope of work i.e. rehabilitation and up gradation work. Noise level will not be exceeded from the permissible limits due to project interventions.

Overall, the absence of industrial operations contributed to maintaining good air quality across these divisions. Transport of materials in project area where THQs are located in arid/semi-arid zones will lead to the noise and dust emissions/air pollution from construction activities will be minimal.

3.3.7 Water Quality

Water quality[11] in Sindh is characterized by spatial and seasonal variability, influenced by anthropogenic pressures, hydrogeological conditions, and climatic factors. The province relies heavily on the Indus River system for its surface water needs; however, water quality is compromised by upstream withdrawals, reduced flows, and discharge of untreated municipal sewage, industrial effluents (particularly in Karachi, Hyderabad, and Sukkur), and agrochemical runoff. Key physico-chemical parameters in surface water often exceed WHO and NEQS thresholds, with elevated Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), nitrates, phosphates, and pathogen indicators (e.g., total and fecal coliforms).

Groundwater quality is highly variable. In the lower Indus Basin aquifer, which underlies most of Sindh, only 30 – 40% of groundwater is considered potable. High Total Dissolved Solids (TDS) levels (>1,500 mg/L), electrical conductivity, and salinity are widespread, particularly in southern districts and coastal areas due to seawater intrusion and poor recharge. Hydro-chemical analyses indicate elevated levels of sodium, chloride, sulfate, fluoride (often exceeding 1.5 mg/L), and arsenic (in some areas exceeding 50 µg/L). Shallow hand pumps frequently show microbial contamination due to poor sanitary seals and proximity to latrines.

The widespread use of untreated canal and groundwater for irrigation also contributes to soil salinization and reduced crop productivity. The lack of effective wastewater treatment infrastructure, weak monitoring systems, and over-dependence on deteriorating water supply networks further exacerbate the situation. Addressing water quality in Sindh requires integrated interventions, including robust water quality surveillance, groundwater regulation, safe wastewater reuse, and investment in decentralized water treatment technologies.

Through E&S screening it was observed and discussed with the community about the sub-project area drinking water quality. Through stakeholder consultations, it was observed that the drinking water quality at the selected 06 Taluka Headquarters hospitals (THQs) are not fit for drinking.

However, confirmatory water testing was carried out through SEPA approved third party Lab. The water quality was assessed from 9 selected THQs across the Karachi division for 32 drinking water parameters as per SEQS requirements. The analytical water quality testing results are provided in table below, while the Lab reports are attached as Annexure R.

[11] Website: Sindh EPA

Table 3-1: Water Quality Monitoring Results

S.No.	Parameters	Units	SEQS Limits	THQ - Tando Ghulam Haider	THQ - Golarchi	THQ - Mirpur Bathoro	THQ- Rohri	THQ - Qazi Ahmed	THQ-Kot Ghulam Muhammad	THQ - Kotdiji	THQ - Kandiaro	THQ - Manjhand
1	Temperature	°C	NGVS	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.7	25.8
2	pH @ 25°C	-	6.5-8.5	7.4	7.4	7.3	7.6	7.2	7.7	7.9	7.5	8
3	Odour	-	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
4	Color	TCU	≤15	5	5	2	16	2	7	2	2	7
5	Taste	-	Acceptable	Unacceptable	Acceptable	Acceptable	Acceptable	Unacceptable	Acceptable	Acceptable	Acceptable	Acceptable
6	Total Hardness	mg/l	<500	690	150	630	120	490	110	200	290	90
7	Total Dissolved Solids	mg/l	<1000	1600	310	1520	140	1230	150	270	570	180
8	Turbidity	NTU	<5	2.68	1.82	0.63	19.6	0.21	8.60	0.2	0.37	8.2
9	Chloride	mg/l	<250	810	120	645	25	485	45	40	165	70
10	Chlorine, Residual	mg/l	0.2 - 0.5	0	0	0	0	0	0	0	0	0
11	Aluminum	mg/l	≤0.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12	Antimony	mg/l	≤0.005	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13	Barium (Ba)	mg/l	0.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14	Boron	mg/l	0.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15	Fluoride	mg/l	≤1.5	1.4	0.7	1.0	0.6	1.1	0.6	0.6	0.8	0.6
16	Nitrate	mg/l	≤0.50	0.7	0.5	1.6	2.7	0.6	1.1	1.8	0.4	1.8
17	Nitrite	mg/l	≤3	0.009	0.009	0.494	0.016	0.111	0.021	0.005	0.007	0.019
18	Arsenic	mg/l	≤0.05	0.022	BDL	0.012	BDL	BDL	BDL	BDL	BDL	BDL
19	Cadmium	mg/l	0.01	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20	Chromium	mg/l	≤0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21	Copper	mg/l	2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22	Cyanide	mg/l	≤0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
23	Lead	mg/l	≤0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24	Manganese	mg/l	≤0.5	BDL	BDL	BDL	BDL	BDL	0.011	0.003	BDL	0.004
25	Mercury	mg/l	≤0.001	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

S.No.	Parameters	Units	SEQS Limits	THQ - Tando Ghulam Haider	THQ - Golarchi	THQ - Mirpur Bathoro	THQ- Rohri	THQ - Qazi Ahmed	THQ-Kot Ghulam Muhamma d	THQ - Kotdiji	THQ - Kandiaro	THQ - Manjhand
26	Nickel	mg/l	≤0.02	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27	Phenols	mg/l	NGVS	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28	Selenium	mg/l	0.01	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29	Zinc	mg/l	5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
30	Total Coliform	cfu	0/100ml	18	17	0	0	0	22	17	3	20
31	E. Coli	cfu	0/100ml	0	1	0	0	0	9	0	0	0







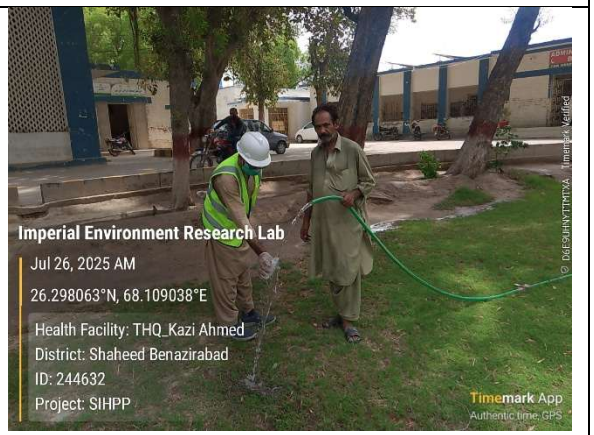

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District: Sukkur
ID: 284641
Project: SIHPP
Timemark App
Authentic time, GPS


Imperial Environment Research Lab
07/20/2025 04:19 PM
Imperial Environment research Lab:
Health Facility: THQ_Kot Ghulam Muhammad
Project: SIHPP
District: Mirpurkhass
Timemark App
Authentic time, GPS


Imperial Environment Research Lab
07/19/2025 07:02 PM
24.650336°N, 68.536754°E
Imperial Environment research Lab:
Health Facility: THQ_Golarchi
Project: SIHPP
District: Badin
Timemark App
Authentic time, GPS


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Project: SIHPP
District: Sujawal
Timemark App
Authentic time, GPS


Imperial Environment Research Lab
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District: Tando Muhammad Khan
ID: 274639
Project: SIHPP
Timemark App
Authentic time, GPS


Imperial Environment Research Lab
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26.298063°N, 68.109038°E
Health Facility: THQ_Kazi Ahmed
District: Shaheed Benazirabad
ID: 244632
Project: SIHPP
Timemark App
Authentic time, GPS

Furthermore, the contractor will be required to conduct comprehensive environmental monitoring, sampling, and testing at project sites before the commencement of civil works to establish the baseline, where necessary. The required cost for this activity is estimated the budget for implementing this ESMP.

However, confirmatory water testing will be carried out by the contractor before executing the subproject through SEPA approved third party Lab.

3.3.8 Natural Disaster and Vulnerability

Sindh is susceptible to three major natural hazards like floods, earthquakes, and drought. It is also vulnerable to cyclones. The province is susceptible to flooding from the Indus River basin, which causes damages almost annually. These incidents impact infrastructures regularly, but can also destroy roads, schools, hospitals, homes, and irrigation facilities.

Environmental and social screening revealed significant vulnerability to natural disasters in the region. Flooding, exacerbated by the Indus River's high water levels, causes significant damage to infrastructure, agriculture, and displaces communities. Droughts, worsened by water scarcity and low river flow, lead to crop failures and water shortages. Heat waves, intensified by climate change, pose health risks in urban areas. The region's vulnerability is due to poor infrastructure, reliance on agriculture, limited disaster preparedness, and climate change. Strengthening disaster preparedness, improving flood protection, and promoting climate-resilient practices are essential for mitigating these risks. All 15 THQs are affected by floods, due to severity of flood, the THQs are badly affected.

3.3.9 Climate

The province of Sindh is situated in subtropical region. It is hot in the summer and cold in winter. Temperature frequently rises above 46℃ between May and August and the minimum average temperature of 20℃ occurs during December and January. The coldest period spans from December to February, with mean monthly temperatures ranging from 20℃ in the southern coastal zone to 15℃ in the northern region of the province. Summer temperatures peak May and June with mean monthly highs from 25℃ to 45℃.

The annual rainfall averages between seven inches, falling mainly during July and August. The south westerly monsoon wind begins to blow in mid-February and continues until the end of September, whereas the cool northerly wind blows during the winter months from October to January. Sindh spans four distinct climatic regions: hot very arid, hot arid, semi-arid and coastal.

In the proposed project districts Badin and Sujawal, Tando Muhamad Khan fall in Semi-arid zones where warm summer and mild winters are experienced. Mirpurkhas fall in hot arid zones where warm summer and cool winters Naushehro Feroz and Shaheed Benazir Abad, fall in hot very arid zone where hot summer and cool winters are experienced. Sukkur, Ghotki and Kashmor & Khairpur fall in hot very arid zone where hot summer and mild winters are experienced.

3.3.10 Current Situation of the 15 THQs.

The 15 THQs across five divisions of Sindh, have been affected by the 2022 floods. Flood waters have contaminated water sources, disrupted sanitation systems, and made it difficult for health workers to maintain hygiene and provide essential care. Communities face long travel distances to seek medical assistance. The floods have not only damaged infrastructure but also disrupted livelihoods, leaving families without access to food and proper nutrition. Immediate reconstruction efforts are needed to rebuild flood-resistant health units, restore water and sanitation systems, and ensure the access to

essential healthcare services.

3.3 Ecological Environment

The ecological environment of Sindh varies but is primarily shaped by the Indus River and its canal irrigation systems. Sukkur Division, located along the river, has a rich aquatic ecosystem supported by the Sukkur Barrage, providing habitats for migratory birds and aquatic species, though it's agricultural lands are under pressure from water scarcity and urbanization. Larkana Division, with its dry climate, relies heavily on irrigation for agriculture but faces challenges of habitat degradation, water over-extraction, and limited natural vegetation. Similarly, Shaheed Benazirabad division's ecological environment is dominated by agricultural lands, with canal irrigation supporting crops like sugarcane and cotton, while facing threats from water scarcity, overgrazing, and climate change. Across all three divisions, water scarcity, habitat loss, and the impacts of climate change pose significant threats to local ecosystems, requiring sustainable resource management and conservation efforts.

The region contains many habitats including deserts, mountains and agricultural lands. This diverse landscape contributes to significant biodiversity in the region. The region's unique wildlife is protected through national parks, wildlife sanctuaries, and other protected land systems. The region has different ecosystems, and has a distinct flora and fauna as described below.

3.3.1 Flora

The proposed project sites across Sindh, including the divisions of Larkana, Sukkur, Shaheed Benazirabad, Hyderabad, and Mirpur Khas, are characterized by flora commonly found in arid and semi-arid rangeland environments. These plant species are primarily dependent on seasonal rainfall, with their growth and productivity fluctuating accordingly, showing higher growth during the monsoon season and significantly reduced activity during dry or drought periods. Importantly, no flora will be removed or cut as part of the rehabilitation works for the 15 Tehsil Headquarter Hospitals (THQs), as the interventions are limited to existing facility footprints and do not involve encroachment into natural vegetation zones.

3.3.1.1 Grasses

The rangelands across Sindh, including the divisions of Larkana, Sukkur, Shaheed Benazirabad, Hyderabad, and Mirpur Khas are predominantly covered with a variety of native grass species adapted to arid and semi-arid conditions. These rangelands play a crucial role in supporting the livelihoods of rural communities by providing grazing grounds for livestock, which is a major source of income and food security in the region. The primary ecosystem service of these rangelands is livestock grazing, especially in northern and central Sindh.

Common grass species found throughout Sindh's rangelands include: Needle Grass (*Aristida adscensionis*), Buffel Grass (*Cenchrus ciliaris*), Sandbur (*Cenchrus biflorus*), Bermuda Grass (*Cynodon dactylon*), Millet Grass (*Cymbopogon jwarancusa*), Goosegrass (*Eleusine flagellifera*), Sewan Grass (*Lasiurus sindicus*), and Seed Thrower (*Sporobolus marginatus*). The productivity of these grasses is closely tied to seasonal rainfall, with peak growth during the monsoon and significant decline during drought periods.

3.3.1.2 Forbs

Across the rangelands of Sindh—including the divisions of Larkana, Sukkur, Shaheed Benazirabad, Hyderabad, and Mirpur Khas, forbs are an essential and vibrant component of the natural ecosystem. These herbaceous, broad-leaved plants flourish especially during the spring and rainy seasons, adding ecological richness and visual diversity to the landscape. Forbs play a crucial role in supporting rangeland

health by attracting a wide range of pollinators such as flies, bees, and other insects, which are vital for ecosystem functioning and biodiversity conservation.

Key forb species commonly found in Sindh's rangelands include: Kapok Bush (*Aerva tomentosa*), Chad (*Cassia holosericea*), Bindweed (*Convolvulus glomeratus*), Two-form Rattlepod (*Crotalaria bifolia*), *Heliotropium ophioglossum*, Jhil (*Indigofera oblongifolia*), and Snout Bean (*Rhynchosia minima*). These species contribute not only to pollination but also enhance soil fertility and provide supplementary forage for livestock, particularly in well-vegetated patches following seasonal rains.

3.3.2 Fauna

A screening survey was carried out across all proposed Taluka Headquarter Hospitals (THQs) in the divisions of Larkana, Sukkur, Shaheed Benazirabad, Hyderabad, and Mirpur Khas to assess potential impacts of the project on local wildlife. The assessment confirmed that all project activities are confined to the existing premises of government-owned health facilities, with no encroachment into natural habitats or ecologically sensitive areas. As a result, no wildlife species or critical habitats were identified within or near the project sites. This indicates that the project poses no risk to local fauna and is in compliance with environmental regulations, allowing the rehabilitation works to proceed without ecological disturbance.

3.4 Socio-Economic Environment

A socio-economic profile provides an overview of the social and economic characteristics of a specific group, community, or population, including demographic factors (age, gender, education), economic conditions (income levels, employment, livelihoods), social aspects (housing, healthcare, literacy), and access to infrastructure and services. The socio-economic aspects are being studied with respect to human and economic development and quality of life values of the population in the Project Area. During the socio-economic survey, people were informed about the project objective, its location and basic design features. To get the maximum information about the PAPs and proposed Project area, both primary and secondary sources were used for data collection. To assess the socioeconomic conditions of the PAPs, a series of questions were asked during the socio-economic survey with the following objectives particularly under frameworks like the World Bank's ESS 10:

- Observe and document the existing socio-economic conditions of the PAPs;
- To obtain information about the demographic characteristics of the PAPs;
- Identify the economic resource dependency of the PAPs;
- Explore the situation of housing conditions, civic amenities, drinking water conditions, education and health facilities etc.
- Get feedback from the community about existing and potential social issues; and
- Evaluate the possibilities of addressing their concern through relevant authorities.

Detailed findings of the survey are discussed in the following sections.

3.5.1 Approach and Methodology

The socioeconomic survey aimed to gather in-depth insights into the living conditions, economic participation, and social well-being of different demographic groups. The study employed a combination of quantitative and qualitative research methods, including structured questionnaires and in-person interviews. This mixed-methods approach allowed for the collection of both statistical data and personal narratives, providing a comprehensive understanding of the survey population's experiences.

The socio-economic survey was conducted with 285 respondents, carefully selected to represent the broader population. A stratified random sampling method was employed to ensure that key demographic groups; such as gender, age, education, and income level were adequately represented.

The gender distribution of respondents was as follows:

- **Male respondents**: 829 (53%)
- **Female respondents**: 727 (47%)

This near-equal distribution ensured that gender differences could be explored in the analysis of socioeconomic variables such as employment, income, access to services, and overall quality of life.

Data Collection Methods

Primary Data:

- **Household Surveys**: Structured questionnaires were administered to 285 households, including 727 female and 829 males, covering 1,548 individuals.
- **Key Informant Interviews (KIIs)**: Conducted with local leaders, government officials, and community representatives to gain deeper insights into socioeconomic trends.
- **Focus Group Discussions (FGDs)**: Engaged diverse community members, including women and vulnerable groups, to understand social dynamics and challenges.

Secondary Data:

- Census data from the 7th Population and Housing Census-2023 was analyzed.
- Official reports, administrative records, and local government statistics were reviewed to validate findings.

Sampling Strategy

- A stratified random sampling method was used to ensure representation across different demographics, locations, and socioeconomic backgrounds.
- The sample covered areas within five division; Hyderabad, Mirpur Khas, Larkana, Sukkur & Shaheed Benazir Abad.

Data Analysis

- Descriptive statistics were applied to assess household composition, education levels, employment, and income distribution.
- Thematic analysis was conducted on qualitative data from interviews and FGDs to identify key social and economic concerns.

3.5.2 The Project Area at a Glance

The proposed project of 15 THQs in five divisions of Sindh (Hyderabad, Mirpur Khas, Larkana, Sukkur & Shaheed Benazir Abad), the general socioeconomic characteristics of the three divisions are discussed in the following sections.

3.5.3 Demography

This section incorporates demographic data (see table 3-2 & table 3-3) from the recently announced results of the 7th Population and Housing Census-2023 conducted by the Pakistan Bureau of Statistics

(PBS)[12].

According to 2017 population census reports, the Sindh province contains 23.04% of Pakistan's total population. Total number of population is 47.9 million. Out of which 47.98% live in rural Sindh. The average house hold size is 5.6. Most of the population falls in the category of below 15 years. 22.27 % population falls in 15 years to 25 years' age group.

Table 3-2: Demographic Data

Name of Admin Unit	Households	Population 2023	Average Household Size	Population 2017	Growth Rate
Sindh Province	9,871,620	55,696,147	5.64	47,854,510	2.57

According to 2017 population census, Sindh accounts for 23.04% of Pakistan's total population i.e. almost 48 m out of a total 221 million. In the province population density is 250 persons per square km in rural areas. The urban centers are densely populated with an average of 1000 person per square kilometer.

An overview of Sindh Province is are presented in Table 3-3, highlighting their geographical coverage and population distribution. Where overall male population is more than female population. This information provides valuable insights into the spatial extent and demographic characteristics of the region. Understanding these factors helps in addressing infrastructure needs, social services, and economic opportunities across different areas within the province.

Table 3-3: Population of Project area Divisions

Name Of Administrative Unit	Area In Sq. Km	Population-2023								Population 2017	2017-2023 Avg. Annual G. Rate
		All Sexes	Male	Female	Trans Gender	Sex Ratio	Density Per Sq. Km	Urban Proportion	Avg. H. Hold Size		
Sindh Province	140,914	55,696,147	29,014,424	26,677,501	4,222	108.76	395.25	53.97	5.6	47,854,510	2.57

3.5 Key Findings of the Socio-Economic Survey

The Key Findings of the Socio-Economic Survey of 15 THQs in Sindh, conducted under the Sindh Integrated Health and Population Project (SIHPP), provide valuable insights into the socio-economic conditions of the communities near by these health facilities. The survey aimed to assess the socio-economic status and overall living conditions of households in the vicinity of these THQs. By collecting data on income, education, employment, healthcare utilization, and basic infrastructure, the findings highlight the strengths and challenges within the project area healthcare system, as well as the socio-economic disparities faced by local populations. These insights are important for informing future health interventions, policy development, and resource allocation to improve both the socio-economic and health outcomes for the people of Sindh.

During the Socio-Economic Survey of the Subproject area, 285 Households (HH) comprising of 820 males and 727 females were documented and key findings are covered in below subsequent subsections.

[12] https://www.pbs.gov.pk/sites/default/files/population/2023/Sindh.pdf

3.5.1 Gender Composition of Household

According to the survey of households, the male population was high as compared to the female population in the project area. However, during the consultation for the project the female household's participation was more than the male households. An average the male population was 56% male population as compared to the 44% female population among the sampled families for the consultation. As per the survey, the household size was 5.6 persons per household. The detail of the population of affected households is given in Table 3-4.

Table 3-4: Gender Composition of Household Population

Total Household	Population and Family Size				Total Population	Average Household Size
	Male	%	Female	%		
285	829	53%	727	47%	1548	5.6

3.5.2 Age Group of the Household Members

Table 3-5, shows the Age group, Age is another important demographic characteristic that has a bearing on employment and mobility. As per the findings of the field survey, the age-wise frequency distribution indicates a predominantly young population among the 1,548 individuals surveyed. The largest age group was children aged up to 10 years, comprising 27.5% (426 individuals) of the total population. This was followed by the youth aged 18–25 years, making up 19.5% (302 individuals), and the 26–35 age group representing 17.2% (266 individuals). Adolescents between 11–17 years accounted for 14.3% (221 individuals). Adults aged 36–45 made up 11.5% (178 individuals), while those above 45 years constituted the smallest segment at 10% (150 individuals). Overall, the field data highlights that more than half of the surveyed population is under the age of 25, indicating a youthful demographic profile in the area.

Table 3-5: Age Group of Household Members

S.No	Frequency Distribution	Number	Percentage
1	Up To 10 years	426	27.5
2	11-17	221	14.3
3	18-25	302	19.5
4	26-35	266	17.2
5	36-45	178	11.5
6	Above 45	155	10
	Total	**1,548**	**100**

3.5.3 Educational Level

According to the United Nations Educational, Scientific and Cultural Organization (UNESCO), Pakistan has one of the lowest literacy rates in the world, and stands 160th among world nations. As per the Pakistan Social and Living Standards Measurement Survey (2019), literacy rate in rural Sindh stands at only 39%, whereas the female literacy rate is further disproportionately low at 21% compared to male literacy rate (55%). Apart from that, only 3.65% rural population is literate beyond higher education.

The field survey data provides insights into the educational background of 1,548 respondents, comprising 820 males and 727 females. The largest proportion of respondents were illiterate, accounting for 19.6% of the total. This was followed by individuals with middle-level education (14.3%), intermediate education (14.2%), and matriculation (15.6%). Primary education was recorded for 13.2% of respondents, while 10.5% had completed graduation, and 8.5% had attained postgraduate qualifications. A small segment

(4.1%) had received religious education only. Overall, the data reflects a varied educational landscape, with a significant portion of the population having only basic or no formal education. Whereas the educational status of the affected HH member is shows in Table 3-6.

Table 3-6: Educational Level of the Respondents[13]

S. No:	Educational Level	Number of Respondent		Percentage (%)
		Male	Female	
1	Illiterate	142	131	19.6
2	Primary	156	132	13.2
3	Middle	195	169	14.3
4	Metric	112	99	15.6
5	Intermediate	73	76	14.2
6	Graduation	43	68	10.5
7	Post Graduate	54	47	8.5
8	Religious	45	5	4.1
	Sub Total	**829**	**727**	**100**
	Total	**1,548**		

3.5.4 Occupation & Earning

According to the Economic Survey of Pakistan, agriculture is the main source of employment in Sindh. 42% of the population works in the agriculture, fisheries and forestry sectors, followed by 35% in services (including government) and 22% in industry and associated jobs.

The field survey covered 1,548 respondents and provided valuable insights into their educational and professional profiles. In terms of education, 19.6% of respondents were illiterate, while the remaining had varying levels of formal education ranging from primary (13.2%) and middle (14.3%) to matriculation (15.6%) and intermediate (14.2%). A smaller portion had completed graduation (10.5%) or post-graduate degrees (8.5%), and 4.1% reported only religious education. Professionally, the respondents were engaged in a mix of occupations. A notable 22% reported general experience of up to 10 years, possibly across informal sectors. Agriculture and livestock were the main livelihoods for many, with 11% solely dependent on it, 9.5% relying on livestock alone, and additional small percentages combining agriculture with government (3%) or private sector jobs (5%). Students made up 13% of the surveyed population, while housewives accounted for 11%. Other occupations included laborers (5%), shopkeepers and small business owners (4% each), private jobholders (3%), and government employees (2%). Unemployment stood at 6.5%, and 1% were classified as retired or elderly.

Overall, the data reflects a semi-literate, agrarian-based community with limited formal employment opportunities and a significant proportion of women engaged in domestic roles. Survey details have been provided in Table 3-7.

Table 3-7: Occupation of the Respondents

S. No.	Professional Status	Number	Percentage (%)
1.	Up to 10 years	341	22
2.	Agriculture Livestock	170	11
3.	Agriculture+ Govt Job	46	3
4.	Agriculture+ Private Job	77	5

[13] Source: Socio-Economic Survey and consultations with the affected households (HH), which are directly or indirectly impacted by the project.

5.	Livestock	147	9.5
6.	Shopkeeper	62	4
7.	Business	62	4
8.	Labor	77	5
9.	Student	201	13
10.	Govt Job	31	2
11.	Private Job	46	3
12.	House wives	170	11
13.	Retired/Old	15	1
14.	Un-employment	101	6.5
	Total	**1,548**	**100**

3.5.5 Language Spoken

The project covers the entire province of Sindh, excluding Karachi. In the sub-project area, Sindhi is the predominant language spoken by the majority of the population. Additionally, Punjabi, Siraiki and other regional languages are also spoken by certain groups. While Sindhi is the dominant language, Urdu, being the national language, is widely spoken and understood by most people in the sub-project area.

3.5.6 Religion and Ethnicity

The majority of the population of the Sindh province is Muslim. Although, 90.34% of the total population declares Islam as their faith, the province has still relatively higher proportion of minorities living in it. The largest community amongst minorities is Hindu, which constitute almost 7% of total population reported in Census-2017. Tharparkar has the highest proportion of Hindu population (more than 43%). Other districts also have significant Populations of Hindus and other minority communities. Christians constitute almost 1% of the provincial population. They are mostly concentrated in Karachi, with limited presence in other cities. Their presence in the rural areas is minimal.

3.5.7 Type of family System

The survey indicates that more than half of the household within the project area are nuclear families. Survey details have been provided in Table 3-8.

Table 3-8: Type of Family System

S. No	Type	Number	Percentage (%)
1	Nuclear	125	44
2	Joint	160	56
	Total	**285**	**100**

3.5.8 Monthly Expenditures

The poverty line of Pakistan is at PKR 3,030 per capita per month. The field survey data on household income distribution shows that a majority of the respondents fall within the low to middle-income brackets. Out of 285 surveyed households, 39% (111 households) reported a monthly income between PKR 21,000 to 36,000, making it the most common income range. This is followed by 25.6% (73 households) earning between PKR 37,000 to 40,000. Households with an income of less than PKR 20,000 constituted 22.9% (65 households), indicating a significant portion living under economic constraints. Only 12.5% (36 households) reported earning more than PKR 40,000 per month. The data highlights a generally low-income economic profile in the area, with a large majority of households earning less than PKR 40,000 monthly. Survey details have been provided in Table 3-9.

Table 3-9: Monthly Expenditure

S. No	Distribution	Number	Percentage (%)
1	Less than 20,000	65	22.9
2	21,000-36000	111	39
3	37000-40,000	73	25.6
4	40,000 and above	36	12.5
	Total	**285**	**100**

3.5.9 Ownership status of houses

Housing is a major element of people's material living standards. It is essential to meet basic needs, such as shelter from harsh weather conditions, and to offer a sense of personal security, privacy, and personal space. Good housing conditions are also essential for people's health and affect childhood development. Further, housing costs make up a large share of the household budget and constitute the main component of household wealth.

Regarding house ownership, the survey findings indicate that 55% of respondents own their houses, while the remaining 45% live in rented accommodations or other housing arrangements.

3.5.10 Type of Construction of Housing Structure

The table 3-10, shows the types of houses occupied by respondents. The field survey data on housing types in subproject area reveals that a significant portion of the population lives in non-permanent or semi-permanent structures. Out of the 285 households surveyed, 30.6% (87 households) reside in straw houses, which are typically the least durable. This is followed by 25.8% (74 households) living in pucca (permanent) structures, and 23.1% (66 households) in semi-pucca houses, which combine elements of both kacha and pucca construction. Meanwhile, 20.5% (58 households) reported living in kacha houses, made from mud or other temporary materials. Overall, the data highlights that nearly three-quarters of the population lives in either straw, kacha, or semi-pucca houses, indicating limited access to durable housing infrastructure in the area. This distribution emphasizes the need for improved housing infrastructure in the surveyed area.

Table 3-10: Type of Structure

S. No	Type of House	Numbers	Percentage (%)
1	Kacha	58	20.50
2	Pucca	74	25.80
3	Semi Pacca	66	23.10
4	Straw	87	30.60
	Total	**285**	**100**

3.5.11 Mode of Transport

The major source of transport in the villages of the sub-project area is public transport including buses, Van/pickup, Jeeps, Qingqi Rickshaw, while individual cars and motorbikes are other modes of transport in the sub-project area. The farm inputs and outputs are transported through trucks and tractor trolleys.

3.5.12 Access to Social Amenities

Basic civic facilities are available in forest surrounding villages and hamlets although these facilities are compromised. Electricity and road network is available, but mostly the quality of roads is poor while

power supply is unreliable and subject to long hours of load shedding. Primary and secondary schools for boys and girls are also available. Students has to approach to the nearest cities for higher studies. Medical facilities are scarce and least available.

Social infrastructure and amenities are key to creating sustainable communities. The field survey data on access to social amenities in subproject are highlights both progress and gaps in basic infrastructure. Among the 216 surveyed households, 100% reported access to telephone or mobile services, indicating full connectivity in terms of communication. Schools were available to 85.2% (184 households), and hospitals to 78.1% (223 households), suggesting relatively good coverage in education and basic healthcare. Electricity was accessible to 75.6% (215 households), while road infrastructure served 69.8% (199 households). However, access to clean drinking water remains a challenge, with only 35.2% (100 households) having water supply connections and 62% (177 households) reporting availability of a water filtration plant. Sewerage systems were the least developed, with just 15% (43 households) having access. Additionally, gas connections were available to only 25.6% (73 households).

The data reflects that while certain services like communication, education, and health are relatively widespread, there are significant gaps in sanitation, clean water, and energy infrastructure. Available social amenities are given in Table 3-11.

Table 3-11: Access to Social Amenities

Sr. No.	Social Amenities	Number	Percentage
1	Electricity	215	75.6
2	School	243	85.2
3	Hospital	223	78.1
4	Gas	73	25.6
5	Water Supply	100	35.2
6	Sewerage	43	15
7	Telephone / Mobile	285	100
8	Water Filtration Plant	177	62
9	Road	199	69.8

3.5.13 Social Cohesion and Conflict

Social organization in all settlements is strongly based on the community (tribal and clans) system, where each tribal and clan have a leader. Though the settlements are multi-trible/clans, there is a single leader of the settlement, which is recognized by all tribes/clans.

The tribe/clan leaders are mostly landlords and politically active. All families belonging to the same tribes have strong interactions with one another but mostly remain separate from other tribes. This extends to marriages, where it is the preference for young tribal members to marry a member of the same tribe.

3.5.14 Conflict Resolution within Tribes and Villages

In rural areas of Sindh most of the conflict associated among individual and among tribes are associated to land or land base assets. Minor conflict issues are settle down through informal Panchayat system. If the conflict is escalated, it may raise to legal court or to police station. To manage the conflict regarding the project activities GRM system is proposed if following chapter.

In rare cases when parties to dispute do not agree on the decision of village head or tribal chief, the matter is taken to police and a court of law. The police and the courts of law are the last resort and this

option is rarely exercised.

According to the consultation and social survey, no major conflict was found in the sub-project area. The minor conflicts like disputes related to marriages petty property disputes at village level are settled by the village head and the conflict of similar nature among tribes are resolved by tribal chief. Mainly conflicts were settled at village level. The people accept the mediation and decisions of the village head and tribal chief as village heads and tribal chief are being held in high esteem by the local population.

3.5.15 Source & Satisfaction of Drinking Water

The findings of published data[14] for quality of drinking water about the rural areas of the province, indicate that water in the project area is of not good quality and is not fit for the drinking. In some areas, ground water is saline therefore the communities have to fetch the water from nearby town. Waterborne diseases are abundant in the rural areas.

The findings of the survey indicated that 100% of the households had the facility of the drinking water inside their home and around in the shape of, water wells, hand pumps and electric water pumps. Also, the findings of the survey revealed that 59% of the respondents were satisfied with the drinking water quality, while 41% of the respondents were not satisfied with the water quality level.

3.5.16 Heritage Aspects

Sindh is known for its unique cultural and historical heritage shaped by centuries of indigenous traditions and diverse influences, particularly those of the Rajput and Sindhi communities. The province is home to a vibrant mix of Hindu and Muslim populations who have lived together in harmony for generations. This religious and cultural coexistence is reflected in the regions numerous temples, shrines, folk festivals, traditional music, and crafts.

Although the Environmental and Social Screening Survey confirmed that no archaeological or cultural heritage sites are located within the designated subproject areas, a chance find procedure will be implemented. This measure ensures that any unexpected discoveries during project activities will be managed appropriately, in compliance with the heritage preservation standards set by the Islamic Development Bank and the World Bank.

3.5.17 Women Issues

Women in the project area are not socially and economically at par with their male counterparts. Women are economically and socially marginalized and politically lacked voices. Lack of skills, limited opportunities in the job market, and social and cultural restrictions limit women's chances to compete for resources in the public arena. This situation has led to the social and economic dependency of women that becomes the basis for male power over women in all social relationships.

During the survey following issues related to the women highlighted by the respondents which are prioritized as under;

- Limited public transport services, particularly for females.
- Restricted access to proper medical treatment, especially after the 2022 flood, which damaged nearby health facilities, forcing locals to travel to nearby towns. This travel is often difficult for women when medical care is needed.

[14] Adolescent food insecurity in rural Sindh, Pakistan: a cross-sectional survey, Romania Iqbal, Rahat Qurashi.

- Insufficient educational facilities for women in local institutions.
- Lack of skill development centers in the project area.
- Inadequate sanitation and hygiene facilities for females.

3.5.18 Vulnerable Households

Households have been identified due to poverty and making income below the minimum wage rate (Rs. 37,000/month) fixed by the Government of Sindh in the budget of the financial year 2024-25, Among the 285 surveyed households, 186 earn less than Rs. 37,000 per month. To determine the vulnerability, households were enumerated by keeping in view all factors like poverty, women headed household, household headed by differently abled persons or child headed etc.

3.5.19 Internally Displaced Persons

Internally Displaced Persons (IDPs) in Sindh are individuals or groups who have been forced to flee their homes due to factors like conflict, natural disasters, or other emergencies but remain within Sindh's borders. However, during E&S screening of 15 THQs, no IDPs identified in the project area.

3.5.20 Security Situation and Movement of Project Staff

During the social survey, locals informed that there will be no issue for the contractor and the concerned project staff to live and work in the project area. Furthermore, the labor force would typically comprise of people from all ethnicities residing. Therefore, law and order situation is not likely to pose any problems for the project. For additional precaution, unnecessary movement of workers outside the construction camps during night time will be avoided.

Moreover, if and when will security situation may require at project site, the security management plan will be followed in letter and spirit and will involve law and order agencies.

4. Stakeholder Consultations and Information Disclosure

The project has prepared a Stakeholder Engagement Plan (SEP) to describe objectives, process and outcome of the stakeholder engagement already carried out during the project preparation and to be carried out during the project implementation in accordance with the WB ESS 10 (Stakeholder Engagement and Information Disclosure)[15].

The SEP, being a live document is to be updated throughout the life of the project to ensure effective, robust and transparent stakeholder engagement. Through the ESS 10, the ESF requires the timely, relevant, understandable, and accessible disclosure of project information in a way that is free of manipulation, interference, coercion, discrimination, and intimidation.

4.1 Identification and Classification of Stakeholders

The communities living in the project surrounding areas, associated departments/agencies, NGOs and others, whose assets/land, business, structures, installations, or interests may be impacted due to the project activities. The three categories of Project Stakeholders are: Affected Parties, Other Interested Parties and Disadvantaged/vulnerable individuals or groups. The list of identified stakeholders for this project is provided in Table 4-1: List of Identified Stakeholders.

Table 4-1: List of Identified Stakeholders

Category	Sector	Stakeholders	Project Component
Affected Parties	Community	Users and general community living in and around the construction sites of GDs, BHUs, RHCs, THQ, DHQ (Mothers/Newborn/Children/Adolescents/Men)	Component 1 and 2
	Govt/ Institutions	Staff and management of Primary public healthcare facilities (GDs/BHUs/RHCs) including doctors, nurses, dispensers, LHW, CHW, FHW etc.	Component 1 and 2
		Staff of Secondary and tertiary public healthcare facilities (*taluka* and district hospitals) including medical superintendents, doctors, nurses, dispensers, administrators, non-medical staff, lab technicians, primary vendors, waste managers, etc.	Component 1 and 2
		Community Health Workers/Family Healthcare Workers	Component 1 and 2
		Community Midwives	Component 1 and 2
		PPHI	Component 1 and 2
		District Health Offices	Component 1 and 2
	Private Sector	Contractors for Construction and rehabilitation works	Component 1
		Other service providers (e.g. ambulance services, supply of medical equipment and medicines)	Component 1
Other Interested	Government/I nstitutional	Provincial Disaster Management Authority (PDMA)	Component 1 and 2
		Planning & Development Department	All

[15] ESS10 requires that borrowers engage with stakeholders throughout the project life cycle, commencing such engagement as early as possible in the project development process and in a timeframe that enables meaningful consultations with stakeholders on project design. The nature, scope and frequency of stakeholder engagement have to be proportionate to the nature and scale of the project and its potential risks and impacts.

Parties		Social Welfare Department	Component 1 and 2
		Local Government Department	Component 1
		Environment, Climate Change & Coastal Development Department	Component 1
		Women Development Department, Sindh	Component 1 and 2
		Labor and Human Resources Department, Sindh	Component 1 and 2
		Academic institutions	Component 1 and 2
	NGOs/CBOs/CSOs/Private Sector	JIMS, Grievance Redressal Mechanism Information System-GMIS, Private medical facilities, International Development Agencies, INGOs, and NGOs	Component 1 and 2
		Social Franchises in PHC and FP	Component 1 and 2
Disadvantaged / vulnerable individuals or groups	Government	Female Staff (involved in project)	Component 1 and 2
	Community	Internally Displaced persons due to flood	Component 1 and 2
		Persons with Disabilities	Component 1 and 2
		Poor Women/Pregnant/Lactating/Girls/Children/ Adolescents with underlying health issues (respiratory and dust allergy) or experiencing emotional or mental stress	Component 1 and 2
		Seasonal Workers	Component 1 and 2
		Female/child headed households	Component 1 and 2
		Religious and ethnic minorities	Component 1 and 2
		Transgender communities	Component 1 and 2
		Senior citizens	Component 1 and 2
		Citizens without CNIC	Component 1 and 2
		People with low / no literacy levels	Component 1 and 2
		Economically marginalized groups including household below poverty line	Component 1 and 2

4.2 Consultation methodology

During the design phase initial interaction was carried out with the Government Department and PMU to comprehend the objective and methodology of implementation along with identification of various tiers of the Govt linked with the project. The PMU intimated various Govt Officers regarding commencement of Survey / Design Phase and presence of the Consultant. The survey teams of the Consultants further coordinated and held meetings with relevant stakeholders of the THQs, List of interviewed Stakeholders consulted and district wise details are given in **Annexure-E**.

The participation process for the projects was inclusive. All stakeholders were at all times encouraged to be involved in the consultation process. Equal access to information was provided to all stakeholders. Special attention is given to vulnerable groups, in particular women, persons with disabilities, youth, elderly and the cultural sensitivities of diverse ethnic and religious minority groups and those living in remote or inaccessible areas.

The Environmental and Social (E&S) team, comprising specialists Social/Gender, Environment, and architecture led comprehensive stakeholder consultations for the subprojects in Hyderabad, Mirpur Khas, Sukkur, Larkana & Shaheed Benazir Abad divisions. 15 THQs were visited just to collect feedback from stakeholders regarding the planned construction work.

The meetings were held in an open and encouraging atmosphere, allowing participants to express their concerns and views freely. The discussions moved forward as follows:

(1) A brief project description was explained to the stakeholders.
(2) Stakeholders were allowed to raise issues or queries regarding the project activities.
(3) Issues were documented and questions were responded to.

During the consultation process 601 males and 533 females were interviewed.

4.3 Summary of Stakeholders Consultations Conducted

Stakeholder consultations were carried out in Hyderabad, Mirpur Khas, Sukkur, Larkana and Shaheed Benazirabad divisions with various stakeholders including Health Facility's staff, Local NGOs & CSOs, District PPHI Office, Academic Institutes, EPA & PDMA, Vulnerable group and minorities etc., and potential beneficiary community and vulnerable groups in flood affected areas. These stakeholders were interviewed through face-to-face sessions.

This engagement aimed to ascertain institutional needs, inform stakeholders about planned activities, improve project design, create synergies, and enhance the socio-environmental sustainability of the project activities across different components. The key concerns/suggestions of stakeholders and PMU response are shown in Table 4-2, and consultation photographs are provided in **Annexure –F.**

Table 4-2: Stakeholders' Concerns/ Feedback and Response

S No.	Concerns of Participants	Concerns raised district wise	PMU Response
1.	Provision of safe drinking water in healthcare facilities is a major concern	Badin, Jamshoro, Sujawal, Tando Muhammad Khan, Mirpur Khas, Kashmore, Nausheroeroz, Shaheed Benazirabad, Ghotki and Khairpur.	The provision of water filter plant in project is available
2.	The existing THQ is in not good condition after flood 2022, So, the new THQ building should construct at the existing building with modern health facilities.	Badin, Jamshoro, Sujawal, Tando Muhammad Khan, Mirpur Khas, Kashmore, Nausheroeroz, Shaheed Benazirabad, Ghotki, Khairpur and Sukkur.	The provision of construction of New THQ in project is available.
3.	There is no filtration plants installed in any Health Facility.	Badin, Jamshoro, Sujawal, Tando Muhammad Khan, Mirpur Khas, Kashmore, Nausheroeroz, Shaheed Benazirabad, Ghotki, Khairpur and Sukkur.	The provision of water filter plant in the health facility project. Is available
4.	Provision of Solar panel system in healthcare facilities	Badin, Jamshoro, Sujawal, Tando Muhammad Khan, Mirpur Khas, Kashmore, Nausheroeroz, Shaheed Benazirabad, Ghotki, Khairpur and Sukkur.	The provision of Solar Panel System 10kw in this project is available.
5.	Ramps should be provided for disabilities persons in health facilities	Badin, Jamshoro, Sujawal, Tando Muhammad Khan, Mirpur Khas, Kashmore, Ghotki, Khairpur and Sukkur.	The provision of ramps for disable persons has been considered in the design of the THQ.
6.	Fire Extinguishers should be provided in health facility	Badin, Jamshoro, Sujawal, Tando Muhammad Khan, Mirpur Khas, Kashmore, Nausheroeroz, Shaheed Benazirabad, Ghotki, Khairpur and Sukkur.	The provision of Fire Extinguishers in a project is available.
7.	Windows in the exiting damaged health facility building is too small; it should be bigger for better ventilation	Badin, Jamshoro, Mirpur Khas, Kashmore, Nausheroeroz, Shaheed Benazirabad, Ghotki, Khairpur and Sukkur.	With the architects and designers to create a layout that prioritize natural ventilation. Ensure that windows are strategically placed to allow for optimal air flow throughout the building
8.	Height of health facility compound wall is short; it should be raised.	Badin, Jamshoro, Sujawal, Tando Muhammad Khan, Mirpur Khas, Kashmore, Nausheroeroz, Shaheed Benazirabad, Ghotki, Khairpur and Sukkur.	The height of compound wall has been considered in the design to raise up to 10 feet

9.	Provision of jobs for skilled and qualified as well as for unskilled local laborers should be accepted as the right of inhabitants of Area.	Badin, Jamshoro, Sujawal, Tando Muhammad Khan, Mirpur Khas, Kashmore, Nausheroeroz, Shaheed Benazirabad, Ghotki, Khairpur and Sukkur.	Special clause will be added in the contract of contractor to ensure full compliance.
10.	Chances of some environmental effects like noise/and dust emissions to the nearby dwellings/ community.	Badin, Jamshoro, Sujawal, Tando Muhammad Khan, Mirpur Khas, Kashmore, Nausheroeroz, Shaheed Benazirabad, Ghotki, Khairpur and Sukkur.	A special clause will be added to the contract of the contractor to ensure full compliance. These issues are already included in the ESMP, and corresponding mitigation measures have been added.
11.	Is there any forum for the complaint registration?	Sujawal, Tando Muhammad Khan, Mirpur Khas, Kashmore, Nausheroeroz, Shaheed Benazirabad, Ghotki, Khairpur and Sukkur.	A multi-tier GRM has been established & put up for notification. The detailed GRM procedure is given in the ESMP document.
12.	The movement of commuters in the respective streets/ locations towards the Masjid, school, and hospitals should not be disturbed.	Badin, Jamshoro, Sujawal, Tando Muhammad Khan, Mirpur Khas, Kashmore, Nausheroeroz, Shaheed Benazirabad, Ghotki, Khairpur and Sukkur.	• In case unavoidable, an alternate route will be provided to avoid the disturbance and the issue will be discussed in the construction management plan. • GRM is established to address the local complaints
13.	Women privacy, purdah as well as mobility issue may create for the student, proper cordoning of the construction area to be ensured.	Badin, Jamshoro, Sujawal, Tando Muhammad Khan, Mirpur Khas, Kashmore, Nausheroeroz, Shaheed Benazirabad, Ghotki, Khairpur and Sukkur.	• Temporary purdah arrangements shall be carried out at construction sites in all HFs. • Special clause will be added in the contract of contractor to ensure full compliance implemented at construction site
14.	Health and safety of the community children playing in streets as in rural areas there is no parks and playground hence used to play in streets.	Badin, Jamshoro, Sujawal, Tando Muhammad Khan, Mirpur Khas, Kashmore, Nausheroeroz, Shaheed Benazirabad, Ghotki, Khairpur and Sukkur.	Contractor should be developed site specific Community health & safety plan and implemented at construction site.
15.	The construction material should not be dumped in the streets and should not block sidewalks and pedestrian passages.	Badin, Jamshoro, Sujawal, Tando Muhammad Khan, Mirpur Khas, Kashmore, Nausheroeroz, Shaheed Benazirabad, Ghotki, Khairpur and Sukkur.	The construction material will be dumped and stored inside the HF premises. If space not available in the HF an alternate arrangement will be made by the contractor.
16.	Deputy director EPA concerns about water quality during construction, cutting of tress, implementation of Health and Safety and environmentally friendly health care waste disposal	Badin, Jamshoro, Sujawal, Tando Muhammad Khan, Mirpur Khas, Kashmore, Nausheroeroz, Shaheed Benazirabad, Ghotki, Khairpur and Sukkur.	Contractor will ensure the all-environmental social compliances during construction, consultant and PMU E & S will also supervise for the implementation of ESMP. For environment friendly health care waste

			management will use standard size burial pits at THQ level.
17.	Fear of blockage of small gray water channels adjacently located to HFs due to construction waste	Badin, Jamshoro, Sujawal, Tando Muhammad Khan, Mirpur Khas, Kashmore, Nausheroeroz, Shaheed Benazirabad, Ghotki, Khairpur and Sukkur.	The construction and workers waste will be disposed according to the Waste Management Plan.as will be submitted by contractor into Site specification ESMP.
18.	The existing THQ building has been damaged after flood 2022, it requires to build new building for health facility.	Badin, Jamshoro, Sujawal, Tando Muhammad Khan, Mirpur Khas, Kashmore, Nausheroeroz, Shaheed Benazirabad, Ghotki, Khairpur and Sukkur.	Existing Building will be demolished, the new building will be constructed to give better health facilities to the local communities and the people of surrounding areas.
19.	Lack of Medical Equipment/ Machineries.	Badin, Jamshoro, Sujawal, Tando Muhammad Khan, Mirpur Khas, Kashmore, Nausheroeroz, Shaheed Benazirabad, Ghotki, Khairpur and Sukkur.	This project's scope is to reconstruct the damaged building will be consider for future if any budget will available may consider the machineries/equipment
20.	Staff quarters and medical officers' residence is fully damaged, it should be construct.	Badin, Jamshoro, Sujawal, Tando Muhammad Khan, Mirpur Khas, Kashmore, Nausheroeroz, Shaheed Benazirabad, Ghotki, Khairpur and Sukkur.	The criteria for the selection of site is damaged during flood 2022, it is genuine that staff quarters and officers' residences also affected. Meanwhile the sub-project is to reconstruct the THQ health facility in the project scope.
21.	MO suggested that consultation shall be a regular process during all stages of the construction to solve any issues arising out of the civil works.	Badin, Jamshoro, Sujawal, Tando Muhammad Khan, Mirpur Khas, Kashmore, Nausheroeroz, Shaheed Benazirabad, Ghotki, Khairpur and Sukkur.	The suggested consultation plan will be implemented during all phases of construction.

Further site-specific consultation sessions will be carried out before the start of every new activity and will continue till the completion of the project.

4.4 Consultation with Women, Vulnerable Communities & Minorities

The women in rural communities of these divisions carry out agricultural work, household work and look after the family and children. 15 sessions have been conducted with women and minorities. Most of the female population in the project area was not socially and economically at par with the male population because of negation of their roles as producers and providers in all social roles. Thus, women are economically exploited; socially marginalized and politically lacked voices. Lack of skills, Lack of education limited opportunities in the job market, and social and cultural restrictions. Key concerns of women and PMU Response against each is indicated in Table 4-3.

Table 4-3: Key Concerns of Woman and PMU Response

Sr.	Key Concerns	PMU Response
1	The lack of job distribution for local communities, as the local communities are in priority	Provision of this sub-project will give job opportunities to the local communities
2	The lack of skills in women	Provision of Skill development for women in this sub-project
3	An adequate health services at Taluka Headquarter hospitals after the flood 2022.	Provision of improve health service delivery will be provided by the sub-project.

4.5 Information Disclosure

As disclosure requirement, the environmental and social management Plan (ESMP) will be uploaded on the SIHP project website after the approval of World Bank, (https://www.sihpp.gos.pk/). In addition to this, ESMP document will be made available at the campsites.

5. Environmental and Social Impact Assessment and Mitigation Measures

This chapter identifies the potential environmental and social risks and impacts envisaged due to the implementation of proposed Project. The appropriate mitigation and remedial measures of each environmental and social impact are proposed in this chapter keeping in view the mitigation hierarchy

The following is the list of activities which may have adverse E & S impacts;

- Doctor's room,
- Lady Health Visitor (LHV) room,
- Expanded Program on Immunization (EPI) & Nutrition room,
- Additional rooms for doctors,
- A basic laboratory,
- An ultrasound room, a labor room with autoclave and scrub,
- Additional observation beds for gynecology/labor,
- A female waiting area, a male waiting area,
- A store/yellow room, a pharmacy a washing area, a meeting room, and more.
- The health facility will be equipped to operate on a hybrid solar system, include water filtration plants to provide clean drinking water for visitor

The impact assessment, most of the risks and impacts are anticipated at the implementation/ operational phase and are temporary site-specific, reversible. Further, adopting simple mitigation measures, in accordance with the mitigation hierarchy under the relevant ESSs, these potential impacts will either be avoided altogether, or their likelihood of occurrence and severity will be reduced, thus making the proposed Project environmentally responsible and socially acceptable.

5.1 Adverse Environmental and Social Impacts

The rehabilitation of Taluka Headquarter Hospitals (THQs) across Sindh may involve certain adverse environmental and social impacts, primarily due to construction-related activities. These impacts are generally temporary and localized but may include dust and noise pollution, waste generation, disruptions to hospital operations, health and safety risks for workers and patients, and limited access to healthcare services during the rehabilitation and operational phase. Proper planning and mitigation measures are essential to minimize these risks and ensure compliance with environmental and social safeguards.

5.1.1 Rehabilitation Phase Impacts & Mitigation Measures

5.1.1.1 Air Quality Impacts

Main sources of air quality pollution are emissions from construction related traffic and machinery (excavator, dumpers, concrete mixer, tractor, lifting machine, generators, transit mixture etc.), excavation, filling of earth material, loading/unloading of material etc. The storage and transportation of material will also generate airborne dust and particulate matter. Dust raised from the above activities will have impacts on the surrounding population. There are no sensitive receptors observed within the vicinity of health facilities. The construction activities will be carried out within the existing health facilities, therefore, overall impact on air quality is assessed to be temporary, moderate to low in nature.

Mitigation Measures

- Construction equipment and machinery will be serviced regularly to reduce excessive exhaust emissions.
- The material stockpiles and access roads will be watered as and when required to minimize the potential for environmental nuisance due to dust.
- Construction vehicles carrying materials will be covered with tarpaulin sheets to avoid dust pollution.
- Speed limits will be imposed on all vehicle movement at the worksite to reduce dust emissions. Unnecessary movement of vehicles will be avoided.
- All dust raising locations shall be kept wet with water sprinkling. Fugitive dust emissions will be minimized by appropriate methods such as spraying water on material where required and appropriate and install dust screens where necessary.
- Continuous air monitoring will be carried out near the sensitive receptors to ensure they do not exceed ambient levels and SEQS.
- Open burning of solid waste shall be strictly prohibited and ensure the provision of PPEs.
- Raw materials such as cement, gravel and sand will be kept under sheet covers. The height of material stockpiles will be minimized.
- Selection of activities that may be deemed to create dust will be undertaken early in the morning or in the afternoons.

5.1.1.2 Water Quality

The assessment revealed that the drinking water quality at all the selected 15 Taluka Headquarter Hospitals (THQs) is unfit for consumption. It was told that staff bring water from their homes or nearby households. During rehabilitation work, surface and groundwater quality may further deteriorate due to spills from construction equipment and fuel, vehicle washing, and improper waste disposal. This increases the risk of waterborne diseases on-site and in the surrounding area.

Mitigation Measures

- The contractor will test water of all sites, and those with groundwater unsuitable for drinking, the contractor will install filtration plant or RO.
- During construction activities contractor must provide the safe filtered water to all workforce.
- In the case of potable water only boiled water will be allowed for drinking/human consumption.
- Oil and fuel storage and refilling will be offsite to the extent possible; in case it is done at site, proper arrangements including impermeable surfaces and secondary containment will be provided.
- Management guidelines proposed in ECP 1: Waste management and ECP 7: Workers' Health and Safety will also be followed.
- For THQ Operation, A water filtration plant will be installed to ensure a sustainable supply of clean drinking water to the staff and visitors.

5.1.1.3 Noise Generation

Noise will be generated from vehicular movement, excavation machinery, concrete mixing and other construction activities during the construction phase and will disturb the residents. This impact is assessed to be temporary and low adverse.

Mitigation Measures

- Construction equipment and machinery will be serviced regularly to reduce excessive noise generation and restricted to daylight hours.
- Ensure that machinery and generators will be equipped with well-functioning mufflers.
- Adjacent communities will be notified prior to any typical noise events, where required.
- Loading and unloading of vehicles and handling operations will be organized for the purpose of minimizing construction noise on the work site.
- Potential noisy activities will be limited to normal working hours.
- Adequate PPEs will be provided to workers such as hearing protection.
- Regular noise monitoring will be carried out and ensure the compliance with SEQ.
- Awareness sessions will be conducted with the workers and near community to raise the awareness about the noise pollution, its health impacts and mitigation measures.

5.1.1.4 Traffic Impacts/Disruption of Public Access

The delivery of construction material to subproject sites may increase the traffic in the area. Movement of construction machinery and open storage of construction material during facility construction may cause congestion on local routes and pose threat to the commuters and locals residing nearby. This impact is assessed as moderate adverse.

Mitigation Measures

- The Contractor will restrict truck deliveries, where practicable, to day time working hours.
- Storage of material outside the designated area will be prohibited.
- Suitable signboards will be placed at strategic locations of the access road.
- The Contractor will restrict the transport of oversize loads.
- If community access is hindered, the option of alternate routes will be used.
- Contractor will prepare the Traffic Management Plan (TMP) as a part of Contractor ESMP.

5.1.1.5 Occupational Health and Safety (OHS)

Approximately 35 - 40 workers will be engaged per THQ in a single 10-hour shift. The expected duration for construction work is 12 months, During the construction activities, demolition of building, excavation, removal of construction waste, unloading of construction material, electrical works. Construction site workers may be exposed to risks of accidental collisions with moving vehicles, strains from repeated movements or from lifting and heaving of heavy objects, slips and falls, including falls from heights, resulting in injuries and even fatalities. Accidental cuts from tools and machines are also safety risks. Wet cement as a construction material is corrosive on contact with human skin and risks associated with lack of adequate occupational, health and safety measures used on site including lack of PPE. During summer season, workers will have to work in extreme hot weather conditions which can bring heat stress. This impact is assessed as moderate to substantial.

Mitigation Measures

- An occupational Health and Safety Plan will be included in the Contractor's ESMP.
- Labor Management Procedures (LMP) has been developed for the project and will be followed mitigate the OHS risk. Ensure the compliance with World Bank Group EHS guidelines and Sindh

occupational Safety and Health Act, 2017 and SEQs.

- Health and safety induction will be conducted for all workers. Training will be provided for workers conducting high risk activities. Workers with inadequate training will not be allowed to operate vehicle/machinery.
- SOPs will be prepared for certain activities such as working on heights, erecting and using scaffolds and using ladders.
- Safety signs will be installed at the entrance to and around the site.
- All safety related activities will be documented including all illness/injury, exposures, and near misses.
- All incidents /accidents will be investigated, recorded, reported and Root Cause Analysis (RCA) for fatal incidents will be done.
- Emergency response measures will be provided onsite including posting of Emergency Contacts, provision of first aid kits, provision of emergency transport vehicle, designating of a muster point, provision of fire extinguishers/sand buckets, provision of spill clean- kits, etc. workers will be provided first aid training.
- The contractor will establish an MOU with the nearest ambulance service provider.
- Proper site sanitation and housekeeping will be maintained on construction sites.
- Toolbox Talk (TBT) with workers shall be held regularly before the start of work regarding the hazards associated with the work.
- In case of an incident involving injury, the injured will be taken to the nearest medical facility after providing necessary first aid.
- Provision of clean drinking water will be ensured for the project workers.
- Appropriate and high-quality PPE for workers such as gloves, vests, safety shoes, masks etc., will be provided and their use will be strictly enforced. Training for the workers will be provided in the use of PPE.
- A site-specific Occupational Health and Safety (OHS) and Traffic Management Plan (TMP) will be prepared to address location-specific hazards, impacts, and control measures.
- The contractor will designate an OHS focal person at each site to ensure the plan's effective implementation.

5.1.1.6 Community Health and Safety

The local community may be exposed to health and safety risks associated with rehabilitation/construction activities such as accidents due to movement of vehicles, improper storage of materials, exposure to hazardous materials and wastes air emissions from construction sites especially vulnerable groups. Accidental spillage /releases may contaminate the drinking water source and other water bodies, damage crops, degrade the soil and contaminate ambient air. The transport of equipment and construction materials through the community roads can deteriorate these roads, especially the link roads which are already in poor condition. The labor with different transmittable diseases may cause spreading of those diseases in the local residents. Improper management of domestic solid wastes may cause the spread of vector-borne and water-borne diseases among the workers and local communities Impacts can be exacerbated during the rainy seasons. This impact is assessed as moderate to substantial.

Mitigation Measures

- Ensure compliance with the World Bank Group Environment, Health, and Safety (WBG EHS) Guidelines
- Construction site will be appropriately fenced or cordoned off to prevent stray animals and

vagrant persons, including communities, residents, from straying on to the site.

- Excavated areas and pits will be marked with appropriate signage. Provision of do not enter/do not pass signs and danger signs will be ensured.
- Awareness sessions will be organized to sensitize construction workers and local communities including Children.
- Vehicles accessing the site will be expected to abide by speed limits and other traffic rules. Drivers will be briefed on safety requirements and exercise caution.
- Ensure effective implementation of GRM to timely address the issues.
- Delivery of construction materiel and equipment will be timed to coincide with off-peak traffic hours.
- Storage of material outside the designated area will be prohibited. Construction materials will be brought to the site as and when required.
- If community access is hindered, alternate routes will be provided. If provision of alternate route is not present, the contractor will inform the public of the date and time of activity well before start of work.
- Traffic Management Plan will be included in Contractor's ESMP.
- Ensure limited transportation of construction material during school hours and communicate such for preparedness.
- Ensure effective implementation of GRM to timely address the issues;
- The communicable disease of most concern during construction phase, like Sexually-Transmitted Disease (STDs) such as HIV/AIDS, will be prevented by successful initiative typically involving health awareness; education initiatives; training heath workers in disease treatment; immunization program and providing health service;

Contractor will take due care of the local community and observe sanctity of local customs and traditions by his staff. Contractor will warn the staff strictly not to involve in any unethical activities and to obey the local norms and cultural restrictions.

5.1.1.7 Liquid and Solid Waste Generation

Municipal, construction and hazardous waste will be generated from construction activities including waste material, earth material, wood cut-offs, wood shavings, plastic cut-offs, empty cement sacks, paint cans, electrical wiring, scrap metal etc. (approximately 10-15kg per day). Liquid waste streams will include equipment wash-out after daily construction activity, and human wastes from construction workers. Approximately 35 - 40 workers will be engaged per sub-project site. This will be a moderate adverse.

Mitigation Measures

- Waste Management Plan will be included in the Contractor's ESMP.
- Adequate waste collection receptacles will be provided. Burning of waste material will not be allowed.
- Waste will be regularly removed from the site and taken to the dump site for disposal, with the consent of the Engineer.
- Burning of any type of waste generated will not be allowed onsite.
- A treatment system for wastewater from toilet facilities will be provided such septic tank or link with exiting draining system and ensure the adequate drainage arrangements.
- If hazardous waste is generated onsite the waste will be carefully collected and removed from site and disposed of in an approved manner. Organic waste will be disposed of through the

municipal waste disposal system.

- Segregation and reuse or recycling of all the wastes will be ensured, wherever practical, to protect the natural resources.
- Equipment washout will be discharged in a manner that avoid contaminating of any nearby water course or natural water bodies.
- The contractor will be required to provide separate toilets and ablution facilities for construction workers.
- All solid and liquid wastes entering waterways will be prevented by collecting solid waste, oils, and wastewaters from brick and concrete where possible and transport to an approved waste disposal site.
- Training will be provided to all personnel in waste management practices and procedures as a component of the environmental induction process.
- Resource conservation themes to be included in awareness raising and training sessions for project staff.

5.1.1.8 Spills and Contamination

Generation of contaminated waste such as left over concrete, used oil from the machinery, paints and other solid waste which could contaminate the soil. Similarly, spills from storage and use of fuel and other hazardous materials may contaminate soil, nearby waterways and, groundwater. This impact is moderate adverse. Handling and use of chemicals including petrol, diesel, oil, lubricants, paints, and other any chemicals, may have environmental implications.

Mitigation Measures

- The Contractor will avoid the storage of significant quantity of fuel (for generator etc.) onsite.
- Any fuel storage will be done within a contained impervious area with all the safety systems in place.
- Contained area will be drained through an oil-water separator or be covered to prevent accumulation of rainfall.
- Storage containers will be labeled as to their content and capacity.
- Warning signs will be installed in storage areas, such as ‘Flammable’ and ‘No Smoking’.
- Workers will be made aware of the proper handling practices to avoid spills.
- Spill clean-up kits to be provided.
- Regular maintenance of machinery will be conducted to ensure the proper functioning so as toavoid unnecessary leaks.
- All the chemicals will be properly handled in designated area, use of spill containment measures and dispose the hazardous waste as per environmental regulations. i.e., Sindh hazardous substances rules 2014 and WBG EHS guidelines for health care facilities.

5.1.1.9 Installation of Solar Panel

The solar panels and their support structure may be damaged by the windstorm. Installation of solar systems may also generate small amount of waste, cause buildings damages if not do correctly, its plumbing and electric wiring, and roof leakage. Solar panels may add weight and increase wear and tear on the roof, potentially reducing its lifespan, especially if the roof is already weakened or damaged. This impact is low adverse in nature.

Mitigation Measures

- Only shortlisted/pre-qualified service providers should be hired for the supply of solar systems;
- The technical design for installation of solar panel must consider all the above-mentioned factors and load bearing assessment of health facility roof as well. The supporting structure will need to be designed adequately to avoid any damage during the wind storms;
- Lead/acid/cadmium-based batteries will not be procured for solarization;
- Ensure panels are treated with anti-reflective coating which reduces the sun's reflection from PV panels;
- Ensure that no waste material left behind after the completion of work;
- The Contractor will be made responsible to repair any damaged caused by the construction activities.

5.1.1.10 Gender Base Violence/ Sexual Exploitation and Abuse/Sexual Harassment

Risk of gender-based violence may arise due to the presence of labor from outside (although influx of workers will be minimal), new workers (outside of their social spheres) may form close social relationships with local communities, conflicts with locals, increased illicit behavior and crime. This can lead to unacceptable and/or illegal behavior, ranging from unwanted aggressive advances, SEA/SH against women and children. The presence of construction personnel/workers in the local community will escalate the risks of gender-based violence (GBV) and harassment. As most of the selected THQs are in populated areas surrounded by residential Houses. As a cultural and societal norms privacy issues may arise in the adjacent communities which can lead to discontent, violence and conflict among the workers and residents. This impact could be moderate impact.

Mitigation Measures

- Ensure the compliance the labor management procedure prepared separately for this project.
- The camp layout plan and workers' code of conduct will be prepared by the contractor and will be submitted for review and approval by the Engineer, the sample Worker's code of conduct is attached as **Annexure-G.** Project staff (skilled and unskilled) will sign the code of conduct before commencement of civil works, describing acceptable and prohibited behaviors and communicated through training and publicized;
- The establishment of temporary housing for workers onsite will be discouraged. The contractor will rent out a room/place for outside workers away from the construction site.
- The use of language or behavior, towards women or children, that is inappropriate, harassing, abusive, sexually provocative, demeaning or culturally inappropriate will be prohibited.
- It will be captured in the Contractors' Clauses for selected contractors to recruit local labor and practicable to minimize the chances of GBV/SEA and harassment. Provision related to SEA/SH or GBV will be incorporated in the bidding document A separate SEA/SH Action Plan will also be prepared and implemented.
- Service providers will be identified and mapped to address SEA/SH issues;
- The exchange of money, employment, goods, or services for favors or other forms of humiliating, degrading or exploitative behavior will be prohibited.
- Ensure effective implementation of GRM to timely address the issues.
- Training/orientation sessions will be conducted to sensitize PMU and the Contractor's staff/workers on the importance of addressing GBV/SEA/SH risks at the project level.
- The communities will be consulted as well as informed about the construction timings in advance.

- If privacy of the nearby households is affected, the Contractor will make some fence/screen arrangements for the households.
- Contractor will warn the staff strictly not to involve in any un-ethical activities and to obey the local norms and cultural restrictions particularly with reference to women.

5.1.1.11 Discrimination against vulnerable groups and social exclusion

Discrimination against vulnerable groups particularly in the hiring process of workers might be an issue. Additionally vulnerable groups, may be excluded from stakeholder consultations, particularly in remote and underserved areas limiting their ability to provide feedback on project design and impacts, and potentially preventing them from fully benefiting from the project. This impact substantial adverse.

Mitigation Measures

- Contractors will implement a fair and equitable hiring process.
- Where possible the employment of vulnerable groups will be encouraged.
- Employment opportunities will be provided to individuals residing near the project site, aiming to enhance social benefits through the recruitment of local residents.
- The wages offered to all staff will be in line with labor laws or higher set standards, which shall be competitive in all categories of workers.
- Mapping and engaging stakeholders, including vulnerable groups at the start of the design process and obtaining their feedback about project interventions;
- Ensure the implementation of the SEP and GRM.
- Conduct targeted consultations with vulnerable groups.
- Provide job training and job opportunity
- Ensure culturally appropriate grievance handling.

5.1.1.12 Risk of Security staff

In certain areas security concern exists due to law-and-order situation and presence of dacoits etc. There is a need that proper security be provided to all personals working on the project. This could be moderate impact.

Mitigation Measures

- Contractor will provide appropriate security personnel (police/home guard or private security guards) and enclosures to prevent unauthorized entry into the camp area. Security of security staff is very important to protect the personal as well as the camp site Mitigation measures
- Contractor will hire local personals for security purpose
- Inform the current station house officer (SHO) regarding the camp site and security guard information.
- Inform the district health officer about the staff which will hired by contractor
- Inform the local elders about the security personal
- Health facility in charge will be overall responsible to the safety of all construction activities.
- Contractor will ensure that if any thread received by security staff should be inform to concerned authorities timely.
- Brief Security management Plan is attached in **Annexure-H.**

5.1.1.13 Forced and Child Labor

There is a risk that child labor and forced labor may be used during the implementation of the project. This includes indentured labor, and hiring of under age children. These risks are likely to be higher in economically disadvantaged and remote areas. The impacts are assessed as moderate adverse.

Mitigation Measures

- Contractors will be prohibited from hiring children below the age of 14 for any type of labor, and below the age of 18 for hazardous work. Contractor through contractual agreement will be bound to follow the provincial labor laws (Sindh Prohibition of Employment of Children Act 2017) and World Bank requirements during hiring the labor force;
- Project staff will monitor sites to check for child labor and will hold regular consultations to keep a check on forced labor at subproject sites. Workers will be required to provide legally recognized documents, such as a Computerized National Identity Card (CNIC), to verify their age at the time of hiring.
- Awareness will be created among the local communities and project staff about the adverse impacts of child labor. Contractors will be required to follow the LMP with regard to contracts and terms of employment for labor;
- Beneficiaries and primary suppliers will be made aware of the provincial labor laws and World Bank regulations regarding child/forced labor.

5.1.2 Operational Issues

During operation stage social issue may raise like gender-based violence/ Sexual exploitation/ sexual harassment in the health facility by staff or patients will visit the health facility. Health facility staff may misuse the sensitive data also, occupational health and safety, cold chain management for vaccine and generation of wastes. The impacts are assessed as moderate to substantial adverse.

Mitigation Measures

- Ensure the presence of qualified female staff at all the health facilities in order to interact with females accompanying the children for health checkups;
- Sensitization of health facilities and staff on privacy and gender issues. Ensure the implementation of SEA/SH Action Plan.
- Ensure compliance with Sindh Occupational Safety and Health Act, 2017, Sindh Hospital Waste Management Rules, 2014, and compliance with SEQS, 2016.and World Bank Group Environmental, Health, and Safety Guidelines for Health Care Facilities;
- Ensure the provision of fire prevention and firefighting equipment at health care facilities;
- Ensure the provision of appropriate PPEs to health service providers and sanitary workers;
- Ensure the compliance with the GRM.
- Cold chain management, in accordance to the National Expanded Program on Immunization (EPI) Policy and Strategic Guidelines shall be ensured at all levels.
- Regular maintenance of the septic tank and sewer line.
- Proper waste segregation, storage and disposal will be done at the facility level.
- For health care waste management, a separate health care waste management plan (HCWMP) has been developed which guides on the handling of infectious waste.

5.2 Potential Positive Impacts

a. Taluka headquarter hospitals often offer maternal and child health services, including prenatal care, postnatal care, and child vaccinations. These services help improve maternal and child health, leading to reduced maternal and infant mortality rates.
b. Rehabilitation work will provide an improved Health Care environment that will Taluka headquarter hospitals are embedded within the local community, fostering a sense of trust and familiarity. This community-based care approach encourages people to seek healthcare without fear or hesitation.
c. Implementation activities will have a positive impact for the local economy, particularly regarding job creation (labor for rehabilitation works, maintenance and monitoring).
d. Civil works will have some impacts on the local economy and income generation; While this additional employment and economic growth may be limited to the construction stage, the civil works in THQs will contribute to an increase in diversified skills base through skills and technology transfer and collective business acumen of the locality, which will have secondary benefits in the long term.
e. Creation of job opportunities for the locals. At the Rehabilitation phase, it will generate opportunities for increased employment (local artisans and laborers in the district where facilities will be built) and business growth for local communities (boost in trade of construction materials and goods and services for the contractor and contractor's employees).
f. An estimated 35~40 laborers will be employed at each THQs location. Employment and incomes for these people could have ramifying positive effects.
g. Overall, THQs have a transformative impact on the local population by enhancing healthcare access, promoting preventive care, and addressing health needs at the community level. They are an integral part of the healthcare system, fostering healthier communities and contributing to overall population well-being.
h. The provision of solarization of the THQ could have positive impact for the medical staff as well as the patients those visit the health facility to avail the electricity facility during the stay at health facility also very much beneficial for the medicines in the refrigerator.

6. Environmental and Social Management and Monitoring Plan (ESMMP)

This chapter presents the Environmental and Social Management and Monitoring Plan (ESMMP) which details the mitigating measures that will be implemented to avoid or minimize the potential adverse impacts of the project and the monitoring plan to monitor and evaluate the effectiveness of the actual implementation of the mitigating measures. This chapter summarizes the mitigation, monitoring requirements, institutional arrangement monitoring and measures to be taken during the implementation and implementation budget.

6.1 Key Steps for Environmental and Social Management

- Information disclosure and stakeholder consultations as per guidance provided in the SEP.
- Inclusion of ESMP in bidding documents/ agreements to bound the Contractor for compliance.
- Implementation of mitigation measures provided in this ESMP by the E&S staff/Focal Persons (FPs) of PMU at Headquarter, district and field level and monitoring the compliance.
- Sufficient budget should be allocated in the BOQ under a separate budget head for the effective implementation of mitigation measures.
- Strengthening and capacity building through trainings/awareness sessions/workshops of the E&S staff.
- Information pertaining to implementation of mitigation measures adopted should be reported in detail in the progress reports.
- Roles and responsibilities of key players involved in the implementation of ESMP should be defined.

6.2 Institutional arrangements

Project Management Unit (PMU)

The PMU is responsible for civil works technical aspects and associated activities. The SIHPP PMU have an overall supervisory role in the implementation of the project and has as part of its team an Environmental Specialist, Social Specialist (also acting as Gender focal person) who will oversee the environmental, social and health and safety aspects of the project. At the provincial level, the PMU will oversee activities, while at the district level, the PMU has nominated an E&S focal person to manage and monitor E&S activities under the supervision of the PMU team.

The Environmental and Social Specialists of the supervision consulting firm (EDQSA) will also support the PMU in implementation of this ESMP. The E&S monitoring Checklists shall be used to monitor the implementation (Sample attached as **Annexure I).**

The Environmental & Social Specialists will ensure that the ESMP are adhered to where applicable, that the contractors comply with the requirements of the Environmental mitigation measures to be issued by the SEPA, and that the Contractor prepare and implement Contractor's Environmental and Social Management Plan. The Environmental & Social Specialists will report to the Project Director and Deputy Project Director.

The E & S Specialists will support and ensure that ESMP training and capacity building plan for all the sites is prepared by the contractor and that the training activity is a pre-requisite for THQs construction any form. This will include making sure that the firm has also developed training manuals which will also be reviewed and approved by the PMU and World Bank.

The Environmental and Social Specialists will conduct random visits to multiple sites and will also visit specific sites if any significant concerns may be raised. In addition, the supervision consultant's Environmental and Social (E&S) staff will be responsible for ensuring compliance with all environmental, social, health, and safety (ESHS) requirements across the project sites. EDSQA designated E&S staff will visit and monitor each site once a month and contractor's designated staff will be available on each site to ensure the compliance of E&S aspects. The Environmental andSocial Specialists of the PMU will conduct unannounced visits as well as joint visits with the EDSQA and Contractor'sHSSE Personnel. The subproject implementation framework responsibilities are indicated in Table 6-1.

Table 6-1: Project Implementation Framework Responsibilities

S.N.	Position	Responsibilities
1	Project Management Unit (PMU)	• Overall supervisory role in the implementation of the project. • Supervision of the selected consulting firm on the implementation of ESMP. • Review of Environmental and Social safeguards compliance Reports prepared by PMU E&S team. • Confirmation of the scope of construction works for each of the selected THQs. • Monitoring of civil works • Engage other specialists and/or firms to carry out external monitoring as third-party validation.
2	Environmental Specialist, Social / Gender Specialist (PMU Staff)	• Oversee the environmental, social and health and safety aspects of the project. • Ensure that the local/ regional legal (including SEPA) and World Bank E&S requirements are adhered to and comply with. • Ensure project activities do not fall under the Exclusion List. • Ensure that EDSQA ToRs include provision of Environmental and Social impacts mitigation plan/strategy. • Ensure that bidding and contract documents include all relevant E&S requirements. • Monitoring of ESMP implementation through site visits • Capacity building of the staff of PMU, field staff, contractors and consultant who will be responsible for implementing the ESMP. • Conduct regular site visits and coordination with the supervision firm and the contractor for smooth and effective implementation of E&S aspects. • Stakeholder consultations as per the guidelines outlined in the SEP. • Review of plans and reports submitted by the supervision firm. • Preparation of quarterly environmental monitoring reports and submission to the WB. • Notify the World Bank within 48 hours of any serious incident related to the project that may significantly impact the environment, communities, the public, or workers. The Incident Reporting Form is attached as an **Annexure- J.**

3	Engineering Supervision Design Quality & Assurance (ESDQ&A)	• Supervision of project interventions for compliance of ESMP requirements through identified and trained E&S staff. • Ensuring that the day-to-day construction activities are carried out in an environmentally and socially sound and sustainable manner. Inform the E&S specialists-PMU of any conflict and E&S related matters. • Carry out regular site visits and meetings with the contractor and PMU. • Review of interim payment certificates IPCs submitted by the contractor and submit report to PMU. • Preparation of quarterly environmental monitoring reports and submission to the SIHPP- PMU. Progress reporting to PMU. • The Supervision consultant firm has to deploy one Environmental and Social Expert at District/divisional level. • To organize periodic E & S training programs and workshops for the relevant E & S staff including PMU and contractor. • Suggest any additional mitigation measures (if required)
4	The Contractor	• Comply with the project's environmental and social mitigation measures, management procedures, and guidelines outlined in the ESMPs, LMP, contract documents, and relevant local legislation, including SEPA's requirements. • Take all necessary measures to protect the health and safety of workers and community members, and avoid, minimize, or mitigate any environmental harm resulting from project activities. • Prepare and implement the Contractor's Environmental and Social Management Plan with the support/consent of E&S staff of PMU and the guidelines provided in the ESMP. The Contractor will submit CESMP to the supervisory firm and SHIPP PMU within 28 days of contract signature for approval prior the commencement of works. • Prepare a Code of Conduct for its workers written in simple language URDU AND SINDHI. Once understood and accepted the code shall be signed by all workers onsite. • Conduct training of workers in health, safety, and environment requirements, including health and safety induction prior to commencement of work onsite and regular toolbox sessions. • Liaise with the SHIPP PMU Environmental and Social Specialist and Supervisory Firm Environmental, Health and Safety Personnel on compliance. • Conduct site inspections, audits, and permanent supervision at the construction site to ensure adequate and timely implementation of, and compliance with the Contractor's ESMP. The template for contractor's ESMP is attached as **Annexure- K**. • Address any grievances of stakeholders. • Monthly Report on environmental, social, health and safety compliance; and • Oversee the clean-up and decommissioning of the site on the completion of works. • The contractor has to deploy one Environmental & Social and one Health and Safety Specialist at Division level. • The contractor has to deploy one Environmental, Social and Health & Safety Officer at District level.
5	Third party validation	• Independent third-party monitors will be responsible for ensuring monitoring the project compliance with the all environmental and social requirement

		• To make sure that responses to incidents are handled effectively.

6.3 Impacts Mitigation Monitoring Plan

Environmental and Social mitigation and Monitoring Plan, provided in Table 6-2 will be used as the management tool for mitigation measures. The plan includes the envisaged impacts and their recommended mitigation measures and; the person/organization directly responsible for adhering to or executing the required mitigation measures and suggest frequency of monitoring the mitigation measures. Detailed E&S impacts and mitigation measures have been provided in Chapter 5.

Table 6-2: Environmental and Social Management & Monitoring Plan (ESMMP)

Sr. No.	Parameters	Environmental and Social Impacts	Mitigation Measures	Frequency	Implementing Agency	Monitoring Agency
Rehabilitation Phase						
1.	Rehabilitation of THQs	Air quality Impacts (Dust and Exhaust emissions)	• Construction equipment and machinery will be serviced regularly. • The material stockpiles and access roads will be watered as and when required. • Construction vehicles carrying materials will be covered with tarpaulin sheets. • Speed limits will be imposed on all vehicles at the worksite. Unnecessary movement of vehicles will be avoided. • Fugitive dust emissions will be minimized by appropriate methods such as spraying water where required and installing dust screens where necessary. • Regular air monitoring will be carried out near the sensitive receptors. • Open burning of solid waste shall be strictly prohibited • Raw materials such as cement, gravel and sand will be kept under sheet covers. The height of material stockpiles will be minimized. • Selection of activities that may create dust will be undertaken early in the morning or in the afternoons after school timings.	Weekly	Construction Contractor	EDSQ&A/PMU E&S team/ Third party
		Noise generation	• Construction equipment and machinery will be serviced regularly. • As much as possible, construction activity will be restricted to daylight hours; potential noisy activities will not be allowed outside of normal working hours.	Weekly	Construction Contractor	EDSQ&A/ PMU E&S Team / Third party

			• Machinery and generators will be equipped with well-functioning mufflers • Nearby dwellers and communities will be notified prior to any typical noise events. • Adequate PPEs will be provided to workers such as hearing protection. • Regular noise monitoring will be carried out. • Awareness sessions will be conducted with workers and nearby community to raise the awareness about the noise pollution, its health impacts and mitigation measures.			
		Traffic Impacts	• The Contractor will restrict truck deliveries, where practicable, to day time working hours. • Storage of material outside the designated area will be prohibited. • Suitable signboards will be placed at strategic locations of the access road. • The Contractor will restrict the transport of oversize loads. • If community access is hindered, the option of alternate routes will be used. • Contractor will prepare the Traffic Management Plan (TMP) as a part of Contractor ESMP.	Weekly	Construction Contractor	EDSQ&A/ PMU E&S Team / Third party
		Occupational Health and Safety	• An occupational Health and Safety Plan will be included in the Contractor's site specific ESMP. • Labor Management Procedures (LMP) has been developed for the project and will be followed to mitigate the OHS risk.; • Ensure the compliance with World Bank Group EHS guidelines and Sindh occupational Safety and Health Act, 2017.	Daily	Construction Contractor	EDSQ&A/ PMU E&S Team / Third party

			• Appropriate level of training will be provided to workers. Workers with inadequate training will not be allowed to operate vehicle / machinery. • SOPs will be prepared for high-risk activities such as working on heights, erecting and using scaffolds and using ladders. • Safety signs will be installed at the entrance to and around the site. • All safety related incidents will be documented including all illness/injury, exposures, and near misses. • All incidents /accidents will be investigated, recorded, reported and Root Cause Analysis (RCA) for fatal incidents will be done. • Emergency response measures will be provided onsite including posting of Emergency Contacts, provision of first aid kits, provision of emergency transport vehicle, designating of a muster point, provision of fire extinguishers/sand buckets, provision of spill clean- kits, etc. workers will be provided first aid training. • The contractor will establish a MOU with the nearest ambulance service provider. • Proper site sanitation and housekeeping will be maintained on construction sites. • Toolbox Talk (TBT) with workers shall be held regularly before the start of work. • In case of an incident involving injury, the injured will be taken to the nearest medical facility after providing necessary first aid. • Provision of clean drinking water will be			

			ensured for the project workers. • Appropriate and high-quality PPE and safety gear for workers such as gloves, vests, safety shoes, masks etc., will be provided and their use will be strictly enforced. Training will be provided in the use of PPE. • The contractor will designate an OHS focal person at each site to ensure the plan's effective implementation. • Compliance of emergency response plan as provided in **Annexure-L.**			
		Community health and Safety	• Mitigation measures will ensure compliance with the World Bank Group Environment, Health, and Safety (WBG EHS) Guidelines, including but not limited to the following: • The construction site will be appropriately fenced or cordoned off to prevent stray animals and people, including communities, residents, from straying on to the site. • Where the public could be exposed to danger by any of the site activities, the Contractor will as appropriately provide suitable measures such as, but not limited to, barricading of construction area. • Excavated areas and pits will be marked with appropriate signage. • Awareness sessions will be organized to sensitize construction workers and local communities. • The free flow of traffic around the work site will be maintained. Trucks or other construction equipment will not be left standing on the roadway or shoulders.	Daily/Weekly	Construction Contractor	EDSQ&A/ PMU E&S Team / Third party

			• A Traffic Management Plan will be prepared and implemented by contractor. Traffic Management Guidelines as provided in **Annexure-M.** • Vehicles accessing the site will follow speed limits and other traffic rules. • Drivers will be trained on safety requirements and exercise caution. • Ensure effective implementation of GRM to timely address the issues faced by the community. • As much as possible, delivery of construction materiel and equipment will be timed to coincide with off-peak traffic hours. • Storage of material outside the designated area will be prohibited. • If community access is hindered, alternate routes will be provided. The contractor will inform the public of the date and time of activity well before start of work. • No limited transportation of construction material during school hours. • A safety procedure and protocol will be developed for vacating children away from activity when materials arrive. • Ensure effective implementation of GRM to timely address community issues; • Potential of communicable disease during construction phase, like Sexually-Transmitted Disease (STDs) such as HIV/AIDS, will be prevented by health awareness; education initiatives; training; immunization program and providing health service;			

			• Contractor will take due care of the local community and observe sanctity of local customs and traditions by his staff.			
		Solid waste generation	• Waste Management Plan will be included in the Contractor's site specific ESMP. • Adequate waste collection receptacles will be provided. • Burning of waste material will not be allowed. • Waste will be regularly removed from the site and taken to the dump site for disposal, with the consent of the Engineer. • Adequate toilet facilities will be provided based on the number of workers. • A treatment system for wastewater from toilet facilities will be provided (provision of soak pit and septic tank or link with exiting draining system). • If hazardous waste is generated onsite the waste will be carefully collected and removed from site and disposed of in an approved manner. • Organic waste will be disposed of through the municipal waste disposal system. • Excess earth material will be used in landscaping, • The site will be restored to its environmental status once all works are completed. • Segregation and reuse or recycling of all the wastes will be ensured. • Equipment washout will be discharged in a manner that avoid contaminating any nearby water course or natural water	Daily	Construction Contractor	EDSQ&A/ PMU E&S Team / Third party

			bodies. • The contractor will be required to provide separate toilets and ablution facilities for construction workers. • Solid wastes entering waterways will be prevented by collecting solid waste, oils, and wastewaters where possible and transport to an approved waste disposal site. • Training will be provided to all personnel in waste management practices and procedures. • Resource conservation themes to be included in awareness raising and training sessions for project staff.			
		Spills and Contamination	• The Contractor will avoid the storage of significant quantity of fuel onsite. • Any fuel storage will be done within a contained impervious area with all the safety systems in place. • Contained area will be drained through an oil-water separator or be covered to prevent accumulation of rainfall. • Storage containers will be labeled as to their content and capacity. • Warning signs will be installed in storage areas, such as 'Flammable' and 'No Smoking'. • Workers will be made aware of the proper handling practices to avoid spills. • Spill clean-up kits to be provided. • Regular maintenance of machinery will be conducted to avoid unnecessary leaks.	Daily Monitoring	Construction Contractor	EDSQ&A/PMU E&S team/ Third party
		Installation of Solar Panel	• Only shortlisted/pre-qualified service providers should be hired for the supply of solar systems;	Regular	Construction Contractor	EDSQ&A/PMU E&S team/

			• The technical design for installation of solar panel will consider E&S factors and load bearing assessment of health facility roof. • The supporting structure will be designed adequately to avoid any damage during the wind storms; • Lead/acid/cadmium-based batteries will not be procured for solarization; • Ensure panels are treated with anti-reflective coating which reduces the sun's reflection from PV panels; • Ensure that no waste material left behind after the completion of work; • The Contractor will repair any damage caused by the construction activities.			Third party
		Gender based Violence/ Sexual Abuse & Exploitation/ Harassment	• Ensure the compliance to the labor management procedure prepared separately for this project. • The camp layout plan and workers' code of conduct will be prepared by the contractor and will be submitted for review and approval by the Engineer. Project staff will sign the code of conduct before commencement of civil works; • Establishment of temporary housing for workers onsite will be discouraged. The contractor will rent out a room/place for outside workers away from the construction site. • The use of language or behavior, towards women or children, that is inappropriate, harassing, abusive, sexually provocative, demeaning or culturally inappropriate will be prohibited. • Recruitment of local human resource, as much as it is available and practicable,	Daily Monitoring	Construction Contractor	EDSQ&A/PMU E&S team/ Third party

			will be in the Contractors' Clauses to minimize the chances of GBV/SEA and harassment. Provision related to SEA/SH or GBV will be incorporated in the bidding document. • A separate SEA/SH Action Plan will also be prepared and implemented. Service providers will be identified and mapped to address SEA/SH issues; • The exchange of money, employment, goods, or services for favors or other forms of humiliating, degrading or exploitative behavior will be prohibited. • Ensure effective implementation of GRM to timely address the issues. • Training/orientation sessions will be conducted for PMU and Contractor's staff on GBV/SEA/SH risks at the project level. • The communities will be consulted as well as informed about the construction timings in advance. • If privacy of the nearby households is affected, the Contractor will make some fence/screen arrangements for the households. • Contractor will warn the staff strictly not to involve in any un-ethical activities and to obey the local norms and cultural restrictions particularly with reference to women.			
		Discrimination against vulnerable groups	• Contractors will implement a fair and equitable hiring process. • Where possible the employment of vulnerable groups will be encouraged. • Employment opportunities will be provided to individuals residing near the	Daily Monitoring	Construction Contractor	EDSQ&A/PMU E&S team/ Third party

			project site, aiming to enhance social benefits through the recruitment of local residents. Employment opportunities for people living close to the project site will be provided in order to increase social benefits by targeting recruitment of local people. • The wages offered to all staff will be in line with labor laws or higher set standards, which should shall be competitive in all categories of workers. • Mapping and engaging stakeholders, including vulnerable groups at the start of the design process and obtaining their feedback about project interventions; • Ensure the implementation of the SEP and GRM.			
		Risk of Security staff	• Contractor will provide appropriate security personnel (police/home guard or private security guards) and enclosures to prevent unauthorized entry into the camp area. Security of security staff is very important to protect the personal as well as the camp site Mitigation measures • Contractor will hire local personals for security purpose • Inform the current station house officer (SHO) regarding the camp site and security guard information. • Inform the district health officer about the staff which will hired by contractor • Inform the local elders about the security personal • Health facility in charge will be overall responsible to the safety of all construction activities.	Monthly Monitoring	Construction Contractor	EDSQ&A/PM U E&S team/ Third party

			• Contractor will ensure that if any thread received by security staff should be inform to concerned authorities timely.			
		Forced and Child Labor	• Contractors will be prohibited from hiring children below the age of 14 for any type of labor, and below the age of 18 for hazardous work. Contractor through contractual agreement will be bound to follow the provincial labor laws (Sindh Prohibition of Employment of Children Act 2017) and World Bank requirements during hiring the labor force; • Project staff will monitor sites to check for child labor and will hold regular consultations to keep a check on forced labor at subproject sites. Workers will be required to provide legally recognized documents, such as a Computerized National Identity Card (CNIC), to verify their age at the time of hiring. • Awareness will be created among the local communities and project staff about the adverse impacts of child labor. Contractors will be required to follow the LMP with regard to contracts and terms of employment for labor; • Beneficiaries and primary suppliers will be made aware of the provincial labor laws and World Bank regulations regarding child/forced labor.	Daily Monitoring	Construction Contractor	EDSQ&A/PMU E&S team/ Third party
		Chance Findings of Important Physical and Cultural Resources	• The project sites will be screened for the presence of physical cultural resources prior to commencement of construction and rehabilitation work. • Ensure the compliance with the chance find procedure.	Daily Monitoring	Construction Contractor	EDSQ&A/PMU E&S team/ Third party

		Land Acquisition	• The reconstruction activities will take place on government-owned land; therefore, land acquisition and involuntary resettlement are not anticipated. Furthermore, no voluntary land donation is involved for these THQs. Site surveys confirm that there are no informal settlers on the selected THQ sites.		Construction Contractor	EDSQ&A/PMU E&S team/ Third party
Operation Phase						
1	Environmental Impacts	Solid Waste generation	• For health care waste management, a separate health care waste management plan (HCWMP) has been developed which guides on the handling of infectious. HCWMP is attached as **Annexure-N**. • Proper waste segregation, storage and disposal will be done at the facility level. • Waste Adequate waste collection receptacles will be provided. • Ensure compliance with Sindh Occupational Safety and Health Act, 2017, Sindh Hospital Waste Management Rules, 2014, and compliance with SEQS, 2016.and World Bank Group Environmental, Health, and Safety Guidelines for Health Care Facilities • Waste will be regularly removed from the site and taken to the dump site for disposal. • Waste will not be allowed to accumulatein significant quantities and should be consolidated in a designated area. • Health Workers will be made aware of the waste management procedures.	Monthly	PMU's Implementation Partner i.e. PPHI.	PMU
		Liquid Waste Generation	• Suitable toilet facilities will be provided at THQs. • Train to Health workers to prevent and respond to spills of construction materials,	Monthly	PMU's Implementation Partner	PMU

			fuels, and chemicals promptly. • Regular maintenance of the septic tank and sewer line will be carried out for safe disposal of wastewater. • Dispose of liquid waste in compliance with local regulations and permits. Never dispose of chemicals, oils, or other hazardous substances into storm drains or natural water bodies. • Implement industry-recognized best management practices to minimize the impact of liquid waste on the environment. These may include coverings for stockpiles, dust control measures, and proper storage of medical materials. • Properly store, handle, and dispose of chemicals and materials to prevent them from entering water bodies.		i.e. PPHI.	
		Health and Safety	• Ensure the provision of fire prevention and firefighting equipment at health care facilities. • Ensure the provision of appropriate PPEs to health service providers and sanitary workers. • Cold chain management, in accordance to the National Expanded Program on Immunization (EPI) Policy and Strategic Guidelines shall be ensured at all levels and ensuring that the cold chain does not contain Ozone Depleting substances.	Weekly Monitoring	PMU's Implementation Partner i.e. PPHI.	PMU/E&S team
2	Social Impacts	Gender based Violence/ Sexual Abuse & Exploitation/ Harassment	• Sensitization of health facilities and staff on privacy and gender issues. Ensure the implementation of SEA/SH Action Plan. • Code of Conduct for Health Workers will be followed • The use of language or behavior, towards women or children, that is inappropriate,	Weekly Monitoring	PMU's Implementation Partner i.e. PPHI.	PMU/E&S team

			harassing, abusive, sexually provocative, demeaning orculturally inappropriate shall beprohibited. • The exchange of money, employment, goods, or services for favors or other forms of humiliating, degrading or exploitative behavior shall be prohibited. • GRM information shall be disseminatedso community is aware of the mechanism available for any complaints or grievances pertaining to SEA/SH • Ensure the compliance with the GRM			
		Social conflict	• Availability of Grievance Redressal mechanism • Discussion with community in consultation meetings	Weekly Monitoring	PMU's Implementation Partner i.e. PPHI.	PMU/E&S team

To ensure that the E&S compliance is documented a reporting mechanism will be established. Monthly progress meetings are expected to be held at which HSSE matters will be reported on and discussed. In addition, reporting will be done by the SIHPP PMU, Engineering Design Supervision Quality & Assurance Supervisory (EDSQA) Firm and the Contractor.

6.4 Role of SIHPP PMU

A quarterly Environmental and Social Compliance Report will be prepared by the Environmental andSocial Specialists, documenting the status of compliance, areas of non-compliance, corrective actions recommended, and other improvements required. This report will be submitted to the World Bank ona quarterly basis the reporting mechanism is explained in Reporting Mechanism below.

Table 6-3: Reporting Mechanism

Report	Contents	Prepared by	Submitted to
Monthly ESMP compliance Monitoring Report	ESMP Compliance Physical Progress Report including observations, corrective actions taken, incident/accident reporting, grievances redressal status	E&S safeguard officer of EDSQA/ construction contractor	E&S team PMU
Quarterly Safeguards Compliance Monitoring report	Quarterly progress of the physical E&S activities undertaken, corrective measures taken, compliances from the previous & current period, incidents/accidents reporting, grievances status, plan for the next quarter, capacity building	E&S Specialist PMU	PD/DPD and onward sharing with WBteam
Project Completion Report.	describing the final status of compliance with the E&S risk management measures and submit it to the World Bank	PMU	WB

6.5 Capacity building

The principal objective of the training course is to ensure the sound and sustainable implementation of the ESMP. A successful implementation of ESMP will require comprehensive training and demonstrations. These workshops will focus on identifying and discussing environmental and social issues that will arise during the implementation of this ESMP. These will also sensitize participants about environmental and social obligations under the ESMP, managing the each THQs site relevantproblems, and strategizing implementation of this ESMP activities. E&S team at the PMU will executethe training programs on each THQs construction working site. Training reports will be developed forthe training session conducted. Plan for E&S safeguards training is explained below in table 6-4.

Table 6-4: Plan for E&S Safeguards Training

Description	Aspects to be Covered	Participants	Responsibility	Frequency
ESMP	Objectives and use of ESMP Legal requirement of E&S Management of E&S Monitoring mechanism and Reporting mechanism	District level Health officers, PPHI DMs, construction contractor andfield staff	E&S team PMU	At the start of THQs construction activities Refresher afterwards as and when required/ Quarterly.
Construction related E&S issues	GRM Monitoring	Local Community Councils	E&S team PMU	At the start of THQs construction Activities Refresher afterwards as and when required/ Quarterly.
Construction related E&S issues	Management of waste, air, and water quality atsite, OHS and GRM ● Code of conduct/ Behavioral Standards ● Safe and defensive driving ● Management of hazardous substances ● Housekeeping, hygiene and waste disposal and pollution prevention and control ● Handling and management of E-Waste ● Healthcare waste management ● Labor Management Procedures ● Occupational Health and Safety ● Emergency Response Preparedness ● Community Health and Safety Grievance Redress Mechanisms	Contractorworkers E&S FPs at Field Level, Project Workers, health department staff, and health facility staff other project staff (as a capacity building measures). ,	Contractor E&S staff E&S staff-PMU Supervision Consultant	Monthly during construction works Prior to initiation of project activities and then conducted periodically throughout project implementation.

6.6 Cost of Implementation

Separate estimated budget of 4,858,000/= has been allocated for the implementation of the ESMP for each THQ, which will be the part of BOQ.

Cost for Environmental Social Management Plan (ESMP) for rehabilitation of 15 THQs

Table 6-5: Cost for ESMP for rehabilitation of 15 THQs

S No.	Description	Qty	Frequency	Unit	Rate (Rs)	Amount for one THQ (Rs)	Amount for 15 THQs (Rs)	Remarks
Trainings & Reporting								
1	Training workshops for PMO, CSC, Contractors & Others (labor) on different topics, HSE, PPES, GRM, SEA/SH/ etc.	10	Once every month for period of 10 months	No.				
2	Consultations, Reporting & Communication	10	Once every month for period of 10 months	No.				A standalone SEP has also been prepared for the project.
Environmental Monitoring								
3	Ambient Air Quality Monitoring (24 hrs.)	10	Once in pre-construction period, quarterly during construction period (4)	No.				
4	Noise Monitoring Meter (for PMO/ CSC)	6	Procured to conduct noise monitoring on site at intervals	No.				
5	Drinking Water Quality Monitoring, monthly during construction, conduct the water testing in presence of consultant representative with due protocols, form approved lab, and submission of water quality test report on every month.	10	Once before commencement of work and once in a month during rehabilitation period,	No.				

6	Waste Water Quality Monitoring, monthly during construction, conduct the water testing in presence of consultant representative with due protocols, form approved lab, and submission of water quality test report on every month.	10	Once in a month during rehabilitation period,	No.				
Operational Expenses								
7	Personal Protective Equipment's including; ear muffs, safety shoes, masks, gloves, safety helmets, safety vests, warning tapes and safety signage	10	-	Month				
8	Divergence Equipment's including; Jarsy Barriers, Safety Cones, Hard barricades	10	-	Month				
9	Medical masks, sanitizers and soaps (kit per head)	10	-	Month				
10	First aid box (2), quality first aid medicines containing antibiotics and other seasonal medicine for seasonal diseases, flue, fever and scabies etc, and temperature gun/ infrared thermometers	10	-	Month				
11	Fire Fighting Equipment purchase and monthly refilling	10	-	Month				
12	No any Plant will be cut due to sub project activities, However 15 plants will be planted at THQ	225		No.				Tree plantation will be carried as per 1:5 and where no tree cutting will involve, 10 trees will be planted.
13	Health & Hygiene including; provision of waste collection bins, cleaning of site and dormitory areas, use of disinfectants and solid waste management	10		Month				
Total Amount of ESMP Rs.								

Note:

The contractor has to deploy one Environmental, & one Social and One Occupational, Health and Safety Specialist at Division level. The Cost of these three (3) specialists will be included in overall project cost-staff requirement in key personals of bidding document.

- The contractor has to deploy one Environmental, Social and Occupational Health & Safety Officer at District level. The Cost of each district officer will be included in overall project cost-staff requirement in key personals of bidding document
- The Contractor shall nominate one focal person as the GR Officer and one site supervisor/engineer to serve as the E&S focal person at each active site

7. Grievance Redressal Mechanism (GRM)

The Grievance Redress Mechanism (GRM) is an institutional arrangement to provide an avenue to Project stakeholders to address all type of grievances related to the Project. The GRM defines grievance as any formal communication that expresses dissatisfaction about an action or lack of action, about the standard of service, works or policy, deficiency of service, works or policy of the program management and its implementation mechanism. The GRM is designed to be accessible, culturally appropriate, and understandable for all project stakeholders. Such a mechanism allows for trust-building between the implementers and beneficiaries, and could help prevent discontent, conflicts, and unrest arising from the project. Effective GRM gives an opportunity to the Project to implement a set of specific measures to ensure good governance and accountability, by improving the effectiveness of the program project activities, increasing transparency and managing / mitigating risks of the Program.

7.1 Objective of the GRM

The overall objective of the grievance resolution procedure is to ensure that grievances from stakeholders are handled in a systematic and transparent manner in order to promote mutual confidence and trust during all stages of the Project.

The Specific objectives of the GRM are as follows:

- Develop an organizational framework to address and resolve the grievances of individual(s) or community, fairly equitably and timely.
- To provide enhanced levels of satisfaction to the aggrieved.
- To provide easy accessibility to the aggrieved / affected individual or community for immediate grievance redress.
- To identify systemic flaws in the operational functions of the program and suggest corrective measures.
- To ensure that the program's operation is in line with its conception and transparency to achieve its goals for sustainability.
- To ensure effective implementation of the Project elements directly relevant to improving governance and accountability.

7.2 Composition of Grievance Redressal Committees

The following persons/committees have been identified for functionalization of the GRM. The details of composition of GRCs at each level.

1. **Grievance Redressal Committee at the PMU**
    a. The GRC at the PMU shall be headed by PD
    b. Two women members shall be part of GRC
    c. The GRC shall be represented by all key stakeholders from PMU and external members including representation from Health department, PPHI, etc. Details for the GRC members are provided in the subsequent sections.
    d. There shall be a GRM focal person at the PMU level whose job is to ensure that GRM procedures defined and followed as per planned. The prime responsibility to lead the GRM lies with the Social Safeguards and Gender Specialist. However, the Social Safeguard

and Gender Specialist may constitute a separate team, or delegate tasks to other persons as the need may arise.

2. **Grievance Redressal Committee at District Level**
    a. The GRC at the district level will address complaints referred to by the PMU GRM where resolution is beyond the scope of the program staff and required intervention of district level.
    b. Two women members shall be part of GRC
    c. There shall be nominated GRM focal person at each district. The GRM Focal person shall be nominated by the DHO of the District.
3. **Grievance Redressal Committee at site/Health Facility level**
    a. The GRC at the site/Health Facility level will address complaints received by local community and shared the status with district GRC on daily basis.
    b. Two women members shall be part of GRC

7.3 Grievance Registration Channels

The complaint registration procedure shall involve the following modes of access. The GRM will entertain the anonymous complaints also:

1. **Complaint Register:** A complaint register shall be present at every project site. It shall be the responsibility of every site GRM focal person to make daily inspection of the Complaint Register and sign the register at the time of inspection. The complaint register will be designed at the PMU.
2. **Complaint Box:** There shall be one visible complaint box at every project site. It shall be responsibility of every site GRM focal person to inspect the complaint box and forward the complaint to PMU after making entry in the complaint register, including updating it regarding the resolution or referrals.
3. **Phone Number:** It shall be responsibility of the GRM focal person at PMU to cell number (0304-144-8989) issued for the project and make it widely publicized as the "complaint number" for the project. The number must be managed by staff trained in accepting and logging complaints and must have female staff available for any complainant who wants to speak to a female.
4. **WhatsApp Number:** A similar number as the one mentioned above shall also be available on WhatsApp as well for quick conversation and/or exchange of any photographic evidence regarding a grievance/complaint. mail: It shall be responsibility of the GRM focal person to create one email ID, and make it widely publicized for the purpose or receiving Email Address:
5. **Web-Portal:** The project website shall have dedicated section/tab regarding Complaint Registration
6. Complaints may also be sent in writing by post/mail to the PMU-SIHPP at the following address: Office No. 120, Plot No. 180-C, Al Murtaza commercial lane 2, Phase VIII DHA, Karachi & Email: sgs@sihpp.gos.pk Engagement with the Complainant
7. Below are Complaint Channels as in Table 7-1.

Table 7-1: Complaint Channels

S.NO	CHANNEL	DETAIL
1.	What's App / SMS/ call	0304-144-8989
2.	Email.	sgs@sihpp.gos.pk
3.	Web-Portal	https://www.sihpp.gos.pk/grievance-redressal.php
4.	Office Address	Office No. 120, Plot No. 180-C, al Murtaza Commercial Lane 2, Phase VIII DHA, Karachi

Following the timelines stipulated in this document, the GRM focal person shall, after receiving the complaint, acknowledge to the complainant that their complaint has been received and provide a complaint number. The complainant shall immediately be informed about the tentative time of complaint resolution. This can be done through a feedback SMS, What's App message, email or any other mode found convenient by the GRM focal person.
Complaint resolution and will be closed after the follow-up and confirmation from complainant and on satisfactory closure.

The GRM within the project ambit will have provision for registering anonymous complaints, however, to ensure the legal basis, it is preferred that complaints are registered with proper identification of the complainants. Nevertheless, anonymous complaints will be treated equally importantly. Confidentiality is a fundamental aspect of the project and ensuring confidentiality and accountability is particularly critical in the case of GBV complaints.

7.4 Responsible Parties

Identification of entities and individuals responsible for addressing different types of grievances, including their roles and responsibilities are below, Terms of Reference (ToRs) for Grievance Redress Entities in the GRM. Grievance Reporting and Coordination Hierarchy and Details of responsible parties are provided in below Table 7-2.

Table 7-2: Responsible Parties

Individuals/Committee	Role & Responsibilities
PMU Focal Person for GRM	Ensure the notification of complaints to Grievance Redressal Committees (GRCs)
	Notification for the Focal persons at field level, preparation of training material and impart training sessions to human resource who are dealing with GR
	Development of a comprehensive GR Policy and operational mechanism covering the scope, mode of lodging grievances, mechanisms for timely redressal and an effective appellate and oversight mechanism in local language
	Distribution of the GR policy to all staff, beneficiaries, and potential users
	Development and distribution of grievance manual for staff
	Designing of processing steps for GRM, including, i) uptake, (ii) sorting, (iii) processing, (iv) following up, (v) verification/ investigation, (vi) assessing & reporting, and (vi) responding to complaints
GRCs	Ensure the confidentiality of complainants during the GRM process
	Engage the Government institutions and other relevant Stakeholders in Grievance resolution
	To define process and propose possible solutions for a specific Grievances within the designated timeframe from receipt of the Grievance
	Collaborate with Partner Institutions and other NGOs, CSOs and other entities to conduct outreach initiatives to increase awareness among Stakeholders as to the existence of the GRM and how its services can be accessed through the community engagement activities and communication wing of PMU, with special consideration (e.g., targeted messages, etc.) for women and the vulnerable groups
	Monitor and follow up to Grievance resolutions, as appropriate

ANNEXURES

Annexure-A: Environmental and Social Screening Checklist

SINDH INTEGRATED HEALTH AND POPULATION PROGRAM
ENVIRONMENT AND SOCIAL SCREENING CHECKLIST
THQ KANDIARO

A	**General Information**	
1	Subproject Location	**District: NAUSHAHRO FEROZE** **Taluka: KANDIARO**
2	Subproject Activities	The sub project activities included rehabilitation & upgradation of existing structure of Taluka head quarter (THQ) Hospital, including repair of the compound wall and iron gate, internal and external room walls, sewerage lines, roof ceiling plaster, flooring, painting, and electrical and plumbing fixtures and fittings.
3	Proposed Date of Commencement of Work	Subject to the finalization of relevant documents and procedures.
4	Important geographic / topographic feature (if any)	The Sub Project is located between 27.05413 Latitude and 68.21334 Longitude. It is bounded from the North by City, City in the South, City in the East and National Highway-5 in the West.
5	Important biological feature (if any)	Flora: 0 number of trees will be affected due to project construction activities Fauna: Birds, laughing dove, crow and there will be no impact on fauna due to project construction activities, and these are very common in rural area of Sindh.

B: Environmental Issues

Sr. No	Issues	No/Yes	Risk Level				Remarks/Mitigation Measures
			Low	Moderate	Substantial	High	
1	Will the subproject involve significant land disturbance or site clearance?	No					No Land Disturbance will involve. The rehabilitation activities will be carried out in existing building of the healthcare facility.
2	Will the subproject require the setting up of ancillary facilities?	Yes	✓				The establishment of ancillary facilities will be necessary, including waste management facilities, a temporary labor camp (8-10 workers). Additionally, water, electrical, and sewerage systems will be connected to the existing utilities network. An Environmental and Social Management Plan (ESMP/ESSR) and Site Specific ESMP will be developed, including mitigation plan outlining the relevant mitigation measures.
3	Will the subproject require large amount of raw material or construction materials, energy and/or water?	Yes	✓				Locally available construction materials (such as cement, gravel, sand, soil, steel, etc.), water, electricity, and fuel for generators will be required and stored in a designated area. Staff and contractors will be provided with the necessary instructions.
4	Will the subproject generate large amounts of residual wastes, construction material waste?	Yes	✓				The subproject will produce a low amount of residual waste from the rehabilitation work. Mitigation measures will be incorporated in ESMP/ESSR.
5	Is the sub-project expected to result in soil erosion?	No					Rehabilitation activities may not disturb the surrounding soil outside the site location, any unavoidable soil disturbance will be minimized and addressed through ESMP mitigation measure.
6	Is the sub project expected to create borrow pits for construction material?	Yes	✓				The contractor will be instructed not to create any borrow pits. Instead, the required filling material will be sourced as needed from local vendors.
7	Will the subproject result in potential soil or water contamination (e.g., from oil,	Yes	✓				The subproject may potentially contaminate soil and water due to rehabilitation/upgradation and improper disposal of waste generated at the

Sr. No	Issues	No/Yes	Risk Level				Remarks/Mitigation Measures
			Low	Moderate	Substantial	High	
	grease and fuel from equipment yards)?						construction site. However, these impacts will be managed by implementing the measures outlined in the ESMP/ESSR as well as detailed in Contractor's ESMP.
8	Will the subproject involve the storage, handling or transport of hazardous substances?	Yes	✓				Hazardous substances such as fuel, paints, and similar materials will need to be stored temporarily. Efforts will be made to ensure proper storage away from the construction building, managed by the contractor.
9	Will the sub project disturb the ambient air quality and/or increase the level of harmful air emissions (due to generation of dust from construction activity, vehicular/ machinery exhaust emissions, etc.)	Yes	✓				The ambient air quality will be temporarily affected by airborne dust particles, which may contain hazardous chemicals from Construction Materials. However, these impacts will be managed by implementing the measures outlined in the ESMP/ESSR as well as detailed in Contractor's ESMP.
10	Will the subproject increase ambient noise levels?	Yes	✓				During the rehabilitation/up gradation, the subproject may involve the use of machinery that will increase ambient noise levels. Construction crew will use Personal Protection Equipment (PPEs) to reduce the impact. Site activities will be scheduled according to avoid the Noise disturbance to the nearby community.
11	Are there any protected areas on or around the locations which could be affected by the project?	No					There is no protected area located near the subproject site. The activities will be carried out within allocated area (boundary wall).
12	Will there be any adverse impact on the flora due to project activities?	No					As the project involves rehabilitation and up gradation only, with no new construction, there will be no impact on flora, and no vegetation will be cut or removed.
13	Will there be any adverse impact on the fauna due to project activities?	No					The activities of the subproject will be confined within the boundaries of the healthcare facility, thus no impact on fauna is expected.

C: Social Issues Encourage contractors and health authorities to **recruit local women in skilled and semi-skilled roles**

Sr. No	Issues	No/Yes	Risk Level				Remarks/Mitigation Measures
			Low	Moderate	Substantial	High	
1	Will there be any social conflicts arising from the interaction of labourers with locals, particularly by the induction of outside labour and establishment of construction camps (if any)?	Yes		√			There is a potential for social conflicts arising from interactions with labour. However, the contractor will be encouraged to hire local labour whenever feasible, and activities at the labour camp will be confined within the facility's boundary wall. If necessary, the construction/workers' camp will be set up within the existing facility boundary to minimize social conflicts.
2	Will there be a risk of using Child and forced labour in subproject activities?	Yes		√			There is a concern regarding the potential use of forced labour and child labour by the Contractor. However, strict measures will be implemented through contractual agreements and the ESMP to ensure that no child or forced labour is employed during the project execution.
3	Will the subproject result in an increase in noise levels, vibrations, and a decline in ambient air quality due to the operation of construction machinery/vehicles? On the nearby community or sensitive receptors (mosque, temple, church, graveyard, hospital, school/college/university), if any?	Yes	√				The ambient noise level and air quality may experience temporary disturbances due to airborne dust particles containing hazardous chemicals from rehabilitation activities. Additionally, machinery used during the construction phase may temporarily increase ambient noise levels. However, these impacts will be moderate and short-term, and will be effectively managed by implementing the measures provided in the ESMP.
4	Risks related to Occupational Health and Safety (OHS) caused due to construction and rehabilitation activities, generation of waste (hazardous and non-hazardous), and spread of diseases such as waterborne, vector-borne,	Yes		√			There is a potential for occupational health and safety (OHS) risks such as electrical hazards, risk due to work at height, struck by accidents, slips, trips, falls, exposure to the extreme weather, handling of construction and hazardous waste etc. which will be short-term and addressed through the implementation of the ESMP, during

Sr. No	Issues	No/Yes	Risk Level				Remarks/Mitigation Measures
			Low	Moderate	Substantial	High	
	communicable infections (HIV/STDs), COVID-19 pandemic during subproject implementation and operation.						construction and operation phases. However, the duration of these risks will be limited.
5	Risks related to community health and safety due to the transport, storage, and/or disposal of hazardous, non-hazardous, or dangerous materials (such as fuels and other chemicals, construction waste, and health care waste) and spread of diseases during construction, rehabilitation and operation?	Yes		√			Health and safety risks and potential hazards associated with construction materials may occur, but these will be mitigated through the implementation of the ESMP and strict supervision of the contractor's activities during the construction phase.
6	Risks of Sexual Exploitation and Abuse (SEA), Sexual Harassment (SH), and Violence Against the Children (VAC) during subproject implementation & operation?	Yes		√			There is a risk of Sexual Exploitation and Abuse (SEA), Sexual Harassment (SH), and Violence Against Children (VAC). Local labour will primarily be hired to mitigate these risks. The impacts will be managed by implementing specific measures outlined in the ESMP and Worker Code of Conduct. Additionally, a dedicated SEA/SH Assessment Action Plan will be developed and executed as part of the project. Rehabilitation works and service delivery must include **SEA/SH risk mitigation**: enforce a strict Code of Conduct, train workers on respectful engagement with patients, and establish **confidential grievance redress channels** for survivors.
7	Risk of increase in traffic and pedestrian safety due to the construction vehicle movement,	Yes		√			There is a risk of traffic and pedestrian issues, but effective measures outlined in the ESMP will be implemented to minimize these as much as

Sr. No	Issues	No/Yes	Risk Level				Remarks/Mitigation Measures
			Low	Moderate	Substantial	High	
	particularly near sensitive receptors.						possible.
8	Will there be land acquisition? If yes, is the site for land acquisition and ownership status and current usage of land to be acquired known?	No					The subproject will be carried out on government land; thus, no land acquisition will be necessary. No any Voluntary Land Donation (VLD) is involved.
9	Will there be a loss of shelter and residential land due to the land acquisition or clearance of the existing site?	No					No displacement of residents or loss of shelter will occur since no land acquisition is necessary.
10	Are any informal settlers or flood-affected persons present on the subproject site where construction and rehabilitation activities will be carried out?	No					There are no informal settlers or individuals affected by flooding present at the subproject site.
11	Has there been any Anti-Encroachment Drive to forcefully evict/move people at the site where the works are planned to be carried out?	No					There are no plans for an anti-encroachment drive to forcibly evict or relocate people at the site.
12	Will there be a loss of agricultural land, crops, trees, and fixed assets due to land acquisition?	No					There is no land acquisition involved at this site. However, there will be no impact on flora, and no vegetation will be cut or removed.
13	Will people lose access to natural resources, communal facilities and services due to involuntary land use restrictions or access to legally designated parks / protected areas?	No					The activities of the subproject will take place within the current boundaries of the facility, which is located on government-owned land.
14	Any estimate of the likely number of persons affected by the subproject? If yes, approximately how many? Are any of them falling into disadvantaged/vulnerable groups such as Female/child headed	No					There will be no disruption to people's access to natural resources, as the subproject activities will be confined within the current boundaries of the facility on government land.

Sr. No	Issues	No/Yes	Risk Level				Remarks/Mitigation Measures
			Low	Moderate	Substantial	High	
	households, Internally Displaced Persons (IDPs), Refugees, Ethnic and religious minorities, Persons with disabilities, Transgender communities, Senior citizens, or economically marginalized groups)?						
15	Have there been any past security-related issues at the subproject site?	No					It is anticipated that there will be no security-related issues at the site. However, local authorities will be notified for assistance as needed.
16	Has stakeholder engagement taken place with relevant stakeholders (Provincial / District level Government Departments / Communities/NGOs/CSOs) for the pro- posed subproject?	Yes		√			Consultations with relevant stakeholders are ongoing and will continue throughout the execution phase. All stakeholders are being engaged to ensure their involvement in relevant ESMP measures. To address mobility and cultural barriers, organize **women-only consultation sessions** facilitated by Lady Health Workers (LHWs) and female NGO partners, ensuring women's voices shape rehabilitation and service delivery priorities.
17	Is the proposed subproject being implemented in an area with natural hazard risk? (e.g., floods, earthquakes, cyclones etc.).	Yes		√			Construction activities will be planned with consideration for storm water flood conditions observed in the 2022 flood event. However, there are no urban flooding conditions present.
18	Will there be any impact on women that may hinder their mobility during reconstruction & rehabilitation activities?	Yes		√			There will be minimal disruption to the mobility of women, as the subproject activities will be conducted within the existing boundaries of the facility.
19	Will the proposed subproject potentially involve shifting of public	No					The utilities will be connected to the existing network, and no relocation of public utilities will

Sr. No	Issues	No/Yes	Risk Level				Remarks/Mitigation Measures
			Low	Moderate	Substantial	High	
	utilities?						be necessary.
20	Are any indigenous peoples (as per World Bank ESS7) present in the subproject area?	No					There are no native or indigenous people present in the subproject area.
21	Will the construction and rehabilitation activities cause socio-cultural issues and damage any cultural heritage site?	No					During reconstruction and rehabilitation, there will be no damage to any heritage sites involved. However, "Chance Find Procedure" to be followed during project implementation in case of any chance find physical culture resource during excavation, and shall be made a part of ESMP.

Environmental and Social Management Plan (ESMP): Based on environmental and social screening indicating low to moderate risks, an Environmental and Social Management Plan (ESMP) will be developed. It identifies and mitigates potential environmental and social impacts of a project, ensuring compliance with relevant regulations. By proactively managing risks, the ESMP promotes sustainability, addresses community concerns, and fosters effective stakeholder engagement. Overall, it helps to minimize negative consequences while enhancing the project's long-term viability. An Environmental and Social Screening Report (ESSR)/Site Specific ESMP will also be developed by the contractors, including mitigation plan outlining the relevant mitigation measures.

No Objection Certificate (NOC) A detailed briefing was given to the EPA regarding the project benefits and outcomes. The environmental contamination and cost-effective solutions (to install environment friendly incinerators in the operations phase) were discussed. The Director showed his concerns about the drinking water quality, flora and fauna (cutting of trees may affect them) and air contamination (Dust Emission) especially during the construction and operation. He said that Environmental Quality Standards must be maintained during any activity likely to cause the potential impact. He also emphasized on worker's safety and advised the use of personal protection equipment during the working hours, and mentioned it in ESMP for implementation.

Sindh Environmental Protection Agency (SEPA) NOC / Environmental Approval Required	Yes [✓] No, if Yes, select the required study from below
Type of Environmental and Social Study	EIA [ ], IEE [ ], Environmental Checklist [✓]
Any other NOC from Government of Sindh (GoS)/ Government of Pakistan (GoP) Required	[✓] Yes, [□] No, if Yes, please specify
For World Bank Approval	
Further assessment required	[✓] Yes [ ] No, if Yes, select the required study from below
Type of Environmental and Social Assessment	ESIA [], ESMP [✓], E&S Checklist shall suffice [ ], RAP [ ], PCRMP [ ], Water Balance Study [ ], GHG Estimation [ ], BAP [ ], E&S Audit [ ]

Survey Performed By:

Name: Abdullah Designation: Environmental Engineer Signature: _____ **Date**: 30.01.2025

Reviewed and Approved By:

Name: Col. Ajmal Rasheed Designation: Environmental Engineer\Team Lead Signature: _____ **Date**: 01.02.2025

PICTORIAL REPRESENTATION OF PROJECT SITE

External Structure / Boundary Wall

Front



Right Side



Back



Left Side



Annexure-B: Baseline Social Economic Survey

Project: ___ SIHPP_____Location__THQ Kandiaro _____ Date____30-01-2025_____
Name of Respondent____Mashooque Lund_____
Father's Name_____Aashique Lund_____**Contact No:** _____
Permanent Address of the Respondent
Village/Goth: ___ Kandiaro___ **Approx. Household**_2000_**Union Council** _Kandiaro
Tehsil/Taluka_Kandiaro **District:** __ Naushero Feroz _____**Caste**___Lund_____
Marital Status (Tick): Married_M__Un-Married_Divorced/ Separated/Widowed

Demographic Profile of Respondent (Children up to 10 yrs (#): M_2__, FM _1__=T__3____)

Sr. No.	Relation ship with Respondent	Sex Male=1 Female=2	Age (Yrs.)	Education	Name of Business/ Occupation		Income from Business/ Occupation (Rs. / Annum)		Health Condition
					Main	Secondary	Main	Secondary	
1	Father	Male	38	Matric	Shop keeper		40,000 PKR		Good
2		Wife	37	Nill	Housewife				
3		Son	10	Primary					
4		Son	08	Primary					
5		Daughter	05	Nill					
		Daughter	03	Nill					

Language Spoken _____Siraiki, Sindhi**, _Religion____**Islam
Type of family System 1. Joint: ___Joint____ 2. Nuclear_____
Monthly Expenditures

	Less than 20,000	20,000-30,000	35,001-40,000	40,000 and above	**Remarks**
Monthly Expenditure			**37,000**		

Money Lending
During the last one year, did you borrow money?
i. Yes_____ ii. No___no____ **Remarks**_____
Housing Conditions
Personal _____Personal_____**Rented** _____**Other** _____**Encroacher**_____
Type of Structure a) Kacha_____b) Pacca_____c) Semi-Pacca___Semi Pacca _____
d) Straw_____

Access to Social Amenities

Social Amenities	Available (Yes-No)	Satisfactory (Yes-No)	Remarks
Electricity	Yes	No	
Gas	Yes	No	
Water Supply	No	No	
Water Filtration Plant	No	No	

Telephone	Yes	Yes	
Sewerage/Drainage	No	No	
Hospital /BHU/RHU/Dispensary	Yes	Yes	
Education Facilities (School/College/University)	Yes	Yes	
Religious Institution	Yes	Yes	
Accessibility (Roads/Track)	Yes	Yes	
Other			

Women's Participation and Role in Different Household Activities

Activities	**Participation**
Household activities	yes
Child caring	yes
Farm/Crop activities	no
Livestock rearing	yes
Sale & Purchase of properties	no
Social obligations (marriage, birthday & other functions)	yes
Local representation (councilor/political gathering)	no
Decision Making	no

Source of Drinking Water: i. Public Water Supply ii. Hand Pumps hand pumps
iii. Borehole iv. Tanker v Any other _____
Quality: Good_____ Poor: poor____ **If Poor Reason) _____**

Does any NGO Exist in your Area?
Yes,_____ No_____No_____ **If yes,**
Name of NGO -: _____
Are you member of NGO? yes---------- No-----NO---------- **if yes,**
Role of NGO-:_____

Perceptions of Respondents for the Project
In your opinion, should this Project be implemented at the proposed location?
i. Yes____ Yes____ **ii. No____** ____
i. If yes, then reasons ii. If no, then reasons
---------- ----------

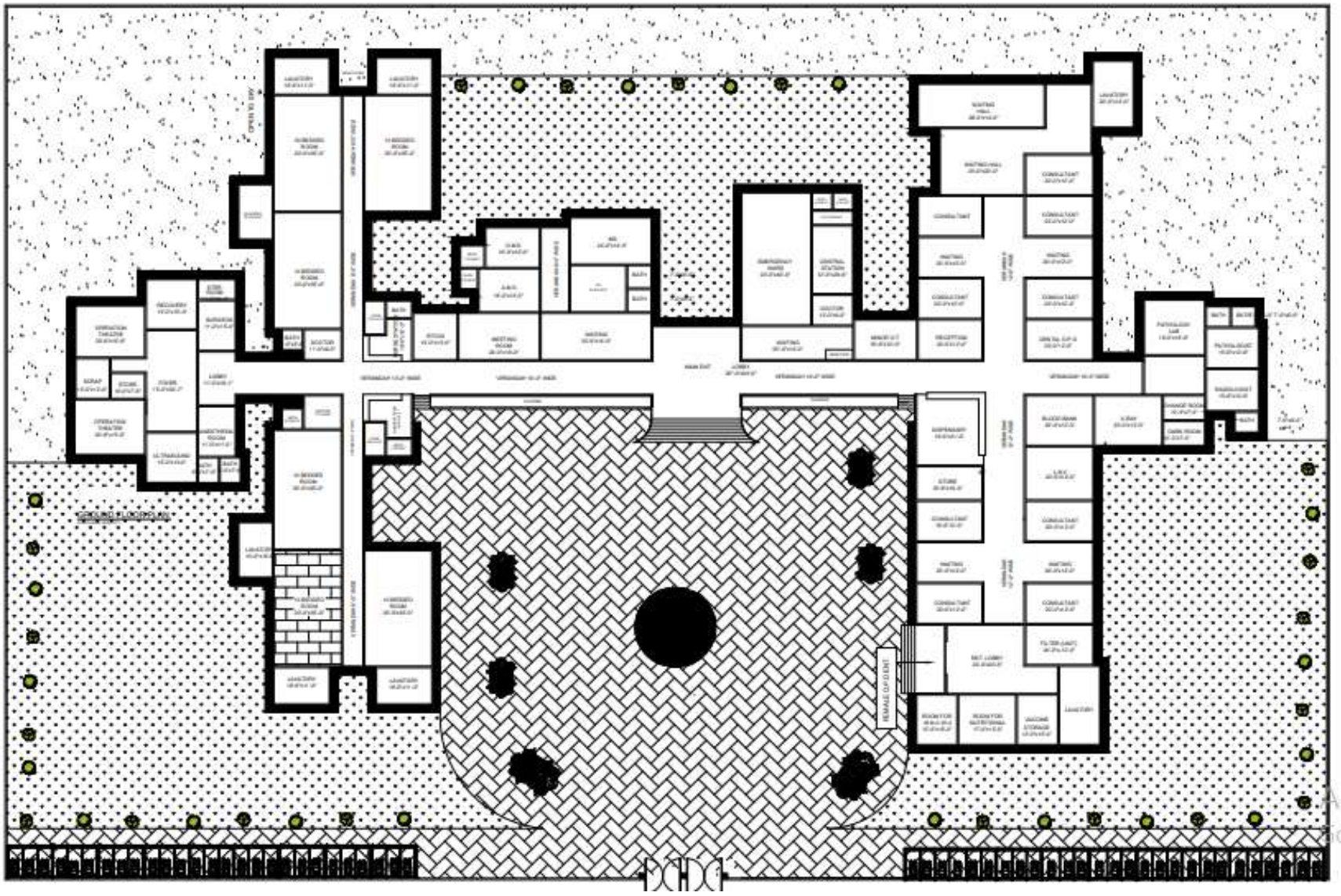
Major diseases common in the proposed project area: ____Malaria, diarrhea, _____
In your opinion, what are some pressing needs of this area?
_____
General Remarks of the Respondents
_____
General Observations of Interviewers
_____

Name of Interviewer: ____Atif_____ **Date:** ___30.01.2025_____

Annexure-C: Location and coordinates of 15 THQs

S.No	Division	District	Health Facility Name	Latitude	Longitude
1	HYD	Badin	Taluka Hospital Tando Bago	24.788563	68.962937
2	HYD	Badin	Taluka Hospital Golarchi	24.65035	68.53702
3	HYD	Jamshoro	Taluka Hospital Manjhand	25.906805	68.23326
4	HYD	Sujawal	Taluka Hospital Hospital Mirpur Bathoro	24.723792	68.260621
5	HYD	Tando Mohd Khan	Taluka Hospital Tando Ghulam Haider	24.967771	68.679523
6	MPK	Mirpurkhas	Taluka Hospital Kot Ghulam Mohammad	25.284679	69.249567
7	MPK	Mirpurkhas	Taluka Hospital Digri	25.152845	69.109879
8	LRK	Kashmore	Taluka Hospital Kashmore	28.4482	69.5857
9	SBA	Naushahro Feroz	Taluka Hospital Moro	26.666703	68.001281
10	SBA	Naushahro Feroz	Taluka Hospital Kandiaro	27.053914	68.213743
11	SBA	Shaheed Benazirabad	Taluka Hospital Sakrand	26.138841	68.277837
12	SBA	Shaheed Benazirabad	Taluka Hospital Kazi Ahmed	26.298236	68.1088
13	SUK	Ghotki	Taluka Hospital Ghotki	28.005246	68.314874
14	SUK	Khairpur	Taluka Hospital Kotdeji	27.337926	68.708523
15	SUK	Sukkur	Taluka Hospital Rohri	27.68494	68.891085

Annexure-D: Design details of 15 THQs



Annexure-E: District Wise Details of Stakeholder Consultations

S.#	THQs	Affected Parties (AP)				Other Interested Parties								Vulnerable	
		Community		Health Facility Staff		Local NGOs & CSOs		District PPHI Office		Academic Institutes		EPA & PDMA		Vulnerable group and Minorities	
		Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
1	Tando Bago	2	2	3	3	1	1	1	1	2	1	1	0	1	1
2	Golarchi	1	2	4	3	0	0	0	0	1	2	0	0	0	0
3	Manjhand	3	2	2	1	1	1	1	0	2	1	1	0	1	1
4	Mirpur Bathoro	3	2	3	2	0	1	1	0	1	2	2	1	1	0
5	Tando Ghulam Haider	2	3	3	2	1	1	1	1	2	1	1	0	1	1
6	Kot Ghulam Mohammad	3	2	4	2	1	1	1	0	1	2	1	1	0	0
7	Digri	2	3	4	3	0	0	0	0	2	3	0	0	1	1
8	Kashmore	2	1	4	3	1	1	2	1	0	2	2	1	0	0
9	Moro	1	2	5	3	1	1	1	1	2	3	1	0	0	1
10	Kandiaro	3	2	4	2	0	0	0	0	1	2	1	1	1	0
11	Sakrand	1	3	5	2	1	1	1	2	2	3	2	0	0	1
12	Kazi Ahmed	2	4	4	3	0	0	0	0	2	1	0	0	1	0
13	Ghotki	3	2	2	2	1	1	1	1	2	2	1	1	0	1
14	Kotdeji	2	3	3	3	1	1	2	1	2	1	0	0	1	0
15	Rohri	3	3	2	3	1	1	1	2	1	2	1	1	0	1
	Sub Total	33	36	52	37	10	11	13	10	23	28	14	6	8	8
	Male														**153**
	Female														**136**
	Total														**289**

Annexure-F: Photographs of Stakeholder Consultations















خناق
Diphtheria


خناق
Diphtheria



Annexure-G: SOP for Tree Plantation and Handing Over to Facility Management

The risk and significance of the impact on flora from the proposed Project is considered low. Plantation in or around the health facility will improve the ecology and aesthetics of the surroundings. The basic purpose of afforestation/plantation of suitable species in the proposed Project areas is to enhance green cover and improve the overall environment of the area. Afforestation will not only reduce the risk been made but will also increase the carrying capacity of the areas regarding many positive aspects.

Importance of Tree Plantation

- Trees contribute to their environment by providing oxygen, improving air quality, climate amelioration, conserving water, preserving soil, and supporting wildlife;
- Trees control climate by moderating the effects of the sun, rain and wind. Leaves absorb and filter the sun's radiant energy, keeping things cool in summer;
- Trees also preserve warmth by providing a screen from harsh wind;
- Trees also lower the air temperature and reduce the heat intensity of the greenhouse effect by maintaining low levels of carbon dioxide;
- Both above and below ground, trees are essential to the eco-systems in which they reside;
- Trees absorb and store rainwater which reduce runoff and sediment deposit after storms. This helps the ground water supply recharge, prevents the transport of chemicals into streams and prevents flooding; and Trees, shrubs and turf also filter air by removing dust and absorbing other pollutants like carbon monoxide, sulfur dioxide and nitrogen dioxide.

Objectives

- To improve the ecology with plantation of native species and quality of air and reduce its pollution;
- To add color to the landscape and enhances the beauty of the environment;
- To uplift the quality of our living environment through active planting, proper maintenance and preservation of trees together with other vegetation;
- To protect and conserve flora and fauna of the proposed Project areas;
- To attract rain which is a positive impact on the proposed Project areas at all; and
- To reduce sedimentation by plantation in the proposed Project areas which will act as protection wall against wind born dust particles.

a) Recommended Species

It is recommended to plant the same specious which will be removed or indigenous species (such as bair, poplar, peach, walnut, phulai, Sheesham, toot, kikar etc.).

b) Plantation Technique

Plantation of different suitable species is to be carried out in the immediate vicinity of the Project area (Basic health unit). The subproject areas can be afforested and vegetation cover can be improved by adopting standard afforestation technique of digging pits. The Project areas are suitable for plantation activities and can be managed thoroughly with care. Planting shall be undertaken immediately after rainy season or initial weeks of spring.

c) Tree Cutting

The implementation of Project will involve cutting of trees. Therefore, the tree plantation will be 1:5 ratio, to improve the ecology and aesthetic of the surroundings, it is recommended to plant the same trees nearby soundings of health facility building.

d) **Tentative Costing:** The tentative costing of tree plantation is mentioned in engineering estimate.

Annexure-H: Workers' Code of Conduct

I, _____, acknowledge that that adhering to environmental, social, health and safety (ESHS) standards, following the project's environmental, social, health and safety (OHS) requirements, preventing GBV/SEA/SH and child abuse/exploitation is important. Any activity, which constitutes acts of gross misconduct is therefore grounds for sanctions, penalties, or even termination of employment. All forms of misconduct are unacceptable be it on the work site, the work site surroundings, or at worker's camps. Prosecution of those who commit any such misconduct will be pursued as appropriate. I agree that while working on this project, I will:

1. Consent to a security background check;
2. Treat women, children (persons under the age of 18), project staff including other workers, and persons with disability with respect regardless of race, color, language, religion, political or other opinions, national, ethnic, or social origin, property, birth, or another status;
3. Not use language or behavior towards men, women, or children/learners that are inappropriate, harassing, abusive, sexually provocative, demeaning, or culturally inappropriate;
4. Carry out his/her duties competently and diligently;
5. Comply with all applicable national/provincial laws, regulations, and World Bank requirements
6. Comply with the CESMP as approved by the Client to meets its ESHS and OHS objectives as well as preventing and/or mitigating the risks of GBV
7. Maintain a safe working environment including but not limited to:
    a. Ensuring that workplaces, machinery, equipment, and processes under each person's control are safe and without risk to health, preventing avoidable accidents, and reporting conditions or practices that pose a safety hazard or threaten the environment
    b. Wearing required personal protective equipment;
    c. Using appropriate measures relating to chemical, physical and biological substances, and agents; and
    d. Following applicable emergency operating procedures.
8. Not engage in any form of sexual harassment including unwelcome sexual advances, requests for sexual favors, and other unwanted verbal or physical conduct of a sexual nature at work site, the work site surroundings/nearby communities, or at worker's camps
9. Not participate in sexual activity with children/learners—including grooming or online grooming. Mistaken belief regarding the age of a child and consent from the child is not a defense;
10. Not exchange money, employment, goods, or services for sex, with community members including sexual favors or other forms of humiliating, degrading, or exploitative behavior;
11. Refrain from all forms of GBV, are unacceptable, regardless of whether they take place on the work site, the work site surroundings, at worker's camps or within the local community.
12. Attend training related to HIV and AIDS, SEA/SH, occupational health, and any other relevant courses/Trainings as a part of this project;
13. Report to the relevant committee any situation where I may have concerns or suspicions regarding acts of misconduct by a fellow worker, whether in my company or not, or any breaches of this code of conduct provided it is done in good faith;
14. Regarding children (under the age of 18):
    a. Refrain from hiring children for labor, which is inappropriate given their age, or developmental stage, which interferes with their time available for education and recreational activities, or which places them at significant risk of injury.

b. Bring to the attention of my manager the presence of any children on the construction site or engaged in hazardous activities.
c. Comply with all relevant local legislation including labor laws and World Bank requirements in relation to child labor and forced labor.

15. Refrain from any form of theft for assets and facilities including from surrounding communities.
16. Remain in the designated working area during working hours;
17. Refrain from possession of alcohol and illegal drugs and other controlled substances in the workplace and being under the influence of these substances on the job and during workings hours;
18. Follow prescribed environmental occupation health and safety standards;
19. Channel grievances through the established grievance redress mechanism.

I do hereby acknowledge that I have read the foregoing Code of Conduct, do agree to comply with the standards contained therein and understand my roles and responsibilities to prevent and respond to ESHS, OHS, and GBV issues. I understand that any action inconsistent with this Code of Conduct or failure to act mandated by this Code of Conduct may result in disciplinary action which could include:

1. Informal warning.
2. Formal warning.
3. Additional Training.
4. Loss of up to one week's salary.
5. Suspension of employment (without payment of salary), for a minimum period of 1 month up to a maximum of 6 months.
6. Termination of employment.
7. Report to the Police if warranted.

Signed by: _____

Signature: _____

Date: _____

For the Employer/Contractor

Signed by: _____

Signature: _____

Date: _____

Annexure-I: Security Management Plan

1. Introduction

This security management plan is being developed for the Project Entitled "Sindh Integrated Health & Population Project-SIHPP" which is being implemented in 30 districts of Province Sindh of Pakistan. It includes Standard Operating Procedures to provide guidelines, regulations, standards, options and hierarchical structure, as well as Policies, Procedures and Protocols (PPP's) for maintaining security of the assets, data, human resources, and boundaries of the currently implemented project. It has been developed after detailed consultation with all the specialists of this project including Project Director and local recipient communities. It is important to mention that this document only provides as a guidance resource and field-based security plans will be devised for the field team in accordance with the local context. SMP provide and maintain a safe physical environment and manage staff activities to reduce the risk of personal injury and property loss during the implementation of the SIHPP Project. This Security Management Plan covers both Component 1, 2, 3and 4 of the Project activities.

SMP for the project lies under the oversight and responsibility of the Project Director at PMU level will work closely with the Ministry of Interior and Coordination of National Government in the deployment of the security guards for the project office. The command and communication structure of the National Police Service will be adopted. The police service shall perform its functions under the overall direction, supervision and control of the Inspector General of Police at Provincial level. The management of security for operations will comply with the four basic pillars of security management:

SMP encompasses the systematic implementation of policies, procedures, and technologies to safeguard an organization's assets, information, and operations from potential threats and risks. It involves the strategic planning, coordination, and oversight of security measures to ensure the confidentiality, integrity, and availability of critical resources. Security management includes risk assessment, threat analysis, and the development of countermeasures to mitigate vulnerabilities. This multifaceted discipline also involves the establishment of access controls, monitoring systems, incident response protocols, and ongoing training to enhance the organization's resilience against evolving security challenges. Effectively managing security requires a comprehensive and adaptive approach, staying abreast of emerging threats and continually refining strategies to address the dynamic nature of the security landscape.

Objective of the SMP: to provide and maintain a safe physical environment and manage staff activities to reduce the risk of personal injury and property loss during the implementation of the SIHPP Project.

Security Approach: The Project Director will ensure that security procedures and criteria are fully designed and updated, and the means fully available to ensure the security for project operations.

The security plan describes how security is organized to face identified threats and how security is continuously reassessed and reorganized in correlation with security situations and operations being undertaken.

The Project Director will leverage in using the existing national and local security infrastructure to access and share conflict related information and encouraging local police leaders to specifically address conflict risks in community engagement activities in timely manner.

2. Standards and Good International Practice

This security management plan is anchored on World Bank Environmental and Social Standard 4 (ESS4) that covers Community Health and Safety on sub section (b) Personnel Security in line with the World

Bank Good Practice Note on Assessing and Managing Risks and Impacts of the Use of Security and the Guidelines for Implementation of the UN Basic Principles on the Use of Force and Firearms by law Enforcement Officials.

The standard role of the public security will be to maintain the rule of law, including safeguarding human rights and deterring act that threaten the project personnel and facilities. The public security forces to be deployed shall be competent, appropriate and proportional to the threat. The security force shall abide by the World Bank Good Practice Note on Assessing and Managing Risks and Impacts of the Use of Security to comply with the commitments on human rights bolstered by its compliance with:

- World Bank Good Practice Note on Assessing and Managing Risks and Impacts of the Use of Security Personnel, 2018,
- Voluntary Principles on Security and Human Rights Toolkit Version 3, 2008,
- Guidelines for Implementation of the UN Basic Principles on the Use of Force and Firearms by law Enforcement Officials, 2016, and
- The Universal Declaration of Human Rights, 1948.

3. Security Management

Security Management for the project lies under the oversight and responsibility of the Project Director at provincial level and will work closely with the Ministry of Interior/home and local administration in the deployment of the security officers to the project. The command and communication structure of the Sindh Police Service will be adopted. The management of security for the project will comply with the four basic pillars of security management:

- DETECT an adversary.
- DETER an adversary if possible.
- DELAY the adversary until appropriate authorities can intervene.
- RESPOND to the adversary's actions.

4. Overview of the Security Situation

Different security risks exist in the project area and may impact the project. The main security risks within the project area include:

- Criminal offences;
- Terrorism;
- Inter-tribal or communal violence which could pose a threat to project personnel;
- Reaction of community to an incident or accident involving project personnel or asset;
- Threat of armed attack;
- Theft/ Larceny; and
- Kidnapping

The project has adopted a systematic and careful examination of the workplace, work activity, working environment and those people who may be at any security risk. Risk assessments shall identify what might go wrong and how, with an evaluation of any security hazards undertaken, this will determine the control measures needed to prevent or minimize the potential security risks. A 5x5 impact and likelihood risk matrix has been adopted as the most appropriate security risk Likelihood verses Consequences 5x5 Risk Assessment Matrix have been adopted.

The matrix works by selecting the appropriate consequences from across the bottom, and then cross

referencing against the row containing the likelihood, to read off the estimated risk rating. Likelihood verses Consequences 5x5 Risk Assessment Matrix See Table -1:

Table 1: Likelihood verses Consequences 5x5 Risk Assessment Matrix

High	LIKELIHOOD	5	5	10	15	20	25
		4	4	8	12	16	20
		3	3	6	9	12	15
		2	2	4	6	8	10
		1	1	2	3	4	5
		1	1	2	3	4	5
			CONSEQUENCES				
			Low →				High

RISK
HIGH
MEDIUM
LOW

Likelihood verses Consequences 5x5 Risk Assessment Matrix has been supported with a table which ties together the risks with the mitigations, roles and responsibilities and timelines and the security situation analysis for the 15 Counties see Table 2:

Table 2: Project Security Risks and Mitigation Measures

Risk description	Likelihood	Impact	Severity	Responsibility	Mitigation Action
Criminal offences: Theft/ Larceny	Medium	Medium	Medium	Project Director	Use of physical security personnel, Staff crime security awareness, Establish formal and consistent reporting and communications mechanisms with public security forces and other stakeholders Adequate lighting, Perimeter fencing.
Terrorism	High	High	High	Project Director	Enhance intra / intra agency cooperation within the project area, Engage with and empower border communities as key contributors in border security and management, Implement Community Policing, Implement Security information exchange mechanisms.

Risk description	Likelihood	Impact	Severity	Responsibility	Mitigation Action
Inter-tribal or communal violence which could pose a threat to	Medium	Medium	Medium	Project Director	Keep abreast of the peace building process among the affected communities, Use Traditional institutions in creating peace, security, law and order in
Armed attack / Kidnapping	Medium	High	High	Project Director	Use of physical security personnel, Project staff crime security awareness, Establish formal and consistent reporting and communications mechanisms with public security forces and other stakeholders Adequate lighting Perimeter fencing especially materials areas and camp(s).
Community Hostility	Low	Medium	Medium	Project Director	Adhere to all provisions in the Project Stakeholder Engagement Plan,
SEA/GBV, and incident response	Low	Low	Low	National Project Coordinator	Adhere to all provisions in the Project Grievance Redress Mechanism Abide by the requirements of SEA/GBV Action Plan, Continuous SEA/GBV awareness creation.

From the risk assessment on Table 2, the project manager shall leverage this process to determine which locations require Police Service, armed security support etc. In the lower risk areas, the project could consider deploying private security unarmed guards to undertake basic security duties such as access control and perimeter security management; if deemed necessary the police may be engaged on a reactive basis. This approach will alleviate undue pressure on local policing resources and reduce the risks of engaging armed officers. An appropriate, formal agreement shall be developed to support service delivery and mitigate the identified risks and respond to stakeholder concerns.

Care will be taken to ensure that security response or presence of security forces will not result in additional risks to communities or individuals within the project implementation areas.

5. Alert States

The PMU will adopt the SIHPP project area alert status in evoking the security state response levels, triggers and actions specific to the project site. Table 3, 4, 5 and 6 with the color shades of Green, Yellow, Orange and Red respectively are the security level responses to be adhered to. Local and regional events (triggers) will be linked to the alert states; the local security situation will be monitored daily and all available information assessed to ensure early identification of increases in risk, which may require a change in alert state.

Table 3: Security Response Level: Green- Business as Usual- Security Risks Effectively Controlled

Security Response Level GREEN Business as Usual- Security Risks Effectively Controlled	
Event Indicator	**Recommended Action(s)**
No direct threat exists and no incidents have taken place to warrant heightened security measures: Under this level the status remains at GREEN. • Site operations are running normally with employees going about their lives with no, or very limited, restrictions. • There are no restrictions on vehicle movement or crew changes • Occasional unrest or demonstrations away from operational sites. No direct threat to the operation • Effective government control and/or rule of law in place. Liaison remains regular and effective • Continued good will of the majority of the local community remains assured	**No restriction to normal movement compliant with local police advisory requirements. Staff and vehicles may move around the area within the protective envelope of the project area security.** • Complete all pre-planning actions • Train staff and ensure awareness of actions to be taken- site drills. • All crisis management and evacuation plans are in place and are maintained as 'living documents' • The security situation, crime levels, political and social events are monitored closely. On-going collection and assessment of information through liaison with authorities and local community, • Ensure daily Personnel on Board (POB) is maintained. • All stakeholders are aware of the contents of the evacuation plan and understand their role within it • Vehicle Escorts taken when traveling to areas where civil unrest has occurred. • Maintain close liaison and good Community Relations

Table 4: Security Response Level: Yellow- Enhanced Security Measures Required

Security Response Level Yellow **Enhanced Security Measures Required**	
Event Indicator	**Recommended Action(s)**
Increased level of disturbance and/or increased probability of impact to operations. Sporadic civil disorder events. A direct threat has been detected to one or more areas of the operation but it is not considered imminent. • Area-wide protests and/or strike action that do not directly impact project operations or personnel, but do present a risk to external logistical operations or works. • Increase in inter-tribal violence adjacent to project area of operations or camp locations. • Vehicle movement is disrupted • Increased difficulty in accessing mission critical items or functions due to local security situation • Significant police or paramilitary deployment required to maintain rule of law; localized curfews in place. • Heavy handed response from police and security service • Erosion of the support and good will of local communities • Difficulties in maintaining good relations with local authorities and traditional leaders	**Project operations continue. Enhanced security controls and operational restrictions required:** • Necessary communications equipment available and all systems checked • Ensure site specific security plans are available and have been revised and practiced • Ensure all security, crisis and evacuation plan representatives understand their roles and responsibilities • Brief local security forces on roles and responsibilities and rules of engagement. Apply controls to ensure actions are tracked. • Review local security risks and controls; operating area Journey Management Plan- implement additional controls. • Maintain regular communication with all stakeholders, including authorities, local community, other sites and activities. • If situation likely to continue, re-assess stocks of resources at operational sites and ability to re-supply (food / water / fuel / people). • Assess requirements to increase physical security controls, access, perimeter protection, and road escorts. • Issue “Business Essential” travel advisory (If not already done). • All employees are briefed / updated on the security situation and controls- revise the evacuation plan • Consideration given to recommending changes to the daily routine to include: ○ identification of any out of bounds areas; ○ local travel restrictions; • Review which business critical and sensitive documents need to be protected and how.

Table 5: Security Response Level: Orange-Increased Security Measures

Security Response Level Orange **Implementation of Increased Security Controls and Preparation for Lock Down and/or Site Evacuation**	
Event Indicator	**Recommended Actions**
Significant obstacle or direct threat has been detected to operations and is deemed imminent, or a security incident has taken place close to one of the project sites: • Wide spread civil unrest, not contained by police or paramilitary forces. • Frequent acts of violence close to project operations. • SIHPP specifically threatened and/or targeted. • Reinforcement of police by military forces to enforce martial law and impose curfews in key areas. • Substantial political or inter-tribal violence • Government ordered curfew in place • Law and order become fragile, shortages of food / water / supplies / power / communication outages. • Failure to observe security restrictions regarded as life-threatening. • Loss of support and good will of majority of local community, • Liaison with authorities and traditional leaders breaks down	**Project operations are suspended. Significant increase in security controls and operational restrictions. All movement outside camps ceases.** • All external movement ceases • Twice daily call schedule with Client Security Manager • Ensure sites including material and equipment are secured – security protection in place. • Consider further increase in security controls including; further reinforcement of security guarding, (police support). • Briefings to local security forces on roles and responsibilities- liaison with local commanders increased. • Consider resupply requirements for all locations and caretaker maintenance and security of unmanned locations. • Instigate evacuation drills and brief all staff on actions • Prepare vehicles for possible road moves and ensure thorough rehearsals have been conducted for any moves under escort.

Table 6: Security Response Level: Red-Cease Operations, Lock down & Evacuation

Security Response Level RED Cease Operations and Lock Down or Evacuate Site	
Event Indicator	**Recommended Actions**
The operation has experienced a direct attack or there is credible evidence of an imminent attack. • Direct threats against project operations • Major civil disorder in areas of operation • Lines of supply untenable (road closures / security risks) • Total collapse of law and order • No or limited local security forces protection • Security force reaction may damage reputation • Major difficulties in accessing basic necessities • Frequent power and communications disruption.	**Suspension of operations and/or activation of total lock down or evacuation plan:** • Confirm operational plan and nomination of key points of contact during evacuation. • Implement evacuation plan • Ensure adequate caretaker security in place if full operations are suspended. • Ensure all critical or sensitive documents have been collected and are ready for destruction or removal • Detailed briefing of all remaining personnel on situation and emergency response plans (as attached template of Template Emergency Response Plan **Annexure-P**). • Provide ongoing communications, guidance and assistance to local and security staff remaining in the project area

Alert State Status Boards

Alert State boards are to be displayed at the camp and indicate the current security alert state and associated restrictions to movement in the project area.

Site Security Layers

All project facilities will undergo the following security layers/protocols.

i. Physical security (guards).
ii. Access control system.
iii. Intelligence Network.
iv. Security induction.
v. Awareness.
vi. Trainings.

These different security layers together reduce the risk of having one system being by-passed. They are implemented by the Security commanders.

Physical Security

This will mainly comprise of fences, gates, guard posts, surveillance / electronic cameras which will be manned by trained personnel who shall document and record daily incidents at the various points and provide reports to their superiors for appropriate action.

Security operating Procedures

This shall entail some of the key security operating procedures which will comprise of:

- **Boundary security:** Security will maintain control of the project's perimeter by deploying personnel at strategic points along the boundaries of the project facilities and also channel people to access-control points that will have security personnel (both armed and unarmed);
- **Access Control Policy and Procedures:** Access to project sites by project personnel and visitors will be through a formal, documented access control procedures to facilitate the implementation of access control policy and associated access controls. Project personnel will be issued with badges and will at all times carry and display these badges when in the field. The badges will enable the bearer to access project facilities upon site security enquiry. Visitor badges will be issued to all visitors who are not employees of the project.
- **Luggage search:** A search of personal luggage will be performed by the guards at the access control point to ensure no access of all the prohibited items into the project facilities.
- **Vehicle Access Control Procedures:** All Vehicles accessing project facilities will be accessed through with the driver only after going through a security check/search for prohibited items. The driver must declare his entire luggage at the main gate (Personal luggage) for checking as well
- **Decision tree model**: the project security shall adopt a structured approach using the collaborative approach for all the armed security operatives in prioritizing the collection of relevant data during incident response. The structured tree model approach helps to define how questions are answered, allows the incident response team to respond consistently with predictable results. The structured approach also provides for definable, reproducible structures to be created facilitating controlled cost exposure during an incident response cycle.
- **Information and Communication:** The project will detail procedures for categorizing, handling, and controlling sensitive information.
- **Code of conduct:** Every police officer shall be subject to Force standing orders and to the provisions of the Code of Regulations for the time being in force.
- **Firearms Security:** The project will adhere to the relevant legislation regarding firearms storage on-site, as well as the responsibilities and procedures for issuing and storing any security firearms, ammunition, and non-lethal weapons. This shall include: location for storage; how weapons are properly secured during storage; records for issuance; who they may be issued to; safeguarding while in possession of the personnel; and audits.
- **Special Situations:** There may be instances where large-scale events (e.g., criminal activity, demonstrations, civil disorder) require interventions by public security which is not specifically associated with the project. When planning for such events or emergencies, there shall be clarity on how project security passes control over to formal public security (for example, police, military, emergency responders in conjunction with the project established decision tree).

Security Supervision and Control

The project will have a clearly defined management structure and responsibility, including overall lines of control, accountability, and supervision for the security effort. In making such arrangements, the project will be guided by the principles of proportionality and GIIP, and by applicable law, in relation to hiring, rules of conduct, training, equipping, and monitoring of such security workers. The project will seek to ensure that government security personnel deployed to provide security services act in a manner

consistent with paragraph 24 of ESS 4, and encourage the relevant authorities to proactively engage with local communities on security issues and address any concerns, subject to overriding security concerns.

The Project coordinator will (i) make reasonable inquiries to verify that the direct or contracted workers retained to provide security are no implicated in past abuses; (ii) train them adequately (or determine that they are properly trained) in international human rights standards or minimal use of force techniques (less use of firearms), and appropriate conduct toward workers (in line with the Labor Management Plan) and affected communities (in line with ESMP); and (iii) require them to act within the applicable law and any requirements set out in the ESCP.

All incidents including thefts, attempted, attempted break-ins must be reported to the center manager and the local police authorities, who will initiate an investigation to determine sequence of events, what may have contributed to the incident, probable cause(s) and contributing factors), and recommendations, corrective actions, and mitigation measures (based on investigative findings) – an incident report will be issued to the Project Coordinator with details of the above actions.

Site specific project requirements such as stakeholder engagement, security arrangements disclosure, incident response, and grievance management would be formally agreed with the appropriate authorities in line with the Project Stakeholder engagement Plans and Grievance Redress Mechanism.

The security responsibilities, authorities and communication process shall follow Government directives and legal provisions from project management down through the project staff when communicating instructions and reporting security breaches**.**

All project personnel are required to be aware of the need for constant vigilance, care and compliance with security procedures, as well as the necessity to report any incident or suspicion to the OCS.

Security personnel / the police will be deployed to provide security to all project sites and facilities. Their roles and responsibilities are detailed below;

- To Implement the Standard Operating Procedures properly without fear or discrimination.
- To ensure respect of the access control procedures and make sure that they are applied to all project personnel.
- Perform interior Patrols days and nights to ensure there are no intruders within the project facilities.
- Check the border status on a regular basis using back tracking security method.
- To report any security incident to the guard posts or security commanders.
- Maintain constant communication with the control room on hourly basis while on duty.
- Report to the control room in case of any technical issues.
- Ensure a proper behavior at all time while applying the SOP; avoid exchanging of words with the project staff.

The security risk assessment process shall be further examined by the relevant parties. This may result in a project level Memorandum of Understanding (MOU) with state security institutions or private security companies, setting out a framework for cooperation and setting standards and expectations. Key clauses for drafting MOU have been adopted from international literature and customized to suit the project including:

- Building trust among relevant stakeholders especially the Local Government, NGOs, civil society and community members to prepare the ground for a meaningful MoU,
- Adherence to the provisions contained in the VPs (Voluntary Principles on Security and Human

Rights) and the UN Code of Conduct for Law Enforcement Officials and the UN Basic Principles on the Use of Force and Firearms by Law Enforcement Officials,

- Institute a vetting procedure to ensure that no one allegedly implicated in past human rights and law abuses (i.e. there is a conviction, pending case or very strong evidence) provide security to the company.
- Institute a training program, for public security forces assigned to the project operations,
- Develop an acceptable protocol for equipment transfers in a manner aligned with the VPs;
- An agreed system of information-sharing around security issues, with due regard for necessary confidentiality.

Other softer measures to be included in the MOU include the camp access protocols, grievance mechanisms, engagement commitments that can, without concern for confidentiality, be made publicly available in order to build trust and or promote cooperation.

Journey Management

Each site manager has the overarching responsibility for project-wide journey management. A journey management log is to be maintained at the control room whereupon vehicle movements are logged and monitored. This will be shared to the National PMU safeguards team by email.

Project staff will be required to complete a Journey Management Plan form, which has to be authorized by the site / station manager.

Security Grievance Redress Mechanism

To extent possible, the SMP shall adopt the Project Grievance Redress Mechanism in managing the security related grievances. Key areas of emphasis will be on the following steps:

- Step 1: Publicizing Grievance Management Procedures,
- Step 2: Receiving and Keeping Track of Grievances,
- Step 3: Reviewing and Investigating Grievances,
- Step 4: Developing Resolution Options and Preparing a Response,
- Step 5: Monitoring, Reporting, and Evaluating a Grievance Mechanism, and
- Step 6: Dedication of adequate resources both human and capital.

Basic Principles on the Use of Force and Firearms by Law Enforcement Officials

The project has adopted the basic principles from the guidelines for implementation of the UN basic principles on the use of force and firearms by law enforcement officials. The adopted principles include:

1. IP and appointed law enforcement agency shall adopt and implement rules and regulations on the use of force and firearms against persons by law enforcement officials.
2. IP and the law enforcement agency shall develop a range of means as broad as possible and equip law enforcement officials with various types of weapons and ammunition that would allow for a differentiated use of force and firearms.
3. The use and deployment of non-lethal incapacitating weapons shall be carefully evaluated in order to minimize the risk of endangering uninvolved persons,
4. Law enforcement officials, in carrying out their duty, shall, as far as possible, apply non-violent means before resorting to the use of force and firearms. They may use force and firearms only if other means remain ineffective or without any promise of achieving the intended result,
5. Whenever the lawful use of force and firearms is unavoidable, law enforcement officials shall:

a) Exercise restraint in such use and act in proportion to the seriousness of the offence and the legitimate objective to be achieved;
b) Minimize damage and injury, and respect and preserve human life;
c) Ensure that assistance and medical aid are rendered to any injured or affected persons at the earliest possible moment;
d) Ensure that relatives or close friends of the injured or affected person are notified at the earliest possible moment.

6. Where injury or death is caused by the use of force and firearms by law enforcement officials, they shall report the incident promptly to their superiors. A detailed report shall be sent promptly to the PMU for responsible administrative review and judicial control, and also to the World Bank,
7. IP shall ensure that arbitrary or abusive use of force and firearms by law enforcement officials is punished as a criminal offence in line with relevant National and provincial laws,
8. Exceptional circumstances such as internal political instability or any other public emergency may not be invoked to justify any departure from these basic principles,
9. The law enforcement agency shall ensure that all law enforcement officials are selected by proper screening procedures, have appropriate moral, psychological and physical qualities for the effective exercise of their functions and receive continuous professional training, and
10. IP and the law enforcement agency/ies shall undertake the policing of unlawful assemblies, policing persons in custody or detention in line with the provision of the UN basic principles on the use of force and firearms by law enforcement officials, 2016.

Annexure-J: Chance Find Procedure

Chance Find Procedures Project may involve excavations. Therefore, the possibility of chance find is not ignorable. In case of any chance find, the contractor will immediately report through Supervision Consultant to DG Directorate General of Archaeology, Sindh and Project Director PMU SIHP, to take further suitable action to preserve those antique or sensitive remains, the contact details of the DG of Archaeology (Email # dgantiquitiessindh@gmail.com, Cell +92-21-99332224, +92-21-99332890 and Address # Antiquities House - C-82, Block-2, Near Bilal Masjid ,Clifton, Karachi, Sindh 75600)Representative of the Director will visit the site and observe the significance of the antique, artefact and Cultural (religious) properties and significance of the project. The report will be prepared by representative and will be given to the Director. The documentation will be completed and if required suitable action will be taken to preserve those antiques and sensitive remains. In case any artefact, antiques and sensitive remains are discovered, chance find procedures should be adopted by contractor workers as follows:

- Stop the construction activities in the areas of chance find.
- After stopping work, the contractor must immediately report the discovery to the Supervision Consultant.
- The Director decides to take over the antiquity for purposes of custody, preservation and protection, the person discovering or finding it shall hand it over to the Director or a person authorized by him in writing.
- Delineate the discovered site or area.
- Consult with the local community and provincial Archaeological Department.
- The Director shall, constitute a team of archaeologists for undertaking preliminary investigation and will decide about further course of action in light of findings of the team.
- The suggestion of the local communities and the concerned authorities will be suitably incorporated during taking the preventive measures to conserve the antique, artefact and cultural (religious) properties; and secure the site to prevent any damage or loss of removable objects. In case of removable antiquities or sensitive remain, a night guard shall be arranged until the responsible local authorities take over.
- Avoid the use of heavy construction machinery during the excavation process.
- Strict Monitoring and supervision as per monitoring plan given in ESMP r should be enforced during works.

Annexure-K: E & S Monitoring Checklist

ENVIRONMENTAL, SOCIAL, HEALTH AND SAFETY MONITORING CHECKLIST
SINDH INTEGRATED HEALTH AND POPULATION PROJECT (SIHPP)

Project Name: _____

Activities Inspected_____

Location _____

Weather Condition_____

Date: _____

Time: _____

SNo	Performance Indicators	Yes	No	N/A	Description	Remarks
1.	Heavy Dust					
2.	Excessive noise or vibration					
3.	Water sprinkling at the construction and disposal sites					
4.	Discharge of waste water to nearby water course/water body					
5.	Any spillage of fuel/oil observed					
6.	Dumping of solid waste at designated Site					
7.	Dumping of construction waste/spoil at designated Site					
8.	Protection of Flora/Fauna					
9.	Availability of Drinking water					
10.	Site housekeeping					
11.	Warning signs displayed near construction zone.					
12.	Use of PPEs by the beneficiaries and workers					
13.	Any incident/accident (use separate proforma)					
14.	Any GBV/SEA and privacy related complaints					
15.	Availability of first aid boxes at site					
16.	Any land ownership provided to women beneficiaries					
17.	Any involuntary resettlement under the project					
18.	Proportion of local labor in the project					
19.	Child/Force Labor					
20.	Is the GRM properly in place					
21.	Regular monitoring of complaint register is in practice					
22.	Any exclusion, specially to women, disadvantaged groups and marginalized people from project forums					
23.	Any elite capture related grievance					
24.	Participation of women, children, and vulnerable groups in consultations and project activities					
25.	Any Unusual Conditions (e.g., heavy rain, extreme weather)					
26.	Chance finds during construction					

Note If any:

Filled By: _____ **Signature** **Name:** _____ **Position:** _____	**Extra Note if needed:**

Annexure-L: Incident Report Format

Serious Incident Report	
General Information	
Program name, country, region	
Contractor Name	
Person submitting the information	
Organizations and/or companies involved in the incident	
Details of the people affected, status (e.g. if they are working as rangers, volunteers, etc.), names, ages, gender. Details of the community or communities involved	
Details of the Incident	
Date and time the Incident occurred	
Location	
Type of Incident	Fatalities, serious injuries and accidents at work ☐
	Fatalities, serious injuries and accidents affecting local communities and others ☐
	Violations of human rights or accusation of human rights violations, incl. sexual and gender-based violence and harmful child labor ☐
	Conflicts, disputes and disturbances leading to loss of life, violence or the risk of violence☐
	Environmental incidents ☐
Detailed chronological description of the Incident and its circumstances (if possible, with photos)	
Root Cause Analysis	
Detailed description of key causational factors (internal and external), potential management failings and identification of absent/ inadequate/ failed/ unused management and control measures (e.g., non-compliances with E&S standards or measures)	
Specification of relevant	

roles and responsibilities of the agencies, authorities and others involved			
Reaction to the incidents by the victims, involved families or communities as well as local/national/international media			
Agency or agencies responsible for investigation of the case. What is the scope of the investigation? Does this include a root cause analysis?			
Response and Corrective Actions			
Description of the response (if available) and agencies involved.			
Description of any corrective actions, plans or next steps to prevent the incident from recurring or follow up to close the case or proceed with further investigations (include action plan with responsibilities and schedule)			
Incident Report Approval			
	Position	**Name**	**Date**
Prepared by			
Approved by (E&S Coordinator or Senior Management)			

Annexure-M: Template of Contractor's ESMP

1 INTRODUCTION
- 1.1 Requirements of CESMP
- 1.2 Aims and Objectives of CESMP
- 1.3 CESMP Administration
- 1.4 Institutional Arrangements for implementation of CESMP
  - 1.4.1 PMU (Project Coordinator and its E&S Staff)
  - 1.4.2 Design and Supervision Consultants
  - 1.4.3 The Contractor

2 PROJECT DESCRIPTION
- 2.1 Location of the Subproject
- 2.2 Contract Description

3 DESCRIPTION OF CONSTRUCTION AREA AND BOUNDARIES
- 3.1 Project Boundaries
- 3.2 Camp Site
- 3.3 Borrow Areas and Materials

4 RISK ASSESSMENT
- 4.1 Risk Assessment and Management
- 4.2 Risk Identification
- 4.3 Risk Assessment Process
- 4.4 Response Options
- 4.5 Sensitive Receptors Assessment
  - 4.5.1 Sensitive Receptor Analysis
  - 4.5.2 Impact on Sensitive Receptors Short-Term Construction Related Activities
  - 4.5.3 Impact of Construction Equipment.
  - 4.5.4 Mitigation- Measures for Noise-Reducing
  - 4.5.5 Impact of Ground borne Dust
  - 4.5.6 Mitigation Measures for Dust
  - 4.5.7 Impact of Operational Noise
  - 4.5.8 Mitigation-to Reduce Operational Noise
  - 4.5.9 Impact of Air Contamination and Smoke
  - 4.5.10 Mitigation Measures for Smoke
  - 4.5.11 Impact of Traffic
  - 4.5.12 Mitigation for Construction Traffic

5 CONSTRUCTION CAMP MANAGEMENT PLAN
- 5.1 Drinking Water Supply
- 5.2 Room / Dormitory Facilities
- 5.3 Sanitary Facilities
- 5.4 Canteen, Cooking and Laundry Facilities
- 5.5 Standards for Nutrition and Food Safety
- 5.6 Leisure, Social and Telecommunications Facilities
- 5.7 Parking Area
- 5.8 Types of Safety & Security Events
- 5.9 Signage & Access Control
- 5.10 Drugs and Alcohol Usage
- 5.11 Security Risk
- 5.12 Hazards and Vulnerability Identification & Management

6 POLLUTION PREVENTION AND CONTROL PLAN
- 6.1 Air Pollution Control
- 6.2 Noise Pollution and Control
- 6.3 Water Pollution
- 6.4 Spill Prevention and Contingency Plan
- 6.5 Plant and Vehicle Maintenance
- 6.6 Treatment of Spills
- 6.7 Run-off from Camps and Worksites
- 6.8 Ground Pollution

7 EMERGENCY PREPAREDNESS & RESPONSE PLAN
- 7.1 Purpose
- 7.2 Emergency Drills
  - 7.2.1 Fire Fighting
  - 7.2.2 Emergency Drills
  - 7.2.3 Emergency Evacuation
  - 7.2.4 Roles and Responsibilities
- 7.3 Emergency Response Team

8 WASTE MANAGEMENT PLAN
9 TRAFFIC MANAGEMENT PLAN
10 PLANS FOR HANDLING OF HAZARDOUS MATERIALS
11 TREES PLANTATION PLAN
12 TRAINING PLAN
13 COMPLIANCE AND EFFECTS MONITORING PLAN
- 13.1 General
- 13.2 Objectives of the Monitoring
- 13.3 Compliance and Effects Monitoring
  - 13.3.1 Compliance Monitoring:
  - 13.3.2 Environmental Effects Monitoring
  - 13.3.3 Social Effects Monitoring
- 13.4 Role & Responsibilities
- 13.5 HSE Inspections

14 Reports
- 14.1 General
- 14.2 Complaint Mechanism

15 Estimated Budget for the Implementation of CESMP
16 PHYSICAL CULTURAL INFRASTRUCTURES (PCIS)
Annexure: Compliance & Effect Monitoring Checklists (Daily & Weekly)

Annexure-N: Template Emergency Response Plan

Emergency Response Plan (ERP) provides an overview of the procedures to mitigate and control the impacts on the project in the event of emergency situations usually occurring suddenly and unexpectedly during the implementation of proposed Project and provide maximum protection to all personnel (involved in the implementation). The E&S Specialists-PMU will be responsible for the implementation of this plan with the support of field staff (E&S Focal Persons) at district level.

Emergency Preparedness and Response Procedures

- In case of any emergency (if occur), the E&S Focal Persons (at Site) will coordinate with relevant department for rescue service, in particular for fire, flooding, earthquake emergencies;
- Staff should be trained for emergency response, and the necessary equipment should be readily available at all times to ensure that all required measures can be implemented safely and rapidly. Written instructions for the different types of emergencies should be display at appropriate locations;
- First Aid Facility/ kits, PPEs and appropriate firefighting equipment will be provided at project site at suitable locations;
- Equipment shall be regularly examined and maintained;
- Fire drills will be conducted at least biannually to ensure that workers are familiar with the action to take in the event of fire;
- Fire awareness materials shall be placed at appropriate locations to educate the service providers and locals on what to do in the event of fire such as safe evacuation;
- In the event of emergencies involving spillage, the spillage or leakage should be stopped as soon as practicable and cleaned up promptly and/ or disinfected;
- Absorbent materials, disinfection chemicals, protective clothing, masks, eye protection, gloves should be used as appropriate in the clean-up and disinfection operations;
- All materials arising from the clean-up of spilled waste should be disposed of in an appropriate manner (as described in Environmental and Health Care Waste Management Plan);
- In case of an incident or accident, report needs to be generated by the E&S Specialists with the support from E&S Focal Persons at district level and same will be made a part of quarterly progress report. The E&S Focal persons should be familiar with the safeguards incidence response toolkit (SIRT) as a guide to report and manage incidents;
- Follow-up investigations of the incidents should be conducted so that improvement measures can be taken to avoid recurrence of similar incidents in future;
- Contacts for police, emergency services and helplines should be displayed at project site; and
- In addition to above, applicable mitigation measures listed in ESMP shall be followed.

Training

Ensure that all staff members are trained on the emergency response protocols and procedures. This includes training on the use of emergency equipment such as first aid kits, PPEs and fire extinguishers etc. Trainings provided by E&S Specialists-PMU or E&S Focal Persons or External Parties at district level during the implementation of proposed Project will also cover the emergency response topic.

Conduct Emergency Drills

Regularly conduct emergency drills to ensure that all staff members are familiar with the emergency response protocols and procedures. This will help to identify any weaknesses in the emergency response plan and provide an opportunity to make improvements.

Maintain Emergency Equipment

Ensure that all emergency equipment is regularly checked and maintained. This includes first aid kits, PPEs, and fire extinguishers.

Review and Update Emergency Response Procedures

Review and update the emergency response procedures on a regular basis to ensure that they remain relevant and effective.

Annexure-Q: Traffic Management Guidelines

Introduction

The Government of Sindh (GoS) has formulated the Sindh Integrated - Integrated Health and Population Project with support from the World Bank (WB) and in line with the national/provincial laws as well as WB safeguards' requirements. To address potentially negative environmental and social impacts of the program, the GoS has conducted an environmental and social assessment of the proposed activities. As an outcome of this assessment, this Environmental and Social Management plan (ESMP) has been prepared.

Objectives

The Traffic Management Plan (TMP) is used to ensure that roads are clear at site during the construction period of the public transportation corridor works, and prevent traffic accidents from occurring in the project scope in construction.

Principles

a. National and local regulations on road traffic and safety should be complied with;
b. A traffic management mechanism should be established and capacity building should be strengthened on traffic management in construction; and
c. Detailed and specific measures on traffic management and emergency response should be prepared and strictly implemented.

Traffic management mechanism

d. Road Traffic Safety Law of the Sindh Government
e. Sindh Motor vehicle ordinance, 2001
f. Sindh urban transport policy
g. Requirements of ESF and WBG EHS Guidelines

Traffic management responsibilities

The PMU, the construction agencies (contractors), and the Road authorities would take different responsibilities (as shown in Table A) in traffic management in the construction period, and they should keep dynamic consultation and cooperation according to the construction progress and traffic situations.

Table-A: Responsibilities for Traffic Management

Responsible party	Responsibilities
Contractor	1. Prepare a detailed traffic organization plan based on the construction organization programs and submit it to PMU for review before construction commissioning; 2. Establish clear organizational structure and duties on traffic management in construction; 3. Provide specific training to related personnel on traffic management in construction; 4. Prepare detailed measures of traffic management within the traffic control zones for the road works based on the approved traffic organization plan, and implement these measures; 5. Record the implementation of these measures, and report any issues once they are recognized; 6. Prepare emergency response plans for traffic accidents in construction;

Responsible party	Responsibilities
	7. Respond to traffic accidents and emergencies in construction as needed.
EDSQA firm (Supervision Consultant)	1. Supervise he traffic management at site during construction 2. Compliance of approve traffic management plan at site 3. Regular reporting to PMU
Program Management Unit (PMU)	1. Review the traffic organization plan; 2. Conduct supervision and inspection on the implementation of traffic management in construction; 3. Review emergency response plans for traffic accidents in construction. 4. Respond to traffic accidents and emergencies in construction as needed.

Traffic management measures

Detailed traffic management measures for the construction period will be prepared in accordance with the relevant laws and regulations. Following basic measures, including but not limited to following, should be considered: -

a. Conduct construction section by section, and avoid all-line construction that might cause large-scale traffic jams.
b. Set special transportation routes in construction, and conduct traffic diversion.
c. Adjust bus stops or routes based on construction arrangements.
d. Set up proper traffic management facilities such as barriers, lights, safe guardrails and marks as required within the traffic control zones for the road works.
e. Provide access roads for pedestrians and/or set proper safe guardrails and marks as needed.
f. Properly arrange the construction personnel, machinery and materials on site to prevent unnecessary traffic congestion.

Safety personnel of each construction team should inspect construction sites every day; and specific personnel should be designated to divert traffic at construction peak hours or traffic jams occur.

Emergency response plans on traffic accidents

The contractors should prepare a detailed emergency response plan for traffic accidents in construction, and equip with necessary facilities for handling emergencies. They should establish a combined emergency response mechanism to traffic accidents and other relevant authorities in charge of road-related public facilities. Preventive measures should be undertaken to avoid accidents in construction, and report and take actions in a timely manner once there are any problems.

Contractor will prepare TMP

The following points to be considered for the preparation of TMP by the Contractor:

- Key Stakeholders
- Permits and approvals
- Potential impacts and mitigation measures
- Traffic diversion and road closures
- Speed limit
- Public notification and community engagement
- Monitoring procedure.

Annexure-R: Healthcare Waste Management Plan

1. Introduction

The government of Sindh under the "Sindh Integrated Health and Population Project-(SIHPP)". Implementation of Environmental & Social Management framework (ESMF) in conformity with the (Health Care Waste Management) Sindh HCWM Rules 2005, a comprehensive Health Care Waste Management Plan (HCWMP) has been developed. The Main objective of HCWMP is to strengthen the hospital waste management system in accordance with Healthcare Waste Management Rule (HWM) rules, 2005 for the safe collection, segregation, storage, transportation and final disposal of the waste. Planning of HCWMP is not limited to the preparation of internal guidelines/instructions for the Management of health care waste but rather a process to sustain and optimize the operation of HCWMP systems in health care facilities. It is the ambition of the District Health Authority (DHA) and Primary People Health care Initiative (PPHI) that the implementation of this plan at operation governmental dispensaries under the SIHPP will result in improved HCW management.
This plan discusses the Health Care Waste Management Plan. It focuses on systems and practices for (i) collection and segregation, (ii) transportation and storage and (iii) safe disposal of health care waste.

Despite many efforts taken by the government and civil society, medical waste (including immunization waste) management across Pakistan remains a challenge, especially at the Tehsil and Union Council levels. Medical waste management practices shows that medical waste is not regulated and not always disposed in an efficient manner. Most of the primary level healthcare facilities do not have effective systems and procedures in place, nor have infrastructure to manage and dispose-off infectious waste. The hazards associated with improper waste disposal by any healthcare facility operation are mostly caused by not following the infection control protocols, not using proper personal protective equipment (PPE), and not employing proper procedures for waste collection, transportation, storage, and final disposal. In addition, recycling of medical waste also poses very serious health risks for the workers involved in recycling and also consumers using the recycled products. Moreover, safety of staff handling sharps such as syringes and needles is at risk if proper procedures are not followed. Air and water quality deterioration is another associated potential impact if the waste is disposed by burning and/or burial.

Current Practices for Waste Management at Project site (Health facility)

The waste at project site (health facility) is collected in colored paddled bins and taken outside (in safety boxes) to the disposal facility.

All the health facilities have adequate capacity to dispose of the waste safely as the technical staff deputed are specifically trained for the said activity. Moreover, the same waste management practice was put in place by Sindh environment protection 2014.

Collection and Segregation

The first and most significant element of the healthcare waste management is collection and segregation. Segregation means separating different waste streams keeping in view the type of treatment and disposal practices. A proper system of segregation would thus identify waste according to the source and type of disposal or disinfections. It would also require containers specifically for each category of waste.

In all type of health care facilities, waste generated has to be classified and segregated into various standard categories such as non-risk waste and risky/ hazardous waste as shown in **Table 1.** Compliance of segregation process will be applied to all project sites, simple enough to be implemented by waste management workers and finally to be easily monitored using a standard checklist. Colored containers

have to be provided along with training of health care staff.

Table 1: Classification and Color Coding of Healthcare Waste to be Adopted for Waste Segregation

Classification	Description	Color of Container	Type of Container
Class 1 (NON-RISK WASTE)	All domestic waste: paper, cardboard, vegetable peelings, food packing, cold drink bottles, cans etc.	White /Green	Suitable Container with plastic bag
Class 2 (SHARPS):	Broken syringes and needles, blades, glass pieces and scalpels, broken and empty vaccine bottles etc.	Yellow, marked Sharp/Danger Waste	Puncture Proof container
Class 3 (INFECTIOUS):	Waste from infected patients, discarded or disposable materials and equipment which have been in contact with such patients (such as used syringes), PPEs (gloves, masks etc.)	Blue, marked Contaminated/Infectious Waste	Container with yellow waste bag

The segregation will be carried out at the source of generation i.e., at health facility. Segregation will be done by type of wastes and collected in the assigned bags. The filled bags will be transported to designated storage/ disposal points.

Transportation

A time-table should be developed for transporting waste on daily basis and shoulder-carrying must be avoided. Wheeled containers / trolleys should be used to transport the waste/plastic bags to the disposal site, particularly for infectious wastes. The collected waste should not be left, even temporarily, at any place other than the designated disposal site.

All concerned staff members are properly trained in the handling, loading, unloading, transportation and disposal of waste (sharps and infectious), and are fully aware of emergency procedures for dealing with accidents and spillages.

Safe Disposal

The hazardous waste should be disposed of immediately through transported to designated incinerator (where applicable).

The bags shall be removed when it is not more than three quarters full and sealed, preferably with self-locking plastic and not by stapling. The bags removed should be immediately replaced with a new one of the same type particularly for infectious wastes.

Non-hazardous waste should also be disposed of through Municipal Corporation according to its regular schedule. Adequate numbers of non-risk waste containers shall be placed at site.

Personal Protective Equipment

All the workers involved in waste management must be equipped with appropriate PPEs.

Monitoring and Testing

The project will monitor the soil, air (where applicable/as burning of waste is involved) and water quality in the surroundings of health care facilities on periodic basis including the third-party validation (described in ESMP) to ensure that the disposal of waste is not impacting soil, air and water quality of the area. The implementation progress reports of the project cover the progress on this Plan as well.

The Health Care Waste Management Plan shall be regularly monitored, documented, reviewed, and revised and updated by the Waste Management Team as and when necessary.

Annexure-S: Lab Reports

Ducom
Analysis, Measure, Calibrate

Address: Ducom Building No. 81-C, Zulfiqar Commercial, Street No.5, DHA Phase VIII, Karachi-Pakistan.
Contact No. 0300-3589664

PROJECT	Sindh Integrated Health & Population Program	**Reference No.**	DUCOM/SIHPP/HYD//THQ/DW/03
Division	Hyderabad	**District**	Badin
Health Facility Name	THQ - Golarchi	**PMU ID**	104611
Report to.	M/s Osmani & Company (Pvt.) Ltd.	**Sample Description**	Drinking Water
Sample Collection Date	19/07/2025	**Source:**	Surface Water
Reporting Date	26/07/2025		
Sample Collected/Submitted by:	DUCOM Representative		

Analytical Test Report of Drinking Water Quality Monitoring

S.No.	Parameter	Method	Unit	SEQS Limit*	Result	Remarks
1.	Temperature	APHA 2550	°C	NGVS	**25.8**	Within Limit
2.	pH @ 25°C	APHA 4500 H^+ B	-	6.5-8.5	**7.4**	Within Limit
3.	Odour	APHA 2150 B	-	Acceptable	**Acceptable**	Within Limit
4.	Color	APHA 2120 B	TCU	≤15	**5**	Within Limit
5.	Taste	APHA 2150 B	-	Acceptable	**Acceptable**	Within Limit
6.	Total Hardness	APHA 2340 C	mg/l	<500	**150**	Within Limit
7.	Total Dissolved Solids	APHA 2540 C	mg/l	<1000	**310**	Within Limit
8.	Turbidity	APHA 2130 B	NTU	<5	**1.82**	Within Limit
9.	Chloride	APHA 4500-Cl B	mg/l	<250	**120**	Within Limit
10.	Chlorine, Residual	APHA 4500-Cl G	mg/l	0.2 - 0.5	**0**	Within Limit
11.	Aluminum	APHA 3111 B	mg/l	≤0.2	**BDL**	Within Limit
12.	Antimony	APHA 3111 B	mg/l	≤0.005	**BDL**	Within Limit
13.	Barium (Ba)	APHA 3111 B	mg/l	0.7	**BDL**	Within Limit
14.	Boron	APHA 3111 B	mg/l	0.3	**BDL**	Within Limit
15.	Fluoride	APHA 4500-F C	mg/l	≤1.5	**0.7**	Within Limit
16.	Nitrate	APHA 4500-NO_3- F	mg/l	≤0.50	**0.5**	Out of Limit
17.	Nitrite	APHA 4500-NO_2- E	mg/l	≤3	**0.009**	Within Limit
18.	Arsenic	APHA 3111 B	mg/l	≤0.05	**BDL**	Within Limit
19.	Cadmium	APHA 3111 B	mg/l	0.01	**BDL**	Within Limit
20.	Chromium	APHA 3111 B	mg/l	≤0.05	**BDL**	Within Limit
21.	Copper	APHA 3111 B	mg/l	2	**BDL**	Within Limit
22.	Cyanide	APHA 4500-CN- G	mg/l	≤0.05	**BDL**	Within Limit
23.	Lead	APHA 3111 B	mg/l	≤0.05	**BDL**	Within Limit
24.	Manganese	APHA 3111 B	mg/l	≤0.5	**BDL**	Within Limit
25.	Mercury	APHA 3111 B	mg/l	≤0.001	**BDL**	Within Limit
26.	Nickel	APHA 3111 B	mg/l	≤0.02	**BDL**	Within Limit
27.	Phenols	APHA 4500-P	mg/l	NGVS	**BDL**	Within Limit
28.	Selenium	APHA 3111 B	mg/l	0.01	**BDL**	Within Limit
29.	Zinc	APHA 3111 B	mg/l	5	**BDL**	Within Limit
30.	Total Coliform	APHA 9221 G	cfu	0/100ml	**17**	Out of Limit
31.	E. Coli	APHA 9221 G	cfu	0/100ml	**1**	Out of Limit

***SEQS** = Sindh Environmental Quality Standards; **BDL** = Below Detection Limit; **NGVS** = Not Guideline Value Standards; **APHA**: American Public Health Association*

Sample Analyzed by	Head of DUCOM Laboratory

Terms & Condition:

- *This Report is not valid for any other certification, or court matters.*
- *The sample will be discarded after one week of issuance of report, unless otherwise informed by the client.*

Ducom
Analysis. Measure. Calibrate

Address: Ducom Building No. 81-C, Zulfiqar Commercial, Street No.5, DHA Phase VIII, Karachi-Pakistan.
Contact No. 0300-3589664

PROJECT	Sindh Integrated Health & Population Program	**Reference No.**	DUCOM/SIHPP/HYD/THQ/DW/01
Division	Hyderabad	**District**	Tando Muhammad Khan
Health Facility Name	THQ - Tando Ghulam Haider	**PMU ID**	324647
Report to.	M/s Osmani & Company (Pvt.) Ltd.	**Sample Description**	Drinking Water
Sample Collection Date	21/07/2025	**Source:**	Groundwater (Depth 50-55 Ft.)
Reporting Date	26/07/2025		
Sample Collected/Submitted by:	DUCOM Representative		

Analytical Test Report of Drinking Water Quality Monitoring

S.No.	Parameter	Method	Unit	SEQS Limit*	Result	Remarks
1.	Temperature	APHA 2550	°C	NGVS	**25.8**	Within Limit
2.	pH @ 25°C	APHA 4500 H^+	-	6.5-8.5	**7.4**	Within Limit
3.	Odour	APHA 2150 B	-	Acceptable	**Acceptable**	Within Limit
4.	Color	APHA 2120 B	TCU	≤15	**5**	Within Limit
5.	Taste	APHA 2160 B	-	Acceptable	**Unacceptable**	Out of Limit
6.	Total Hardness	APHA 2340 C	mg/l	<500	**690**	Out of Limit
7.	Total Dissolved Solids	APHA 2540 C	mg/l	<1000	**1600**	Out of Limit
8.	Turbidity	APHA 2130 B	NTU	<5	**2.68**	Within Limit
9.	Chloride	APHA 4500-Cl^-	mg/l	<250	**810**	Out of Limit
10.	Chlorine, Residual	APHA 4500-Cl	mg/l	0.2 - 0.5	**0**	Within Limit
11.	Aluminum	APHA 3111 B	mg/l	≤0.2	**BDL**	Within Limit
12.	Antimony	APHA 3111 B	mg/l	≤0.005	**BDL**	Within Limit
13.	Barium (Ba)	APHA 3111 B	mg/l	0.7	**BDL**	Within Limit
14.	Boron	APHA 3111 B	mg/l	0.3	**BDL**	Within Limit
15.	Fluoride	APHA 4500-F^-	mg/l	≤1.5	**1.4**	Within Limit
16.	Nitrate	APHA 4500-NO^{3-}	mg/l	≤0.50	**0.7**	Out of Limit
17.	Nitrite	APHA 4500-NO^{2-}	mg/l	≤3	**0.009**	Within Limit
18.	Arsenic	APHA 3111 B	mg/l	≤0.05	**0.022**	Within Limit
19.	Cadmium	APHA 3111 B	mg/l	0.01	**BDL**	Within Limit
20.	Chromium	APHA 3111 B	mg/l	≤0.05	**BDL**	Within Limit
21.	Copper	APHA 3111 B	mg/l	2	**BDL**	Within Limit
22.	Cyanide	APHA 4500-CN^-	mg/l	≤0.05	**BDL**	Within Limit
23.	Lead	APHA 3111 B	mg/l	≤0.05	**BDL**	Within Limit
24.	Manganese	APHA 3111 B	mg/l	≤0.5	**BDL**	Within Limit
25.	Mercury	APHA 3111 B	mg/l	≤0.001	**BDL**	Within Limit
26.	Nickel	APHA 3111 B	mg/l	≤0.02	**BDL**	Within Limit
27.	Phenols	APHA 5530	mg/l	NGVS	**BDL**	Within Limit
28.	Selenium	APHA 3111 B	mg/l	0.01	**BDL**	Within Limit
29.	Zinc	APHA 3111 B	mg/l	5	**BDL**	Within Limit
30.	Total Coliform	APHA 9221	cfu	0/100ml	**18**	Out of Limit
31.	E. Coli	APHA 9221	cfu	0/100ml	**0**	Within Limit

*SEQS = Sindh Environmental Quality Standards; **BDL** = Below Detection Limit; **NGVS** = No Guideline Value Set; **APHA**: American Public Health Association*

Sample Analyzed by	**Head of DUCOM Laboratory**

DUCOM PAKISTAN LAB Measure Analyze Calibrate

Terms & Condition:

- *This Report is not valid for any other certification, or court matters.*
- *The sample will be discarded after one week of issuance of report, unless otherwise informed by the client.*

Ducom
Analysis, Measure, Calibrate

Address: Ducom Building No. 81-C,
Zulfiqar Commercial, Street No.5,
DHA Phase VIII, Karachi-Pakistan.
Contact No. 0300-3589664

PROJECT	Sindh Integrated Health & Population Program	**Reference No.**	DUCOM/SIHPP/HYD/THQ/DW/04
Division	Hyderabad	**District**	Sujawal
Health Facility Name	THQ - Mirpur Bathoro	**PMU ID**	274639
Report to.	M/s Osmani & Company (Pvt.) Ltd.	**Sample Description**	Drinking Water
Sample Collection Date	18/07/2025	**Source:**	Water Supply Line
Reporting Date	26/07/2025		
Sample Collected/Submitted by:	DUCOM Representative		

Analytical Test Report of Drinking Water Quality Monitoring

S.No.	Parameter	Method	Unit	SEQS Limit*	Result	Remarks
1.	Temperature	APHA 2550	°C	NGVS	**25.8**	Within Limit
2.	pH @ 25°C	APHA 4500 H^+	-	6.5-8.5	**7.3**	Within Limit
3.	Odour	APHA 2150 B	-	Acceptable	**Acceptable**	Within Limit
4.	Color	APHA 2120 B	TCU	≤15	**2**	Within Limit
5.	Taste	APHA 2160 B	-	Acceptable	**Acceptable**	Within Limit
6.	Total Hardness	APHA 2340 C	mg/l	<500	**630**	Out of Limit
7.	Total Dissolved Solids	APHA 2540 C	mg/l	<1000	**1520**	Out of Limit
8.	Turbidity	APHA 2130 B	NTU	<5	**0.63**	Within Limit
9.	Chloride	APHA 4500-Cl^-	mg/l	<250	**645**	Out of Limit
10.	Chlorine, Residual	APHA 4500-Cl	mg/l	0.2 - 0.5	**0**	Within Limit
11.	Aluminum	APHA 3111 B	mg/l	≤0.2	**BDL**	Within Limit
12.	Antimony	APHA 3111 B	mg/l	≤0.005	**BDL**	Within Limit
13.	Barium (Ba)	APHA 3111 B	mg/l	0.7	**BDL**	Within Limit
14.	Boron	APHA 3111 B	mg/l	0.3	**BDL**	Within Limit
15.	Fluoride	APHA 4500-F^-	mg/l	≤1.5	**1.0**	Within Limit
16.	Nitrate	APHA 4500-NO^{3-}	mg/l	≤0.50	**1.6**	Out of Limit
17.	Nitrite	APHA 4500-NO^{2-}	mg/l	≤3	**0.494**	Out of Limit
18.	Arsenic	APHA 3111 B	mg/l	≤0.05	**0.012**	Within Limit
19.	Cadmium	APHA 3111 B	mg/l	0.01	**BDL**	Within Limit
20.	Chromium	APHA 3111 B	mg/l	≤0.05	**BDL**	Within Limit
21.	Copper	APHA 3111 B	mg/l	2	**BDL**	Within Limit
22.	Cyanide	APHA 4500-CN^-	mg/l	≤0.05	**BDL**	Within Limit
23.	Lead	APHA 3111 B	mg/l	≤0.05	**BDL**	Within Limit
24.	Manganese	APHA 3111 B	mg/l	≤0.5	**BDL**	Within Limit
25.	Mercury	APHA 3111 B	mg/l	≤0.001	**BDL**	Within Limit
26.	Nickel	APHA 3111 B	mg/l	≤0.02	**BDL**	Within Limit
27.	Phenols	APHA 5530	mg/l	NGVS	**BDL**	Within Limit
28.	Selenium	APHA 3111 B	mg/l	0.01	**BDL**	Within Limit
29.	Zinc	APHA 3111 B	mg/l	5	**BDL**	Within Limit
30.	Total Coliform	APHA 9221	cfu	0/100ml	**0**	Within Limit
31.	E. Coli	APHA 9221	cfu	0/100ml	**0**	Within Limit

*SEQS = Sindh Environmental Quality Standards; **BDL** = Below Detection Limit; **NGVS** = No Guideline Value Set; **APHA**: American Public Health Association*

Sample Analyzed by	Head of Ducom Laboratory

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PROJECT	Sindh Integrated Health & Population Program	**Reference No.**	DUCOM/SIHPP/SUK/DW/03
Division	Sukkur	**District**	Sukkur
Health Facility Name	THQ- Rohri	**PMU ID**	284641
Report to.	Osmani and Company Ltd.	**Sample Description**	Drinking Water
Sample Collection Date	21/07/2025	**Source:**	Water Supply (Dispenser)
Reporting Date	26/07/2025		
Sample Collected/Submitted by:	DUCOM Representative		

Analytical Test Report of Drinking Water Quality Monitoring

S.No.	Parameter	Method	Unit	SEQS Limit*	Result	Remarks
1.	Temperature	APHA 2550	°C	NGVS	**25.8**	Within Limit
2.	pH @ 25°C	APHA 4500 H^+	-	6.5-8.5	**7.6**	Within Limit
3.	Odour	APHA 2150 B	-	Acceptable	**Acceptable**	Within Limit
4.	Color	APHA 2120 B	TCU	≤15	**16**	Out of Limit
5.	Taste	APHA 2160 B	-	Acceptable	**Acceptable**	Within Limit
6.	Total Hardness	APHA 2340 C	mg/l	<500	**120**	Within Limit
7.	Total Dissolved Solids	APHA 2540 C	mg/l	<1000	**140**	Within Limit
8.	Turbidity	APHA 2130 B	NTU	<5	**19.6**	Out of Limit
9.	Chloride	APHA 4500-Cl^-	mg/l	<250	**25**	Within Limit
10.	Chlorine, Residual	APHA 4500-Cl	mg/l	0.2 - 0.5	**0**	Within Limit
11.	Aluminum	APHA 3111 B	mg/l	≤0.2	**BDL**	Within Limit
12.	Antimony	APHA 3111 B	mg/l	≤0.005	**BDL**	Within Limit
13.	Barium (Ba)	APHA 3111 B	mg/l	0.7	**BDL**	Within Limit
14.	Boron	APHA 3111 B	mg/l	0.3	**BDL**	Within Limit
15.	Fluoride	APHA 4500-F^-	mg/l	≤1.5	**0.6**	Within Limit
16.	Nitrate	APHA 4500-NO^{3-}	mg/l	≤0.50	**2.7**	Out of Limit
17.	Nitrite	APHA 4500-NO^{2-}	mg/l	≤3	**0.016**	Within Limit
18.	Arsenic	APHA 3111 B	mg/l	≤0.05	**BDL**	Within Limit
19.	Cadmium	APHA 3111 B	mg/l	0.01	**BDL**	Within Limit
20.	Chromium	APHA 3111 B	mg/l	≤0.05	**BDL**	Within Limit
21.	Copper	APHA 3111 B	mg/l	2	**BDL**	Within Limit
22.	Cyanide	APHA 4500-CN^-	mg/l	≤0.05	**BDL**	Within Limit
23.	Lead	APHA 3111 B	mg/l	≤0.05	**BDL**	Within Limit
24.	Manganese	APHA 3111 B	mg/l	≤0.5	**BDL**	Within Limit
25.	Mercury	APHA 3111 B	mg/l	≤0.001	**BDL**	Within Limit
26.	Nickel	APHA 3111 B	mg/l	≤0.02	**BDL**	Within Limit
27.	Phenols	APHA 5530	mg/l	NGVS	**BDL**	Within Limit
28.	Selenium	APHA 3111 B	mg/l	0.01	**BDL**	Within Limit
29.	Zinc	APHA 3111 B	mg/l	5	**BDL**	Within Limit
30.	Total Coliform	APHA 9221	cfu	0/100ml	**0**	Within Limit
31.	E. Coli	APHA 9221	cfu	0/100ml	**0**	Within Limit

*SEQS = Sindh Environmental Quality Standards; **BDL** = Below Detection Limit; **NGVS** = No Guideline Value Set; **APHA**: American Public Health Association*

Sample Analyzed by	**Head of DUCOM Laboratory**

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Project	Sindh Integrated Health & Population Program	**Reference No.**	DUCOM/SIHPP/SBA/THQ/DW/01
Division	Shaheed Benazirabad	**District**	Nawabshah
Health Facility Name	THQ - Qazi Ahmed	**PMU ID**	244632
Report to.	Osmani and Company Ltd.	**Sample Description**	Drinking Water
Sample Collection Date	18/07/2025	**Source:**	Groundwater
Reporting Date	26/07/2025		
Sample Collected/Submitted by:	DUCOM Representative		

Analytical Test Report of Drinking Water Quality Monitoring

S.No.	Parameter	Method	Unit	SEQS Limit*	Result	Remarks
1.	Temperature	APHA 2550	°C	NGVS	**25.8**	Within Limit
2.	pH @ 25°C	APHA 4500 H^+	-	6.5-8.5	**7.2**	Within Limit
3.	Odour	APHA 2150 B	-	Acceptable	**Acceptable**	Within Limit
4.	Color	APHA 2120 B	TCU	≤15	**2**	Within Limit
5.	Taste	APHA 2160 B	-	Acceptable	**Unacceptable**	Out of Limit
6.	Total Hardness	APHA 2340 C	mg/l	<500	**490**	Within Limit
7.	Total Dissolved Solids	APHA 2540 C	mg/l	<1000	**1230**	Out of Limit
8.	Turbidity	APHA 2130 B	NTU	<5	**0.21**	Within Limit
9.	Chloride	APHA 4500-Cl^-	mg/l	<250	**485**	Out of Limit
10.	Chlorine, Residual	APHA 4500-Cl	mg/l	0.2 - 0.5	**0**	Within Limit
11.	Aluminum	APHA 3111 B	mg/l	≤0.2	**BDL**	Within Limit
12.	Antimony	APHA 3111 B	mg/l	≤0.005	**BDL**	Within Limit
13.	Barium (Ba)	APHA 3111 B	mg/l	0.7	**BDL**	Within Limit
14.	Boron	APHA 3111 B	mg/l	0.3	**BDL**	Within Limit
15.	Fluoride	APHA 4500-F^-	mg/l	≤1.5	**1.1**	Within Limit
16.	Nitrate	APHA 4500-NO^{3-}	mg/l	≤0.50	**0.6**	Out of Limit
17.	Nitrite	APHA 4500-NO^{2-}	mg/l	≤3	**0.111**	Within Limit
18.	Arsenic	APHA 3111 B	mg/l	≤0.05	**BDL**	Within Limit
19.	Cadmium	APHA 3111 B	mg/l	0.01	**BDL**	Within Limit
20.	Chromium	APHA 3111 B	mg/l	≤0.05	**BDL**	Within Limit
21.	Copper	APHA 3111 B	mg/l	2	**BDL**	Within Limit
22.	Cyanide	APHA 4500-CN^-	mg/l	≤0.05	**BDL**	Within Limit
23.	Lead	APHA 3111 B	mg/l	≤0.05	**BDL**	Within Limit
24.	Manganese	APHA 3111 B	mg/l	≤0.5	**BDL**	Within Limit
25.	Mercury	APHA 3111 B	mg/l	≤0.001	**BDL**	Within Limit
26.	Nickel	APHA 3111 B	mg/l	≤0.02	**BDL**	Within Limit
27.	Phenols	APHA 5530	mg/l	NGVS	**BDL**	Within Limit
28.	Selenium	APHA 3111 B	mg/l	0.01	**BDL**	Within Limit
29.	Zinc	APHA 3111 B	mg/l	5	**BDL**	Within Limit
30.	Total Coliform	APHA 9221	cfu	0/100ml	**0**	Within Limit
31.	E. Coli	APHA 9221	cfu	0/100ml	**0**	Within Limit

*SEQS = Sindh Environmental Quality Standards; **BDL** = Below Detection Limit; **NGVS** = No Guideline Value Set; **APHA**: American Public Health Association*

Sample Analyzed by	Head of DUCOM Laboratory

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PROJECT	Sindh Integrated Health & Population Program	**Reference No.**	DUCOM/SIHPP/MPK/GD/THQ/01
Division	Mirpurkhas	**District**	Mirpurkhas
Health Facility Name	THQ-Kot Ghulam Muhammad	**PMU ID**	224629
Report to.	M/s Osmani & Company (Pvt.) Ltd.	**Sample Description**	Drinking Water
Sample Collection Date	19/07/2025	**Source:**	Supply line
Reporting Date	26/07/2025		
Sample Collected/Submitted by:	DUCOM Representative		

Analytical Test Report of Drinking Water Quality Monitoring

S.No.	Parameter	Method	Unit	SEQS Limit*	Result	Remarks
1.	Temperature	APHA 2550	°C	NGVS	**25.8**	Within Limit
2.	pH @ 25°C	APHA 4500 H^+	-	6.5-8.5	**7.7**	Within Limit
3.	Odour	APHA 2150 B	-	Acceptable	**Acceptable**	Within Limit
4.	Color	APHA 2120 B	TCU	≤15	**7**	Within Limit
5.	Taste	APHA 2160 B	-	Acceptable	**Acceptable**	Within Limit
6.	Total Hardness	APHA 2340 C	mg/l	<500	**110**	Within Limit
7.	Total Dissolved Solids	APHA 2540 C	mg/l	<1000	**150**	Within Limit
8.	Turbidity	APHA 2130 B	NTU	<5	**8.60**	Out of Limit
9.	Chloride	APHA 4500-Cl^-	mg/l	<250	**45**	Within Limit
10.	Chlorine, Residual	APHA 4500-Cl	mg/l	0.2 - 0.5	**0**	Within Limit
11.	Aluminum	APHA 3111 B	mg/l	≤0.2	**BDL**	Within Limit
12.	Antimony	APHA 3111 B	mg/l	≤0.005	**BDL**	Within Limit
13.	Barium (Ba)	APHA 3111 B	mg/l	0.7	**BDL**	Within Limit
14.	Boron	APHA 3111 B	mg/l	0.3	**BDL**	Within Limit
15.	Fluoride	APHA 4500-F^-	mg/l	≤1.5	**0.6**	Within Limit
16.	Nitrate	APHA 4500-NO_3^-	mg/l	≤0.50	**1.1**	Out of Limit
17.	Nitrite	APHA 4500-NO_2^-	mg/l	≤3	**0.021**	Within Limit
18.	Arsenic	APHA 3111 B	mg/l	≤0.05	**BDL**	Within Limit
19.	Cadmium	APHA 3111 B	mg/l	0.01	**BDL**	Within Limit
20.	Chromium	APHA 3111 B	mg/l	≤0.05	**BDL**	Within Limit
21.	Copper	APHA 3111 B	mg/l	2	**BDL**	Within Limit
22.	Cyanide	APHA 4500-CN^-	mg/l	≤0.05	**BDL**	Within Limit
23.	Lead	APHA 3111 B	mg/l	≤0.05	**BDL**	Within Limit
24.	Manganese	APHA 3111 B	mg/l	≤0.5	**0.011**	Within Limit
25.	Mercury	APHA 3111 B	mg/l	≤0.001	**BDL**	Within Limit
26.	Nickel	APHA 3111 B	mg/l	≤0.02	**BDL**	Within Limit
27.	Phenols	APHA 5530	mg/l	NGVS	**BDL**	Within Limit
28.	Selenium	APHA 3111 B	mg/l	0.01	**BDL**	Within Limit
29.	Zinc	APHA 3111 B	mg/l	5	**BDL**	Within Limit
30.	Total Coliform	APHA 9221	cfu	0/100ml	**22**	Out of Limit
31.	E. Coli	APHA 9221	cfu	0/100ml	**9**	Out of Limit

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PROJECT	Sindh Integrated Health & Population Program	**Reference No.**	DUCOM/SIHPP/KHP/DW/THQ/01
Division	Sukkur	**District**	Khairpur
Health Facility Name	THQ - Kotdiji	**PMU ID**	174621
Report to.	M/s Osmani & Company (Pvt.) Ltd.	**Sample Description**	Drinking Water
Sample Collection Date	28/07/2025	**Source:**	Groundwater
Reporting Date	06/08/2025		
Sample Collected/Submitted by:	DUCOM Representative		

Analytical Test Report of Drinking Water Quality Monitoring

S.No.	Parameter	Method	Unit	SEQS Limit*	Result	Remarks
1.	Temperature	APHA 2550	°C	NGVS	**25.8**	Within Limit
2.	pH @ 25°C	APHA 4500 H^+	-	6.5-8.5	**7.9**	Within Limit
3.	Odour	APHA 2150 B	-	Acceptable	**Acceptable**	Within Limit
4.	Color	APHA 2120 B	TCU	≤15	**2**	Within Limit
5.	Taste	APHA 2160 B	-	Acceptable	**Acceptable**	Within Limit
6.	Total Hardness	APHA 2340 C	mg/l	<500	**200**	Within Limit
7.	Total Dissolved Solids	APHA 2540 C	mg/l	<1000	**270**	Within Limit
8.	Turbidity	APHA 2130 B	NTU	<5	**0.2**	Within Limit
9.	Chloride	APHA 4500-Cl^-	mg/l	<250	**40**	Within Limit
10.	Chlorine, Residual	APHA 4500-Cl	mg/l	0.2 - 0.5	**0**	Within Limit
11.	Aluminum	APHA 3111 B	mg/l	≤0.2	**BDL**	Within Limit
12.	Antimony	APHA 3111 B	mg/l	≤0.005	**BDL**	Within Limit
13.	Barium (Ba)	APHA 3111 B	mg/l	0.7	**BDL**	Within Limit
14.	Boron	APHA 3111 B	mg/l	0.3	**BDL**	Within Limit
15.	Fluoride	APHA 4500-F^-	mg/l	≤1.5	**0.6**	Within Limit
16.	Nitrate	APHA 4500-NO^{3-}	mg/l	≤0.50	**1.8**	Within Limit
17.	Nitrite	APHA 4500-NO^{2-}	mg/l	≤3	**0.005**	Within Limit
18.	Arsenic	APHA 3111 B	mg/l	≤0.05	**BDL**	Within Limit
19.	Cadmium	APHA 3111 B	mg/l	0.01	**BDL**	Within Limit
20.	Chromium	APHA 3111 B	mg/l	≤0.05	**BDL**	Within Limit
21.	Copper	APHA 3111 B	mg/l	2	**BDL**	Within Limit
22.	Cyanide	APHA 4500-CN^-	mg/l	≤0.05	**BDL**	Within Limit
23.	Lead	APHA 3111 B	mg/l	≤0.05	**BDL**	Within Limit
24.	Manganese	APHA 3111 B	mg/l	≤0.5	**0.003**	Within Limit
25.	Mercury	APHA 3111 B	mg/l	≤0.001	**BDL**	Within Limit
26.	Nickel	APHA 3111 B	mg/l	≤0.02	**BDL**	Within Limit
27.	Phenols	APHA 5530	mg/l	NGVS	**BDL**	Within Limit
28.	Selenium	APHA 3111 B	mg/l	0.01	**BDL**	Within Limit
29.	Zinc	APHA 3111 B	mg/l	5	**BDL**	Within Limit
30.	Total Coliform	APHA 9221	cfu	0/100ml	**17**	Out of Limit
31.	E. Coli	APHA 9221	cfu	0/100ml	**0**	Within Limit

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Sample Analyzed by	**Head of Ducom Laboratory**

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PROJECT	Sindh Integrated Health & Population Program	**Reference No.**	DUCOM/SIHPP/SBA/DW/THQ/01
Division	Shaheed Benazirabad	**District**	Naushahro Feroze
Health Facility Name	THQ - Kandiaro	**PMU ID**	344630
Report to.	M/s Osmani & Company (Pvt.) Ltd.	**Sample Description**	Drinking Water
Sample Collection Date	28/07/2025	**Source:**	Groundwater
Reporting Date	06/08/2025		
Sample Collected/Submitted by:	DUCOM Representative		

Analytical Test Report of Drinking Water Quality Monitoring

S.No.	Parameter	Method	Unit	SEQS Limit*	Result	Remarks
1.	Temperature	APHA 2550	°C	NGVS	**25.7**	Within Limit
2.	pH @ 25°C	APHA 4500 H^+	-	6.5-8.5	**7.5**	Within Limit
3.	Odour	APHA 2150 B	-	Acceptable	**Acceptable**	Within Limit
4.	Color	APHA 2120 B	TCU	≤15	**2**	Within Limit
5.	Taste	APHA 2160 B	-	Acceptable	**Acceptable**	Within Limit
6.	Total Hardness	APHA 2340 C	mg/l	<500	**290**	Within Limit
7.	Total Dissolved Solids	APHA 2540 C	mg/l	<1000	**570**	Within Limit
8.	Turbidity	APHA 2130 B	NTU	<5	**0.37**	Within Limit
9.	Chloride	APHA 4500-Cl^-	mg/l	<250	**165**	Out of Limit
10.	Chlorine, Residual	APHA 4500-Cl	mg/l	0.2 - 0.5	**0**	Within Limit
11.	Aluminum	APHA 3111 B	mg/l	≤0.2	**BDL**	Within Limit
12.	Antimony	APHA 3111 B	mg/l	≤0.005	**BDL**	Within Limit
13.	Barium (Ba)	APHA 3111 B	mg/l	0.7	**BDL**	Within Limit
14.	Boron	APHA 3111 B	mg/l	0.3	**BDL**	Within Limit
15.	Fluoride	APHA 4500-F^-	mg/l	≤1.5	**0.8**	Within Limit
16.	Nitrate	APHA 4500-NO^{3-}	mg/l	≤0.50	**0.4**	Out of Limit
17.	Nitrite	APHA 4500-NO^{2-}	mg/l	≤3	**0.007**	Within Limit
18.	Arsenic	APHA 3111 B	mg/l	≤0.05	**BDL**	Within Limit
19.	Cadmium	APHA 3111 B	mg/l	0.01	**BDL**	Within Limit
20.	Chromium	APHA 3111 B	mg/l	≤0.05	**BDL**	Within Limit
21.	Copper	APHA 3111 B	mg/l	2	**BDL**	Within Limit
22.	Cyanide	APHA 4500-CN^-	mg/l	≤0.05	**BDL**	Within Limit
23.	Lead	APHA 3111 B	mg/l	≤0.05	**BDL**	Within Limit
24.	Manganese	APHA 3111 B	mg/l	≤0.5	**BDL**	Within Limit
25.	Mercury	APHA 3111 B	mg/l	≤0.001	**BDL**	Within Limit
26.	Nickel	APHA 3111 B	mg/l	≤0.02	**BDL**	Within Limit
27.	Phenols	APHA 5530	mg/l	NGVS	**BDL**	Within Limit
28.	Selenium	APHA 3111 B	mg/l	0.01	**BDL**	Within Limit
29.	Zinc	APHA 3111 B	mg/l	5	**BDL**	Within Limit
30.	Total Coliform	APHA 9221	cfu	0/100ml	**3**	Out of Limit
31.	E. Coli	APHA 9221	cfu	0/100ml	**0**	Within Limit

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PROJECT	Sindh Integrated Health & Population Program	**Reference No.**	DUCOM/SIHPP/HYD/DW/THQ/01
Division	Hyderabad	**District**	Jamshoro
Health Facility Name	THQ - Manjhand	**PMU ID**	154619
Report to.	M/s Osmani & Company (Pvt.) Ltd.	**Sample Description**	Drinking Water
Sample Collection Date	29/07/2025	**Source:**	Surface Water (Water Supply)
Reporting Date	06/08/2025		
Sample Collected/Submitted by:	DUCOM Representative		

Analytical Test Report of Drinking Water Quality Monitoring

S.No.	Parameter	Method	Unit	SEQS Limit*	Result	Remarks
1.	Temperature	APHA 2550	°C	NGVS	**25.8**	Within Limit
2.	pH @ 25°C	APHA 4500 H^+	-	6.5-8.5	**8**	Within Limit
3.	Odour	APHA 2150 B	-	Acceptable	**Acceptable**	Within Limit
4.	Color	APHA 2120 B	TCU	≤15	**7**	Within Limit
5.	Taste	APHA 2160 B	-	Acceptable	**Acceptable**	Within Limit
6.	Total Hardness	APHA 2340 C	mg/l	<500	**90**	Within Limit
7.	Total Dissolved Solids	APHA 2540 C	mg/l	<1000	**180**	Within Limit
8.	Turbidity	APHA 2130 B	NTU	<5	**8.2**	Out of Limit
9.	Chloride	APHA 4500-Cl^-	mg/l	<250	**70**	Within Limit
10.	Chlorine, Residual	APHA 4500-Cl	mg/l	0.2 - 0.5	**0**	Within Limit
11.	Aluminum	APHA 3111 B	mg/l	≤0.2	**BDL**	Within Limit
12.	Antimony	APHA 3111 B	mg/l	≤0.005	**BDL**	Within Limit
13.	Barium (Ba)	APHA 3111 B	mg/l	0.7	**BDL**	Within Limit
14.	Boron	APHA 3111 B	mg/l	0.3	**BDL**	Within Limit
15.	Fluoride	APHA 4500-F^-	mg/l	≤1.5	**0.6**	Within Limit
16.	Nitrate	APHA 4500-NO^{3-}	mg/l	≤0.50	**1.8**	Out of Limit
17.	Nitrite	APHA 4500-NO^{2-}	mg/l	≤3	**0.019**	Within Limit
18.	Arsenic	APHA 3111 B	mg/l	≤0.05	**BDL**	Within Limit
19.	Cadmium	APHA 3111 B	mg/l	0.01	**BDL**	Within Limit
20.	Chromium	APHA 3111 B	mg/l	≤0.05	**BDL**	Within Limit
21.	Copper	APHA 3111 B	mg/l	2	**BDL**	Within Limit
22.	Cyanide	APHA 4500-CN^-	mg/l	≤0.05	**BDL**	Within Limit
23.	Lead	APHA 3111 B	mg/l	≤0.05	**BDL**	Within Limit
24.	Manganese	APHA 3111 B	mg/l	≤0.5	**0.004**	Within Limit
25.	Mercury	APHA 3111 B	mg/l	≤0.001	**BDL**	Within Limit
26.	Nickel	APHA 3111 B	mg/l	≤0.02	**BDL**	Within Limit
27.	Phenols	APHA 5530	mg/l	NGVS	**BDL**	Within Limit
28.	Selenium	APHA 3111 B	mg/l	0.01	**BDL**	Within Limit
29.	Zinc	APHA 3111 B	mg/l	5	**BDL**	Within Limit
30.	Total Coliform	APHA 9221	cfu	0/100ml	**20**	Out of Limit
31.	E. Coli	APHA 9221	cfu	0/100ml	**0**	Within Limit

*SEQS = Sindh Environmental Quality Standards; **BDL** = Below Detection Limit; **NGVS** = No Guideline Value Set; **APHA**: American Public Health Association*

Sample Analyzed by	**Head of Ducom Laboratory**

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GOVERNMENT OF SINDH

LABOR MANAGEMENT PROCEDURES

SINDH INTEGRATED HEALTH AND POPULATION PROJECT-P178530

DEPARTMENT OF HEALTH

January 2024

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BHUs	Basic Health Units
CERC	Contingency Emergency Response Component
CHW	Community Health Workers
CMW	Community Midwives
CNIC	Computer National Identity Card
COC	Code of Conducts
DHIS	District Health Information System
DHQ	District Headquarter Hospitals
DOH	Department of Health
EHS	Environment, Health and Safety
ES	Environmental Specialist
ESF	Environmental & Social Framework
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ESS	Environmental and Social Safeguard
FP	Family Planning
GBV	Gender Based Violence
GDs	Government Dispensaries
GoS	Government of Sindh
GRC	Grievance Redressal Committees
GRM	Grievance Redress Mechanism
HF	Health facility
HR	Human Resource
IDP	Internally Displaced Persons
LMP	Labor Management Plan
M&E	Monitoring and Evaluation
MSDS	Minimum Service Delivery Standard
NGO	Non-Governmental organization
OHS	Occupational Health & Safety
OHSMP	Occupational Health and Safety Management Plans
PD	Project Director
PMU	Project Management Unit
PPEs	Personal Protective Equipment's
PPHI	People's Primary Healthcare Initiative
PPP	Public Private Partnership
PSC	Project Steering Committee
RHC	Rural Health Centers
RMNCAH+N	Reproductive, Maternal, Neonatal, Child, Adolescent Health and Nutrition
SBCC	Social and behavior change communication
SEA	Sexual Exploitation and Abuse
SIHPP	Sindh Integrated Health & Population Project

SH	Sexual harassment
SSESMP	Site Specific construction Environmental and Social Management Plan
THQ	Taluka Head Quarters
WMO	Women Medical Officer
WBG	World Bank Guidelines

1 Overview of Labor Use on the Project

The Government of Sindh (GoS), through Department of Health, is implementing "Sindh Integrated Health and Population Project" (SIHPP) with the support from the World Bank (WB). The objective of the project is to improve utilization and quality of basic Reproductive, Maternal, Neonatal, Child, Adolescent Health and Nutrition (RMNCAH+N), for poor and vulnerable populations, especially women and children, in targeted areas of Sindh.

These Labor Management Procedures (LMP) have been prepared as per the requirements of the World Bank's Environmental and Social Framework (ESF), Environmental and Social Standard 2 (ESS2) on Labor and Working Conditions, to discuss the requirements with regard to labor and working conditions applicable to the proposed project. It aims to guide the management and execution of activities that may induce labor related risks during the implementation of the project. ESS2 defines "project workers" as including:

1. Direct workers – people employed or engaged directly by the Borrower to work on project activities.
2. Contracted workers – people employed or engaged through third parties (contractors, subcontractors, brokers, agents, or intermediaries) to perform work related to the core functions of the project.
3. Primary supply workers – people employed or engaged by the Borrower's primary suppliers (suppliers who directly provide goods and materials essential to the core functions of the project).
4. Community workers – people voluntarily employed or engaged in providing community labor in a number of different circumstances.

This LMP applies to all types of project workers to be engaged by the Project, whether full-time, part-time, temporary, seasonal, or migrant workers.

1.1 Number of Project Workers

The Project will involve direct, contracted, and primary supply workers. An overview of project workers is provided in the table below. The LMP is a living document, which is initiated early in the planning stage of the project preparation, and is evaluated and updated throughout development and implementation of the project.

Table 1 Summary of Labor Use

Type of Workers	*Entity*	*Estimate Number of Staff*
Direct Workers (staff who will be contracted by the project)	PMU	Project Director (1) Technical Advisor (1) Financial Management Specialist (1) Monitoring and Evolution Officer (1) Environmental Specialist (1) Social (to also act as focal person for Gender related issues) Specialist (1) Civil Engineer (1) Monitoring and Evolution Specialist (1) Micro Finance Specialist (1) Media Communication Specialist (1) Environmental Officer (1) Finance Management Officer (1)

		Public Health Officer (1) Micro Finance Officer (1) Training Coordinator (1) Procurement Assistant (1) Data Analyst (1) Data Processing Assistant (1)
Government Workers (government staff who will provide services for the project, but will be employed and paid through their existing government contracts)	Department of Health, GoS	District Focal Persons (30) Community Health workers 6 per BHU Community health worker 4 per GD Paramedical staff 25 per BHU Paramedical staff 11 per GD Ambulance crew (18) per ambulance for 24 hours Mobile Clinic (08) Mobile Laboratories (05)
Contracted Workers (People employed or engaged through third parties to perform work related to core functions of the project, regardless of location)	Capacity Building Firm	Firm with 10 positions
	Monitoring and Evaluation Consultant	Firm with 8-10 8-10 positions (Estimated)
	Design and supervision firm	Firm with 12-15 positions
	Workers hired by contractors for construction/civil works activities and project services (rehabilitation/reconstruction health facilities/Regional training institutes/ public health schools/community midwife schools).	15-20 in each health facility (estimated) .
Primary Supply Workers (People employed or engaged by primary suppliers who, on an ongoing basis, provide directly to the project goods or materials essential for the core functions of the project.)	Companies who the project will procure goods and services from: ambulances/ Mobile Laboratories/ Mobile Clinics, laboratory equipment, medical equipment.	Primary supply workers on SIHPP will be the workers of the entities from which the Project procures essential goods and services. At appraisal stage the number of primary supply workers is not known.

1.1.1 Direct Workers

The project's direct workers are comprised of the project-based staff of the Project Management Unit (PMU), to perform work that is explicitly related to the Project. The PMU is composed of various technical professionals. The PMU may additionally hire consultants and support personnel who will be paid on a contract basis. The national and provincial labor regulations will serve as the basis for these consultants' terms and conditions.

1.1.2 Government Workers

The implementation of the project will involve the participation of government staff who are already employed by the government of Sindh and the Department of Health. These staff members will actively support and be involved with the project

While ESS2 does not apply to such persons, the potential risks and impacts of the project to such persons will be assessed in accordance with ESS1, including any OHS and GBV/SEA/SH considerations.

1.1.3 Contracted Workers

The Project will contract third party firm for the following roles:

- Design and supervision firm – to manage and oversee all construction activities on the project. An estimated 15 staff members from this firm will provide services to the Project.
- Monitoring and evaluation consultant – this firm will be responsible for overall M&E on the project, and will have estimated 8-10 staff members providing services to the Project.
- Construction contractors – which will implement the construction and rehabilitation activities designed under the Project. An estimated 15-20 staff members in each health facility from this firm will provide services to the Project. To reduce the number of migrant workers, local labor will be hired to the extent possible as unskilled and skilled workers, particularly for simple tasks. The contractor will be legally obligated to engage with PMU to prioritize the nearby communities and vulnerable groups, including female workers and labors with disabilities at their request, in order to ensure equal chances in employment.

1.1.4 Community Workers

The project will not have community workers as defined under ESS2.

1.1.5 Primary Supply Workers

Primary supply workers on SIHPP will be the workers of the entities from which the Project procures essential goods, including but not limited to ambulances/ Mobile Laboratories/ Mobile Clinics, laboratory equipment, medical equipment.

As procurement of these inputs will be done on an on-demand basis, numbers of primary supply workers are not known at stage.

1.2 Characteristics of Project Workers

The Project will engage both male and female workers, with a mix of skilled, unskilled, and professional workers for the PMU. Staff will be hired from within Sindh, while technical experts and consultants may be hired from across Pakistan, or internationally as required. The expectation is that the majority of labor will be locally hired, also the skilled workers (where applicable). Provisions will be made to train and hire as many as possible from local communities where the activities are taking place.

1.3 Timing of Labor Requirements

1.3.1 Direct Workers

Direct workers at the PMU will be engaged throughout the life of the project. Additional direct workers, including service providers and technical consultants will be hired on an on-demand basis as needed during project implementation.

1.3.2 Contracted Workers

The Project will employ contractors for activities related to construction and rehabilitation, trainings, monitoring and evaluation (M & E) and research and survey. The contracted entities will hire contracted workers based on the needs of the relevant activities. Contracted workers under the Project will be hired on an on-demand basis, as required by the specific activities being implemented.

2 Assessment of Key Potential Risks

2.1 Project Activities

The project has the following four components, the brief description of each component is given below:

Component 1: Improving RMNCAH+N services utilization and quality and support during public health emergencies this component has following three (03) subcomponents:

Subcomponent 1.1: Public Health Emergency Response to Combat Health Impact due to the Floods. This sub-component will support integrated outreach healthcare and reproductive health services through existing mobile health teams and the provision of additional fixed and/or mobile health units, delivery vans and ambulance services for referral and surveillance system, including labs. It will finance procurement of lifesaving medicines and essential medical equipment and supplies, including reproductive health kits, midwifery kits, newborn baby kits, safe delivery kits, dignity kits, family planning (FP) commodities to prevent unintended pregnancies, insecticide treated bed nets for vector control and nutrition services (i.e. SBCC counselling, growth monitoring and promotion, micronutrient supplementation and referral of acutely malnourished child to therapeutic centers). Referral facilities will be equipped with trained human resources (HR) and supporting equipment and supplies. It will also strengthen surveillance systems for disease outbreak detection and response, especially in the worst affected districts.

Subcomponent 1.2: Strengthening/Rehabilitating of the Health Facilities for Providing Preventive Care. It will support provision of minimum service delivery standard (MSDS), including GBV responses, for RMNCAH+N through (a) revitalization of an identified set of government dispensaries (GDs) in the catchment areas of the underserved and unserved populations of Sindh and other health facilities, including basic health units (BHUs), rural health centers (RHCs), tehsil headquarter hospitals (THQs) and district headquarter hospitals (DHQs), affected by the floods by including refurbishment of the health facilities, purchase of equipment including medicines and supplies, and ambulance services for referral; (b) recruitment and/or deployment of female health workers, specifically woman medical officers (WMO), community midwives (CMW), and community health workers (CHW); (c) effective structural and functional integration of health facility-based FP services and community-based services; (d) training of the healthcare providers on MSDS, GBV prevention and management, climate-induced disaster and epidemic response including disease surveillance and tele-health services for RMNCAH+N at places with access to the internet; and (e) establishment of a dynamic, integrated electronic medical records system linked to the Sindh District Health Information System (DHIS) and other key health databases, to track patient related data. This component will also include prevention programs, including health education, screening for hypertension and blood sugar, and vaccinations.

Sub-component 1.3: Strengthening of Referral Hospitals for Effective Delivery and Neonatal Care. It will support an identified set of THQ and DHQ hospitals to provide comprehensive obstetric and neonatal care through (a) purchase of equipment, medicines and supplies; (b) provision of blood storage units; and (c) training of the healthcare providers on MSDS and management of mothers and children referred by GD's.

Component 2: Strengthening Demand for RMNCAH+N Services, Including Women's Empowerment for Availing Health Services. This component will cover SBCC and related activities to encourage uptake of RMNCAH+N services using social marketing strategy and rebranding of GDs and their services package to create awareness. It will also include women's empowerment for exercising sexual and reproductive health rights. Social and behavior change activities will include extensive community outreach, involvement of community leaders to reach these GD catchment areas and the internally displaced population (IDP) due to flood. These activities will involve

partnering with non-governmental organizations (NGOs), community-based organizations, and other private sector organizations.

Component 3: Project Management, Monitoring and Evaluation and Research. This component will support the strengthening of the DoH and its coordinating structures and agencies for the coordination and management of project activities, including financial management, procurement, Public Private Partnership (PPP) node and stakeholder engagement. This component would also support monitoring and evaluation (M&E) including third-party monitoring, rapid household surveys and surveys to measure quality of service delivery at health facilities.

Component 4: Contingency Emergency Response Component (CERC). In the event of an Eligible Crisis or Emergency, the project will contribute by providing immediate and effective response to said crisis or emergency.

2.2 Key Labor Risks

Potential labor related risks of the SIHPP project include[1] the following:

- Occupational health and safety risks that may arise during the construction/rehabilitation activities of health facilities, deep excavations, steel fixing, working at height, slip trip & fall, noise & vibrations, electricity, installation of a batching plant, concrete pouring, installation of solar panels, movement of project vehicles and equipment, manual & mechanical handling during loading-unloading operation, fire hazard, ,bad housekeeping, inappropriate collection, storage, transportation and disposal of hazardous (paint, varnish, cement) material & waste, installation of medical equipment, exposure to infectious blood at blood storage units, risks related to development and management of contractor/ workers camps (if established)[2], lack of provision of PPEs Construction and rehabilitation work will involve unskilled and semi-skilled workers who have to work in the open sky during harsh weather conditions and may be exposed to extreme heat, particularly in the summer months. They may be facing discrimination during engagement and allotting work. Other risks may include communicable disease, unsafe potable water, lack of provision of basic facilities, lack of proper grievance redress channel and trainings for workers, disputes over terms and conditions of employment.
- Labor deployment may result in conflicts between local communities and project workers, which may be related to religious, cultural, or ethnic differences, or based on competition for local resources.
- The risk of child labor and forced labor remains relevant, particularly for contracted workers, and for primary supply workers.
- Gender related risks are also relevant due to the deployment of external personnel, including, project staff, contractors, labor, etc. Risks related to the exclusion of women, girls, and gender minorities as well as gender-based violence, sexual harassment, and sexual abuse and exploitation may arise or be exacerbated by several factors.

[1] *Detailed descriptions of risks and mitigation measures are provided in the SIHPP Environmental and Social Management Framework, available from https://sihpp.gos.pk/environment.php*

[2] *If the contractor/ workers camp is established, then contractor shall ensure the compliance with the requirements of ESS2 including Guidance Note with the consent of E&S Specialists of PMU.*

3 Brief Overview of Labor Legislation: Terms and Conditions

This chapter presents an overview of the labor legislation in the country relevant to the SIHPP project, It examines the World Bank's criteria regarding workforce and work environment standards, delineates the labor rights defined by the Constitution of Pakistan, describes the international labor standards to which Pakistan is a signatory, and outlines the country's federal and provincial legislations governing labor management practices.

3.1 Labor Rights in the Constitution of Pakistan

The 1973 Constitution of Pakistan establishes a rights framework for the labor force, detailing economic and social welfare provisions. Part II of the Constitution includes labor rights as livelihood security, prohibition of bonded labor, abolition of slavery, and the right to association. Specific articles related to labor in Part II include:

- Article 11: prohibition of all forms of slavery, forced labor, and child labor
- Article 17: guarantee of the right to freedom of association and union formation
- Article 18: gives the right to citizens to pursue any lawful profession, occupation, or business
- Article 25: assurance of equality before the law, and prohibition of discrimination based on gender
- Article 37(e): Provision for fair and humane working conditions. With particular attention to preventing employment in unsuitable occupations for children and women, and ensuring maternity benefits for employed women.

3.2 Provincial Labor Laws

Following the 18th Amendment to the Constitution of Pakistan in 2010, the authority over labor and employment matters was decentralized to the provinces. This amendment made federal labor laws adaptable by provinces under Article 270 AA (6) of the Constitution. This significant constitutional change has redefined the labor administration landscape in Pakistan, endowing provinces with increased responsibilities and resources for crafting and executing labor legislation. Each province, including Sindh with its Sindh Labor Policy 2018, has formulated its own labor policy to safeguard worker rights.

The 2018 Sindh Labor Policy particularly encompasses critical areas in a revamped structure, prioritizing strategies for effectively implementing labor standards, enhancing workplace safety, ensuring living wages, and addressing issues like child and bonded labor. It emphasizes raising awareness, improving labor inspections, offering quality technical training through upgraded centers, streamlining labor laws, and providing medical facilities for retired workers. Furthermore, the policy focuses on establishing labor colonies, schools for workers' children, efficient disbursement of welfare grants, and a gradual expansion of the labor protection framework. The following subsections detail the provincial labor laws relevant to the project.

3.2.1 Sindh Industrial Relations Act, 2013

The Act seeks to regulate the formation of trade unions, regulation, and improvement of relations between employers and workers, and the avoidance and settlement of any differences or disputes arising between them.

3.2.2 Sindh Workers' Welfare Fund Act, 2014

This Act provides for the establishment of a Workers' Welfare Fund in Sindh. It defines the responsibilities of

employers and workers regarding the fund, and penalties for noncompliance.

3.2.3 Sindh Employees Old-Age Benefits Act, 2014

The Sindh Employees' Old Age Benefits Act 2014 establishes a mandatory social security system for employees across industries and organizations in the Sindh province. This Act ensures financial security for retirees by creating an "Employees' Old Age Benefits Institution" which manages a fund accumulated through contributions from both employers (5% of employee wages) and employees (1% of wages). Upon reaching retirement age (60 for men, 55 for women), eligible employees become entitled to a monthly pension calculated based on their wages and contribution period. The Act also covers cases of invalidity and death, providing survivor pensions and lump sum settlements for dependents. Importantly, it repeals and replaces the previous 1976 Act, specifically governing old-age benefits in Sindh. This updated framework aims to strengthen financial protection for retired workers and their families, contributing to a more secure and dignified post-retirement life.

3.2.4 Sindh Companies Profits (Workers' Participation) Act, 2015

The Sindh Companies Profits (Workers' Participation) Act, 2015 mandates companies with net profits exceeding a prescribed amount to establish funds for their employees using a prescribed proportion of the profits. This scheme aims to enhance worker welfare, promote industrial harmony, and encourage employee participation in company decision-making.

3.2.5 Sindh Minimum Wages Act, 2015

This Act states that every employer shall be responsible for the payment of minimum wages (as established by the Government of Sindh) to all unskilled workers employed, either directly or through contractors, in a commercial or industrial establishment. Presently, the minimum wage in Sindh is 32,000/ per month for 2023-2024.

3.2.6 Sindh Terms of Employment (Standing Orders) Act, 2015

The Act provides for regulation of industrial and commercial employment in the province. The Act outlines the classification of workers into: permanent; probationer; badly; temporary; apprentice; contract worker. The terms and conditions of employment shall be provided to the worker in writing, holidays and leave with pay shall be provided. Rules for termination of services are defined in the Act. The Act outlines special provision for construction workers employment and termination at the end of the project.

3.2.7 Sindh Bonded Labor System (Abolition) Act, 2015

The Act seeks to eradicate bonded labor practices. It defines "bonded labor" as a system of forced or partly forced labor, under which a debtor enters, or is presumed to have entered into an agreement with a creditor to the effect that:

- In consideration of an advance obtained by him or by any of the members of his family (whether or not such advance is evidenced by any document) and in consideration of the interest, if any, due on such an advance, or
- In pursuance of any customary or social obligation, or
- For any economic consideration received by him or by any members of his family

3.2.8 Sindh Factories Act, 2015

This Act consolidates and amends the law regulating labor in factories. It includes provisions on inspections, health and safety, working time, leave, and child labor. The Act replaces the Federal Factories Act, 1934 for matters relating to Sindh.

3.2.9 Sindh Shops and Commercial Establishment Act, 2015

This Act makes provisions relating to the working hours and other working conditions of persons employed in shops, commercial, industrial, and other establishments in the province.

3.2.10 Sindh Payment of Wages Act, 2015

The Act provides for the regulation of minimum wage rates and various allowances for different categories of workers employed in certain industrial and commercial undertakings and establishments.

3.2.11 Sindh Prohibition of Employment of Children Act, 2017

Analogous to the Federal equivalent, this act prohibits the employment of children, and regulates the employment of adolescents in certain hazardous occupations. A child is a person who is below fourteen years of age and an adolescent is a person who is over fourteen years of age and below eighteen years of age. The Act outlines that no child labor shall be employed and no adolescent shall be employed to conduct hazardous work as defined in the Schedule.

3.2.12 Sindh Employees Social Security Act, 2016

This Act introduces a social security scheme for providing benefits to certain employees or their dependents in the event of sickness, maternity, employment, injury, or death.

3.2.13 Sindh Occupational Safety and Health Act, 2017

The law deals with health and safety provisions at workplace and determines duties of employers and workers for promotion of health and safety culture. The act applies in any Project situation where worker's rights and protections are enforced.

3.2.14 Sindh Workers' Compensation Act, 2015

This act outlines the details regarding compensation to be paid to workers in case of fatality, loss of hearing, eye sight, limbs during the conduct of work activities. It also outlines the Occupational diseases according to the nature of work and compensation to be paid to the workers in case it proved that the worker suffered from the disease due to workplace exposure.

3.2.15 Sindh Maternity Benefits Act

Maternity Benefits law regulates conditions of employment, paid leave, pre and post- delivery medical care, nursing and special work arrangements for entitled women. Under section 3 of the Act, an entitled woman worker must be granted mandatory maternity paid leave of 4 weeks before and 12 weeks after delivering child**.**

3.2.16 Sindh Empowerment of Persons with Disabilities Act 2018

This act provides legal protection to disable persons in terms of Equality and non-discrimination of 'Persons with Disabilities", right to privacy, Ease of access and mobility, Protection from torture or cruel, inhuman or degrading treatment, Freedom from Exploitation, violence and Abuse, Equity in health and rehabilitation services, Skills Development and Equity in Employment and in any other disability discrimination**.**

3.3 Federal Labor Laws

This section provides an overview of the various federal laws governing labor issues in Pakistan and some federal laws mentioned in above section are superseded from federal laws as provincial laws.

3.3.1 Industrial and Commercial Employment Act, 2013

This legislation defines the framework for industrial relations, aiming to maintain peace and resolve disputes through negotiation, reconciliation, arbitration, and adjudication. It lays out procedures for addressing grievances, resolving disputes, and managing lock-outs and strikes. Additionally, it guarantees workers the right to form or join trade unions.

3.3.2 Protection against Harassment of Women at the Workplace Act, 2010

The 2010 Protection against Harassment of Women at Workplace Act was enacted to safeguard women from harassment in professional settings, thus amending prior legislation related to women's employment rights in Pakistan. It explicitly addresses and criminalizes sexual harassment at work, aiming to cultivate a workplace devoid of sexual harassment, intimidation, and abuse. Under this law, any act of force or threat thereof against a woman, with the intent to compromise her dignity, is considered a criminal offense.

3.4 International Labor Standards Applicable in Pakistan

Pakistan is obligated to comply with a number of international labor laws under its commitments as a signatory to multiple international legal instruments. Notably, it adheres to the Universal Declaration of Human Rights 1948, which ensures rights related to employment, choice, fair and favorable working conditions, and protection against unemployment, alongside the rights to equal pay, dignified living standards, and trade union membership.

The International Covenant on Economic, Social, and Cultural Rights 1966, specifically under Articles 6-8, expands on these rights by mandating signatory states to safeguard employment rights and strive for their full realization/ this includes ensuring fair and equal wages, safe working environments, equal promotion opportunities, and rights to rest and leisure.

Similarly, the International Covenant on Civil and Political Rights 1966 focuses on civil rights and trade union membership. These, coupled with the 1979 Convention for the Elimination of All Forms of Discrimination against Women, and the 1998 Declaration of Fundamental Rights at Work, emphasize the eradication of employment discrimination, including gender-based discrimination. Pakistan's commitment is further underscored by its ratification of the Protection against Harassment of Women at the Workplace Act 2010.

3.5 ILO Labor Conventions

The Government of Pakistan has confirmed ratification of 36 ILO Conventions, inclusive of the eight fundamental conventions. The fundamental conventions encompass critical workplace principles and rights, including freedom

of association, recognition of collective bargaining rights, eradication of forced or compulsory labor, abolition of child labor, and the prohibition of employment and occupational discrimination. The eight fundamental conventions are:

1. Freedom of Association and Protection of the Right to Organize Convention, 1948 (No. 87)
2. Right to Organize and Collective Bargaining Convention, 1949 (No. 98)
3. Forced Labor Convention, 1930 (No. 29) and its 2014 Protocol
4. Abolition of Forced Labor Convention, 1957 (No. 105)
5. Minimum Age Convention, 1973 (No. 138)
6. Worst Forms of Child Labor Convention, 1999 (No. 182)
7. Equal Remuneration Convention, 1951 (No. 100)
8. Discrimination (Employment and Occupation) Convention, 1958 (No. 111)

3.6 World Bank ESS2: Labor and Working Conditions

ESS2 requires all World Bank funded projects to foster effective worker-management relations and assure safe and healthy work conditions. ESS2's primary goals are to ensure equitable treatment, non-discrimination, and equal opportunity for project workers; protect workers, particularly vulnerable groups; prohibit all forms of forced and child labor; uphold freedom of association and collective bargaining in alignment with national laws; provide mechanisms for workers to voice workplace concerns; and enhance occupational health and safety.

ESS2 is applicable to a broad spectrum of project workers, encompassing full-time, part-time, temporary, seasonal, and migrant workers. However, it excludes government civil servants involved in the project, who continue under their existing public sector employment terms, barring legal employment transfers. This LMP will clarify how ESS2 applies to various worker categories, including direct and contract workers, and ensure that workers are adequately informed about their employment terms and conditions, legal rights, and ESS2 mandates, including aspects such as work hours, wages, overtime, and benefits, both at the start of employment and upon significant changes.

4 Brief Overview of Labor Legislation: Occupational Health and Safety

This chapter lists the national, provincial legislations, guidelines and international conventions relating to occupational health and safety of labor.

4.1 National and Provincial Legislations on OHS

4.1.1 Occupational Health and Safety Act, 2017

The act is the applicable local legislation as this Act applies to all Workplaces. Details of each chapter are described below.
Chapter I identifies the duties of the employer as follows:

1. Undertake practical measures for Safety & Health and Welfare;
2. Identify, assess and address existing & new hazards;
3. Report and investigate incidents;
4. Provide and apply Safe Systems of Work, Safe tools & equipment & appliances
5. Safe use, handling, storage, disposal and transport of materials and substances;
6. Control physical, chemical, biological, ergonomic, psychosocial or other hazards, affecting workers and others;
7. Provide Information, Instruction and Training to ensure Safety &Health at Work;
8. Maintain workplace in safe, clean, orderly and risk-free condition with safe means of access;
9. Inform workers regarding work hazards, risks involved and preventive and protective measures;
10. Provide adequate PPE to prevent risk from injury and ill health;
11. Maintain records of all accidents at workplace;
12. Provide first aid arrangements and emergency provisions;
13. Take measures to prevent fires & measures in the event of fire; and
14. Collaborate in the case of simultaneous operations or joint premises

The duties of workers and volunteers are identified as follows:

1. Ensure safety & health of others who may be affected by his acts & omissions & not willfully do anything to endanger himself or others;
2. Use & take care of PPE provided by the employer;
3. Do not willfully interfere or misuse any appliance or equipment or convenience provided for safety & health of persons at workplace;
4. Resolve any situation being unsafe posing immediate threat with the employer or cease work until the dispute is resolved
5. Until the dispute is resolved, employer may assign the affected workers some temporary alternative work; and

6. Worker shall report any occupational accident, occupational Disease, dangerous occurrences, or commuting accident as per company OSH Policy.

Chapter II states rules that that Government has made for the safety and health of workers in any establishment by notification in official gazette. The rules include the following matters:

1. Cleanliness and maintenance of building;
2. Disposal of wastes and effluents;
3. Personal protective equipment;
4. Excessive weights;
5. Scaffolding and work at heights; and

Whereas, The Sindh Occupational Health & Safety (OHS) Act calls for:

1. Written Statement of Policy;
2. Consultation - formation of OHS Committee with worker representation; appointment of OHS officer;
3. Training of Health & Safety Representative;
4. Precautions against Contagious & Infectious Disease at Workplace; and
5. Compulsory Vaccination and Inoculation

Chapter III details enforcement measures and requires:

- Registration of workplaces and approval of site, buildings and other constructions to be used as workplaces; and
- Notification and investigation of accidents, dangerous occurrences and occupational illnesses

The Act has also fixed penalties and offences in case of non-compliance with the provisions of the Act. The maximum penalty for non-compliance is Rs.250, 000. The Sindh Occupational Health & Safety (OHS) Rules 2019 outline the measures to be undertaken to implement the requirements of the Sindh OSH Act 2017. The contractors and suppliers shall comply with the provisions of the Act.

4.1.2 Sindh Workers' Compensation Act, 2015

The Act mandates employers to compensate workers or their families for injuries or death arising from accidents during work. This includes both temporary and permanent disabilities, medical expenses, and loss of earning capacity. The Act outlines the types of accidents covered, the scale of compensation based on the severity of the injury, and the procedures for claiming compensation. It applies to all workers employed in factories, mines, and other hazardous occupations, as well as certain non-hazardous occupations.

4.2 International Conventions

Pakistan is signatory to the following international conventions and agreements:

4.2.1 ILO Technical Convention: C187 – Promotional Framework for Occupational Safety and Health

This convention stresses (i) a safe and healthy working environment by formulating a national policy; (ii) Each Member shall promote and advance, at all relevant levels, the right of workers to a safe and healthy working

environment; (iii) in formulating its national policy, each Member, in light of national conditions and practice and in consultation with the most representative organizations of employers and workers, shall promote basic principles such as assessing occupational risks or hazards; combating occupational risks or hazards at source; and developing a national preventative safety and health culture that includes information, consultation and training.

4.2.2 Prevention of Major Industrial Accidents Convention, 1993 (No. 174)

The purpose of this Convention is the prevention of major accidents involving hazardous substances and the limitation of the consequences of such accidents. The convention protects workers, the public and the environment by preventing major accidents from occurring at these installations, minimizing the consequences of a major accident either on- or off-site and provides guidance on appropriate emergency planning.

4.2.3 ILO Code of Practice on Safety and Health in Construction

The objective of this code is to provide practical guidance on a legal, administrative, technical and educational framework for safety and health in construction with a view to: preventing accidents and diseases and harmful effects on the health of workers arising from employment in construction; ensuring appropriate design and implementation of construction projects; providing means of analyzing from the point of view of safety, health and working conditions, construction processes, activities, technologies and operations, and of taking appropriate measures of planning, control and enforcement.

4.2.4 ILO Code of Practice on Safety and Health in Building and Civil Engineering Works

This CoP relates to occupational safety and occupational health in civil engineering and the construction industry. It includes provisions concerning the work environment and equipment, fire protection, noise, machinery (including building machinery and electrical machinery, ionizing radiations, explosives, handling, occupational health, welfare, and health services).

This code of practice covers 42 topics related to safety and health in building and civil engineering. The main topics include: workplaces and equipment; scaffolds, ladders and stairs; lifting appliances; railways, road and similar transport; construction equipment; electricity; blasting; concrete work; other building operations; excavations; underground construction; work in compressed atmosphere; work clothes and personal protective equipment; hygiene and welfare; medical supervision.

4.3 World Bank EHS Guidelines

The World Bank Group (WBG) has guidelines for Environment, Health, & Safety (EHS) that serve as useful references for general issues as well as sector specific activities. Projects financed by the WBG are expected to comply with this guideline as required by the policies and the standards. The EHS Guidelines are mainly on occupational health and safety, community health and safety as well as on construction and decommissioning. It contains guidelines on environmental issues (waste management, ambient air quality, noise, and water pollution), occupational health and safety issues amongst others.

5 Responsible Staff

5.1 Project Management Unit (PMU) Responsibilities

Overall responsibility for managing the Project lies with the PMU, including as aspects of implementing the Labor Management Procedures, particularly ensuring that contractors adhere to the LMP requirements. Contractors will subsequently be responsible for managing their activities with contract/activity specific LMPs, the implementation of which will be supervised by the PMU on a regular basis. The PMU will address all LMP aspects as part of procurement for works as well as during contractor induction.

The E&S specialists at the PMU will implement and monitor the provisions of this LMP as follows:

- Verifying adherence to the LMP and OHS requirements for Project workers. In the case of contracted workers, this will involve including in bidding documents and agreements signed with contractors, the specific terms included in Annexure I – Due Diligence for Hiring of Contractors.
- Upholding commitments to all categories of project workers, as outlined in this LMP, the ESMF, and other relevant safeguard instruments
- Overseeing training for project workers and contractors
- Monitoring for potential labor related risks that were not identified during project preparation
- Developing and implementing grievance mechanisms for project workers, and ensuring that grievances are handled quickly and appropriately
- Ensuring that project workers are properly informed of the grievance mechanism
- Maintaining records of recruitment and employment, including age verification of hired workers
- Providing induction and regular training to project workers on OHS issues
- Providing training on implementation of the LMP to contractor's OHS specialists and focal persons
- Reporting through Project Coordinator to the World Bank on labor and OHS performance, and of any incidents or accidents involving project workers.
- Implementing the workers' GRM, as described in Section 9 of this LMP
- Conducting project level monitoring of LMP implementation, including collecting and maintaining records of employment of all project workers, verifying compliances with codes of conduct and other commitments reflected in this LMP.
- Supporting the PMU in providing training to contractors and contracted workers
- Monthly reporting to the PMU on LMP implementation, with indicators related to child labor, forced labor, working conditions, terms of employment, OHS, freedom of association, non-discrimination, gender issues, and trainings.

5.2 Contractor Responsibility

The Project will engage third party contractors for management and implementation activities. Contractors will be responsible for implementation of the LMP within their respective activities.

All contractors involved in project implementation will engage an OHS specialist or appoint an OHS focal person from existing positions if the activity specific OHS risks are low. Contractors carrying out construction activities will additionally appoint OHS inspectors for each construction site. The contractor's OHS staff will be supervised by the PMU environmental and social specialists, and will be responsible for ensuring day-to-day compliance with OHS policies, providing trainings to contracted workers, and maintaining records of incidents or accidents. Minor incidents will be reported to the PMUs on a monthly basis, while serious incidents will be reported immediately.

Contractors will keep records of employment and other records relevant to compliance with the requirements defined in this LMP. The PMU, may at any time request contractors for these records, and will do so at minimum on a monthly basis. Contractors may be required to take immediate remedial actions if instructed by the PMU. Contracted workers are entitled to use the labor GRM, as described in Chapter 9 of this document. Contractors will ensure that all contracted workers are informed and trained on the GRM and are provided with refresher trainings periodically.

Conditions related to the implementation of the LMP will be included in all contracts with third parties. Contractors will be required to pass down these conditions to contracted workers by ensuring that all workers sign a Code of Conduct for Workers. An indicative code of conduct is provided in Annexure II – Sample Workers' Code of Conduct.

Contractors involved in construction activities will be required to prepare and implement an activity-specific LMP.

6 Policies and Procedures

6.1 Labor Policies and Procedures

The employment of project workers will be based on the principles of non-discrimination and equal opportunities. There will be no discrimination with respect to any aspects of the employment relationship, including recruitment, compensation, working conditions and terms of employment, access to training, promotion or termination of employment. The PMU shall ensure that this LMP is incorporated in the tender documents for all procurements undertaken, and that contractors include the implementation of this LMP in their bids. The following measures will be followed by contractors and monitored by the PMU with support from HR to ensure fair treatment of all employees:

- Recruitment procedures will be transparent, public and non-discriminatory, and open with respect to ethnicity, religion, sexuality, disability or gender.
- Applications for employment will only be considered if submitted via the official application procedures established by the contractors.
- Clear job descriptions will be provided in advance of recruitment and will explain the skills required for each post.
- All workers will have written contracts describing terms and conditions of work and will have the contents explained to them. Workers will sign the employment contract.
- Unskilled labor will be preferentially recruited from the surrounding communities, settlements, and adjacent villages.
- Employees will be informed at least one month before their expected release date of the coming termination.
- The contracted workers will not be required to pay any hiring fees. If any hiring fees are to be incurred, these will be paid by the Employer.
- Depending on the origin of the employer and employee, employment terms and conditions will be communicated in two languages, in the national language and the language that is understandable to both parties.
- In addition to written documentation, an oral explanation of conditions and terms of employment will be provided to workers who may have difficulty understanding the documentation.
- It is noted that language-related problems are not expected, but if they are, interpretation will be provided for workers as necessary.
- All workers will be 18 years old or above for civil works. This will be a requirement in civil works contractors.
- Normal working time should not exceed 40 hours per week. With a six-day working week, the duration of daily work is determined by the internal work regulations approved by the employer after prior consultation with the representatives of the workers, in compliance with the established working week duration.

The PMU will inform the World Bank of any significant event (social issues) as soon as possible, but no later than five working days, after the occurrence of the event. Such events include strikes or other workers' demonstrations. The PMU will prepare a report on the event and the corrective measures and subsequently submit it to the World Bank within 30 days of the event.

6.2 Occupational Health and Safety

SIHPP is committed to comply with legislation which relates to the occupational health and safety requirements as stipulated in the chapter 3. These laws and standards will enable OHS hazards identification and risk elimination through promotion of appropriate skills, knowledge and attitudes towards hazards.

The PMU will have designated environmental and social specialists who will be required to have OHS experience. These staff will be additionally trained on OHS and implementation of the LMP, and will in turn provide training and oversight to all third-party contractors.

The PMU will ensure that all workers irrespective of any category should be provided with appropriate type of protective masks, helmet, overall and safety shoes, and safety goggles, protective clothing as well as other appropriate PPEs as per work job hazard analysis and method statements (such as working on live wires). The PMU and contractors must also ensure appropriate demarcation of workplace and notices for hazardous area where applicable; accident reporting, notification and investigation practices at each workplace required; safety sign and symbols displayed at workplace and ensure availability of first aid box. Also identify nearby hospitals for complicated accidental and health problems as well as specific details will be included in the emergency management procedures, prepared by the contractors.

Contractors involved in construction and rehabilitation activities and staff involved in provision of health care services will be required to prepare activity specific Occupational Health and Safety Management Plans (OHSMPs), (guidelines are provided in Annexure-III). These OHSMPs must at minimum include information on:

- Details of staff with specific OHS responsibilities, and a description of how those responsibilities are coordinated
- OHS induction training plans
- Arrangements for managing OHS incidents
- Safety rules and description for ensuring that all staff are informed of the rules
- Assessment of potential risks, linked to clear mitigation measures.
- Project Site Security Procedure
- Camp management procedure (where applicable)
- Personal Protective Equipment
- Emergency Response Procedure
- Monthly reporting procedure

6.2.1. Child and Forced Labor

To prevent engagement of underage workers, the age employment scheme should be strictly adhered to by parties involved in hiring. The process of hiring Direct Workers should include a proper screening, with age verification to ensure no children are employed in the implementation of the project. Likewise, all contracts must have a provision as to the minimum age requirement and the hiring authority shall keep a registry of all hired workers.

6.2.2 Labour Influx and SEA/SH

All project workers will undergo relevant seminars and training to prevent risks of labor influx (where applicable, a large-scale labor influx is not anticipated) or SEA/SH issues. Project workers particularly those coming from other communities will be briefed on the culture and history of the area, allowing them to adapt to the community values and to avoid any conflicts due to the dissimilarities of their cultural backgrounds.

6.2.3 Discrimination and exclusion of vulnerable groups

The employment of project workers will be based on the principle of equal opportunity and fair treatment, and there will be no discrimination with respect to any aspects of the employment relationship, such as recruitment and hiring, terms of employment (including wages and benefits), termination and access to training. This project shall comply with the national labor laws on gender equality in the workplace, which will include provision of maternity leave and nursing breaks and sufficient and suitable toilet and washing facilities, separate for men and women workers.

6.2.4 Development of a SEA/SH Action Plan and Mitigation Measures for Risks Related to Gender

According to the Note on Good practices to combat SEA/SH in the Framework of Financing Investment Projects involving major civil engineering works, all projects, whatever their risk level, should guarantee the minimum actions recommendations for addressing the risks of SEA/SH related issues.

The initial SEA/SH mitigation measures have been developed and included, where these measures may need to be reviewed and further modified in the ESMPs. In addition, a separate SEA/SH Action Plan shall be prepared and implemented.

6.2.5 Labour Disputes over Terms & Conditions of Employment

Fair, reasonable, and lawful terms and conditions shall be applied in the contractual provisions of all project workers to prevent labor disputes. Moreover, there will be an efficient grievance redress mechanism in place to address any issues that may arise during existence of the contract. The guidelines provided later in the document shall be strictly observed to avoid disputes over terms and conditions of employment.

All the contractors who will be engaged for the project will be required to produce their grievance procedure as a requirement under the tendering process which at a minimum comply with these requirements. In addition, good international practice recommends that the procedures be transparent, confidential, adhere to non-retribution practices, and include right to representation. After contractors are engaged, they will be required to produce proof that each worker has been inducted and signed that they have been inducted on the procedure.

6.2.6 Monitoring and Reporting

The PMU will report on the status of implementation of the above policies and procedures on a monthly basis. The PMU will closely monitor labor and occupational health and safety performance of the project and report to the World Bank on a quarterly basis.

6.2.7 Fatality and Serious Incidents

In the event of an occupational fatality or serious injury, the PMU shall report to the World Bank within 48 hours of becoming aware of such incident (Incident reporting form is attached as Annexure-IV) and inform the government authorities (where available) in accordance with national as well as Bank reporting requirements. Corrective actions shall be implemented in response to project-related incidents or accidents. The PMU or, where relevant the consultant, may conduct a root cause analysis for designing and implementing further corrective actions.

Detailed descriptions of risks and mitigation measures are provided in the SIHPP Environmental and Social Management Framework.

7 Age of Employment

Pakistan has ratified ILO's Convention on Minimum Age for Admission to Employment No. 138, and the Worst Forms of Child Labor Convention No. 182. Employment of children at the federal and provincial level is governed by the Employment of Children's Act 1991 and the Sindh Prohibition of Employment of Children Act 2017 respectively, which sets the minimum age for admission to employment at 14 years. Both the federal and provincial laws set an age limit of 18 years for hazardous work, which are defined in the text of the respective Acts. For this project, minimum age of 18 will be applicable for the labor work.

Contractors will be required to verify and identify the age of all workers. This will require workers to provide official documentation, which could include a birth certificate, computerized national identity card (CNIC), passport, or medical or school record. If a minor under the minimum labor eligible age is discovered working on the project, measures will be taken to immediately terminate the employment or engagement of the minor in a responsible manner, considering the best interest of the minor.

Age verification shall be undertaken prior to the engagement of labor, and should be documented.

8 Terms and Conditions

8.1 Terms of Employment/Employment Letter

The employment terms and conditions applicable to project employees as set out in the labor rules will apply to all project employees who are assigned to work on the Project (direct workers).

This section will be updated and modified, if necessary, after the allocation of the contracts of the different posts of the PMU. The terms and conditions applicable to the employees of these bodies are defined in the contracts, which provide for the rights of the employees in accordance with the Code of work. These internal work rules and regulations will apply to PMU employees who are assigned to specific work related to the Project (direct workers).

All the recruiting procedures are documented and filed in the folders in accordance with the requirements of provincial labor legislations. Monthly timesheets are also filed and kept accurately. The work hours for workers are 40 hours per week. All project workers will receive at least two rest days (48 hours) after five consecutive days of work.

The contractors' activity-specific LMP will set out terms and conditions for the contracted and subcontracted workers. These terms and conditions will be in line, at a minimum, with this LMP.

A contract of employment, written in a language known to the parties, shall be executed between the Project and the direct worker that specify the following:

- Parties to the contract, including the name of worker, age, citizenship, civil status, gender, and address;
- Premises with regard to the needed services, acceptance of the parties, qualifications of the worker, and attestation that the worker is not related within the third degree of consanguinity or affinity to the hiring authority and/or its representative, and that the worker has not been previously dismissed from government service by reason of administrative offense;
- In accordance with Standing Order 3(1) & (2) of the Sindh Terms of Employment (Standing Orders) Act 2015, every worker shall at the time of employment be provided with: terms and conditions of the contract, including the hours and place of work, remuneration payable to the worker, job description, summary of deliverables, duration of contract, procedure for suspension or termination of contract, statement that there is no employer and employee relationship between the contracting parties.

8.2 Non-discrimination and Equal Opportunities

Article 19-A of the Constitution imparts the State's obligations aimed at achieving equality in the form of securing the well-being of the people, irrespective of sex, caste, creed or race, by raising their standard of living, by preventing the concentration of wealth and means of production and distribution in the hands of a few to the detriment of general interest and by ensuring equitable adjustment of rights between employers and employees.

The Project is committed to equal opportunities for all its employees and potential employees where everyone is treated with respect and dignity and where there is equal opportunity for all. All employees, whether part-time, full time or temporary, will be treated fairly and with respect. Selection for employment, promotion,

training or any other benefits will be on a basis of aptitude and ability. Decisions about pay and benefits, terms and conditions of employment, appraisals, dismissal or redundancy will be made objectively and without unlawful discrimination. All employees will be helped and encouraged to develop their full potential, and the talents and resources of the workforce will be fully utilized to maximize the efficiency of the organization.
The Project will ensure that:

- Equality and non-discrimination policy is adhered to within its own area of responsibility;
- Bring the details of the equality in employment policy to the attention of the team members;
- Ensure that information on equality of opportunity is included in all induction processes; and
- Ensure that the team members are available to attend relevant equality training programs (if any).

The PMU is responsible for ensuring that equality on employment is effectively communicated to all employees and all those involved with the organization at whatever level or position and for providing advice and guidance where appropriate. They will, in particular, provide full text and induction on equal opportunities to all new employees; translate this policy into Sindh and Urdu and send to all relevant involved parties. In addition, upon any significant update, the policy will be presented to all members of staff or at department/office meetings and re-translated to all relevant involved parties.

In case of underpayment, delayed payment, and non-payment of wages and other financial benefits including payment of over-time, if the Workers' Grievance Redress Mechanism (GRM) described in this document does not resolve workers issue, the workers may approach the legal forum i.e. the Authority under the Sindh Payment of Wages Act, 2015. They can also lodge case of individual grievance in the concerned Labor Court established under the Sindh Industrial Relations Act, 2013.

8.3 Hours of Work

The Sindh Factories Act, 2015 and the Sindh Shops and Commercial Establishments Act, 2015 regulate working hours for the workers of industrial and commercial establishments. Working hours under these laws are 8 hours a day and 48 hours in a week. For all workers under various activities and interventions under SIHPP, the working hours will be eight hours a day, and no more than 48 hours in a week.

8.4 Rest and Leave

Holidays, rest, sick leaves, annual paid leaves, festival holidays for the workers in industrial and commercial establishments are regulated under the Sindh Factories Act, 2015 and the Sindh Shops and Commercial Establishments Act, 2015.

The number of holidays and leaves admissible to contracted workers in various activities and interventions under SIHPP are reflected in the last column of the table below.

Table 2 Summary of Applicable Rest and Leaves

Leave Type	*Position under Labor Laws*	*Number of Leaves/Holidays*
Weekly holiday	There is one weekly holiday under the Sindh Shops and Commercial Establishments Act and the Sindh Factories Act. In case a worker has to do work on weekly holiday, he will be given compensatory holiday.	One weekly holiday and a compensatory holiday if workers have to work on weekly holiday due to certain emergency.
Festival holiday	10 days in a calendar year with full wages festival holidays are permissible under the Sindh Shops and Commercial Establishments Act. Under the Sindh Factories Act, festival holidays are admissible as per the notification from Government.	10 days with full wages in a calendar year conforming to government notifications.
Casual leave	10 days with full pay in a calendar year under the Sindh Shops and Commercial Establishments Act and the Sindh Factories Act.	10 days with full wages in a calendar year
Sick leave	16 days with full wages in a calendar year under the Sindh Shops and Commercial Establishments Act and 16 days with half average wage in a calendar year under the Sindh Factories Act.	16 days with full wages in a calendar year
Annual leave	14 days in the Sindh Shops and Commercial Establishments Act and annual leaves can be accumulated up to 30 days. 14 days under the Sindh Factories Act which can be carried forward for 14 days and can be accumulated up to 28 days and payment should be made to the worker in lieu of leave not availed.	14 days with full wages and can be accumulated up to 30 days. Leaves can be cashed if not availed.
Maternity leave	The Sindh Maternity Benefits Act, 2018 provides for 16 weeks maternity leave with full wages i.e. four weeks before the expected date of delivery and 12 weeks after the delivery.	Maternity leave of 16 weeks i.e. Four weeks before the expected date of delivery and twelve weeks after the delivery.

8.5 Special Provisions for Women Workers

As provided under section 66 of the Sindh Factories Act, 2015 no woman shall be allowed to work in a factory except between 7 a.m. and 7 p.m. provided that if the employer arranges for transport facilities, which shall drop at the door steps of such worker, or nearest possible place, the female workers may work up to 10 p.m. in two shifts. Accordingly, under various interventions and activities under SIHPP, women will only be engaged in the night duty after obtaining their consent in writing and they will be provided with free and safe pick and drop facility during night work.

The government employees attached with the project and employees recruited for the project activities will be regulated under Government leave rules and medical entitlement.
Women contracted workers, along with medical coverage, will be entitled to maternity leave of 16 weeks as provided under the Sindh Maternity Benefits Act, 2018.

Section 53(1) of the Sindh Factories Act, 2015 requires provision of shelter to workers. The workers engaged in SIHPP by the contractors during construction and rehabilitation activities will be provided with shelter facility at workplace for use of workers during rest and if women are also engaged, they should be provided with separate shelter.

8.6 Minimum Wages

The Sindh Minimum Wages Act, 2015 provides for fixation of rates of minimum wages for workers of different categories. These rates are fixed and notified by the Government on the basis of the recommendations of the Sindh Minimum Wages Board.

All the contracted workers under SIHPP will be paid wages in accordance with the prescribed minimum rates of wages notified by the Government for different categories of workers.

Contracted worker who will be engaged for civil work (i.e. for construction and rehabilitation activities, and similar types of physical work which are on daily wage basis) will be paid on the basis of market rates. For daily wagers under the project, a uniform formula will be observed in order to ensure that they are paid at par with other contracted workers and they get an additional amount of 11 percent of their wages in respect of contribution for social protection (Social Security and old-age benefits). The wage of a daily wage worker will be calculated on the basis of the following formula: Monthly Minimum Wage for the Specific Category of Daily Wager + 11 % of that Wage.

The project will also ensure that salary of the direct workers specifically the staff at the lowest tier should not be less than the legally prescribed minimum wages of unskilled workers in the province.

8.7 Payment of Wages

As provided under section 6 of the Sindh Payment of Wages Act, 2015 all wages shall be paid to the employed persons in current currency through cross cheque or through bank transfer of any Scheduled Banks or commercial Banks along with provision of pay slip showing the details.

Deductions from the wages will be made only in accordance with the provisions of section 7 (2) of the Sindh Payment of Wages Act, 2015. Any deduction not in consonant with the provision of Sindh Payment of Wages Act will be considered as illegal.

Daily wage workers under SIHPP will be paid daily in cash with proper receipt and record will be maintained for such payments. All workers engaged by the contractors under SIHPP who are required to be paid on monthly basis will be paid wages /remuneration of the previous month by 7th of the following month i.e. within seven days of the lapse of the wage period.

8.8 Workers' Welfare and Compensation

Contractors working with the project will be responsible to register their establishments and workers with the Sindh Employees' Social Security Institution (SESSI) and Employees' Old-Age Benefits Institution (EOBI). They will also deposit necessary contribution of 6 percent of their employees' wages to the SESSI for health coverage of the secured employees and their dependents. The contractors/employers will also contribute their share of 5 percent of employees' wages to Employees' Old-Age Benefits Institution meant for old-age pension of the insured worker. All contractors have to ensure also that the registered employees/workers with these institutions are provided with proof/cards showing that they are secured and insured under SESSI and EOBI. Workers, employees secured under SESSI are entitled to many benefits including sickness benefit, injury benefit, maternity benefit, Iddat benefit, death grant, disability gratuity, partial pension, total disablement pension and survivors' pension. Benefits for the employees/ workers insured under EOBI are old-age pension, survivors' pension, invalidity pension and old-age grant.

Employers employing at least 20 workers will also be responsible for workers' compulsory group insurance of all permanent workers as provided under S.O. 12 of the Sindh Terms of Employments (S.O.) Act, 2015.

Contracted workers will be entitled to compensation in case of injury, occupational diseases or death as provided under the Sindh Workers' Compensation Act, 2015. Aggrieved workers or their heir can approach to the respective courts of Workers' Compensation Commissioners.

8.9 Termination of Contract

The contract of employment shall cease at the end of the period stated in the contract. However, the contract may be pre-terminated by the hiring authority due to breach of any provision thereof, breach of trust, loss of confidence, and for reasons detrimental to the interest of the agency, provided that the project worker is informed in writing at least 30 days prior to the affectivity of such termination. Likewise, the project worker may pre-terminate the contract provided that a written notice is submitted to the hiring authority, stating therein the reasons for the pre- termination, at least 30 days prior to the proposed date of affectivity thereof, and the same has been received, accepted, and approved in writing by the hiring authority. Industrial and Commercial Employment (Standing Industrial and Commercial Employment (Standing Orders) Ordinance 1968 was enacted to address to the contractual relationship between employer and employee. The ordinance is applicable to establishments employing 20 or more workers. The ordinance classifies workmen in six classes: permanent, probationers, temporary, apprentices and contract workers (the last category was added in 2006). The legislation requires that workmen should be provided the contract in writing, showing the terms and conditions of his service, at the time of hiring, promotion and transfer. It also requires that the wage rates paid to different categories of workers/work should be posted on the notice boards.

Termination of an employment contract may be either termination simpliciter, which is termination on grounds other than misconduct after a notice (section 12) or termination on account of misconduct (section 15). Notice of termination, for termination simpliciter, is mandatory for permanent employees. A notice of one month must be served before severing the employment relationship or payment of one month's wages in lieu of notice may be provided (Section 12.1). The law also obliges the employer to provide the termination certificate in writing stating the reason behind it. Although there is no specific provision for just cause dismissal, the requirement of written termination letter and section 41 of IRA 2008 which allow the labor court to inquire into the legitimacy

of termination provide that there should be bona fide and valid reason for dismissal.

Termination on account of trade union membership and activity is an invalid reason for termination (ILO, 2000). While termination is being done on account of misconduct, worker has still the right of fair hearing. Of the many types of misconduct is "go slow", for which a worker can be fired. Termination on economic reasons/retrenchment has not been focused on law; however, law does provide the procedure of retrenchment (last come, first go) and preference for rehiring of retrenched workmen. In case of laying off the workers, they must also be given due notice or payment in lieu of notice. If the employer wants to close down the whole business or is terminating the employment of 50 or more workers, it must get the prior approval of labor court. An individual whose employment is terminated has first to use internal mechanisms for dispute resolution, however if he is not satisfied with the decision, he may appeal to the labor court. In that case, labor court is authorized to go into all the facts of the case and determine whether the termination was valid and bona fide or not. The above-mentioned ordinance also provides for severance pay/gratuity to be paid (when an employee resigns or his services are terminated other than misconduct) equivalent to 30 days wages for every completed year of service or any part thereof in excess of 6 months (for 20 years of service, this means 90 weeks of severance pay).

8.10 Deductions from Remuneration

No deductions other than those agreed upon in the contract or those prescribed by law or regulations shall be made from a worker's remuneration. The hiring authority is prohibited to demand or accept from the worker any cash payment or gifts in return for admitting such worker to employment or for any other reasons connected with the terms and conditions of employment.

8.11 Workers' Code of Conduct

The Project aims to ensure that project workers are protected under the World Bank's ESS2 in the light of the local laws and they are facilitated to get their basic rights at the workplace and beyond. At the same time, the project also expects that workers are loyal to the cause, work with commitment in order to ensure that project objectives are realized in the requisite timeline. All project workers are expected to abide by the code of conduct provided in Annexure II: sample Workers' Code of Conduct. In case of violation of the code of conduct (COC) by any of the workers, disciplinary proceedings as well as legal course will be adopted by the project management.

8.12 Workers' Organization

Pakistan has ratified ILO's Freedom of Association and Protection of the Right to Organize Convention, 1948 (No. 87) and Right to Organize and Collective Bargaining Convention, 1949 (No. 98). The Constitution of Islamic Republic of Pakistan guarantees this workers' basic right under its Article 17. The country has a framework of industrial relations laws, regulating labor relations, dealing with formation of trade unions, determination of collective bargaining and workers' participation in the management. The Sindh Industrial Relations Act, 2013 and Industrial Relations Act, 2012 (federal law) deal with registration of trade unions and regulation of industrial relations.

Workers working in the development projects may associate themselves in the form of organization or to join organization of their choosing without any restriction or condition by the management, any consultancy firm or

any contractor. Employees and workers can form trans-provincial unions or associations under Industrial Relations Act, 2012 or to establish their organizations under the Sindh Industrial Relations Act, 2013. Under these laws, the employer/ management shall not interfere or influence the process of formation of union or restrict workers to join any union or federation. Any such interference by the employer or his agent shall be taken as unfair labor practice and punishable under the relevant provisions of these enactments by the competent courts.

The worker's organizations formed under the relevant industrial relations laws will encourage participation of women. In this regard, the proviso of section3 (i) of Sindh Industrial Relations Act states that in the establishment where women are also employed, the trade union shall include the women in the executive and office bearers of the said trade union with the same proportion in which they are employed in the establishment.

9 Grievance Redressal Mechanism

A dedicated Grievance Redress Mechanism (GRM) for project workers will be established, separate from the project GRM. The workers' GRM will be based on the requirements of the WB's ESS2. The project workers' GRM will handle grievances related to their employment on the project, including on issues related to conflict with supervisors or other project workers, workplace issues, workers camp, health and safety concerns, SEA/SH, wage related issues including late and non-payment of wages, unauthorized deductions from wages, etc.

Project workers will be informed about this dedicated GRM at the start of their engagement, with periodic refreshers throughout their engagement. Handling of grievances will require objectivity, promptness, and responsiveness' to the needs and concerns of aggrieved workers.

The worker's GRM will also allow for anonymous complaints to be raised and addressed. Individuals who submit their complaints or grievances may request that their names be kept confidential, and this should be respected. Under ESS2, a worker's GRM will be provided for all project workers, including direct workers, contracted/ supply workers, to raise workplace concerns, including SEA/SH issues at the workplace. Any type of worker who has any complaint or grievance has the right to present it and eventually receive a proper response against it.

The Project will appoint a labor GRM focal person in each project district—this may be the relevant District Manager People's Primary Healthcare Initiative (PPHI or Health Officer, or any other suitable staff at district level. The focal person will be responsible to receive workers' complaints and facilitate the resolution of the grievance. A PMU level workers GRC will also be established to provide oversight and guidance to the GRM focal persons. The workers' GRC will be notified by the Project Director. The Project will ensure that workers' GRC includes at least one female member.

Table 3 Composition of Workers' GRCs

Workers' GRC	***Members***
PMU	Project director, social specialist (also act as gender focal person), relevant district Manager PPHI/ Health Officer coopted member from associated government department

The Project will ensure that the lodging of grievances is receptive to the literacy and language needs of all project workers. Project workers will be ensured easy access to the GRM at all project locations, and will be able to lodge complaints, if desired. Avenues for lodging of grievances will include toll free numbers, complaint boxes, SMS services, in-person, and other methods.

The project worker's GRM will operate according to the following key principles:

- It will be made equitably available to all direct and contracted project workers
- Prompt, understandable, and transparent resolution of grievances
- Independent and objective operation
- Project workers will not incur any charges to use the GRM
- Anonymous grievances will be allowed and facilitated accordingly. Such grievances will be treated equally as non-anonymous grievances
- There shall be no discrimination against workers who lodge grievances, and all grievances will be treated confidentially

- It will not impede access to other judicial or administrative avenues for resolving grievances that exist under national and provincial laws, or existing mechanisms of contractors.

9.1 Grievance Redress Procedure

Grievances from project workers may be lodged directly with the workers' GRCs, or with the workers' GRM Focal Persons. Submitted grievances shall be recorded by and assigned unique identifier codes (UID). Once a grievance is lodged, the UID is provided to the complainant, as well as a timeline for resolution. This will take place on the same day the grievance is received.

The GRM focal person will conduct the first review of the grievance, and identify the party responsible for its resolution. The responsible party and the GRM focal person will conduct an inquiry into the grievance to identify its root cause, and subsequent resolution measures. In case the GRM focal person is unable to identify a resolution, the case will be elevated to the respective workers' GRC at the PMU. Upon identification of appropriate resolution measures, the details of the resolution will be recorded by the GRM focal person, and the decision will be communicated to the complainant within 10 days.

On a monthly basis, the workers' GRM focal persons will produce a status report as part of its regular reporting to the PMU. An annual sex-disaggregated qualitative review of a sample of complaints processed (ensuring variation such as along type of complaint, resolution status etc.) will also be undertaken to analyze the efficacy of the system. Regular monitoring of the grievance mechanism and its outcomes, particularly of trends and patterns, will be critical to ensuring to identify systemic problems and adapt practices accordingly.

9.2 GBV/SEA/SH Related Grievances

Complaints related to GBV/SEA/SH will be escalated directly to the PMU workers' GRC. The PMU Social (also act as Gender focal person) Specialist will be responsible for handling of the grievance, including recording, escalation and referrals to identified services providers who are approved to manage GBV related complaints. Details guidelines on the receiving and management of GBV/SEA/SH complaints will be provided in the Project SEA/SH Action Plan, and will be added to the GRM procedures accordingly.

The Worker's GRM Focal Persons will also maintain a register of such complaints, and will provide a summary status report of all complaints lodged on a monthly basis with the Social Specialist (also act as gender focal person) of the PMU.

All concerned responsible staff shall hold regular meetings with project workers to discuss any work-related issues and concerns. Every grievance raised by a worker will be documented with the actions undertaken by the PIU and contractors to address such grievance. The aggrieved worker may raise any issue anonymously through a letter which shall be submitted to their immediate supervisor's office. Any grievances which are left unattended by the contractor can be submitted by the worker to the PIU, in which case, actions shall be taken to resolve the issue. Any labor dispute shall be first resolved through mediation, conciliation, and arbitration, in order to provide an efficient procedure in the settlement of disputes and to promote autonomy and freedom of the parties to make their own arrangements to resolve their grievance.

10 Contractor Management

Contractors are required to monitor, keep records and report on terms and conditions related to labor management. The contractor must provide workers with evidence of all recruitments, payments made, including social security benefits, pension contributions or other entitlements regardless of the worker being engaged on a fixed term contract, full-time, part-time or temporarily. They are expected to be fair in execution of their contract with the project ensuring that all provisions of LMP are implemented. There should not be any unfair labor practices on their part. They are required to maintain and produce the record whenever required by the Project management in this regard including the following:

1. **Labor conditions:** records of workers engaged under the Project, including contracts, registry of induction of workers, hours worked, leave record, maternity benefits, remuneration and deductions (including overtime), negotiation with workers organization and compliance of collective bargaining agreements, (if any);
2. **Safety:** recordable incidents and corresponding inquiries and follow-ups, first aid cases, high potential near misses, and remedial and preventive activities required and rehabilitation measures;
3. **Workers**: number of workers, indication of origin (expatriate, local, non-local nationals), gender, age with evidence that no child labor and forced labor are involved, and skill level (unskilled, skilled, supervisory, professional, management).
4. **Training/ induction**: dates, number of trainees, and topics.
5. **Worker grievances**: details including occurrence date, grievance, and date submitted, actions taken with dates, resolution (if any) and date, and follow-up yet to be taken— grievances listed should include those received since the preceding report and those that were unresolved at the time of that report.
6. **Reporting:** contractors will be responsible to submit reports on the implementation of LMP in respect of their companies and workers engaged under SIHPP on monthly basis to the PMU.
7. **Evaluation:** The project will put in place a system of monitoring and evaluation to monitor and evaluate the working of contractors on a quarterly basis and to issue reports of such evaluations.

The overall responsibility of ensuring implementation of LMP through contractors and contractors is entrusted with the project management which will put in place a robust mechanism of coordination, monitoring, oversight and evaluation.

The PMU will ensure that all contractors are legitimate and reliable entities and that they have procedures established for management of labor in compliance with this LMP. The PMU will monitor the performance of contractors in relation to contracted workers, focusing on compliance by contractors with their contractual agreements (obligations, representations, and warranties). This may include periodic audits, inspections, and/or spot checks of project locations or work sites and/or of labor management records and reports compiled by contractors. Contractors' labor management records and reports may include: (a) a representative sample of employment contracts or arrangements between third parties and contracted workers; (b) records relating to grievances received and their resolution; (c) reports relating to safety inspections, including fatalities and incidents and implementation of corrective actions; (d) records relating to incidents of non-compliance with national law; and (e) records of training provided for contracted workers to explain labor and working conditions and OHS for the project.

11 Community Workers

Community workers are not envisaged to form a part of this project.

12 Primary Suppliers

Primary supply workers for the Project are the employees of suppliers for the provision of goods and services essential to the project's implementation. For SIHPP, these include workers from suppliers of project inputs including (but not limited to): construction equipment and materials, laboratory and medical equipment, ambulances/mobile clinics. All provisions in this LMP shall also apply to primary supply workers.

Primary suppliers are responsible for ensuring that there will no child labor, forced labor, or bonded labor in their establishments. The workers of primary suppliers should be protected under all relevant national and provincial laws.

Primary suppliers must also ensure the occupational health and safety of their workers, and must report to the Project Management any accidents, fatalities, or serious injuries incurred during the implementation of the project.

All primary suppliers will provide annual updates to the PMU on the status of implementation of the LMP within their respective establishments.

Bidding documents issued by the PMU shall include all the requirements described in the LMP to ensure that primary suppliers are aware of and implement the necessary compliance measures. When sourcing for primary suppliers, the project will require such suppliers to identify the risk of child labor/ forced labor and serious safety risks associated with the primary supply chain. The PMU and the consultants will review and approve the purchase of primary supplies from the suppliers following such risk identification/ assessment. Where appropriate, the Project will be required to include specific requirements on child labor/ forced labor and work safety issues in all purchase orders and contracts with primary suppliers.

ANNEX I: Due Diligence for Hiring of Contractors

All activities and interventions under SIHPP will consider the following during selection of contractors for provision of labor or services where workers are involved:

1) LMP should be made part of the Request for Proposal (RFP) in order to seek contending contractor's understanding and experience of implementing LMP, both should be given due weightage during evaluation of RFP.
2) Contending contractors should be asked to provide proof of their registration with Sindh Labor Department, Sindh Employees' Social Security Institution/ Department and Employees' Old-Age Institution (licenses, registrations, permits, and approvals).
3) Applicants should be asked to provide their record of compliance of labor and OSH standards during the last five years.
4) The Project will also require for the following:
    a) Reports on accidents and fatalities record and notifications to authorities;
    b) Record of legally required workers' benefits and proof of workers' registration in the related institutions/ programs;
    c) Workers' payroll record, including hours worked and pay received;
    d) Identification of safety committee members and records of meetings;
    e) Plan and experience of addressing socio-cultural issues usually raising due to influx of workers at construction sites (for contractors applying for construction work);
    f) Copies of previous contracts as contractors and suppliers, showing inclusion relevant provisions of LMP.
5) The contending applicants may also be guided that the applicants will be preferred on the following grounds (proof required):
    a) If they are promoting trade union activities in the establishments and believing in social dialogue.
    b) If they are promoting women employment with gender equitys.
    c) If they are employing and promoting employment of persons with disabilities.
    d) If they believe in consultation and due representation to workers in all relevant committee.
    e) If they have established a robust Grievance Redress Mechanism to address workers individual and collective grievances.
    f) If they had good record of addressing issues confronting to host communities due to workers' influx at construction sites.
    g) If they have never been prosecuted or penalized on the basis of labor violation by the Inspector/Government.

Finally, the contending contractors/ firms or short listed contractors may be given an opportunity of presentation before the PMU to advocate their case highlighting specific approach and strategy to implement LMP, if selected.

ANNEX II: Workers' Code of Conduct

I, _____, acknowledge that that adhering to environmental, social, health and safety (ESHS) standards, following the project's environmental, social, health and safety (OHS) requirements, preventing GBV/SEA/SH and child abuse/exploitation is important. Any activity, which constitutes acts of gross misconduct is therefore grounds for sanctions, penalties, or even termination of employment. All forms of misconduct are unacceptable be it on the work site, the work site surroundings, or at worker's camps. Prosecution of those who commit any such misconduct will be pursued as appropriate. I agree that while working on this project, I will:

1. Consent to a security background check;
2. Treat women, children (persons under the age of 18), project staff including other workers, and persons with disability with respect regardless of race, color, language, religion, political or other opinions, national, ethnic, or social origin, property, birth, or another status;
3. Not use language or behavior towards men, women, or children/learners that are inappropriate, harassing, abusive, sexually provocative, demeaning, or culturally inappropriate;
4. Carry out his/her duties competently and diligently;
5. Comply with all applicable national/provincial laws, regulations, and World Bank requirements
6. Comply with the CESMP as approved by the Client to meets its ESHS and OHS objectives as well as preventing and/or mitigating the risks of GBV
7. Maintain a safe working environment including but not limited to:
    a. Ensuring that workplaces, machinery, equipment, and processes under each person's control are safe and without risk to health, preventing avoidable accidents, and reporting conditions or practices that pose a safety hazard or threaten the environment
    b. Wearing required personal protective equipment;
    c. Using appropriate measures relating to chemical, physical and biological substances, and agents; and
    d. Following applicable emergency operating procedures.
8. Not engage in any form of sexual harassment including unwelcome sexual advances, requests for sexual favors, and other unwanted verbal or physical conduct of a sexual nature at work site, the work site surroundings/nearby communities, or at worker's camps
9. Not participate in sexual activity with children/learners—including grooming or online grooming. Mistaken belief regarding the age of a child and consent from the child is not a defense;
10. Not exchange money, employment, goods, or services for sex, with community members including sexual favors or other forms of humiliating, degrading, or exploitative behavior;
11. Refrain from all forms of GBV, are unacceptable, regardless of whether they take place on the work site, the work site surroundings, at worker's camps or within the local community.
12. Attend training related to HIV and AIDS, SEA/SH, occupational health, and any other relevant courses/Trainings as a part of this project;
13. Report to the relevant committee any situation where I may have concerns or suspicions regarding acts of misconduct by a fellow worker, whether in my company or not, or any breaches of this code of conduct provided it is done in good faith;
14. Regarding children (under the age of 18):
    a. Refrain from hiring children for labor, which is inappropriate given their age, or developmental stage, which interferes with their time available for education and recreational activities, or which places them at significant risk of injury.
    b. Bring to the attention of my manager the presence of any children on the construction site or engaged in hazardous activities.
    c. Comply with all relevant local legislation including labor laws and World Bank requirements in relation to child labor and forced labor.
15. Refrain from any form of theft for assets and facilities including from surrounding communities.

16. Remain in the designated working area during working hours;
17. Refrain from possession of alcohol and illegal drugs and other controlled substances in the workplace and being under the influence of these substances on the job and during workings hours;
18. Follow prescribed environmental occupation health and safety standards;
19. Channel grievances through the established grievance redress mechanism.

I do hereby acknowledge that I have read the foregoing Code of Conduct, do agree to comply with the standards contained therein and understand my roles and responsibilities to prevent and respond to ESHS, OHS, and GBV issues. I understand that any action inconsistent with this Code of Conduct or failure to act mandated by this Code of Conduct may result in disciplinary action which could include:

1. Informal warning.
2. Formal warning.
3. Additional Training.
4. Loss of up to one week's salary.
5. Suspension of employment (without payment of salary), for a minimum period of 1 month up to a maximum of 6 months.
6. Termination of employment.
7. Report to the Police if warranted.

Signed by: _____

Signature: _____

Date: _____

For the Employer/Contractor

Signed by: _____

Signature: _____

Date: _____

آئون نالي، _____، تصديق ڪيان ٿو ته، پروجيڪٽ ماحولياتي، سماجي، صحت ۽ حفاظت (پيشاورنه) جي معيارن جون گهرجون پوريون ڪرڻ، جي پي وي/سي اي اي/ايس ايڇ ۽ هارن جو استعصال جي روڪٿام تمام ضروري آهي ۽ ان جو آئون پابند رهندس. منهنجي ڪابه اهڙي سرگرمي جيڪا سخت بد سلوڪي جي عملن ۾ هجي ته ردعمل ۾ سزا يا روزگار جو خاتمو ٿي سگهي ٿو. ڪم جي سائيٽ، سائيٽ جي ارد گرد يا ڪئيمپ ۾ ڪنهن به قسم جي بدسلوڪي هرگز قابل قبول نه هوندي.

آئون يقين ڏياريان ٿو ته منصوبي تي ڪم دوران هيٺين ڳالهين تي عملدرآمد رهندس؛

1. چال چلن، يا ڪنهن ڏوهه ۾ ملوث جي جانچ پڙتال جي رضامندي،
2. عورتن، هارن (18 سالن کان گهٽ عمر جي فردن)، منصوبي جي عملي سميت ٻين ڪارڪنن، ۽ معذور شخصن جو احترام بغير ڪنهن رنگ، نسل ، ٻولي، مذهب، سياسي يا ٻين راين، قومي، نسلي، يا سماجي اصل، ملڪيت، پيدائش، يا پي حيثيت جي بنياد تي،
3. مردن، عورتن، هارن/ شاگردن سان غيراخلاقي ٻولي يا غيرمناسب رويا جئين؛ تنگ ڪرڻ، بدسلوڪي، هراسان ڪرڻ، جنسي طور اشتعال انگيز، يا ثقافتي ساخ کي مجروح نه ڪرڻ،
4. پنهنجي فرضن کي قابليت ۽ محنت سان انجام ڏيڻ،
5. سڀني قابل اطلاق قومي/صوبائي قانونن، ضابطن ۽ ورلڊ بئنڪ جي ضرورتن جي تعميل ڪرڻ،
6. ڪلائنٽ پاران منظورڪيل سي اي ايس ايم پي جي تعميل ڪرڻ، جيڪو اي ايڇ ايس ۽ او ايڇ ايس جا مقصدن ۽ گڏوگڏ جي پي وي جي خطرن کي روڪڻ يا گهٽائڻ جي گهرجن جي پورائي ڪري ٿو.
7. ڪم ڪرڻ جي بهتر ماحول کي برقرار رکڻ سان گڏوگڏ هيٺين ڳالهين جو ڏيان رکڻ؛
   (ا) يقين ڏهاني ڪرڻ ته هرهڪ ماڻهو، ڪم ڪرڻ جي سائٽ، مشينون، اوزار، ۽ طريقيڪار کي بهتر ۽ محفوظ رکي ته انهن سان ڪنهن جي صحت کي ڪو خطرو لاحق نه ٿئي، پاسو ڪرڻ جهڙي حادثن جي روڪٿام، ۽ سڀني غير محفوظ حالتن ۽ عملن جي آگاهي ڏيڻ جيڪي حفاظتي خطرن ۽ غير محفوظ ماحول جو سبب بڻجن.
   (ب) گهربل ذاتي حفاظتي اوزار پائڻ،
   (ٻ) ڪيميائي، جسماني ۽ حياتياتي مادن، ۽ ايجنٽ سان لاڳاپيل مناسب احتياطي قدمن کي استعمال ڪرڻ، ۽
   (پ) قابل اطلاق ايمرجنسي آپريٽنگ طريقيڪار جي پيروي ڪرڻ.
8. ڪنهن به قسم جي جنسي ڏاڍائي ۾ ملوث نه ٿيڻ جنهن ۾ ناپسنديده جنسي پيش رفت، جنسي خواهشن لاءِ درخواستون، ڪم جي سائيٽي يا ان جي چوڌاري/ ويجهن برادرين، يا مزدورن جي ڪٿمپن ۾ جنسي نوعيت جي ٻين ناپسنديده زباني يا جسماني عمل شامل آهن.
9. هارن/ سڪيا ڏيندڙن سان جنسي سرگرمين ۾ حصو نه وٺن. هار جي عمر جي حوالي سان غلط عقيدو ۽ هار کان رضامندي دفاع نه هوندو.
10. آس پاس رهاڪوئن سان جنسي خواهشن جي بدلي ۾ پئسا، روزگار، سامان، يا خدمتن جي ڏيهه وٺ نه ڪريو، جنهن ۾ جنسي خواهشون، يا ٻئي ڪنهن قسم جي ذلت يا استحصالي رويا آهن،
11. جي پي وي جي سڀني قسمن کان پاسو ڪريو، اهي ناقابل قبول آهن، قطع نظر اهي ڪم جي سائيٽ تي، ڪم جي سائيٽ جي چوڌاري، مزدورن جي ڪٿمپن ۾ يا مقامي ماڻهن سان هجي.
12. هن پروجيڪٽ جي حصي طور ايڇ آئي وي ۽ ائيڊس، سي اي اي/ايس ايڇ ، پيشه ورانه صحت، ۽ ڪنهن ٻئي لاڳاپيل ڪورسز/ٽريننگز سان لاڳاپيل تربيت ۾ شرڪت ڪريو؛
13. لاڳاپيل ڪميٽي کي ڪنهن به صورتحال جي رپورٽ ڪريو جتي مون کي خدشو يا شڪ هجي ته ڪنهن ساڻي ڪم ڪندڙ طرفان بدانتظامي جي عملن جي باري ۾، جيتوٽيڪاهو منهنجي ڪمپني ۾ هجي يا نه، يا هن ضابطه اخلاق جي ڪنهن به خلاف ورزي آهي، بشرطيه اها نيڪ نيتي سان ڪئي وئي هجي؛
14. هارن جي باري ۾ (18 سالن کان گهٽ عمر):
   (ا) هارن کي مزدوريءَ لاءِ ۾رتي ڪرڻ کان پاسو ڪريو، جيڪو سندن عمر جي لحاظ کان نامناسب هجي، جيڪو سندن تعليم ۽ تفريحي سرگرمين ۾ مداخلت ڪري، يا جيڪو هارن لاءِ خطري سان ۾ريل هجي.
   (ب) ڪنهن به هارن جي تعميراتي سائيٽ تي يا خطرناڪ سرگرمين ۾ مصروف ۽ موجودگي جو پنهنجي مئنيجر جي ڏيان ۾ آڻيو.
   (ٻ) هارن جي مزدوري ۽ جبري مزدوري جي حوالي سان سڀني لاڳاپيل مقامي قانون سازي جي تعميل ڪريو جنهن ۾ مزدورن جي قانون ۽ ورلڊ بئنڪ جي گهرجون شامل آهن.
15. آس پاس جي ڪميونٽين سميت اثاثن ۽ سهولتن جي ڪنهن به قسم جي چوري کان پاسو ڪريو.
16. ڪم جي وقت دوران مقرر ڪيل ڪم واري علائقي ۾ رهو؛
17. ڪم جي جڳهه ۾ شراب ۽ غير قانوني منشيات ۽ ٻين پابندي مڙهيل مادو جي قبضي ۽ انهن شين جو ڪم دوران استعمال ۽ ان جي اثر هيٺ نوڪري ڪرڻ کان پاسو ڪيو؛
18. پيش ڪيل ماحولياتي پيشه ورانه صحت ۽ حفاظت جي معيارن تي عمل ڪريو؛

19. **شڪايتن جي حل لاء قائم ڪيل شڪايتن جي حل واري ميڪانيزم جو استعمال ڪرڻ.**

مان هن ريت تسليم ڪريان ٿو ته مون متين ضابطه اخلاق کي پڙهيو آهي، ان ۾ موجود معيارن تي عمل ڪرڻ تي متفق آهيان ۽ اي ايس ايڇ ايس ،او ايڇ ايس۽ جي پي پي مسئلن کي روڪڻ ۽ جواب ڏيڻ لاءِ منهنجي ڪردار ۽ ذميوارين کي سمجهان ٿو. مان سمجهان ٿو ته ڪو به عمل هن ضابطه اخلاق سان مطابقت رکي ٿو يا هن ضابطه اخلاق پاران لازمي طور تي عمل ڪرڻ ۾ ناڪامي جي نتيجي ۾ تي سگهي ٿو نظم و ضبط جي ڪارروائي جنهن ۾ شامل تي سگهي ٿو:

1. ***غير رسمي خبردار ڪرڻ***
2. ***رسمي خبردار ڪرڻ.***
3. ***اضافي تربيت.***
4. ***هڪ هفتي جي پگهار تائين جي ڪٽوتي .***
5. ***روزگار جي معطلي (پگهار جي ادائيگي کان سواء)، گهٽ ۾ گهٽ 1 مهيني جي عرصي تائين وڌ ۾ وڌ 6 مهينن تائين.***
6. ***ملازمت جو خاتمو.***
7. ***جيڪڏهن ضرورت هجي ته پوليس کي رپورٽ ڪريو.***

تصديق ڪندڙ_____صحيح _____
بتاريخ _____

ٽيڪيدار لاء ؛
تصديق ڪندڙ_____صحيح _____
بتاريخ _____

ANNEX III: ToC for Occupational Health and Safety Management Plans

1. Introduction
2. Scope of Document
3. Project Overview
   - 3.1 Project Information - Details of Key Members of the Project Team
   - 3.2 Description of Proposed Works
   - 3.3 Project Health, Safety and Environmental Goals & Objectives
   - 3.4 Project Constraints, Restrictions and Existing Services
   - 3.5 Register of Key Construction Documents
4. Project Management
   - 4.1 Management Structure & Organizational Structure
   - 4.2 Communication and Continued Liaison
   - 4.3 Design Changes Throughout Works
   - 4.4 Selection and Control of Contractors
   - 4.5 Health and Safety Management
   - 4.6 Site Access
   - 4.7 Induction
   - 4.8 Toolbox Talks
   - 4.9 Permits
   - 4.10 Training
   - 4.11 First Aid/Accident & Incident Reporting
   - 4.12 PPE
   - 4.13 Plant and Equipment
   - 4.14 Breaches to H&S – Red Card/Yellow Card
5. Setting of Standards
   - 5.1 Statutory Requirements
   - 5.2 General Site Rules
6. Risk Assessments &Method Statements
7. Welfare Arrangements
8. Monitoring and Review
9. Project Specific Health & Safety Information
   - 9.1 Design Considerations
   - 9.2 Ground Conditions
   - 9.3 Deliveries
   - 9.4 Traffic Management
   - 9.5 Fire and Emergency Provisions
   - 9.6 Storage of Materials
   - 9.7 Storage and Collection of Waste
   - 9.8 Contact with Live Services
10. Site Hazards and Controls
    - 10.1 Slips, Trips and Falls
    - 10.2 Manual Handling
    - 10.3 Lifting Operations

10.4 Management of Plant and Machinery
10.5 Falls from Height
10.6 Noise and Vibration
10.7 Excavations
10.8 Confined Spaces.
10.9 COSHH
10.10 Adverse Weather Conditions
10.11 Electrical Connections, Testing and Commissioning

11. Waste and Environmental Considerations
12. Security Arrangements
13. Complaints and External Liaison
14. Health and Safety File

ANNEX IV: Incident/ Accident Reporting Format

B1: Incident Details:			
Date of Incident:	**Time:**	**Date Reported to PMU:**	**Date Reported to WB:**
Reported to PMU by:	**Reported to WB by:**	**Notification Type**: Email/'phone call/media notice/other	
Trading Name of Main Contractor:		**Trading Name of Subcontractor**:	

B2: Type of Incident (Please check all that apply)

Fatality ☐ Lost Time Injury ☐ Displacement Without Due Process ☐ Child Labor ☐ Acts of Violence/Protest ☐ Disease Outbreaks ☐ Forced Labor ☐ Unexpected impacts on heritage resources ☐ Unexpected impacts on biodiversity resources ☐ Environmental pollution incident ☐ Dam failure ☐ Other ☐

B3: Description/Narrative of Incident

Please replace text in italics with brief description, noting for example:

I. *What is the incident?*
II. *What were the conditions or circumstances under which the incident occurred (if known)?*
III. *Are the basic facts of the incident clear and uncontested, or are there conflicting versions? What are those versions?*
IV. *Is the incident still ongoing or is it contained?*
V. *Have any relevant authorities been informed?*

B4: Actions taken to contain the incident

Short Description of Action	**Responsible Party**	**Expected Date**	**Status**

For incidents involving a contractor:

Have the works been suspended (*for example, under Contract GCC7.6 or GCC8.9 of Works*)? Yes ☐**;** No ☐**; Please attach a copy of the instruction suspending the works.**

B5: What support has been provided to the affected people?

C1: Investigation Findings

Please replace text in italics with findings, noting for example:

I. *where and when the incident took place*
II. *who was involved, and how many people/households were affected*
III. *what happened and what conditions and actions influenced the incident*
IV. *what were the expected working procedures and were they followed*
V. *did the organization or arrangement of the work influence the incident*
VI. *were there adequate training/competent persons for the job, and was necessary and suitable equipment available*
VII. *what were the underlying causes; where there any absent risk control measures or any system failures*

C2: Corrective Actions from the investigation to be implemented (to be fully described in Corrective Action Plan)

Action	Responsible Party	Expected Date

C3a: Fatality/Lost time Injury information

Cause of fatality/injury for worker or member of the public (please check all that apply):

1. Caught in or between objects ☐ 2. Struck by falling objects ☐ 3. Stepping on, striking against, or struck by objects ☐4. Drowning ☐ 5. Chemical, biochemical, material exposure ☐ 6. Falls, trips, slips ☐ 7. Fire & explosion ☐8. Electrocution ☐ 9. Homicide ☐ 10. Medical Issue ☐ 11. Suicide ☐ 12. Others ☐*Vehicle Traffic:* 13. Project Vehicle Work Travel ☐ 14. Non-project Vehicle Work Travel ☐ 15. Project Vehicle Commuting ☐16. Non-project Vehicle Commuting☐ 17.Vehicle Traffic Accident (Members of Public Only) ☐

Name	Age/DOB	Date of Death/Injury	Gender	Nationality	Cause of Fatality/Injury	Worker (Employer)/Public

C3b: Financial Support/Compensation Types (To be fully described in Corrective Action Plan template)

1. Contractor Direct ☐2. Contractor Insurance ☐3. Workman's Compensation/National Insurance ☐ 4. Court Determined Judicial Process ☐ 5. Other ☐ 6. No Compensation Required ☐

Name	Compensation Type	Amount (US$)	Responsible Party

C4: Supplementary Narrative

For incidents involving a contractor:

Have the works been suspended in part or whole (for example, while corrective actions are put in place under Contract GCC7.6 or 8.9 of Works)? Yes ☐; No ☐;

Please attach a copy of the instruction suspending the works.