

The Benazir Bhutto Shaheed University of  
Technology and Skill Development Khairpur Mirs

Tender Documents

Name of work: Establishment of Centre for incubation  
& Enterprise at the BBSU of Technology & Skills  
Development, Khairpur

Volume-I: Conditions of Contract

Volume-II: Technical Specifications

Volume-III: Bill of Quantities (BoQs)

Volume-IV: Tender Drawings

**The Benazir Bhutto Shaheed University of Technology  
and Skill Development Khairpur Mirs**

**Name of Work: Establishment of Centre for incubation  
& Enterprise at the BBSU of Technology & Skills  
Development, Khairpur**

**TENDER AND CONTRACT DOCUMENTS**

**VOLUME -I**

Issued to M/s \_\_\_\_\_  
\_\_\_\_\_

**CONDITIONS OF CONTRACT**



**M/S. ATIF NAZAR (PVT.) LTD.**  
**PROJECT MANAGERS, PLANNERS**  
**ARCHITECTS & CONSULTING ENGINEERS**  
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*Client*  
Signature/Stamp of Contractor  
Director (Works & Services)  
The Benazir Bhutto Shaheed  
University of Technology and Skill Development  
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# INVITATION FOR BIDS

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**NOTICE RE-INVITING TNDERS**

Date: \_\_\_\_\_

Federal/Provincial/Local Government Funds/ Loans / Grant No: \_\_\_\_\_

Bid Reference No: \_\_\_\_\_

1. The Benazir Bhutto Shaheed University of Technology and Skill Development, Khairpur Mirs invites bids on Composite Schedule of Rates (CSR) & Item Rate basis electronically through EPADS (E-Pak Acquisition & Disposal System) on a Single Stage - Two Envelope Procedure from the eligible and experienced, interested persons/contractors/firms/companies/(the bidder(s)).

2. Details of Work:

#	Name of Work	Estimated Cost (Rs. In Million)	Bid Security Rs. In million	Tender fee Rs.	Time for Completion	Date of issuance	Date of submission of bids	Purchase from
1	Establishment of Centre for incubation & Enterprise at the BBSU of Technology & Skills Development, Khairpur	71.186	1.424	5000	12 Months	06-04-2026	21-04-2026 up to 10:30 am	Through SPPRA EPADS

3. Eligibility Criteria:

- Valid registration with Pakistan Engineering Council (PEC): Category C-4 or above in relevant field and specialization codes CE09, CE10, EE04, EE06, EE10 and EE11(vi).
- Valid registration with Sindh Revenue Board (SRB).
- NTN Certificate activated status in Federal Board of Revenue (FBR).
- Having valid license of Electrical Inspector.
- At least 03 years relevant experience.
- Turnover should be more than or equal to the estimated cost of work in last three years.
- Copy of CNIC of owners/proprietors.

4. Qualification:

- List of similar nature of building works with satisfactory Completion Certificates along with Letters of Award issued from the Procuring Agency for costing of work done greater than (twice of the estimated cost) in million (cumulative) for last five (05) years.
- Details of equipment, machinery and transport owned/leased/hired by the bidder related to the building construction with documentary evidence.
- Financial Statement (Summary), Income Tax Returns, Bank Statements and Audited Reports for last three (03) years.
- List of litigation (if any) their nature and status/outcomes.
- Affidavit on original stamp paper of at least Rs.100/- (duly notarized) to the effect that the bidder is not black listed and not involved in any litigation and arbitration with any Government Procuring Agency and bidder has not abandoned any work.
- The bidders shall have to submit complete details of Engineering and Technical personnel along with CVs (duly signed by concerned person with attested copies of testimonials and having relevant experience).
- All documents required should be clearly legible and attested from any gazetted Govt. officer otherwise bid cannot be considered for qualification.
- Bidders shall have to submit affidavit on original stamp paper of at least Rs.100/- (duly notarized) to the effect that:
  - All the documents /particulars/ information furnished are absolutely true & correct.

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- b. Declaring that there is no involvement in any corrupt, fraudulent and collusive practices.
- c. If, at any stage, the information is found to be bogus, fake, forged, or counterfeit, action shall be taken in accordance with the applicable rules.
5. Bidding/Tender Documents:
- i. Interested bidders are required to get registered themselves on EPAD system in the link <https://sindh.eprocure.gov.pk/#!/supplier/registration> for submission of electronics bids. Bidding documents can be viewed /downloaded from <https://portalsindh.eprocure.gov.pk> and also available and viewed from, University's website: <https://bbsutsd.edu.pk/tenders/>.
- ii. The bids prepared in accordance with the instruction given in the bidding document must be submitted on EPADS. The original instruments of tender fee (non-refundable) and bid security, in shape of Call Deposit issued by any scheduled bank of Pakistan, in favour of, "the Benazir Bhutto Shaheed University of Technology and Skill Development Khairpur Mirs" must reach the Procuring Agency (the undersigned) in the sealed envelope prior to the deadline of submission of e-bids. The technical bids will be opened by the Procurement Committee on the same day at 11:00 am, in presence of the bidder(s) or their authorized representative who wish to be present. After completion of Technical Process, the Financial Bids of technically qualified bidders will be opened and uploaded on EPADS, accordingly.
6. Un-responded tenders will be again issued/submitted/opened on the following dates:-  
 Attempt: (a) Issue date (b) Submission & opening date  
 2<sup>nd</sup> 22-04-2026 to 08-05-2026 08-5-2026(10:30am)&08-05-2026(11:00 am)
7. Venue: through EPADS, office of the Director (Works & Services), the Benazir Bhutto Shaheed University of Technology and Skill Development, Khairpur Mirs (Phone# 0243-920168).
8. Un-foreseen situation: In case of such situation resulting in closure of office on the date of opening or if Government declares holiday, the tenders shall be submitted, opened on the next working day at the same time and venue.
9. Funding Position:  
 Government of Sindh (ADP scheme).
10. Terms & Conditions:
- a) Under following conditions bid will be rejected:-  
 i. Conditional bid(s).  
 ii. Bid(s) without bid security of required amount and form.  
 iii. Bids received after specified date and time.  
 iv. Black listed firms.
- b) Bid Validity Period:- 90 days (Ninety Days).
- c) Evaluation Criteria:- The required documents attached with the application/bid shall be evaluated on Yes/No basis (check list).
- d) Procuring Agency reserves the right to reject any or all bids subject to the relevant provisions of Sindh Public Procurement Rules 2010 (amended up to date).

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## INSTRUCTIONS TO BIDDERS

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

### A. GENERAL

#### IB.1 Scope of Bid

- 1.1 Procuring agency as defined in the bidding data hereinafter called "the procuring agency" wishes to receive bids for the construction and completion of works as described in these bidding documents, and summarized in the bidding data hereinafter referred to as the "Works".
- 1.2 The successful bidder will be expected to complete the works within the time specified in Appendix-A to Bid.

#### IB.2 Source of Funds

- 2.1 Procuring agency has received/ applied for loan/grant/ Federal/ Provincial/Local Government funds from the source(s) indicated in the bidding data in various currencies towards the cost of the project/scheme specified in the bidding data, and it is intended that part of the proceeds of this loan/grant/funds will be applied to eligible payments under the contract for which these bidding documents are issued.

#### IB.3 Eligible Bidders

- 3.1 This Invitation for Bids is open to all interested bidders who are eligible under provisions of Sindh Public Procurement Rules as mentioned below and the criteria given in the Notice Inviting Tender (NIT)/ Bidding Document.

Firms and individuals, national or international, may be allowed to bid for any project where international competitive bidding is feasible. Any conditions for participation shall be limited to those that are essential to ensure the bidder's capability to fulfill the contract in question.

- (a) Bidders may be excluded if;
  - (i) As a matter of law or official regulations, commercial relations are prohibited with the bidder's country by the federal government, or
  - (ii) A firm is blacklisted/ debarred by the procuring agency and the matter has been reported to the Authority, subject to Rule 39 of Sindh Public Procurement Rules.
- (b) Government-owned enterprises or institutions may participate only if they can establish that they are;
  - (i) Legally and financially autonomous, and
  - (ii) Operate under commercial law.

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

Bidders shall include all those constructors who are registered or incorporated in Pakistan, irrespective of the nationality of their owners and professional staff, or

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(c) Bidders are:-

- (i) pre-qualified with procuring agency for particular project/scheme;
- (ii) Registered with Pakistan Engineering Council in particular category (if applicable)

#### **IB.4 One Bid per Bidder**

4.1 Each bidder shall submit only one bid either by himself, or as a partner in a joint venture. A bidder who submits or participates in more than one bid (other than alternatives pursuant to Clause IB.16) will be disqualified.

#### **IB.5 Cost of Bidding**

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

#### **IB.6 Site Visit**

6.1 The bidders are advised to visit and examine the site of works and its surroundings and obtain all information that may be necessary for preparing the bid and entering into a contract for construction of the works. All cost in this respect shall be at the bidder's own expenses.

6.2 The bidders and any of their personnel or agents will be granted permission by the procuring agency to enter upon his premises and lands for the purpose of such inspection, but only upon the express condition that the bidders, their personnel and agents, will release and indemnify the procuring agency, his personnel and agents from and against all liability in respect thereof and will be responsible for death or personal injury, loss of or damage to property and any other loss, damage, costs and expenses incurred as a result of such inspection.

### **B. BIDDING DOCUMENTS**

#### **IB.7 Contents of Bidding Documents**

7.1 The bidding documents, in addition to invitation for bids, are those stated below and should be read in conjunction with any addenda issued in accordance with Clause IB.9.

- a. Instructions to Bidders.
- b. Bidding Data.
- c. General Conditions of Contract, Part-I (GCC)
- d. Special Conditions of Contract, Part-II (SCC)
- e. Specifications.
- f. Form of Bid and Appendices to Bid.
- g. Bill of Quantities (Appendix-D to Bid).
- h. Form of Bid Security.
- i. Form of Contract Agreement.
- j. Forms of Performance Security, Mobilization Advance Guarantee and Indenture bond for secured advance.
- k. Drawings.

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7.2 The bidders are expected to examine carefully the contents of all the above documents. Failure to comply with the requirements of bid submission will be at the bidder's own risk. Pursuant to Clause IB.26, bids which are not substantially responsive to the requirements of the BD will be rejects.

#### **IB.8 Clarification of Bidding Documents**

8.1 Any interested bidder requiring any clarification(s) in respect of the bidding documents may notify the procuring agency in writing at the procuring agency's address indicated in the Invitation for Bids/NIT/EOI. Procuring agency will respond to any request for clarification provided they are received at least five calendar days prior to the date of opening of bid.

Copies of the procuring agency's response will be forward to all the bidders including a description of the enquiry, but without disclosing the identity of its/their initiator(s).

#### **IB.9 Amendment of Bidding Documents**

9.1 At any time prior to the deadline for submission of bids, the procuring agency may, for any reason, whether at his own initiative or in response to a clarification requested by a interested bidder, modify the bidding documents by issuing addendum.

9.2 Any addendum thus issued shall be part of the bidding documents pursuant to sub-clause IB 7.1 hereof and shall be communicated in writing to all bidders. Interested bidders shall acknowledge receipt of each addendum in writing to the procuring agency.

9.3 To afford bidders reasonable time in which to take an addendum into account in preparing their bids, the procuring agency may extend the deadline for submission of bids in accordance with IB.20

### **C. PREPARATION OF BIDS**

#### **IB.10 Language of Bid**

10.1 The bid and all correspondence and documents related to the bid exchanged by a bidder and the procuring agency shall be in the language stipulated in the bidding data and I Conditions of the contract. Supporting documents and printed literature furnished by the bidders may be in any other language provided the same are accompanied by an accurate translation of the relevant parts in the bid language, in which case, for purposes of evaluation of the bid, the translation in bid language shall prevail.

#### **IB.11 Documents Accompanying the Bid**

11.1 Each bidder shall:  
As per Notice Inviting Tender

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And

- (c) Furnish a technical proposal taking into account the various Appendices to Bid specially the following:
- |                   |  |
|-------------------|--|
| Appendix-E to Bid | Proposed Construction Schedule           |
| Appendix-F to Bid | Method of Performing the Work            |
| Appendix-G to Bid | List of Major Equipment                  |
| Appendix-K to Bid | Organization Chart for Supervisory Staff |
- And other pertinent information such as mobilization programme etc.

11.2 Bids submitted by a joint venture of two (w) or more firms shall comply with the following requirements:

- (a) One of the joint venture partners shall be nominated as being in charge and this authorization shall be evidenced by submitting a power of attorney signed by legally authorized signatories of all the joint venture partner;
- (b) the bid, and in case of a successful bid, the Form of Contract Agreement shall be signed by the authorized partner so as to be legally binding on all partner;
- (c) the partner-in-charge shall always be duly authorized to deal with the procuring agency regarding all matters related with and/or incidental to the execution of works as per the terms and Conditions of Contract and in this regard to incur any and all liabilities, receive instructions, give binding undertakings and receive payments on behalf of the joint venture.
- (d) all partners of the joint venture shall at all times and under all circumstances be liable jointly and severally for the execution of the contract in accordance with the contract terms and a statement to this effect shall be included in the authorization mentioned under Sub-Para(a) above as well as in the Form of Bid and in the Form of Contract Agreement (in case of a successful bid).

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- (e) a copy of the agreement entered into by the joint venture partners shall be submitted with the bid stating the conditions under which it will function, its period of duration, the persons authorized to represent and obligate it and which persons will be directly responsible for due performance of the contract and can give valid receipts on behalf of the joint venture, the proportionate participation of the several firms forming the joint venture, and any other information necessary to permit a full appraisal of this functioning. No amendments / modifications whatsoever in the joint venture agreement shall be agreed to between the joint venture partners without prior written consent of the procuring agency;
- (f) Submission of an alternative Letter of Intent to execute a Joint Venture Agreement shall be mandatory.

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

#### **IB.12 Bid Prices**

12.1 Unless stated otherwise in the bidding documents, the contract shall be for the whole of the works as described in IB 1.1 hereof, based on the unit rates or prices submitted by the bidder or percentage quoted above or below on the rates of Composite Schedule of Rates (CSR), as the case may be.

12.2 The bidders shall fill in rates and prices for all items of the works described in the Bill of Quantities. Items against which no rate or price is entered by a bidder will not be paid for by the procuring agency when executed and shall be deemed to be covered by rates and prices for other items in the Bill of Quantities. In case of Composite Schedule of Rates, if the bidder fails to mention the percentage above or below, it shall be deemed to be at par with the rates of Composite Schedule of Rates.

12.3 The bid price submitted by the Constructor/constructor shall include all rates and prices including the taxes. All duties, taxes and other levies payable by the constructor under the contract, or for any other cause during the currency of the execution of the work or otherwise specified in the contract as on the date seven days prior to the deadline for submission of bids.

12.4 The rates and prices quoted by the bidders are subject to adjustment during the performance of the contract in accordance with the provisions of Clause 70 of GCC. The bidders shall furnish the prescribed information for the price adjustment formula in Appendix-C to Bid, and shall submit with their bids such other supporting information as required under the said Clause. Adjustment in prices quoted by bidders in case of NCB will not be allowed except on those items notified by Finance Department after the date of opening and will be paid accordingly. In case of ICB, Clause 4(ii) of Section C of Instructions to bidders and bidding data shall apply.

#### **IB.13 Currencies of Bid and Payment**

13.1 The unit rates and the prices shall be quoted by the bidder entirely in Pak rupees. A bidder expecting to incur expenditures in other currencies for inputs to the works supplied from outside the procuring agency's country (referred to as the "Foreign Currency Requirements") shall indicate the same in Appendix-B to Bid. The proportion of the bid price (excluding Provisional Sums) needed by him for the payment of such Foreign Currency Requirements either (i) entirely in the currency of the bidder's home country or, (ii) at the bidder's option, entirely in Pak rupees provided always that a bidder expecting to incur expenditures in a currency or currencies other

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than those stated in (i) and (ii) above for a portion of the foreign currency requirements, and wishing to be paid accordingly, shall indicate the respective portions in the bid.

- 13.2 The rates of exchange to be used by the bidder for currency conversion shall be the selling rates published and authorized by the State Bank of Pakistan prevailing on the date, 07 (seven) days prior to the deadline for submission of bids. For the purpose of payments, the exchange rates used in bid preparation shall apply for the duration of the contract.

#### **IB.14 Bid Validity**

- 14.1 Bids shall remain valid for the period stipulated in the bidding data from the date of opening of bid specified in clause IB.23.
- 14.2 In exceptional circumstances, prior to expiry of the original, the procuring agency may request the bidders to extend the period of validity for a specified additional period, which shall not be for more than one third of the original period of bid validity. The request and the responses thereto, shall be made in writing. A bidder may refuse the request without the forfeiture of the bid security. In case, a bidder agreed to the request, shall not be required or permitted to modify the bid, but will be required to extend the validity of the bid security for the period of the extension, and in compliance with Clause IB.15 in all respects.

#### **IB.15 Bid Security**

- 15.1 Each bidder shall furnish, as part of the bid, a bid security in the amount stipulated in the bidding data in Pak Rupees or an equivalent amount in a freely convertible currency.
- 15.2 The bid security shall be in the form of deposit at call, issued by a Scheduled Bank in Pakistan or from a foreign bank duly counter guaranteed by a Scheduled Bank in Pakistan in favor of the procuring agency, which should commensurate with the bid validity period. The bank guarantee for bid security shall not be acceptable in the manner as provided at Annexure BS-1.
- 15.3 Any bid not accompanied by an acceptable bid security shall be rejected by the procuring agency as non-responsive.
- 15.4 Bid security shall be released to the unsuccessful bidders once the contract has been signed with the successful bidder or the validity period has expires.
- 15.5 The bid security of the successful bidder shall be retained as performance security in addition to 3% additional call deposit or returned when the bidder has furnished the required Performance Security of 10% and signed the Contract Agreement. Security deposit at the rate of 5% shall be deducted from the interim or running bills.
- 15.6 The bid security may be forfeited:
- (a) if the bidder withdraws his bid except as provided in sub-clause IB 22.1;
  - (b) if the bidder does not accept the correction of his bid price pursuant to sub-clause IB 27.2 hereof; or
  - (c) In the case of successful bidder, if he fails within the specified time limit to:
    - (i) Furnish the required Performance Security; or
    - (ii) Sign the Contract Agreement.

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#### **IB.16 Alternate Proposals/Bids**

- 16.1 Each bidder shall submit only one bid either by himself, or as a member of a joint venture, until and unless they have been requested or permitted for alternative bid, then he has to purchase separate bidding documents and alternate bid shall be treated as separate bid.
- 16.2 Alternate proposals are allowed only for procurement of works where technical complexity is involved and more than one designs or technical solutions are being offered. Two stage two envelope bidding procedure will be appropriate when alternate proposal is required.
- 16.3 Alternate bid(s) shall contain (a) relevant design calculations; (b) technical specifications; (c) proposed construction methodology; and (d) any other relevant details / conditions, provided that the total sum entered on the Form of Bid shall be that which represents complete compliance with the bidding documents.

#### **IB.17 Pre-Bid Meeting**

- 17.1 Procuring agency may, on his own motion or at the request of any bidder, hold a pre-bid meeting to clarify issues and to answer any questions on matters related to the bidding documents. The date, time and venue of pre-bid meeting, if convened, shall be communicated to all bidders. All bidders or their authorized representatives shall be invited to attend such a pre-bid meeting at their own expense.
- 17.2 The bidders are requested to submit questions, if any, in writing so as to reach the Procuring agency not later than seven (7) days before the proposed pre-bid meeting.
- 17.3 Minutes of the pre-bid meeting, including the text of the questions raised and the replies given, will be transmitted without delay to all bidders. Any modification of the bidding documents listed in sub-clause IB 7.1 hereof, which may become necessary as a result of the pre-bid meeting shall be made by the procuring agency exclusively through the issue of an Addendum pursuant to Clause IB.9 and not through the minutes of the pre-bid meeting.
- 17.4 Absence at the pre-bid meeting will not be a cause for disqualification of a bidder.

#### **IB.18 Format and Signing of Bid**

- 18.1 Bidders are particularly directed that the amount entered on the Form of Bid shall be for performing the contract strictly in accordance with the bidding documents.
- 18.2 All appendices to bid are to be properly completed and signed.
- 18.3 No alteration is to be made in the form of bid nor in the Appendices thereto except in filling up the blanks as directed. If any such alterations be made or if these instructions be not fully complied with, the bid may be rejected.
- 18.4 Each bidder shall prepare by filling out the forms without alterations and shall provide an original copy along with photocopies as per the requirement of the procuring agency specified in the bidding data. The original as well as copy(ies) of the document shall be clearly marked as "ORIGINAL" and "COPY", as the case may be. If there is any discrepancy between original and copy (ies) then the original shall prevail.
- 18.5 The original and all copies of the bid shall be typed or written in indelible ink (in the case of copies, Photostats are also acceptable) and shall be signed by a person(s) duly authorized to sign

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on behalf of the bidder pursuant to sub-clause IB 11.1 (a) hereof. All pages of the bid shall be initialed and stamped by the person(s) signing the bid.

- 18.6 The bid shall contain no alterations, omissions or additions, except to comply with instructions issued by the procuring agency, or as are necessary to correct errors made by the bidder. Such corrections shall be initialed by the person(s) signing the bid.
- 18.7 Bidders shall indicate in the space provided in the Form of Bid their full and proper postal addresses at which notices may be legally served on them and to which all correspondence in connection with their bids and the contract is to be sent.
- 18.8 Bidders should retain a copy of the bidding documents as their file copy.

#### D. SUBMISSION OF BIDS

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

19.1 Each bidder shall submit his bid through EPADS as under:

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

~~19.2 The inner and outer envelopes shall:~~

- ~~(a) be address to the procuring agency at the address provided in the bidding data.~~
- ~~(b) bear the name and identification number of the contract as defined in the bidding data and~~
- ~~(c) provide a warning not to open before the time and date for bid opening, as specified in the bidding data.~~

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

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

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

- 20.1 (a) Bids must be received by the procuring agency at the address specified no later than the time and date stipulated in the bidding data,
- (b) Bids with charges payable will not be accepted, nor will arrangements be undertaken to collect the bids from any delivery point other than that specified above. Bidders shall bear all expenses incurred in the preparation and delivery of bids. No claims shall be entertained for refund of such expenses.

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- (c) Where delivery of a bid is by mail and the bidder wishes to receive an acknowledgment of receipt of such bid, he shall make a request for such acknowledgment in a separate letter attached to but not included in the sealed bid package,
- (d) Upon request, acknowledgment of receipt of bids will be provided to those making delivery in person or by messenger.

20.2 The Procuring Agency may, at its discretion, extend the deadline for submission of bids by issuing an amendment in accordance with IB 09. In such case, all rights and obligations of the procuring agency and the bidders shall remain the same as mentioned in the original deadline.

**IB.21 Late Bids**

- 21.1 (a) Any bid received by the procuring agency after the deadline for submission of bids prescribed in to clause IB 20 shall be returned unopened to such bidder.
- (b) Delays in the mail, person transit, or delivery of a bid to the wrong office shall not be accepted as an excuse for failure to deliver a bid at the proper place and time. It shall be the bidder's responsibility to submit the bid in time.

**IB.22 Modification, Substitution and Withdrawal of Bids**

- 22.1 Any bidder may modify, substitute or withdraw his bid after bid submission provided that the modification, substitution or written notice of withdrawal is received by the procuring agency prior to the deadline for submission of bids.
- 22.2 The modification, substitution, or notice for withdrawal of any bid shall be prepared, sealed, marked and delivered in accordance with the provisions of Clause IB.19 with the other and inner envelopes additionally marked "MODIFICATION", "SUBSTITUTION" OR "WITHDRAWAL" as appropriate.
- 22.3 No bid may be modified by a bidder after the deadline for submission of bids except in accordance with to sub – clauses IB 22.1 and IB 27.2.
- 22.4 Withdrawal of a bid during the interval between the deadlines for submission of bids and the expiration of the period of bid validity specified in the Form of Bid may result in forfeiture of the bid security in pursuance to clause IB 15.

**E. BID OPENING AND EVALUATION**

**IB.23 Bid Opening**

- 23.1 Procuring agency will open the bids, including withdrawals, substitution and modifications made pursuant to Clause IB.22, in the presence of bidders' representatives who choose to attend, at the time, date and location stipulated in the bidding data. The bidders or their representatives who are attendance shall sign an attendance sheet.
- 23.2 Envelopes marked "MODIFICATION", "SUBSTITUTION" OR "WITHDRAWAL" shall be opened and read out first. Bids for which an acceptable notice of withdrawal has been submitted pursuant to clause IB.22 shall not be opened.
- 23.3 Procuring agency shall read aloud the name of the bidder, total bid price and price of any Alternate Proposal(s), if any, discounts, bit modifications, substitution and withdrawals, the presence or absence of bid security, and such other details as the procuring agency may

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consider appropriate, and total amount of each bid, and of any alternative bids if they have been requested or permitted, shall be read aloud and recorded when opened.

- 23.4 Procuring Agency shall prepare minutes of the bid opening, including the information disclosed to those present in accordance with the sub-clause 23.3.

#### **IB.24 Process to be Confidential**

- 24.1 Information relating to the examination, clarification, evaluation and comparison of bid and recommendations for the award of the contract shall not be disclosed to bidders or any other person not officially concerned with such process. Any effort by a bidder to influence the procuring agency's processing of bids or award decisions may result in the rejection of such bidder's bid.

#### **IB.25 Clarification of Bid**

- 25.1 To assist in the examination, evaluation and comparisons of bids, the procuring agency may, at its discretion, ask any bidder for clarification of the bid, including breakdowns of unit rates. The request for clarification and the response shall be in writing but no change in the price or substance of the bid shall be sought, offered or permitted except as required to confirm the correction arithmetic errors discovered by the procuring agency in the evaluation of the bids in accordance with clause IB 28.

#### **IB.26 Examination of Bids and Determination of Responsiveness**

- 26.1 Prior to the detailed evaluation of bids, the procuring agency will determine whether the bidder fulfills all codal requirements of eligibility criteria given in the tender notice such as registration with tax authorities, registration with PEC (where applicable), turnover statement, experience statement, and any other condition mentioned in the NIT and bidding document. If the bidder does not fulfill any of these conditions, it shall not be evaluated further.
- 26.2 Once found to be fulfilling the eligibility criteria, as mentioned in sub-clause 26.1, these bids of eligible bidders will be evaluated for technical responsiveness as per specification and criteria given in the bidding documents. Technical and financial evaluations may be carried out in accordance with single stage-single one envelope, single stage-two envelopes, two stage or two state-two envelopes bidding procedures, depending on the selection procedure adopted by the procuring agency.
- 26.3 A bid will be considered technically responsive if it (i) has been properly signed; (ii) is accompanied by the required bid security; and (iii) conforms to all the terms, conditions and specifications of the bidding documents, without material deviation or reservation. A material deviation or reservation is one (i) which affect in any substantial way the scope, quality or performance of the works; (ii) which limits in any substantial way, inconsistent with the bidding documents, the procuring agency's rights or the bidder's obligations under the contract; or (iii) adoption/rectification whereof would affect unfairly the competitive position of other bidders presenting substantially responsive bids.
- 26.4 If a bid is not substantially responsive, it will be rejected by the procuring agency, and may not subsequently be made responsive by correction or withdrawal of the non-conforming deviation or reservation.

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## **IB.27 Correction of Errors before Financial Evaluation**

27.1 Bids determined to be substantially responsive will be checked by the procuring agency for any arithmetic errors. Errors will be corrected by the procuring agency as follows:

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

27.2 The amount stated in the Form of Bid will be adjusted by the procuring agency in accordance with the above procedure for the correction of errors and with the concurrence of the bidders. The amount thus corrected shall be considered as binding upon the bidder. If the bidder does not accept the corrected bid price, his bid will be rejected, and the bid security shall be forfeited in accordance with sub- clause IB 15.6(b) hereof.

## **IB.28 Financial Evaluation and Comparison of Bids**

28.1 The procuring agency will evaluate and compare only the Bids determined to be substantially responsive in accordance with clause IB 26.

28.2 In evaluating the Bids, the procuring agency will determine for each bid the evaluated bid price by adjusting the bid price as follows:

- (a) Making any correction for error pursuant to clause IB 27;
- (b) Excluding provisional sums (if any), for contingencies in the Summary Bill of Quantities, but including competitively priced Day work; and
- (c) Making an appropriate adjustment for any other acceptable variation or deviation.

28.3 The estimated effect of the price adjustment provisions of the conditions of contract, applied over the period of execution of the contract, shall not be taken in to account in bid evaluation.

28.4 If the bid of the successful bidder is seriously unbalanced in relation to the procuring agency's estimate of the cost of work to be performed under the contract, the procuring agency may require the bidder to produce detailed price analyses for any or all items of Bill of Quantities to demonstrate the internal consistency of those prices with the construction methods and schedule proposed. After evaluation of the price analyses, the procuring agency may require that the amount of the Performance Security set forth in clause IB.32 be increased at the expense of the successful bidder to a level sufficient to protect the procuring agency against financial loss in the event of default of the successful bidder under the contract.

28.5 Evaluation Report

After the completion of evaluation process, as describe in clauses IB 27 and IB 28, the procuring agency shall prepare an evaluation report. The evaluation report shall contain names of all the bidders, technical and financial score or comparison, name of lowest evaluated bidder and any other information that procuring agency may like to include in the report.

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## F. AWARD OF CONTRACT

### IB.29 Award

- 29.1 Subject to clause IB 30 and IB 34, the procuring agency shall award the contract to the bidder whose bid has been determined to be substantially responsive to the bidding documents, and who has offered the lowest evaluated bid, provided that such bidder has been determined to be eligible in accordance with the provisions of clause IB 03 and quality pursuant to sub-clause IB 29.2.
- 29.2 Procuring agency, at any stage of the bid evaluation, having credible reasons for or having *prima facie* evidence of any deficiency(ies) in constructor's capacities, may require the constructor to provide information concerning their professional, technical, financial, legal or managerial competence whether already pre-qualified or not for the said project.

Provided that such qualification shall only be laid down after recording reasons, thereof, in writing. They shall form part of the records of that bid evaluation report.

### IB.30 Procuring agency's Right to Reject all Bids or Annul the Bidding Process

- 30.1 Notwithstanding clause IB 29, the procuring agency reserves the right to annul the bidding process and reject all bids or proposals, at any time prior to award of contract, without thereby incurring any liability to the affected bidders or any obligation except that the grounds for rejection of all bids shall be communicated promptly to all bidder who submitted a bid, without giving justification of grounds.

### IB.31 Notification of Award

- 31.1 Prior to expiry of the period of bid validity, including extension, prescribed by the procuring agency, the procuring agency shall notify the successful bidder in writing ("Letter of Acceptance") that his bid has been accepted. This letter shall mention the sum which the procuring agency will pay to the constructor in consideration of the execution and completion of the works by the constructor as prescribed by the contract (hereinafter and in the conditions of contract called the "Contract Price").
- 31.2 No negotiation with the bidder having evaluated as lowest responsive or any other bidder shall be permitted, however, procuring agency may hold meeting to clarify any item in the bid evaluation report.
- 31.3 The notification of award and its acceptance by the bidder will constitute the formation of the contract, binding the procuring agency and the bidder till signing of the formal Contract Agreement.
- 31.4 Upon furnishing by the successful bidder of a Performance Security and signing of the contract, the procuring agency will promptly notify the name of the successful bidder to all bidders and return their bid securities accordingly.
- 31.5 The notification of the award shall be hoisted on the Authority's website ([www.pprasindh.gov.pk](http://www.pprasindh.gov.pk)) as well as the procuring agency's website, if available.
- 31.6 **Debriefing.**

- (a) A bidder may ask the procuring agency for reasons for non acceptance of his bid any may request for a debriefing meeting and procuring agency shall give him the reasons

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for such non acceptance, either in writing or by holding a debriefing meeting with such a bidder.

(b) The requesting bidder shall bear all the costs of attending such a debriefing.

### **IB.32 Performance Security**

- 32.1 The successful bidder shall furnish to the procuring agency at Performance Security in the form and the amount stipulated in the bidding data and the Conditions of Contract within a period of 28 days after the receipt of Letter of Acceptance.
- 32.2 Failure of the successful bidder to comply with the requirements of Sub-clause IB.32.1 or clauses IB 33 or IB 35 shall constitute sufficient grounds for the annulment of the award and forfeiture of the bid security.
- 32.3 Validity of performance security shall extend at least ninety days beyond the date of completion of contract, or as mentioned in the bidding data to cover defects liability period subject to final acceptance.

### **IB.33 Signing of Contract Agreement**

- 33.1 Within 14 days from the date of furnishing of acceptable Performance Security under the Conditions of Contract, the procuring agency will send the successful bidder the Contract Agreement in the form provided in the bidding documents, incorporating all agreements between the parties.
- 33.2 The formal Agreement between the procuring agency and the successful bidder shall be executed within 14 days of the receipt of the Contract Agreement by the successful bidder from the procuring agency.

Provided that the procuring agency may reduce the maximum time limit for signing of contract, as and when required, and shall be mentioned in the bidding documents.

- 33.3 A procurement contract shall come into force when the procuring agency signs contract, the date on which the signature of both the procuring agency and the successful bidder are affixed to the written contract, Such affixing of signature shall take place within the time prescribed in bidding documents.
- 33.4 **Stamp Duty**  
The formal agreement between the procuring agency and the bidder shall be duly stamped at rate of 0.35% of bid price (or updated from time to time by the Government) will be paid by successful bidder as government stamp duty.

### **IB.34 General Performance of the Bidders**

Procuring agency may in case of consistent poor performance of the constructor and his failure to remedy the underperforming contract may take such actions as may be deemed appropriate under the circumstances of the case including the rescinding the contract and/or black listing of such constructor and debarring him from participation in future bidding process.

### **IB.35 Integrity Pact**

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The bidder shall sign and stamp the Integrity Pact provided at Appendix-L to bidding the bidding documents for all Provincial/Local Government procurement contracts exceeding Rupees ten million. Failure to provide such Integrity Pact shall make bidder non-responsive.

**IB.36 Instructions non Part of Contract**

Bids shall be prepared and submitted in accordance with these Instructions which are provided to assist bidders in preparing their bids, and do not constitute part of the bid or the Contract Documents.

**IB.37 Arbitration**

Any dispute that is not amicably resolved shall be finally settled, unless otherwise specified in the Contract, under the Arbitration Act 1940 updated from time to time and would be held anywhere in the Province of Sindh at the discretion of procuring agency.

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Signature/Stamp of Contractor  
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# BIDDING DATA

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## NOTES ON BIDDING DATA

This Section is intended to assist the procuring agency in providing the specific information in relation to corresponding clauses in Instruction to Bidders and should be prepared to suit each individual contract.

The procuring agency should provide in the bidding data information and requirements Specific to the circumstances of the procuring agency, the processing of the bid, the Applicable rules regarding bid price and currency, and the bid evaluation criteria that will Apply to the bids. In preparing this section, the following aspects should be checked:

- (1) Information that specifies and complements the provisions of section; Instruction to Bidders must be incorporated.
- (2) Amendments and/or supplements, if any, to the provisions of Instructions to Bidders, necessitated by the circumstances of each individual contract, can be introduced only in this section since Instruction to Bidders will remain unchanged.

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## Bidding Data

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

### Instructions to Bidders

#### Clause Reference

**1.1 Name and address of the procuring agency:**

Director (Works & Services), the Benazir Bhutto Shaheed University of Technology & Skill Development at Khairpur Mirs, Sindh (Phone # 0243-920168)

**1.2 Name of the scheme**

Establishment of Centre for incubation & Enterprise at the BBSU of Technology & Skills Development, Khairpur

**2.1 Name of the Borrower/Source of Financing/Funding Agency/Funding Source:**

PROCUREMENT AGENCY'S OWN SOURCES THROUGH GOVT. OF SINDH (ADP SCHEME)

**8.1 Time limit for clarification:**

5 working days prior to last date of submission

**10.1 Bid language:**

English

**11.1 Qualification:**

As per Notice Inviting Tender (NIT)

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- 13.1 Bidders to quote entirely in Pak. Rupees
- 14.1 Period of Bid Validity:  
90 Days
- 15.1 Amount of Bid Security:  
Rs. 1.424 million.
- 17.1 Venue, time, and date of the pre-Bid meeting:  
---
- 18.4 Number of Copies of the bid to be completed and returned:  
One Original & one through EPADS (All volumes)
- 19.2 (a) Procuring Agency's address for the purpose of bid submission:  
Office of the Director (Works & Services), the Benazir Bhutto Shaheed University of  
Technology and Skill Development at Khairpur Mirs, Sindh
- 20.1 (a) Date for issuance of bids.  
As notified by the procuring agency in invitation for bid / notice inviting tender
- (b) Last Date for collection of bids  
As notified by the procuring agency in invitation for bid / notice inviting tender
- (c) Deadline for submission of bids:  
As notified by the procuring agency in invitation for bid / notice inviting tender
- (d) Venue, time, and date of bid opening:  
As notified by the procuring agency in invitation for bid / notice inviting tender
- 32.1 Standard form and amount of Performance Security acceptable to the procuring agency:  
  
5% of the Contract price stated in the Letter of Acceptance in the shape of Call  
Deposit/Pay order, from scheduled bank of Pakistan.

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# FORM OF BID AND APPENDICES TO BID



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The Benazir Bhutto Shaheed  
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*Client*  
*Contractor*

FORM OF BID

Bid Reference No. \_\_\_\_\_  
 (Name of Contract/Works)

To:

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Gentleman,

1. Having examined the bidding documents including Instructions to Bidders, Bidding Data, and Conditions of Contract, Specifications, Drawings and Bill of Quantities and Addenda Nos. \_\_\_\_\_ for the execution of the above-named works, we, the undersigned, offer to execute and complete such works and remedy any defects therein in conformity with the Conditions of Contract. Specifications, Drawings, Bill of Quantities and Addenda for the sum of Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_) or such other sum as may be ascertained in accordance with the said conditions.
2. We understand that all the Appendices attached hereto form part of this Bid.
3. As security for due performance of the undertakings and obligations of this Bid, we submit herewith a bid security in the amount of Rupees \_\_\_\_\_ (Rs. \_\_\_\_\_) drawn in your favor or made payable to you and valid for a period of \_\_\_\_\_ days beginning from the date Bids are opened.
4. We undertake, if our bid is accepted, to commence the works and to complete the whole of the works comprised in the contract within the time stated in Appendix-A to Bid.
5. We agree to abide by this bid for the period of \_\_\_\_\_ days from the date fixed for opening the same and it shall remain binding upon us and may be accepted at any time before the expiration of that period.
6. Unless and until a formal Agreement is prepared and executed, this Bid, together with your written acceptance thereof, shall constitute a binding contract between us.
7. We do hereby declare that the bid is made without any collusion, comparison of figures or arrangement with any other bidder for the works.
8. We understand that you are not bound to accept the lowest or any bid you may receive.

Dated this \_\_\_\_\_ day of \_\_\_\_\_ 20 \_\_\_\_\_

Signature: \_\_\_\_\_

In the capacity of \_\_\_\_\_ duly authorized to sign Bids for and on behalf of

\_\_\_\_\_  
 (Name of Bidder in Block Capitals)

(Seal)

  
 Signature/Stamp of Client

Signature/Stamp of Contractor

Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Witness:

Signature: \_\_\_\_\_

Name: \_\_\_\_\_

Address: \_\_\_\_\_  
\_\_\_\_\_

Occupation: \_\_\_\_\_



**SPECIAL STIPULATION**  
**Clause**  
**Conditions of Contract**

1	Amount of Performance Security	4.2	5% of the Contract price stated in the Letter of Acceptance in the shape of Call Deposit/Pay order, from scheduled bank.
2	Time for Furnishing Programme	8.3	Within 14 days from the date of receipt of Letter of Acceptance.
3	Minimum amount of Third Party Insurance	18.3	Rs.100,000 /= (for person insurance Rs 0.5 Million for damage to property in both case) per occurrence with number of occurrences unlimited.
4	Time for Commencement	8.1	Within 14 days from the date of receipt of Engineer's Notice to Commence, this shall be issued within fourteen (14) days after signing of Contract Agreement.
5	Time for Completion (works & sections)	8.2 & 10	12 Months from the date of receipt of Engineer's Notice to Commence.
6	Amount of Liquidity Damages / Delay Damages / Penalties	8.7	0.1 % of the Contract Price per day) for each day of delay in completion of the works subject to a maximum of 10% of contract price stated in the Letter of Acceptance.
7	Defects Liability Period	11	12 Months from the effective date of Taking Over Certificate.
8	Percentage of Retention Money	14	5 % of the amount of Interim/Running Payment Certificate.
9	Limit of Retention Money	14	5 % of Contract Price stated in the Letter of Acceptance.
10	Minimum amount of Interim/Running Payment Certificates	14	Rs. 5 Millions
11	Time of Payment from delivery of Engineer's Interim/Running Payment Certificate to the procuring agency.	14.7	15 working days for checking of constructor's bill by Consultant/Engineer In charge and after verification of bill, the client will process the bill within 15 working days. However, payment will be made on availability of released funds.
12	Mobilization Advance.	14.2	10% of Contract Price stated in the Letter of Acceptance on submission of Bank guarantee from scheduled bank of Pakistan
13	Secured Advance	14.5	Item secured advance can be paid if client and Consultant/Engineer In charge deemed essential.
14	Escalation	15	As per given BoQ.

**FOREIGN CURRENCY REQUIREMENTS**

1. The bidder may indicate herein below his requirements of foreign currency (if any), with reference to various inputs to the works.
2. Foreign Currency Requirement as percentage of the bid price excluding Provisional Sums \_\_\_\_\_%.
3. Table of Exchange Rates

Unit of Currency	Equivalent in Pak. Rupees
Australian Dollar	.....
Euro	.....
Japanese Yen	.....
U.K. Pound	.....
U.S. Dollars	.....
.....	.....
.....	.....

DELETED / NOT USED



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**PRICE ADJUSTMENT UNDER CLAUSE 70  
OF CONDITIONS OF CONTRACT  
(FOR FOREIGN FUNDED PROJECTS ONLY)**

The source of indices and the weightages or coefficients for use in the adjustment formula under Clause 70 shall be as follows:

(To be filled by the procuring agency)

Cost Element	Description	Weightages	Applicable index
1	2	3	4
			Market Rate at the date of opening of tender will be considered as basic cost.
(1)	Cement – in bags		" " "
(2)	Reinforcing Steel		" " "
(3)	Bricks		" " "

**Notes:**

- 1) Any fluctuation in the indices or prices of materials other than those given above shall not be subject to adjustment of the Contract Price or the basic cost will be inclusive of cartage i.e. difference would only be paid on ex-factory basic price.

  
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**PRICE ADJUSTMENT UNDER CLAUSE OF  
CONDITIONS OF CONTRACT**

**A. Weight ages or coefficients are used for price adjustment.**

The source of indices and the weight ages or coefficients for use in the adjustment formula under Clause 13.8 shall be as follows:

*(To be filled by the procuring agency)*

Cost Element	Description	Weight ages	Applicable index
1	2	3	4
(i)	Fixed Portion	0.350	
(ii)	Local Labor		Government of Pakistan (GoP) Federal Bureau of Statistics (FBS) Monthly Statistical Bulletin.
(iii)	Cement – in bags		" " "
(iv)	Reinforcing Steel		" " "
(v)	High Speed Diesel (HSD)		" " "
(vi)	Bricks		" " "
(vii)	Bitumen		" " "
(viii)			
	Total	1.000	

**Notes:**

- 1) Indices for "(ii)" to "(vii)" are taken from the Government of Pakistan Federal Bureau of Statistics, Monthly Statistical Bulletin. The base cost indices or prices shall be those applying 15 days prior to the latest day for submission of bids. Current indices or prices shall be those applying 28 days prior to the last day of the billing period.
- 2) Any fluctuation in the indices or prices of materials other than those given above shall not be subject to adjustment of the Contract Price.
- 3) Fixed portion shown here is for typical road project, procuring agency to determine the weight age of Fixed Portion considering only those cost elements having cost impact of seven (7) percent or more on his specific project.

- B When Escalation is allowed on the materials only.**  
Price adjustment on following items shall be allowed:

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

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(Procuring Agency using this price adjustment provisions may add or delete any elements as deemed appropriate to the project.)

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Signature/Stamp of Contractor

## BILL OF QUANTITIES

## A. Preamble

1. The Bill of Quantities shall be read in conjunction with the Conditions of Contract, Specifications and Drawings.
2. The quantities given in the Bill of Quantities are estimated and provisional, and are given to provide a common basis for bidding. The basis of payment will be the actual quantities of work executed and measured by the Constructor and verified by the Engineer and valued the rated and prices entered in the priced Bill of Quantities, where applicable, and otherwise at such rates and prices as the Engineer may fix as per the Contract.
3. The rates and prices entered in the priced Bill of Quantities shall, except insofar as it is otherwise provided under the contract include all costs of constructor's plant, labour, supervision, materials, execution, insurance, profit, taxes and duties, together with all general risks, liabilities and obligations set out or implied in the contract. Furthermore all duties, taxes and other levies payable by the constructor under the contract, or for any other cause, as on the date 28 days prior to deadline for submission of Bids, shall be included in the rates and prices and the total bid price submitted by the bidder.
4. A rate or price shall be entered against each item in the priced Bill of Quantities, whether quantities are stated or not. The cost of items against which the constructor will have failed to enter a rate or price shall be deemed to be covered by other rates and prices entered in the Bill of Quantities.
5. The whole cost of complying with the provisions of the Contract shall be included in the items provided in the priced Bill of Quantities, and where no items are provided, the cost shall be deemed to be distributed among the rates and prices entered for the related items of the works.
6. General directions and description of work and materials are not necessarily repeated nor summarized in the Bill of Quantities. References to the relevant section of the bidding documents shall be made before entering prices against each item in the priced Bill of Quantities.
7. Provisional sums included and so designated in the bill of Quantities shall be expended in whole or in part at the direction and discretion of the Engineer in accordance with sub-clause 58.2 of Part I, General Conditions of Contract.
8. No cartage of any material arranged by the contractor himself /themselves will be paid in any shape.
9. Only palatable water of approved quality will be used and Contractors shall have to make their own arrangement of palatable water for use in work at his / their own cost.
10. Concrete shall be mixed with mechanically operated Concrete Mixer with due concentration to aggregate and water ratio.
11. If any wherever nomenclature or any item is elaborated or not clear or any typographical error occurs in the schedule for the tender it should be read strictly as per composite schedule of rates of standing rates committee Govt. of Sindh.



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12. All material shall confirm the standard specifications.
13. No any premium shall be allowed on non-scheduled items / offered rates.
14. All the debries and surplus stuff shall be removed from the site / disposed of by the contractor for which no any extra cost of cartage etc shall be paid.
15. All RCC / PCC cost in Situ shall be mechanically vibrated by the contractor for which no any extra cost will be paid.
16. Work will be carried out as per specifications.
17. All materials / mixes used in structure shall be tested from recognized laboratory and test report shall be submitted without any delay for which no any extra cost etc shall be paid.
18. Electricity used shall be the responsibility of contractor for which no any extra cost etc shall be paid.
19. Camp office / stock / go-down constructed at site shall be the responsibility of contractor for which no any extra cost etc shall be paid.
20. All workers within the execution area should wear protection helmets and full boots and ensure all security measures for lives of labours / inhabitants shall be the responsibility of contractor for which no any extra cost etc shall be paid.
21. Deployment of full time engineer at site shall be the responsibility of contractor for which no any extra cost etc shall be paid.
22. Inspection request shall be submitted before 24 hrs of execution of any new trade.
23. Pour slip to be submitted for approval of any CC and RCC work well before execution of pouring.
24. The contractor shall have to visit the site before filling the bidding documents.



**BILL OF QUANTITIES (SAMPLE)**

**B. Work Items. (Road /PHE Work)**

1. The Bill of Quantities contains the following Bills and Schedule:

Bill No. 1	-	Earthworks
Bill No. 2	-	Hard Crust and Surface Treatment
Bill No. 3	-	Culverts and Bridges
Bill No. 4	-	Subsurface Drains, Pipe Laying and Man holes
Bill No. 5	-	Tube wells, Pump houses and Compoundwall
Bill No. 6	-	Miscellaneous Items

Day work Schedule

Summary Bill of Quantities

2. Bidders shall price the Bill of Quantities in Pakistani Rupees only.



## BILL OF QUANTITIES (SAMPLE)

**B. Work Items (Buildings)**

1. The Bill of Quantities contains the following Bills and Schedule:

Bill No. 1	-	Plinth and Foundation.
Bill No. 2	-	Ground floor.
Bill No. 3	-	First and Subsequent Floors.
Bill No. 4	-	Internal Water Supply and Sanitary Fittings.
Bill No. 5	-	Internal Electrification.
Bill No. 6	-	Miscellaneous Items.
Bill No. 7	-	External Development.
Day work Schedule		
Summary Bill of Quantities		

2. Bidder shall price the Bill of Quantities in Pakistani Rupees only.



## BILL OF QUANTITIES (SAMPLE)

## Bill NO. 1 Earthworks/Plinth and Foundation

Item	Description	Unit	Quantity	Rate		Amount Rupees
				Rupees in figures	Rupees in words	
1	2	3	4	5		6
101						
102						
103						
104						
105						
106						
Total for Bill No.1 (Carried forward to Summary page)						

  
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## BILL OF QUANTITIES (SAMPLE)

Bill No.2 Hard Crust and Surface Treatment /Ground Floor.

Item	Description	Unit	Quantity	Rate		Amount Rupees
				Rupees in figures	Rupees in words	
1	2	3	4	5		6
201						
202						
203						
204						
205						
206						
Total for Bill No.2 (Carried forward to Summary page)						

  
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## BILL OF QUANTITIES (SAMPLE)

Bill No.3 Culverts and Bridges/ First and Subsequent Floors.

Item	Description	Unit	Quantity	Rate		Amount Rupees
				Rupees in figures	Rupees in words	
1	2	3	4	5		6
301						
302						
303						
304						
305						
306						
Total for Bill No.3						
(Carried forward to Summary page)						

## BILL OF QUANTITIES (SAMPLE)

Bill No.4 Surface Drains/ Pipe Laying and Man holes/Internal water  
Supply and Sanitary Fittings.

Item	Description	Unit	Quantity	Rate		Amount Rupees
				Rupees in figures	Rupees in words	
1	2	3	4	5		6
401						
402						
403						
404						
405						
406						
Total for Bill No.4 (Carried forward to Summary page)						

  
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## BILL OF QUANTITIES (SAMPLE)

Bill No.5 Tube wells and Pump-houses/Internal Electrification.

Item	Description	Unit	Quantity	Rate		Amount Rupees
				Rupees in figures	Rupees in words	
1	2	3	4	5		6
501						
502						
503						
504						
505						
506						
Total for Bill No.5 (Carried forward to Summary page)						

  
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## BILL OF QUANTITIES (SAMPLE)

Bill No.6 - Miscellaneous Items.

Item	Description	Unit	Quantity	Rate		Amount Rupees
				Rupees in figures	Rupees in words	
1	2	3	4	5		6
601	Mobilization Cost					
602						
603						
604						
605						
606						
Total for Bill No.6						
(Carried forward to Summary page)						

  
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## BILL OF QUANTITIES (SAMPLE)

Bill No.7 External Development.

Item	Description	Unit	Quantity	Rate		Amount Rupees
				Rupees in figures	Rupees in words	
1	2	3	4	5		6
701	Mobilization Cost					
702						
703						
704						
705						
706						
Total for Bill No.2 (Carried forward to Summary page)						

  
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## BILL OF QUANTITIES

### General

1. Reference is made to Sub-Clause 52.4 of the General Conditions of Contract Part-I. Work shall not be executed on a day work basis except by written order of the Engineer. Bidders shall enter basic rates for day work items in the Schedules, which rates shall apply to any quantity of day work ordered by the Engineer. Nominal quantities have been indicated against each item of day work, and the extended total for day work shall be carried forward to the bid price.

### Day work Labour

1. In calculating payments due to the constructor for the execution of day work, the actual time of classes of labour directly doing the day work ordered by the Engineer and for which they are competent to perform will be measured excluding meal breaks and rest periods. The time of gangers (charge hands) actually doing work with the gang will also be measured but not the time of foreman or other supervisory personnel.
2. The constructor shall be entitled to payment in respect of the total time that labour is employed on day work, calculated at the basic rates entered by him in the Schedule of day work Rates for labour together with an additional percentage, payment on basic rates representing the constructor's profit, overheads, etc., as described below:
3. the basic rates for labour shall cover all direct costs to the constructor, including (but not limited to) the amount of wages paid to such labour, transportation time, overtime, subsistence allowances and any sums paid to or on behalf of such labour for social benefits in accordance with Pakistan law. The basic rates will be payable in local currency only; and
4. the additional percentage payment to be quoted by the bidder and applied to costs incurred under (a) above shall be deemed to cover the constructor's profit, overheads, superintendence, liabilities and insurance and allowances to labour timekeeping and clerical and office work; the use of consumable stores, water, lighting and power; the use and repair of staging's, scaffolding, workshops and stores, portable power tools, manual plant and tools; supervision by the constructor's staff, foremen and other supervisory personnel; and charges incidental to the foregoing.



## SCHEDULE OF DAY WORK RATES

## I. Labour

Item No.	Description	Unit	Nominal Quantity	Rate (Rs) in Figure	Rate(Rs) In Words	Extended Amount (Rs.)
1	2	3	4	5	6	7
D101	Ganger	Hr	500			
D102	Laborer	Hr	5,000			
D103	Brick layer	Hr	500			
D104	Mason	Hr	500			
D105	Carpenter	Hr	500			
D106	Steel work Erector	Hr	500			
	-----etc-----	Hr	500			
D13	Driver for vehicle up to 10 tons	Hr	1,000			
D14	Operator for excavator, dragline, shovel or crane	Hr	500			
D15	Operator for tractor, (tracked)-with dozer blade or ripper	Hr	500			
D122	<b>Sub Total</b>					
	Allow _____ percent of subtotal for Constructor's overhead, profit, etc, in accordance with Paragraph 3(b) of Day work Schedule _____ Total for Day work: Labour: _____ (Carried forward to Day work Summary)					



Day work Material

4. The constructor shall be entitled to payment in respect of materials used for day work (except for materials for which the cost is included in the percentage addition to labour costs as detailed heretofore), at the basic rates entered by him in the Schedule of Day work Rates for materials together with an additional percentage payment on the basic rates to cover overhead charges and profit, as follows:

a) The basic rates for materials shall be calculated on the basis of the invoiced price, freight, insurance, handling expenses, damage, losses, etc., and shall provide for delivery to store for stockpiling at the site. The basic rates shall be stated in local currency but payment will be made in the currency or currencies expended upon presentation of supporting documentation;

b) The additional percentage payment shall be quoted by the bidder and applied to the equivalent local currency payments made under Sub-Para(a) above; and

c) The cost of hauling materials used on work ordered to be carried out as Day work from the store or stockpile on the site to the place where it is to be used will be paid in accordance with the terms for labour and Constructional Plant in this Schedule.



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## SCHEDULE OF DAY WORK RATES

## II. Materials

Item No.	Description	Unit	Nominal Quantity	Rate (Rs) in Figure	Rate(Rs) In Words	Extended Amount (Rs.)
1	2	3	4	5	6	7
D201	Cement, ordinary Portland or equivalent in bags	M.Ton	200			
D202	Mild Steel reinforcing bar up to 16mm diameter to BS 4449 or equivalent	M.Ton	100			
D203	Fine aggregate for concrete as specified in Clause _____	Cu.M	1,000			
D204	-----etc-----					
D222	Gelignite (Noble Special Gelatine 60% or equivalent) including caps, fuse, wire and requisite accessories	M.Ton	10			
D223	<b>Sub Total</b>					
	Allow _____ percent of subtotal for Constructor's overhead, profit, etc, in accordance with Paragraph 4(b) of Day work Schedule _____ Total for Day work: Materials: _____ (Carried forward to Day work Summary)					



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## Appendix-D to Bid

## Day Work Constructional Plant

5. The constructor shall be entitled to payments in respect of constructional plant already on site and employed on Day work at the basic rental rates entered by him in the Schedule of Day work Rates for constructional plant. The said rates shall be deemed to include complete allowance for depreciation, interest, indemnity and insurance, repairs, maintenance, supplies, fuel, lubricants, and other consumables, and all overhead, profit and administrative costs related to the use of such equipment. The cost of drivers, operators and assistants will be paid for separately as described under the section on Day work Labour.
6. In calculating the payment due to the Constructor for constructional plant employed on Day work, only the actual number of working hours will be eligible for payment, except that where applicable and agreed with the Engineer, the traveling time from the part of the site where the constructional plant was located when ordered by the Engineer to be employed on Day work and the time for return journey thereto shall be included for payment.
7. The basic rental rates for constructional plant employed on Day work shall be Stated in Pakistani Rupees.



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SCHEDULE OF DAY WORK RATES

2. Constructional Plant

Item No.	Description	Unit	Nominal Quantity	Rate (Rs) in Figure	Rate(Rs) In Words	Extended Amount (Rs.)
1	2	3	4	5	6	7
D301	Excavator ,face shovel or dragline: 1. Up-to and including 1 Cu.M. 2. Over 1 Cu.M to 2 Cu. M. 3. Over 2 Cu.M	Hr Hr Hr.	500 400 100			
D302	Tractor (tracked) including bull or angle dozer: 1. Up-to and including 150 HP 2. Over 150 to 200 HP 3. Over 200 to 250 HP	Hr Hr Hr	500 400 200			
D303	Tractor with ripper: 1. Up-to and including 200 HP 2. Over 200 to 250 HP	Hr Hr	400 200			
D304	-----etc-----					
Total for day work: Constructional Plant _____ (Carried forward to day work summary)						



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DAYWORK

Summary (Day work)

	Amount(Rs.)
(I) Total for day work: Labour	_____
(II) Total for day work: Materials	_____
(III) Total for day work: Constructional Plant	_____
Total for day work	_____
(Carried forward to summary page of Bill of Quantities)	

DELETED / NOT USED



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## BILL OF QUANTITIES (SAMPLE)

## SUMMARY

		Amount (Rs.)
Bill No. 1:	Earthworks/Plinth and Foundation	
Bill No. 2:	Culverts and Bridges/Ground Floor	
Bill No. 3:	Subsurface Drains/Internal Water Supply & Sanitary Fittings	
Bill No. 4:	Subsurface Drains/ Pipe Laying and Man holes/Internal water Supply and Sanitary Fittings	
Bill No. 5:	Tube wells and Pump-houses/Internal Electrification	
Bill No. 6:	Miscellaneous Items	
Bill No. 7:	External Development	
	Sub- Total of Bills	_____
	Day work	_____
	Bid Price	_____

Note: All Provisional Sums are to be expended in whole or, in part at the direction and discretion of the Engineer in accordance with Sub-Clauses 52.4 and 58.2 of the General Conditions of Contract Part-I.

  
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**PROPOSED CONSTRUCTION SCHEDULE**

Pursuant to Sub-Clause 43.1 of the General Conditions of Contract, the works shall be completed on or before the date stated in Appendix-A to Bid. The bidder shall provide as AppendixOE to Bid, the Construction Schedule in the bar chart (CPM, PERT or any other to be specified herein) showing the sequence of work items and the period of time during which he proposes to complete each work item in such a manner that his proposed programmed for completion of the whole of the works and parts of the works may meet procuring agency's completion targets in days noted below and counted from date of receipt of Engineer's Notice to Commence (Attach sheets as required for the specified form of Construction Schedule):

<u>Description</u>	<u>Time for Completion</u>
1) Whole works	_____ days
2) Part-A	_____ days
3) Part-B	_____ days
4) Part-C	_____ days



**METHOD OF PERFORMING THE WORK**

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

1. Organization Chart indicating head office and field office personnel involved in management and supervision, engineering, equipment maintenance and purchasing.
2. Mobilization in Pakistan, the type of facilities including personnel accommodation, office accommodation, provision for maintenance and for storage, communications, security and other services to be used.
3. The method of executing the works, the procedures for installation of equipment and machinery and transportation of equipment and materials to the site.]



**LIST OF MAJOR EQUIPMENT – RELATED ITEMS**

[The bidder will provide on Sheet 2 of this Appendix a list of all major equipment and related items, under separate heading for items owned, to be purchased or to be arranged on lease by him to carry out the works. The information shall include make, type, capacity, and anticipated period of utilization for all equipment which shall be in sufficient detail to demonstrate fully that the equipment will meet all requirements of the Specification.]



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LIST OF MAJOR EQUIPMENT (SAMPLE)

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

  
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## Appendix-H to Bid

**CONSTRUCTION CAMP AND HOUSING FACILITIES**

The Constructor in accordance with Clause 34 of the Conditions of Contract shall provide description of his construction camp's facilities and staff housing requirements.

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

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

1. Site Preparation (clearing, land preparation, etc.).
2. Provision of Services.
  - a) Power (expected power load, etc.).
  - b) Water (required amount and system proposed).
  - c) Sanitation (sewage disposal system, etc.).
3. Construction of Facilities
  - a) Constructor's Office, Workshop and Work Areas (areas required and proposed layout, type of construction of buildings, etc.).
  - b) Warehouses and Storage Areas (are required, type of construction and layout).
  - c) Housing and Staff Facilities (Plans for housing for proposed staff, layout, type of construction, etc.).
4. Construction Equipment Assembly and Preparation (detailed plans for carrying out this activity).
5. Other Items Proposed (security services, etc.).



Appendix-I to Bid

**LIST OF SUBSTRUCTORS**

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

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

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

## Appendix-J to Bid

## ESTIMATED PROGRESS PAYMENTS (SAMPLE)

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

Quarter/Year/Period	Amounts (in thousands)
1	2
1 <sup>st</sup> Quarter	
2 <sup>nd</sup> Quarter	
3 <sup>rd</sup> Quarter	
4 <sup>th</sup> Quarter	
5 <sup>th</sup> Quarter	
6 <sup>th</sup> Quarter	
7 <sup>th</sup> Quarter	
8 <sup>th</sup> Quarter	
9 <sup>th</sup> Quarter	
10 <sup>th</sup> Quarter	
<b>Bid Price</b>	



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Appendix-K to Bid

**ORGANIZATION CHART  
FOR THE  
SUPERVISORY STAFF AND LABOUR**

(To be filled in by the bidder)



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(INTEGRITY PACT)

DECLARATION OF FEES, COMMISSION AND BROKERAGE ETC.  
PAYABLE BY CONSTRUCTORS.

Contract No. \_\_\_\_\_ Date \_\_\_\_\_  
Contract Value: \_\_\_\_\_  
Contract Title: \_\_\_\_\_

..... [name of Constructor] hereby declares that it has not  
Obtained or induced the procurement of any contract, right, interest privilege or other obligation or  
benefit from Government of Sindh (GoS) or any administrative subdivision or agency thereof or any  
other entity owned or controlled by it (GoS) through any corrupt business practice.

Without limiting the generality of the foregoing, [name of Constructor] represent and warrants that  
it has fully declared the brokerage, commission, fees etc. paid or payable to anyone and not given or  
agreed to give and shall not give or agree to give to anyone within or outside Pakistan either directly  
or indirectly through any natural or juridical person, including its affiliate, agent, associate, broker,  
Engineer In charge director, promoter, shareholder, sponsor or subsidiary, any commission,  
gratification, bribe, finder's fee or kickback, whether described as consultation fee or otherwise,  
with the object of obtaining or inducing the procurement of a contract, right, interest, privilege or  
other obligation or benefit in whatsoever form from, from procuring agency (PA) except that which  
has been expressly declared pursuant hereto.

[name of Constructor] accepts full responsibility and strict liability that it has made and will make  
full disclosure of all agreements and arrangements with all persons in respect of or related to the  
transaction with PA and has not taken any action or will not take any action to circumvent the above  
declaration, representation or warranty.

[name of Constructor] accepts full responsibility and strict liability for making any false declaration,  
not making full disclosure, misrepresenting facts or taking any action likely to defeat the purpose of  
this declaration, representation and warranty. It agrees that any contract, right, interest, privilege or  
other obligation or benefit obtained or procured as aforesaid shall, without prejudice to any other  
rights and remedies available to PA under any law, contract or other instrument, be avoidable at the  
option of PA.

Notwithstanding any rights and remedies exercised by PA in this regard, [name of  
Supplier/Constructor/Engineer In charge agrees to indemnify PA for any loss or damage incurred by  
it on account of its corrupt business practices and further pay compensation to PA in an amount  
equivalent to ten time the sum of any commission, gratification, bribe, finder's fee or kickback given  
by [name of Constructor] as aforesaid for the purpose of obtaining or inducing the procurement of  
any contract, right, interest, privilege or other obligation or benefit in whatsoever form from PA.

.....  
[Procuring Agency]

[Constructor]

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**FORMS**

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



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**BID SECURITY  
(Bank Guarantee)**

Security Executed on \_\_\_\_\_  
(Date)

Name of Surety (Bank) with Address: \_\_\_\_\_  
(Scheduled Bank in Pakistan)

Name of Principal (Bidder with Address: \_\_\_\_\_

Penal Sum of Security Rupees: \_\_\_\_\_ (Rs. \_\_\_\_\_)

Bid Reference No. \_\_\_\_\_

KNOW ALL MEN BY THESE PRESENTS, that in pursuance of the terms of the bid and at the request of the said Principal (Bidder) we, the Surety above named, are held and firmly bound unto

\_\_\_\_\_ (hereinafter called the 'Procuring Agency') in the sum stated above for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Bidder has submitted the accompanying bid dated \_\_\_\_\_ for Bid No. \_\_\_\_\_ for \_\_\_\_\_ (Particulars of Bid) to the said Procuring Agency; and

WHEREAS, the Procuring Agency has required as a condition for considering said bid that the **bidder** furnishes a bid security in the above said sum from a Scheduled Bank in Pakistan or from a foreign duly counter-guaranteed by a Scheduled Bank in Pakistan, to the procuring agency, conditioned as under:

- (1) that the bid security shall remain in force up to and including the date 28 days after the deadline for validity of bids as stated in the Instruction to bidders or as it may be extended by the procuring agency, notice of which extension(s) to the Surety is hereby waived;
- (2) that the bid security of unsuccessful bidders will be returned by the procuring agency after expiry of its validity or upon signing of the Contract Agreement; and
- (3) that in the event of failure of the successful bidder to execute the proposed Contract Agreement for such work and furnish the required Performance Security, the entire said sum be paid immediately to the said procuring agency pursuant to Clause 15.6 of the Instruction to bidders for the successful bidder's failure to perform.

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



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

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

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

SURETY (Bank)

WITNESS:

Signature \_\_\_\_\_

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

Name \_\_\_\_\_

\_\_\_\_\_

Title \_\_\_\_\_

Corporate Secretary (Seal)

Corporate Guarantor (Seal)

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

\_\_\_\_\_

Name, Title & Address



Signature/Stamp of Client  
**Director ( Works & Services)**  
**The Benazir Bhutto Shaheed**  
University of Technology and Skill Development  
Khairpur Mirs

Signature/Stamp of Contractor

**FORM OF PERFORMANCE SECURITY  
(Bank Guarantee)**

Guarantee No. \_\_\_\_\_  
Executed on \_\_\_\_\_  
Expiry date \_\_\_\_\_

[Letter by the Guarantor to the Procuring Agency]

Name of Guarantor (Bank) with address: \_\_\_\_\_

(Scheduled Bank in Pakistan)

Name of Principal (Constructor) with address: \_\_\_\_\_

Penal Sum of Security (express in words and figures) \_\_\_\_\_

Letter of Acceptance No. \_\_\_\_\_ Dated \_\_\_\_\_

KNOW ALL MEN BY THESE PRESENTS, that in pursuance of the terms of the bidding documents and above said Letter of Acceptance (hereinafter called the Documents) and at the request of the said Principal we, the Guarantor above name, are held and firmly bound unto the \_\_\_\_\_ (hereinafter called

the procuring agency) in the penal sum of the amount stated above for the payment of which sum well and truly to be made to the said procuring agency, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has accepted the procuring agency's above said Letter of Acceptance for \_\_\_\_\_ (Name of Contract) for the \_\_\_\_\_ (Name of Project).

NOW THEREFORE, if the Principal (Constructor) shall well and truly perform and fulfill all the undertakings, covenants, terms and conditions of the said Documents during the original terms of the said Documents and any extensions thereof that may be granted by the procuring agency, with or without notice to the Guarantor, which notice is, hereby, waived and shall also well and truly perform and fulfill all the undertakings, covenants terms and conditions of the Contract and of any and all modifications of said Documents that may hereafter be made, notice of which modifications to the Guarantor being hereby waived, then, this obligation to be void; otherwise to remain in full force and virtue till all requirements of Clause 49, Defects Liability, of Conditions of Contract are fulfilled.

Our total liability under this Guarantee is limited to the sum stated above and it is a condition of any liability attaching to us under this Guarantee that the claim for payment in writing shall be received by us within the validity period of this Guarantee, failing which we shall be discharged of our liability, if any, under this Guarantee.

We, \_\_\_\_\_ (the Guarantor), waiving all objections and defenses under the Contract, do hereby irrevocably and independently guarantee to pay to the procuring agency without delay upon the procuring agency's first written demand without cavil or arguments and without requiring the procuring agency to prove or to show grounds or reasons for such demand any sum or sums up to the amount stated above, against the procuring agency's written declaration that the Principal has refused or failed to perform the obligations under the

Signature/Stamp of Client \_\_\_\_\_ 64

**Director ( Works & Services)**  
**The Benazir Bhutto Shaheed**  
**University of Technology and skill Development**  
Khairpur Mirs

Signature/Stamp of Contractor \_\_\_\_\_

Contract which payment will be effected by the Guarantor to Procuring Agency's designated Bank & Account Number.

PROVIDED ALSO THAT the procuring agency shall be the sole and final judge for deciding whether the Principal (Constructor) has duly performed his obligations under the Contract or has defaulted in fulfilling said obligations and the Guarantor shall pay without objection any sum or sums up to the amount stated above upon first written demand from the procuring agency forthwith and without any reference to the Principal or any other person.

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

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

Witness:

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

Signature: \_\_\_\_\_

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

Name: \_\_\_\_\_

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

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

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



Signature/Stamp of Client  
Director ( Works & Services)  
The Benazir Bhutto Shaheed  
University of Technology and skill Development  
Khairpur Mirs

Signature/Stamp of Contractor

### FORM OF CONTRACT AGREEMENT

THIS CONTRACT AGREEMENT (hereinafter called the "Agreement") made on the \_\_\_\_\_ day of \_\_\_\_\_ (month) 20\_\_\_\_\_ between \_\_\_\_\_ (hereafter called the "Procuring Agency") of the one part and \_\_\_\_\_ (hereafter called the "Constructor") of the other part.

WHEREAS the Procuring Agency is desirous that certain works, viz \_\_\_\_\_ Should be executed by the Constructor and has accepted a bid by the Constructor for the execution and completion of such works and the remedying of any defects therein.

NOW this Agreement witnesses as follows:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to.
2. The following documents after incorporating addenda, if any, except those parts relating to Instructions to bidder shall be deemed to form and be read and construed as part of this Agreement, viz:
  - (a) The Contract Agreement;
  - (b) The Letter of Acceptance;
  - (c) The completed Form of Bid;
  - (d) Special Stipulations (Appendix-A to Bid);
  - (e) The Special Conditions of Contract – Part II;
  - (f) The General Conditions – Part I;
  - (g) The priced Bill of Quantities (Appendix-D to Bid);
  - (h) The completed Appendices to Bid (B, C, E to L);
  - (i) The Drawings;
  - (j) The Specifications.
  - (k) \_\_\_\_\_ (any other)
3. In consideration of the payments to be made by the procuring agency to the Constructor as hereinafter mentioned, the Constructor hereby covenants with the procuring agency to execute and complete the works and remedy defects therein in conformity and in all respects with the provisions of the contract.
4. Procuring agency hereby covenants to pay the constructor, in consideration of the execution and completion of the works as per provisions of the contract, the contract Price or such other sum as may become payable under the provisions of the contract at the times and in the manner prescribed by the contract.

  
 Signature/Stamp of Client  
**Director ( Works & Services)**  
**The Benazir Bhutto Shaheed**  
 University of Technology and skill Development  
 Khairpur Mirs

Signature/Stamp of Contractor

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

Signature of the Constructor

\_\_\_\_\_

(Seal)

Signature of Procuring Agency

\_\_\_\_\_

(Seal)

Signed, Sealed and Delivered in the presence of;

Witness:

\_\_\_\_\_

(Name, Title and Address)

Witness:

\_\_\_\_\_

(Name, Title and Address)

**MOBILIZATION ADVANCE GUARANTEE**

Bank Guarantee No . \_\_\_\_\_ Date \_\_\_\_\_

WHEREAS \_\_\_\_\_ (hereinafter called the 'Procuring Agency') has entered into a Contract for \_\_\_\_\_

(Particulars of Contract)

With \_\_\_\_\_ (hereinafter called the "Constructor").

AND WHEREAS, the Procuring Agency has agreed to advance to the Constructor, at the Constructor's request, an amount of Rupees \_\_\_\_\_ (Rs \_\_\_\_\_ ) which amount shall be advanced to the Constructor as per provisions of the Contract.

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

AND WHEREAS, \_\_\_\_\_  
(Scheduled Bank in Pakistan)

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

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

Notice in writing of any default, of which the procuring agency shall be the sole and final judge, on the part of the Constructor, shall be given by the procuring agency to the Guarantor, and on such first written demand, payment shall be made by the Guarantor of all sums then due under this Guarantee without any reference to the Constructor and without any objection.

This Guarantee shall remain in force until the advance fully adjusted against payments from the Interim Payment Certificates of the Constructor or until \_\_\_\_\_ whichever is earlier.  
(Date)

The Guarantor's liability under this Guarantee shall not in my case exceed the sum of Rupees \_\_\_\_\_ (Rs \_\_\_\_\_).

This Guarantee shall remain valid up to the aforesaid date and shall be null and void after the aforesaid date or earlier if the advance made to the Constructor is fully adjusted against payments from Interim Payment Certificates of the Constructor provided that the Guarantor

  
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Director ( Works & Services)  
The Benazir Bhutto Shaheed  
University of Technology and skill Development  
Khairpur Mirs

Signature/Stamp of Contractor

agrees that the aforesaid period of validity shall be deemed to be extended if on the above mentioned date the advance payment is not fully adjusted.

GUARANTOR

- 1. Signature \_\_\_\_\_
- 2. Name \_\_\_\_\_
- 3. Title \_\_\_\_\_

WITNESS

- 1. \_\_\_\_\_  
\_\_\_\_\_  
Corporate Secretary (Seal)

- 2. \_\_\_\_\_  
(Name Title & Address)

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

**INDENTURE FOR SECURED ADVANCES.**

(For use in cases in which is contract is for finished work and the constructor has entered into an agreement for the execution of a certain specified quantity of work in a given time).

This INDENTURE made the ..... day of.....  
..... 20 .....BETWEEN (hereinafter called "the Constructor"  
which expression shall where the context so admits or implied be deemed to include his  
heirs, executors, administrators an assigns) of the one part an THE GOVERNOR OF SINDH  
(hereinafter called "the Government" of the other part).

WHEREAS by an agreement, dated (hereinafter called the said agreement, the constructor  
has agreed to perform the under-mentioned works (hereinafter referred to as the said  
work):-

(Here enter the description of the works).<sup>1</sup>

AND WHEREAS the constructor has applied to the .....  
.....for an advance to him of Rupees .....  
(Rs. ....) on the security of materials the quantities and other particulars of which are  
detailed in Part II of Running Account Bill (B). the said works signed by the constructor

Fin R.Form17.A

On .....and on such covenants and conditions as are hereinafter contained  
an the Government has reserved to itself the option of making any further advance or advances on  
the security of other materials brought by the Constructor to the site of the said works.

NOW THIS INDENTURE WTTNESSETH that in pursuance of the said agreement and in  
consideration of the sum Rupees.....  
(Rs. ....) on or before the execution of these presents paid to the Constructor by the  
Government (the receipt whereof the Constructor doth hereby acknowledge) and of such further  
advances (if any) as may be made to him as aforesaid (all acknowledge) and of such further  
advances (if any as may be made to him as aforesaid (all of which advances are hereinafter  
collectively referred to as the said amount) the Constructor doth hereby assign unto the  
Government the said materials by way of security for the said amount

And doth hereby covenant and agree with the Government and declare ay follow:-

(1) That the said sum of Rupees. .... Rs.  
..... ) so advanced by the Government to the Constructor as aforesaid  
and all or any further sum or sums which may be advanced as aforesaid shall be employed  
by the constructor in or towards expending the execution of the said works and for no  
other purpose whatsoever.

(2) That the materials detailed in the said Running Account Bill (B) which have been  
Fin R Form No. 17-A

Offered to and accepted by (the Government as security for the said amount are absolutely by the  
Constructors own property free from encumbrances of any kind and the Constructor will not make  
any application for or receive a further advance on the security of materials which are not  
absolutely his own property and free from encumbrances of any kind and the constructor hereby  
agrees at all times, to indemnify and save harmless the Government against all claims whatsoever  
to any materials,in respect of which an advance h as been made to him as aforesaid.

  
Signature/Stamp of Client  
**Director ( Works & Services)**  
**The Benazir Bhutto Shaheed**  
University of Technology and skill Development  
Khairpur Mirs

Signature/Stamp of Contractor

- (3) That the said materials detailed in the said Running Account Bill (B) and all other  
Fin. R. Form No. 17-A

Materials on the security of which any further advance or advances may hereafter be make as aforesaid (hereinafter called the said materials) shall be used by the Constructor solely in the execution of the said works in accordance with the directions of the Divisional Officer ----- (hereinafter called the Divisional Officer) and in the terms of the said agreement.

(4) That the Constructor shall make at his own cost all necessary and adequate arrangement for the proper watch, safe custody and protection against all risks of the said material and that until used in construction as aforesaid the said materials shall remain at the site of the said works in the Constructor's custody and at his own risk and on his own responsibility and shall at all times be open to inspection by (the Divisional Officer or any officer authorized by him). In the event of the said materials of any part (hereof being stolen, destroyed or damaged or becoming deteriorated in a greater degree than is due to reasonable use and wear) thereof Constructor will forthwith replace the same with other materials of like quality or repair and make good the same as required by the Divisional Officer and the materials so brought to replace the said materials so repaired and make good shall also be considered as security for the said amount.

(5) 'Hurt the said materials shall not on any account be removed from the site of the said works except with the written permission f the divisional Officer or an officer authorized by him in that behalf.

(6) That the said amount shall be payable in full when or before the Constructor receives payment, from the Government of the price payable to him for the said works under the terms and provisions of the said agreement PROVIDED THAT if any intermediate payments are made to the constructor on account of work done then on the occasion of each such payment the Government will be at liberty to make a recovery from the Constructors Bill for such payment by deducting there from in the value of the said materials (hen actually used in the construction and in respect of which recovery has not been made previously the value for this purpose being determined in respect of each description of material at (he rates at which the amount of the advances made under these presents were calculated).

(7) That if the Constructor shall at any time make any default in the performance or observation in any respect of any of the terms and provisions of the said agreement or of these presents the total amount of the advance or advances that may still be owing to the Government shall immediately on the happening of such default be repayable by the Constructor to the Government together with interest thereon at twelve percent per annum from the date or respective dates of such advance or advances to the date or repayment and with all costs, charges, damages and expenses incurred by the Government in or for the recovery thereof or the enforcement of this security or otherwise by reason of (he default of the Constructor and any moneys so becoming due and payable shall constitute a debt due from the Constructor to the Government and the Constructor hereby covenants and agrees with the Government to repay and the same respectively to it accordingly.

(8) That the Constructor hereby charges all the said materials with the repayment to the Government of the said sum of Rupees .....  
(Rs. ....) and any further sum or sums which may be advanced as aforesaid and all cost charges damages and expenses payable under these present PROVIDED ALWAYS and it is hereby agreed and declared that not withstanding anything in the said agreement and without prejudice to the powers contained therein if and whether the covenant for payment and repayment hereinbefore contained shall become enforceable and the money owing shall not be paid to accordingly.

Signature/Stamp of Client  
**Director ( Works & Services)**  
**The Benazir Bhutto Shaheed**  
University of Technology and skill Development  
Khairpur Mirs

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Once there with the Government may at any time thereafter adopt all or any of following courses as it may deem best :-

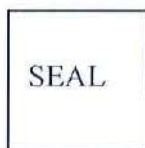
- (a) Seize and utilize the said materials or any part thereof in the completion of the said works on behalf of the Constructor in accordance with the provisions in that behalf contained in the said agreement debiting the Constructor with the actual cost of effecting such completion the amount due in respect of advances under these presents and crediting the Constructor with the value of work done as he had carried it out in accordance with the said agreement and at the rates thereby provided. If the balance is against the Constructor he is to pay the same to the Government on demand.
- (b) Remove and sell by public auction the seized materials or any part thereof and out of the money arising from the sale retain all the sums aforesaid repayable to the Government under these presents and pay over the surplus (if any) to the Constructor.
- (c) Deduct all or any part of the moneys owing out of the security deposit or any sum due to the Constructor under the said agreement.

(9) That except as is expressly provided by the presents interest on the said advance shall not be payable.

(10) That in the event of any conflict between the provisions of these presents and the said agreement the provisions of these presents shall prevail and in the event of any dispute or difference arising over the construction or effect of these presents the settlement of which has not been hereinbefore expressly provided for the same shall be referred to the Superintending Engineer ..... Circle whose ..... decision shall be final and the Indian Arbitration Act for the time being in force so far they are applicable shall apply to any such reference.

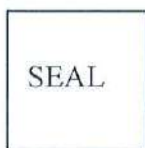
In witnesses whereof the \* ..... on behalf of the Governor of Sindh and the said ----- have hereunto set their respective hands and seals the day and first above written.

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



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

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



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

  
Signature/Stamp of Client  
Director ( Works & Services)  
The Benazir Bhutto Shaheed  
University of Technology and Skill Development  
Khairpur Mirs

Signature/Stamp of Contractor

## Notes on the Conditions of Contract

The Conditions of Contract comprise two parts:

- (a) Part I - General Conditions of Contract
- (b) Part II - Special Conditions of Contract

Over the years, a number of “model” General Conditions of Contract have evolved. The one used in these Standard Bidding Documents was prepared by the International Federation of Consulting Engineers (Federation Internationale des Ingenieurs-Conseils, or FIDIC), and is commonly known as the FIDIC Conditions of Contract. (The used version is the harmonized Edition March 2006).

The FIDIC Conditions of Contract have been prepared for an ad measurement (unit price or unit rate) type of contract, and cannot be used without major modifications for other types of contract, such as lump sum, turnkey, or target cost contracts.

The standard text of the General Conditions of Contract chosen must be retained intact to facilitate its reading and interpretation by bidders and its review by the procuring agency. Any amendments and additions to the General Conditions, specific to the contract in hand, should be introduced in the Particular Conditions of Contract.

The use of standard conditions of contract for all civil works will ensure comprehensiveness of coverage, better balance of rights or obligations between procuring agency and Contractor, general acceptability of its provisions, and savings in time and cost for bid preparation and review, leading to more economic prices.

The prospective bidders are required to obtain copy of the above mentioned Conditions of Contract directly from head office of FIDIC, on the address indicated above against payment of their usual charges.

The Successful bidder after award of Work shall have to provide two (02) copies of the said FIDIC Conditions of Contract for Work of Civil Construction one in original obtained from the publishers for incorporation of the same in the Contract Agreement of the Work.

---

\* Add the following text if the bidding documents, as issued, do not include a copy:

“Copies of the FIDIC Conditions of Contract can be obtained from: To request such permission please contact:

FIDIC CASE POSTALE, CH-1215 Switzerland;

Tel. +41 22 799 49 00;

Fax; +41 22 799 49 01

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

  
Signature/Stamp of Client  
Director ( Works & Services)  
The Benazir Bhutto Shaheed  
University of Technology, and Skill Development  
Khairpur Mirs

General Conditions

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Signature/Stamp of Client  
**Director ( Works & Services)**  
**The Benazir Bhutto Shaheed**  
University of Technology and Skill Development  
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Signature/Stamp of Contractor

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Director (Works & Services)  
The Benazir Bhatti Shaheed  
University of Technology and Skill Development  
Khairpur Mirs

Signature/Stamp of Contractor

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## General Conditions

### General Provisions

#### 1.1

##### Definitions

In the Conditions of Contract (“these Conditions”), which include Particular Conditions, Parts A and B, and these General Conditions, the following words and expressions shall have the meanings stated. Words indicating persons or parties include corporations and other legal entities, except where the context requires otherwise.

#### 1.1.1

##### The Contract

1.1.1.1 “Contract” means the Contract Agreement, the Letter of Acceptance, the Letter of Tender, these Conditions, the Specification, the Drawings, the Schedules, and the further documents (if any) which are listed in the Contract Agreement or in the Letter of Acceptance.

1.1.1.2 “Contract Agreement” means the contract agreement referred to in Sub-Clause 1.6 [Contract Agreement].

1.1.1.3 “Letter of Acceptance” means the letter of formal acceptance, signed by the Employer, of the Letter of Tender, including any annexed memoranda comprising agreements between and signed by both Parties. If there is no such letter of acceptance, the expression “Letter of Acceptance” means the Contract Agreement and the date of issuing or receiving the Letter of Acceptance means the date of signing the Contract Agreement.

1.1.1.4 “Letter of Tender” means the document entitled letter of tender or letter of bid, which was completed by the Contractor and includes the signed offer to the Employer for the Works.

1.1.1.5 “Specification” means the document entitled specification, as included in the Contract, and any additions and modifications to the specification in accordance with the Contract. Such document specifies the Works.

1.1.1.6 “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.

1.1.1.7 “Schedules” means the document(s) entitled schedules, completed by the Contractor and submitted with the Letter of Tender, as included in the Contract. Such document may include the Bill of Quantities, data, lists, and schedules of rates and/or prices.

1.1.1.8 “Tender” means the Letter of Tender and all other documents which the Contractor submitted with the Letter of Tender, as included in the Contract.

1.1.1.9 “Bill of Quantities”, “Day work Schedule” and “Schedule of Payment Currencies” mean the documents so named (if any) which are comprised in the Schedules.

1.1.1.10 “Contract Data” means the pages completed by the Employer entitled contract data which constitute Part A of the Particular Conditions.



## 1.1.2

### Parties and Persons

1.1.2.1 "Party" means the Employer or the Contractor, as the context requires.

1.1.2.2 "Employer" means the person named as employer in the Contract Data and the legal successors in title to this person.

1.1.2.3 "Contractor" means the person(s) named as contractor in the Letter of Tender accepted by the Employer and the legal successors in title to this person(s).

1.1.2.4 "Engineer" means the person appointed by the Employer to act as the Engineer for the purposes of the Contract and named in the Contract Data, or other person appointed from time to time by the Employer and notified to the Contractor under Sub-Clause 3.4 [Replacement of the Engineer].

1.1.2.5 "Contractor's Representative" means the person named by the Contractor in the Contract or appointed from time to time by the Contractor under Sub-Clause 4.3 [Contractor's Representative ], who acts on behalf of the Contractor.

1.1.2.6 "Employer's Personnel" means the Engineer, the assistants referred to in Sub-Clause 3.2 [Delegation by the Engineer] and all other staff, labour and other employees of the Engineer and of the Employer; and any other personnel notified to the Contractor, by the Employer or the Engineer, as Employer's Personnel.

1.1.2.7 "Contractor's Personnel" means the Contractor's Representative and all personnel whom the Contractor utilizes on Site, who may include the staff, labour and other employees of the Contractor and of each Subcontractor; and any other personnel assisting the Contractor in the execution of the Works.

1.1.2.8 "Subcontractor" means any person named in the Contract as a subcontractor, or any person appointed as a subcontractor, for a part of the Works; and the legal successors in title to each of these persons.

1.1.2.9 "DB" means the person or three persons appointed under Sub-Clause 20.2 [Appointment of the Dispute Board ] or Sub-Clause 20.3 [ Failure to Agree on the Composition of the Dispute Board ].

1.1.2.10 "FIDIC" means the Federation International des Ingénieurs-Conseils, the international federation of consulting engineers.

1.1.2.11 "Bank" means the financing institution (if any) named in the Contract Data.

1.1.2.12 "Borrower" means the person (if any) named as the borrower in the Contract Data.

## 1.1.3

### Dates, Tests, Periods and Completion

1.1.3.1 "Base Date" means the date 28 days prior to the latest date for submission and completion of the Tender.

1.1.3.2 "Commencement Date" means the date notified under Sub-Clause 8.1 [ Commencement of Works ].

1.1.3.3 "Time for Completion" means the time for completing the Works or a Section (as the case may be) under Sub-Clause 8.2 [ Time for Completion ], as stated in the Contract

  
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Data (with any extension under Sub-Clause 8.4 [Extension of Time for Completion]), calculated from the Commencement Date.

1.1.3.4 "Tests on Completion" means the tests which are specified in the Contract or agreed by both Parties or instructed as a Variation, and which are carried out under Clause 9 [ Tests on Completion ] before the Works or a Section (as the case may be) are taken over by the Employer.

1.1.3.5 "Taking-Over Certificate" means a certificate issued under Clause 10 [ Employer's Taking Over ].

1.1.3.6 "Tests after Completion" means the tests (if any) which are specified in the Contract and which are carried out in accordance with the Specification after the Works or a Section (as the case may be) are taken over by the Employer.

1.1.3.7 "Defects Notification Period" means the period for notifying defects in the Works or a Section (as the case may be) under Sub-Clause 11.1 [ Completion of Outstanding Work and Remedying Defects ], which extends over twelve months except if otherwise stated in the Contract Data (with any extension under Sub-Clause 11.3 [Extension of Defects Notification Period ]), calculated from the date on which the Works or Section is completed as certified under Sub-Clause 10.1 [ Taking Over of the Works and Sections ].

1.1.3.8 "Performance Certificate" means the certificate issued under Sub-Clause 11.9 [Performance Certificate]

1.1.3.9 "day" means a calendar day and "year" means 365 days.

1.1.4  
Money and Payments

1.1.4.1 "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.

1.1.4.2 "Contract Price" means the price defined in Sub-Clause 14.1 [ The Contract Price ], and includes adjustments in accordance with the Contract.

1.1.4.3 "Cost" means all expenditure reasonably incurred (or to be incurred) by the Contractor, whether on or off the Site, including overhead and similar charges, but does not include profit.

1.1.4.4 "Final Payment Certificate" means the payment certificate issued under Sub-Clause 14.13 [Issue of Final Payment Certificate].

1.1.4.5 "Final Statement" means the statement defined in Sub-Clause 14.11 [ Application for Final Payment Certificate ].

1.1.4.6 "Foreign Currency" means a currency in which part (or all) of the Contract Price is payable, but not the Local Currency.

1.1.4.7 "Interim Payment Certificate" means a payment certificate issued under Clause 14 [Contract Price and Payment], other than the Final Payment Certificate.

1.1.4.8 "Local Currency" means the currency of the Country.

1.1.4.9 "Payment Certificate" means a payment certificate issued under Clause 14 [Contract Price and Payment].

  
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1.1.4.10 "Provisional Sum" means a sum (if any) which is specified in the Contract as a provisional sum, for the execution of any part of the Works or for the supply of Plant, Materials or services under Sub-Clause 13.5 [ Provisional Sums].

1.1.4.11 "Retention Money" means the accumulated retention moneys which the Employer retains under Sub-Clause 14.3 [ Application for Interim Payment Certificates ] and pays under Sub-Clause 14.9 [Payment of Retention Money ].

1.1.4.12 "Statement" means a statement submitted by the Contractor as part of an application, under Clause 14 [ Contract Price and Payment ], for a payment certificate.

1.1.5  
Works and Goods

1.1.5.1 "Contractor's Equipment" means all apparatus, machinery, vehicles and other things required for the execution and completion of the Works and the remedying of any defects. However, Contractor's Equipment excludes Temporary Works, Employer's Equipment (if any), Plant, Materials and any other things intended to form or forming part of the Permanent Works.

1.1.5.2 "Goods" means Contractor's Equipment, Materials, Plant and Temporary Works, or any of them as appropriate.

1.1.5.3 "Materials" means things of all kinds (other than Plant) intended to form or forming part of the Permanent Works, including the supply-only materials (if any) to be supplied by the Contractor under the Contract.

1.1.5.4 "Permanent Works" means the permanent works to be executed by the Contractor under the Contract.

1.1.5.5 "Plant" means the apparatus, machinery and vehicles intended to form or forming part of the Permanent Works, including vehicles purchased for the Employer and relating to the construction or operation of the Works.

1.1.5.6 "Section" means a part of the Works specified in the Contract Data as a Section (if any).

1.1.5.7 "Temporary Works" means all temporary works of every kind (other than Contractor's Equipment) required on Site for the execution and completion of the Permanent Works and the remedying of any defects.

1.1.5.8 "Works" mean the Permanent Works and the Temporary Works, or either of them as appropriate.

1.1.6

Other Definitions

1.1.6.1 "Contractor's Documents" means the calculations, computer programs and other software, drawings, manuals, models and other documents of a technical nature (if any) supplied by the Contractor under the Contract.

1.1.6.2 "Country" means the country in which the Site (or most of it) is located, where the Permanent Works are to be executed.

1.1.6.3 "Employer's Equipment" means the apparatus, machinery and vehicles (if any) made available by the Employer for the use of the Contractor in the execution of the Works, as stated in the Specification; but does not include Plant which has not been taken over by the Employer.



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1.1.6.4 "Force Majeure" is defined in Clause 19 [ Force Majeure ].

1.1.6.5 "Laws" means all national (or state) legislation, statutes, ordinances and other laws, and regulations and by-laws of any legally constituted public authority.

1.1.6.6 "Performance Security" means the security (or securities, if any) under Sub-Clause 4.2 [Performance Security ].

1.1.6.7 "Site" means the places where the Permanent Works are to be executed, including storage and working areas, and to which Plant and Materials are to be delivered, and any other places as may be specified in the Contract as forming part of the Site.

1.1.6.8 "Unforeseeable" means not reasonably foreseeable by an experienced contractor by the Base Date.

1.1.6.9 "Variation" means any change to the Works, which is instructed or approved as a variation under Clause 13 [ Variations and Adjustments ].

## 1.2

### Interpretation

In the Contract, except where the context requires otherwise:

- (a) words indicating one gender include all genders;
- (b) words indicating the singular also include the plural and words indicating the plural also include the singular;
- (c) provisions including the word "agree", "agreed" or "agreement" require the agreement to be record in writing;
- (d) "written" or "in writing" means hand-written, type-written, printed or electronically made, and resulting in a permanent record; and
- (e) the word "tender" is synonymous with "bid", and "tenderer" with "bidder" and the words "tender documents" with "bidding documents".

The marginal words and other headings shall not be taken into consideration in the interpretation of these Conditions.

In these Conditions, provisions including the expression "Cost plus profit" require this profit to be one-twentieth (5%) of this Cost unless otherwise indicated in the Contract Data.

## 1.3

### Communications

Wherever these Conditions provide for the giving or issuing of approvals, certificates, consents, determinations, notices, requests and discharges, these communications shall be:

- (a) in writing and delivered by hand (against receipt), sent by mail or courier, or transmitted using any of the agreed systems of electronic transmission as stated in the Contract Data; and
- (b) delivered, sent or transmitted to the address for the recipient's communications as stated in the Contract Data. However:
  - (i) if the recipient gives notice of another address, communications shall thereafter be delivered accordingly; and
  - (ii) if the recipient has not stated otherwise when requesting an approval or consent, it may be sent to the address from which the request was issued.



Approvals, certificates, consents and determinations shall not be unreasonably withheld or delayed. When a certificate is issued to a Party, the certifier shall send a copy to the other Party. When a notice is issued to a Party, by the other Party or the Engineer, a copy shall be sent to the Engineer or the other Party, as the case may be.

The Contract shall be governed by the law of the country or other jurisdiction stated in the Contract Data.

1.4  
Law and Language

The ruling language of the Contract shall be that stated in the Contract Data.

The language for communications shall be that stated in the Contract Data. If no language is stated there, the language for communications shall be the ruling language of the Contract.

1.5  
Priority of Documents

The documents forming the Contract are to be taken as mutually explanatory of one another. For the purposes of interpretation, the priority of the documents shall be in accordance with the following sequence:

- (a) the Contract Agreement (if any),
- (b) the Letter of Acceptance,
- (c) the Tender,
- (d) the Particular Conditions - Part A,
- (e) the Particular Conditions - Part B,
- (f) these General Conditions,
- (g) the Specification,
- (h) the Drawings, and
- (i) the Schedules and any other documents forming part of the Contract.

If an ambiguity or discrepancy is found in the documents, the Engineer shall issue any necessary clarification or instruction.



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## PART II - SPECIAL /PARTICULAR CONDITIONS OF CONTRACT

### 4.2 Performance Security

If the Contract requires the Constructor to obtain security for his proper performance of the Contract, he shall obtain and provide to the procuring agency, such security within 28 days after the receipt of the Letter of Acceptance in the sum stated in the special stipulation. When providing such security to the procuring agency, the Constructor shall notify the Engineer of so doing. Such security shall be in the form annexed to these Conditions or in such other form as may be agreed between the procuring agency and the Constructor. The institution providing such security shall be subject to the approval of the procuring agency. The cost of complying with the requirements of this Clause shall be borne by the Constructor, unless the Contract otherwise provides.

### 7.9 Use of Pakistani Materials and Services

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

### 8.1 Commencement of Works

The contractor shall commence the works on site within the period stated in special stipulation to Bid from the date of receipt by him from the Engineer of a written Notice to Commence. Thereafter, the contractor shall proceed with the works with due expedition and without delay.

### 8.2 Time for Completion

The whole of the works and, if applicable, any Section required to be completed within a particular time as stated in the special stipulation to Tender, shall be completed, in accordance with the provisions of Clause 10, within the time stated in the special stipulation to Tender for the whole of the works or the Section (as the case may be), calculated from the Commencement Date,

### 8.3 Programme

The Constructor shall, within the time sated in special stipulation of these Conditions after the date of the Letter of Acceptance, submit to the Engineer shall reasonably prescribe, for the execution of the works. The Constructor shall, whenever required by the Engineer, also provide in writing for his information a general description of the arrangements and methods which the Constructor proposes to adopt for the execution of the works.

- A) Bar Chart identifying the critical activities.
  - B) Critical Path Method (CPM) identifying the critical path/activities.
  - C) Program Evaluation and Review Techniques (PERT).
- (Procuring Agency to select appropriate one)

### 8.7 Liquidated Damages for Delay

If the Constructor fails to comply with the Time for Completion in accordance with Clause 10, for the whole of the works or, if applicable, any Section within the relevant time prescribed by Clause 10, the Constructor shall pay to the procuring agency the relevant sum stated in the special stipulation to Tender as liquidated damages for such default and not as a penalty (which sum shall be the only monies

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due from the Constructor for such default) for every day or part of a day which shall elapse between the relevant Time for Completion and the date stated in Taking-Over Certificate of the whole of the works or the relevant Section, subject to the applicable limit stated in the special stipulation to Tender. Procuring agency may, without prejudice to any other method of recovery, deduct the amount of such damages from any monies due or to become due to the Constructor. The payment or deduction of such damages shall not relieve the Constructor from his obligation to complete the works, or from any other of his obligations and liabilities under the Contract.

## 10 Taking-Over Certificate

When the whole of the works have been substantially completed and have satisfactorily passed any Tests on Completion prescribed by the contract, the constructor may give a notice to that effect to the Engineer with a copy to the procuring agency, accompanied by a written undertaking to finish with due expedition any outstanding work during the Defects Liability Period. Such notice and undertaking shall be deemed to be a request by the constructor for the Engineer to issue a Taking-Over Certificate in respect of the works. The Engineer shall within 21 days of the date of delivery of such notice, either issue to the constructor, with a copy to the procuring agency, a Taking-Over Certificate, stating the date on which, in his opinion, the works were substantially completed in accordance with the contract, or give instructions in writing to the constructor specifying all the work which, in the Engineer's opinion, is required to be done by the constructor before the issue of such certificate. The Engineer shall also notify the constructor of any defect in the works affecting substantial completion that may appear after such instructions and before completion of the works specified therein. The constructor shall be entitled to receive such Taking-Over Certificate within 21 days of completion, to the satisfaction of the Engineer, of the works so specified and remedying any defects so notified.

### 10.1 Taking Over of Sections or Parts

Similarly, in accordance with the procedure set out in Sub-Clause 48.1, the Constructor may request the Engineer shall issue a Taking-Over Certificate in respect of:

- (a) any Section in respect of which a separate Time for Completion is provided in the Appendix to Tender,
- (b) any substantial part of the Permanent Works which has been both completed to the satisfaction of the Engineer and, otherwise than as provided for in the Contract, occupied or used by the procuring agency, or
- (c) any part of the Permanent Works which the procuring agency has elected to occupy or use prior to completion (where such prior occupation or use is not provided for in the Contract or has not been agreed by the Constructor as a temporary measure).

### 10.2 Substantial Completion of Parts

If any part of the Permanent Works has been substantially completed and has satisfactorily passed any Tests on Completion prescribed by the Constructor, the Engineer may issue a Taking-Over Certificate in respect of that part of the Permanent Works before completion of the whole of the works and, upon the issue of such Certificate, the Constructor shall be deemed to have undertaken to complete with due expedition any outstanding work in that part of the Permanent Works during the Defects Liability Period.

### 10.3 Surfaces Requiring Reinstatement

  
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Provided that a Taking-Over Certificate give in respect of any Section or part of the Permanent Works before completion of the whole of the works shall not be deemed to certify completion of any ground or surfaces requiring reinstatement, unless such Taking-Over Certificate shall expressly so state.

### 11.1 Defect Liability Period

In these Conditions the expression "Defects Liability Period" shall mean the defects liability period named in the special stipulation to Tender, calculated from:

- (a) the date of completion of the works certified by the Engineer in accordance with Clause 48, or
- (b) In the even of more than one certificate having issued by the Engineer under Clause 48, the respective dates so certified, and in relation to the Defects Liability Period the expression "the Works" shall be construed accordingly.

### 11.2 Completion of Outstanding Work and Remedying Defects

To the intent that the works shall, at or as soon as practicable after the expiration of the Defects Liability Period, be delivered to the procuring agency in the condition required by the Contract, fair wear and tear excepted, to the satisfaction of the Engineer, the Constructor shall:

- (a) complete the work, if any, outstanding on the date stated in the Taking-Over Certificate as soon as practicable after such date, and
- (b) execute all such work of amendment, reconstruction, and remedying defects, shrinkages or other faults as the Engineer may, during the Defects Liability Period stated in Special stipulation, as a result of an inspection made by or on behalf of the Engineer prior to its expiration, instruct the Constructor to execute.

### 11.3 Cost of Remedying Defects

All work referred to in Clause 10 shall be executed by the Constructor at his own cost if the necessity thereof is, in the opinion of the Engineer, due to:

- (a) the use of materials, Plant or workmanship not in accordance with the Contract,
- (b) where the Constructor is responsible for the design of part of the Permanent Works, any fault in such design, or
- (c) the neglect or failure on the part of the Constructor to comply with any obligation, expressed or implied, on the Constructor's part under the Contract.

If, in the opinion of the Engineer, such necessity is due to any other cause, he shall determine an addition to the Contract Price in accordance with Clause 52 and shall notify the Constructor accordingly, with a copy to the procuring agency.

### 11.4 Constructor's Failure to Carry Out Instructions

In case of default on the part of the Constructor in carrying out such instruction within a reasonable time, the procuring agency shall be entitled to employ and pay other persons to carry out the same and if such work is work which, in the opinion of the Engineer, the Constructor was liable to do at his own cost under the Contract, then all cost consequent thereon or incidental thereto shall, after due consultation with the procuring agency and the Constructor, be determined by the Engineer and shall be recoverable from the Constructor by the procuring agency, and may be deducted by the procuring agency from any monies due or to

become due to the Constructor and the Engineer shall notify the Constructor accordingly, with a copy to the procuring agency.

#### 14.1 Monthly Payments

The Engineer shall, within 15 to 25 days of receiving such statement, certify to the procuring agency the amount of payment to the Constructor which he considers due and payable in respect thereof, subject:

- (a) firstly, to the retention of the account calculated by applying the Percentage of Retention stated in the special stipulation to Tender,
- (b) Secondly, to the deduction, other than pursuant to Clause, of any sums this may have become due and payable by the Constructor to the procuring agency.

Provided that the Engineer shall not be bound to certify any payment under this Sub-Clause if the net amount thereof, after all retentions and deductions, would be less than the Minimum Amount of Interim Payment Certificates stated in the special stipulation to Tender.

Notwithstanding the terms of this Clause or any other Clause of the Contract no amount will be certified by the Engineer for payment until the performance security, if required under the Contract, has been provided by the Constructor and approved by the procuring agency.


#### 14.2 Mobilization Advance/Advance Payment

Advance Payment/Mobilization Advance shall be made available to the Contractor by the procuring agency on following conditions:

- (i) Mobilization advance up to 10 % of the Contract Price may be paid by the procuring agency to the Contractor on the works costing Rs2.5 million or above on following conditions:
  - a. on submission by the Contractor of a mobilization advance guarantee for the full amount of the advance in the specified form, from a Scheduled Bank in Pakistan, acceptable to the procuring agency;
  - b. contractor shall pay interest on the mobilization advance at the rate of 10% per annum on the advance; and
- (ii) This Advance including the interest shall be recovered in 5 equal installments from the 5 R.A bills and in case the number of bills is less than 5 then 1/5 of the advance inclusive of the interest thereon shall be recovered from each bill and the balance together with interest be recovered from the final bill. It may be insured that there is sufficient amount in the final bill to enable recovery of the Mobilization Advance.

#### 14.5 Plants and Materials intended for Works

- (I) The Contractor shall be entitled to receive from the procuring agency Secured Advance against an INDENTURE BOND in Public Works Account Form No.31 (Fin. R. Form No. 2) acceptable to the procuring agency of such sum as specified in Special stipulation and the Engineer may consider proper in respect of non-perishable materials brought at the site but not yet incorporated in the Permanent Works provided that:
  - (i) The materials are in accordance with the specifications for the permanent works;
  - (ii) Such materials have been delivered to the site and are properly stored and protected against loss or damage or deterioration to the satisfaction and verification of the Engineer/Assistant Engineer but at the risk and cost of the Contractor;

  
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- (iii) The Contractor's records of the requirements, orders, receipts and use of materials are kept in a form approved by the Engineer, and such records shall be available for inspection by the Engineer;
- (iv) The Contractor shall submit with his monthly statement the estimated value of the materials on site together with such documents as may be required by the Engineer for the purpose of valuation of materials and providing evidence of ownership and payment therefore;
- (v) Ownership of such materials shall be deemed to vest in the procuring agency and these materials shall not be removed from the site or otherwise disposed of without written permission of the procuring agency;
- (vi) The sum payable for such materials on site shall not exceed 75 % of the (i) landed cost of imported materials, or (ii) ex-factory / ex-warehouse price of locally manufactured or produced materials, or (iii) market price of stands other materials;
- (vii) Secured Advance shall not be allowed unless and until the previous advance, if any, is fully recovered;
- (viii) Detailed account of advances must be kept in part II of running account bill or a separate statement; and
- (ix) Secured Advance may be permitted only against materials/quantities anticipated to be consumed / utilized on the work within a period of 3 months from the date of issue of secured advance and in no case for full quantities of materials for the entire work/contract.

**(II) Recovery of Secured Advance:**

Secured Advance paid on non-perishable materials to the Contractor under the above provisions shall be effected from the monthly payments on actual consumption basis, but not later than period specified in the rules not more than three months (even if unutilized);

**14.7 Time for Payment**

The amount due to the Constructor under any Interim Payment Certificate issued by the Engineer pursuant to this Clause, or to any other term of the Contract, shall, be paid by the procuring agency to the Constructor within specified time in special stipulation after such Interim Payment Certificate has been delivered to the procuring agency, or, in the case of the Final Payment Certificate within 56 days, after such Final Payment Certificate has been delivered to the procuring agency.. The provisions of this Sub-Clause are without prejudice to the Constructor's entitlement.

**15 Escalation.**

- A. The rates of escalation / difference in cost of materials as approved by standing rates committee Govt. of Sindh will be paid only.
- B. No further escalation in cost of material will be paid in future during currency of work.
- C. The rates of escalation in cost of material may be treated as Frozen.



**15.6 Corrupt and fraudulent Practices.**

If the Contractor or any of his Subcontractors, agents or servants is found to have violated or involved in violation of the Integrity Pact signed by the Contractor as Appendix-L to his Bid, then the procuring agency shall be entitled to:

- a. recover from the Contractor an amount equivalent to ten times the sum of any commission, gratification, bribe, finder's fee or kickback given by the Contractor or any of his Subcontractors, agents or servants;
- b. terminate the Contract; and
- c. Recover from the Contractor any loss or damage to the procuring agency as a result of such termination or of any other corrupt business practices of the Contractor or any of his Subcontractors, agents or servants.

The termination under sub-para (b) of this Sub-Clause shall proceed in the manner prescribed under sub-clauses 15.2 & 15.5 and the payment under Sub-Clause 15.4 shall be made after having deducted the amounts due to the procuring agency under Sub-Para (a) and (c) of this Sub-Clause.

**18.3 Minimum Amount of Insurance**

Such insurance shall be for at least the amount stated in the special stipulation of Tender. Costs of such insurances shall be borne by the contractor.



**VOLUME-II  
SPECIFICATIONS**

**VOLUME-III  
BILL OF QUANTITIES (BOQS)**

**Volume-IV  
TENDER DRAWINGS**

  
**Director ( Works & Services)**  
**The Benazir Bhutto Shaheed**  
**University of Technology and Skill Development**  
**Khanpur Mian**

# The Benazir Bhutto Shaheed University of Technology and Skill Development Khairpur Mirs

**Name of work: Establishment of Centre for  
incubation & Enterprise at the BBSU of  
Technology & Skills Development, Khairpur**

## TENDER AND CONTRACT DOCUMENTS

### VOLUME -II

Issued to M/s \_\_\_\_\_

## TECHNICAL SPECIFICATIONS



### M/S. ATIF NAZAR (PVT.) LTD.

**PROJECT MANAGERS, PLANNERS**

**ARCHITECTS & CONSULTING ENGINEERS**

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## SECTION - 1 GENERAL REQUIREMENTS

### 1. General

The General Conditions of Contract & Special Conditions of Contract shall form an integral part of these General Requirements.

The Constructor shall notify all sub-Constructor of the provisions of the Conditions of Contract and the General Requirement of this Specification.

The arrangement and divisions of these Specifications is not to be construed as establishing the limits of responsibility of sub-trades.

The Constructor is responsible for delineating the scope of Sub-Contracts and for coordinating all the Works.

All works shall be carried out in accordance with the following specifications, supplemented by detailed specifications contained in the following sections. Any inconsistencies or ambiguities shall be brought to the notice of the Engineer for his clarification/decision. Decision and direction of the Engineer, in all such cases shall be final and binding.

The Constructor shall make himself thoroughly familiar with the site conditions, foresee any and all problems likely to be encountered during execution of the works, and shall be able and ready to solve them effectively. Proposals for solutions to the problems shall be submitted to the Consultant/Engineer Incharge for approval before proceeding with the work.

The Tender Drawings, Design Criteria and Specifications are to be read in conjunction and shall be mutually explanatory. In case of any conflict the order of preference shall be as under duly followed by the Special and General Conditions of Contract in Volume I of Tender & Contract documents.


- i) Specifications
- ii) Tender Drawings
- iii) Bill of Quantities

### 2. Scope of Work

The scope of work comprises “**Establishment of Centre for incubation & Enterprise at the BBSU of Technology & Skills Development, Khairpur**”, as per drawings and specification as defined hereunder and as specified in subsequent sections of tender documents. The Constructor shall perform all relevant engineering, procurement, installation, construction and execution, coordination with other services, testing and commissioning including all documentation, drawings, calculations and supply of manuals as required completing the work. The Constructor shall also be responsible to supply and install all other items not specifically mentioned in these documents but which are necessary for proper completion of the works included in the scope of this Contract.

### 3. Applicable Codes and Standards

In the absence of other Standards being required by the Contract Documents, all work and materials shall meet the requirement of the Uniform Building Code of the United States, and/or applicable American Society for Testing Materials (ASTM) American Association of State Highway and Transportation Officials (AASHTO) Specifications and the latest American Concrete Institute Manual of Concrete Practice and American.

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Institute of Steel Construction (AISC) Manual relevant to the Works except in cases where the Pakistan Building Code requires a higher standard. In such cases the Pakistani Code shall govern, where the abbreviations listed below are used, it refers to the latest code, standards, or publications of the following organizations:

AASHTO	American Association of State Highway and Transportation Officials.
ACI	American Concrete Institute
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
ASA	American Standard Association
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing and Material
AWS	American Welding Society
BSI	British Standards Institute
ICAO	International Civil Aviation Organization
BSICP	British Standard Institute Code of
PCA	Practice Portland Cement Association
PSI	Pakistan Standard Institute
UBC	Uniform Building Code

Should the Constructor, at any time and for any specific reasons, wish to deviate from the above standards or desires to use materials or equipment other than those provided for by the above standards, then he shall state the exact nature of the change giving the reasons for making the change and shall submit complete specifications of the materials and descriptions of the equipment for the Engineer's approval, whose decisions shall be conclusive and binding upon the Constructor.

#### 4. Codes, Standards, Certificates

The Constructor shall supply and have at his site office:

Copies of all latest editions of codes and standards referred to in these specifications by number, or equivalent codes and standards approved by the Engineer.

Catalogues and published, recommendations from manufacturers supplying products and materials for the project.

The Constructor shall provide manufacturer's or supplier's certificates to the Engineer for all products and materials which must meet the requirements of a specific code or standard as stated in these Specifications.

#### 5. Units of Measurements

The British System of Units (FPS) shall be used throughout this Project.

#### 6. Manufacturer's Recommendations

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Installation of manufactured items shall be in accordance with procedures recommended by the manufacturer or as approved by the Engineer.

**7. Existing Condition at Site**

Drawings and information pertaining to existing project conditions are furnished for reference. Neither the Employer nor the Engineer warrants the adequacy or correctness of these.

**8. Protection and Precautions**

The Constructor and his sub-Constructor shall afford all necessary protection to existing structures and will be required to make good at his own expense any damage done to such structures through his own or his representatives or subConstructor' fault and negligence.

The Constructor and his sub-Constructor shall afford all necessary protection to existing roads in the area. He will clear and make good at his own expense any damage to or debris on these roads through his own fault and negligence. He must at all time ensure the free and normal flow of traffic and shall not cause obstruction to the traffic system. The Constructor and his sub-Constructor shall provide and maintain necessary protection and precautionary measures such as warning signs, warning lamps and barricades etc. to prevent accidents.

The Constructor shall promptly correct all such damage to original condition at no additional expense to the Employer.

The Constructor shall cooperate with trades performing work under other Contracts as necessary for completion.

**9. Setting Out of Work**

Establish all boundaries, markers, leveling stakes and benchmarks on the site to adequately set out all work. Verify all data and their relationship to establish and Engineer's survey control points and public benchmarks and report discrepancies to the Engineer.

Permanently mark the necessary controls for distance and elevation sufficient to serve throughout the Contract and protect these control points adequately against damage and displacement.

Project setting out is for the use of all trades; each trade is responsible for the layout of its own work.

**10. Sequence of Construction**

The Constructor shall submit his proposal for approval of the Engineer the sequence of Construction, prior to starting the works. the works shall be executed as per approved sequence of construction.

**11. Lines and Levels**

Survey control points will be established by' the Engineer. The Constructor shall be responsible for verifying these and shall be responsible for all requirements necessary for the execution of any work to the locations, lines, and levels specified or shown on the drawings, subject to such modifications as the Engineer may require as work progresses.

**12. Partial Possession**

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Whenever, as determined by the Employer any portion of work performed by the Constructor is in a condition suitable for use, the Employer may take possession of or use such portion.

Such use by the Employer shall in no instance be construed as constituting final acceptance, and shall neither relieve the Constructor of any of his responsibilities under the Contract, nor acts a waiver by the Employer of any of the conditions thereof, provided that the Constructor shall not be liable for the cost of repairs, re-work, or renewals which may be required due to ordinary wear and tear resulting from such use. However, if such use increases the cost or delays to the completion of remaining portions of work, the Constructor will be entitled to an equitable adjustment.

If, as a result of the Constructor's failure to comply with the provision of the Contract, such use proves to be unsatisfactory, the Consultant/Engineer Incharge will have the right to continue such use until such portion of the work can, without injury to the Consultant/Engineer Incharge, be taken out of service for correction of defects, errors, omissions, or replacement of unsatisfactory materials or equipment, as necessary for such work to comply with the Contract; provided that the period of such operation or pending completion of appropriate remedial action shall not exceed twelve months unless otherwise mutually agreed upon in writing between the parties.

### 13. Existing Services

The Constructor shall search for, find locate and protect any visible/un visible wiring, cable, duct, pipe work, etc., within or immediately adjoining the site area.

The Constructor shall take full responsibly for safety of existing service lines, utilities and utility structures uncovered or encountered during excavation, dismantling and construction operations.

The Constructor 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 Constructor shall forthwith take remedial action, initiate safety precautions, install temporary services and carryout repair all at his own cost and expense and inform the Engineer and notify all relevant authorities.

Existing utilities which are to remain in service or after the works are to be determined by the Constructor. 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.

### 14. Plant and Equipment

The Constructor shall submit a detailed list of plant and equipment, which he shall undertake to bring to the site to carry out the work. The list shall satisfy the Engineer as to type, size and quantity. The list shall include for each piece of equipment the type, manufacturer, model, identification number and year of manufacture. The Constructor shall provide on the site of the work at his cost all of the equipment listed and all subsequent equipment required for approval of the detailed program of work and such equipment which may be directed by the Engineer. The Constructor shall supply all plant and equipment necessary for the construction of each phase of the work and it must be on site, inspected and approved by the Engineer.

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**15. Construction Area and Access**

The Constructor shall confine his operations to the areas that are actually required for the Works and shall fence the area accordingly. Arrangements for access roads, storage areas and routes for haulage of materials are to be made by the Constructor at his own cost, subject to the approval of the Engineer.

**16. Storage & Handling Facilities**

The Employer will provide the Constructor possible space within or nearby the area of site of works for the storage of plant, equipment and materials and for Constructor's temporary office, during the currency of the Contract. In case the adjacent area as required by the Constructor is not available within the Project boundary for storage of plant, equipment and machines then the Constructor shall arrange at his own expense possible space for storage of plant, equipment and machines at his own cost and expense. On no account shall such temporary installations conflict/ interfere with any of the permanent installations, services and any operational function of Employer. The handling and storage of all plants, equipment and materials at site shall be the sole responsibility of the Constructor and at no risk and cost to the Employer.

The Constructor shall protect all material against corrosion, mechanical damage or deterioration during storage and erection on site. The protection methods shall be to the approval of the Engineer.

**17. Test Laboratory and Testing**

- 17.1 Testing, except as otherwise specified herein, shall be performed by an approved testing agency as proposed by the Constructor and at no extra cost to the Employer. The Engineer may require all testing to be carried out under his supervision only.
- 17.2 If suitable and adequate material testing laboratory is not available in the vicinity, then the Constructor shall provide and maintain a materials testing laboratory in the vicinity of the Constructor's Camp and the laboratory shall have sufficient working area and shall be equipped with all necessary facilities including a suitable store room.
- 17.3 The Constructor shall supply and maintain to the satisfaction of the Engineer or his representative complete testing equipment, apparatus, tools, gauges, instruments, etc. in sufficient number and adequate for all tests to be carried out as specified in these specifications. Valid calibration certificates of gauges instruments requirement shall be provided by the Constructor.
- 17.4 The Constructor, after the approval by the Engineer for the source of cement and steel "shall make available at the site sufficient stock of the materials in advance in order to allow sample testing for quality control prior to use.
- 17.5 The quality contract testing shall be performed" by the Constructor's competent personnel in accordance with a site testing and quality control program to be established by the Constructor and approved by the Engineer or his Representative. The Constructor shall keep a complete record of all quality tests performed on site and submit the same to the Engineer. All quality control and related tests shall be carried out in accordance with applicable standards and codes.

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## 18. Construction & Checking At Site

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

The submitting to these suggestions and arrangements, and the approval thereof by the Engineer shall not relieve the Constructor of his responsibilities and duties under the Contract.

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

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

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

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

## 19. Bar Bending Schedule

Bar bending (reinforcement bars) schedule of all drawings shall be prepared by the Constructor and submitted to Consultant/Engineer Incharge for approval. The approved bar bending scheduled shall be followed for cutting of steel and preparation of bills.

## 20. Drawings

20.1 Tender Drawings: The drawings listed in the General Conditions of contract, Volume I and provided in Volume III are referred to as Tender Drawings and these show the scope of work to be performed by the Constructor. Tender Drawings shall not be used as a basis for fabrication or construction but may be used as a basis for placing preliminary order for materials, subject to corrections based on the future issue of Drawings as provided under sub-clause 19.2 Drawings Issued for Construction. Tender Drawings are subject to be modified and supplemented by additional detail by the Engineer.

20.2 Drawings Issued for Construction: After Award of Contract, Tender Drawings shall be replaced by Drawings Issued for Construction including supplementary Specifications as may be necessary. Such drawings and specifications shall be construed to be included in the expression Custody of Drawings under Sub-Clause 6.1 of General Conditions of Contract Part I. Drawings Issued for Construction may include some of the Tender Drawings

  
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with or without modification and additional drawings as required to express design intent in greater detail. Such drawings may also be modified from time to time. Drawings Issued for Construction will be the drawings from which shop, fabrication, erection installation, concrete placing, formwork, or other construction detail drawings shall be prepared by the Constructor. The work shall be executed in conformity with Drawings Issued for Construction. The Constructor shall prepare a schedule of Drawings Issued for Construction of various parts of the Works based on Construction program approved by the Engineer for issuance to the Constructor from time to time.

20.3 Study of Drawings: The Constructor shall study all Drawings Issued for Construction carefully as soon as practicable after receipt thereof, and any errors discovered shall promptly be brought to the knowledge of the Engineer for his instructions.

20.4 Copies of Drawing: Drawings will be issued to the Constructor free of charge as follows:

Drawings Issued for Construction - Two copies as specified in sub-clause 6.1 Custody of Drawings, of General Conditions of Contract - Part I Volume I.

20.5 Drawings to be furnished by the Constructor:

**Shop Drawings**

All shop drawings required for the work including all kinds of fabrication, field erection, installation, placement and layout drawings shall be furnished by the Constructor for approval of the Engineer. If additional detail drawings are necessary to complete any part of the work, such including reinforcing steel, drawings shall be prepared by the Constructor and submitted to the Engineer. for approval. All drawings shall be complete and shall be submitted in due time and in logical order to facilitate proper coordination.

**a. Lift and placement Drawings.**

At least thirty calendar. days prior to starting construction of any concrete lift or other placement, the Constructor shall submit lift or other placement drawings to the Engineer for approval. Lift or other placement drawings shall be submitted for each lift or other placement of concrete to be placed. These drawings shall be to such scale as to clearly show all recesses, openings, and embedded parts, including embedded structural steel, mechanical and electrical items, reinforcement placement in each lift in sufficient detail for proper execution of the work.

**b. Construction Plant Layout Drawings.**

Three prints of drawings, showing the layout of construction plant and equipment the Constructor proposes to use on the work, shall be submitted by the Constructor for review to the Engineer. The drawings shall show the locations of the principal components of the construction plant, offices, storage areas and yards which the Constructor proposes to construct or use at the site of the work and elsewhere. The drawings shall also show the unloading facilities for materials and equipment at the work site.

**c. Submissions and Approvals:**



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Except as otherwise specified, three copies of each drawing for approval or review shall be furnished to the Consultant /Engineer Incharge. Within thirty calendar days after receipt the Consultant/Engineer Incharge will send one copy to the Constructor marked Approved, Approved/Except as Noted, or Returned for Correction. The notations Approved and Approved/Except as Noted will authorize the Constructor to proceed with the fabrication of the materials and equipment covered by such drawings subject to the corrections, if any, indicated thereon. Drawings returned for correction will be resubmitted for approval in the same manner as for new drawings. Every revision made during the life of the Contract shall be shown by number, date and subject in a revision block.

Upon receipt of prints which have been Approved or Approved Except as Noted, the Constructor shall furnish three prints plus one reproducible of each drawing to the Engineer. If revisions are made after a drawing has been approved, the Constructor shall furnish 3 additional prints and one reproducible subsequent to each approved revision.

- d. Shop drawings to be prepared by a Sub-Constructor shall be submitted in the same manner as (a) & (b) above but they will be submitted through the Constructor.
- e. All of the applicable requirements of this Clause with reference to drawings to be prepared by the Constructor, including SubConstructor, shall apply equally to catalogue cuts, illustrations, printed specifications, or other data submitted for approval.
- f. Any work done on Constructor's drawings shall be at the Constructor's risk. The Engineer will have the right to request any additional details and to require the Constructor to make any changes in the drawings which are necessary to conform to the provisions and intent of design and specifications without additional cost to the Employer. The approval of the drawings by the Consultant/Engineer Incharge shall not be construed as a complete check but will indicate only that the general method of construction and detailing is satisfactory. Approval by the Engineer of the Constructor's drawings shall not be held to relieve the Constructor of his obligation to meet all the requirements of the Specifications or of his responsibility for the correctness of the Constructor's drawings or of his responsibility for correct fit of assembled parts in final position or of his responsibility for the adequacy of method of construction.

## 21. As-Built Drawings

The Constructor shall, at all times, keep on the site one copy of all drawings and approved samples together with copies of all building, mechanical, electrical and public safety codes and relevant standards applicable to the works. All such material shall be made available to the Engineer.

In addition, the Constructor shall, at all times, keep on site a separate set of prints on which shall be noted neatly, accurately and promptly as the work progresses all significant changes between the work shown on the drawings and that which is actually constructed. The sub-Constructor shall each keep on site, at all times, a separate set of prints of the drawings showing their parts of the work on which shall be noted, neatly accurately and promptly as work progresses the exact

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physical location and configuration of the works as actually installed, including any revisions or deviation from the Contract Documents.

At the completion of the works, the Constructor shall at his expense, supply to the Engineer six copies and one reproducible copy of all drawings along with CD containing all as built drawings amended to comply with the work "As Built". The Constructor shall provide in the same format as the original drawings, any additional drawing required to record the work.

**22. Restoration and Cleaning**

The Constructor shall do regular cleaning and clean away all rubbish and excess materials that may accumulate from time to time on completion and before handing over. Upon completion of the works he shall obliterate all signs of temporary construction facilities such as work areas, structures, foundations of temporary structures, stock piles of excess or waste materials, or any other vestiges of construction, unless otherwise directed by the Consultant/Engineer Incharge. The works and site shall be left in a clean and satisfactory state for immediate use and occupation. Care shall be taken not to use any cleaning materials which may cause damage to the surface to be cleaned.

**23. Protection of the Works**

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

The Constructor shall take all proper steps for protection at all places on or about the works which may be dangerous to his workmen or any other person or to traffic. The Constructor shall provide and maintain warning signs, warning lamps and barricades as necessary.

**24. Product Data**

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

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

**25. Samples**

**25.1** The Constructor shall furnish for approval of the Engineer with reasonable Promptness all samples as directed by the Consultant/Engineer Incharge or specifically called for in these Specifications. The Consultant/Engineer Incharge shall check and approve such samples with reasonable promptness for compliance with the requirements of Contract Documents. All work shall be in accordance with approved samples.

**25.2** Duplicate final approved samples, in addition to any required for the Constructor's use, shall be furnished to the Consultant/Engineer Incharge, one for office use and the other for the Site.

  
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- 25.3 Samples shall be furnished so as not to delay fabrication, allowing the Consultant/Engineer Incharge reasonable time for consideration of the sample' submitted.
- 25.4 Each sample shall be properly labeled with the name and quality of the material, manufacturers name, name of the project, the Constructor's name and the date of submission, and the Specifications Article number to which the sample refers.
- 25.5 The manufacturer's installation directions shall be provided with each sample. The Constructor shall pay all transportation costs and deliver samples to the Engineer's office & Consultants' office, Site or testing laboratory as directed by the Engineer. Samples will not be returned unless return is requested at the time of submission; all packing and transportation costs for the return of samples shall be paid by the Constructor.
- 25.6 Samples shall be of adequate size and number to permit proper evaluation of the material by the Consultant/Engineer Incharge. Where variations in color, texture, dimensions or other characteristics are to be expected, the Constructor shall submit samples showing the maximum range of variation. Materials exceeding the range of variation of the approved samples shall not be used on the Work.
- 25.7 If both Shop Drawings and samples are required for the same item, the Consultant/Engineer In charge may require both to be submitted before approving either,25.7 No acceptance or approval of any Shop Drawings or sample, or any indication or directions by the Engineer on any Shop Drawings shall constitute an authorization for any increase in the Contract Sum.

In the event that the site cannot be connected to a local electricity network or where the available power is insufficient the Constructor has to make his own provision and maintain such installation.

A temporary lighting system shall be furnished, installed and maintained by the Constructor as required to satisfy the minimum requirements for safety and security. The temporary lighting system shall afford adequate general illumination to all building areas. Adequate outdoor lighting shall be provided to illuminate staging trenches and the like to the satisfaction of the Engineer Incharge and general illumination throughout adequate for watchmen and emergency personnel. .

Temporary equipment and wiring for power and lighting shall be in accordance with the applicable provisions of governing codes. Temporary wiring shall be maintained in a safe manner and utilized so as not to constitute a hazard to persons or property.

When the permanent electrical power and lighting systems are in an operating condition, they may be used for temporary power and lighting for construction purposes provided that the Constructor obtains the written approval of the Client and assumes full responsibility for the entire power and lighting system and pays all charges/costs for operation and maintenance of the system mutually agreed between the Employer and the Constructor.



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At completion of construction work, or at such time as the Constructor makes use of permanent electrical equipment and devices, temporary electricity services shall be removed by the Constructor as his own expense.

#### 25.6.1 Waste Disposal

The Constructor shall make such temporary provisions as may be required in order to dispose of any chemicals, fuels, grease, bituminous materials, waste and soil waste and the like without causing pollution to either the site or the environment. Disposal of any materials, wastes, effluents, garbage, oil, grease, chemicals and the like shall be in areas specified by the concerned local authority proposed by the Constructor and subject to the approval of the Engineer. If any waste material is dumped in unauthorized areas the Constructor shall remove the material and restore the area to the condition of the adjacent undisturbed area. If necessary, contaminated ground shall be excavated, disposed off as directed by the Engineer In charge and replaced with suitable fill material compacted and finished with topsoil all at the expense of the Constructor.

#### 25.6.2 Fire Protection

The Constructor shall provide and maintain adequate fire protection in the form of barrels of water with buckets, fire bucket tanks, fire extinguishers, or other effective means ready for instant use, distributed around the project and in and about temporary inflammable structures during construction of the works.

Gasoline and other flammable liquids shall be stored in and dispensed from safety containers approved by the Engineer In charge and storage shall not be within building.

Torch-cutting and welding operations performed by the Constructor shall have the approval of the Engineer In charge before such work is started and a chemical extinguisher is to be available at the location where such work is in progress.

The Constructor shall follow the instructions and specifications of the relevant department and or other local authority.

#### 25.6.3 Telephone

The Constructor shall immediately after receiving the Letter of Acceptance take the necessary steps to obtain mobile and land line telephone on site. He shall be responsible for all installation and connection charges and periodic mobile and landline telephone accounts. The telephone shall be made available to the Engineer for the due performance of his duties at all times and free of charges during construction and defects liability period.

### 26. Construction Schedule

A Construction schedule shall be maintained in accordance with the provisions of the General Conditions of Contract.

The schedule shall be accompanied with sufficient data and information including all necessary particulars of constructional plant, equipment machinery, temporary

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Works, arrival of plant, equipment at site and their installation, method of operation, work forces employed, etc, for an activities of the Works.

Should the Consultant / Engineer consider any alteration or addition in the program and time schedule, the Constructor shall conform thereto without any cost to the Employer.

Whenever necessary and wherever the progress of the actual work shows departure, the program and time schedule shall be undated and submitted to the Consultant/Engineer In charge for his approval.

**27. Notification from Constructor to the Consultant/Engineer Incharge**

The Constructor intends to perform the works on site for next day shall have to notify to the Consultant's/Engineer's representative in writing (nature and location of works) so as to enable necessary inspection and measurement to be carried out. The Consultant/Engineer Incharge may, if necessary, direct that longer notice be given of certain operations.

**28. Night Work**

When work is done at night the Constructor shall maintain from sunset to sunrise such lights on or about his work and plant as the Engineer may deem necessary for the proper observations of the work and the efficient prosecution hereof.

**29. Weather**

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

**30. Co-Ordination With Other Constructor**

The Constructor shall make all necessary coordination with other Constructor and shall make sure that all embedding components such as pipes, steel bases etc. (as required for completion of electrical works) are properly, accurately and timely installed. The Constructor shall inform the other Constructor the schedule of any construction activity well in advance giving him sufficient time to finish his part of job, before any compaction/concreting etc. The Constructor shall get the signature of the authorized representation of the other Constructor before carrying out any construction activity.

If any part of electrical work is damaged or has to be dismantled or redone due to negligence omissions / incorrect position of the embedding etc. on part of the Constructor, all such losses/expensed shall be borne by the Constructor.

All expenses incurred for the above works including coordination are deemed to be covered in his tendered cost and no separate/extra payment shall be paid against such item.

**31. Submission Requirements**

**31.1** Schedule submission at least sixty days before the dates when reviewed submittals will be needed.

**31.2** Submit Shop Drawings as per provision given in Sub-Clause 20.5 (a) and number of copies of Product Data which the Constructor requires for distribution plus four copies which will be retained by the Engineer.

**31.3** Submit three samples unless otherwise specified.

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31.4 Accompany submittals with transmittal letter, in duplicate, containing: Date Project title and number Constructor's name and address The number of each Shop Drawing, Product Data and the Sample submitted. Notification of deviations from Contract Documents. Other pertinent data.

**32. Resubmission Requirements Shop Drawings:**

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

**33. Survey Instruments**

All the instruments, equipment, stakes and other material necessary to perform all work shall be provided by the Constructor. The survey work shall be carried out by competent staff consistent with the current practices. The Constructor shall maintain on site surveying instruments in perfect working conditions to enable the Engineer to check lines and level at all times.

Survey instruments and equipment shall include but not limit to the following:

Electronic Total Station

Laser Meter

Precision Level invert Staff

Automatic Levels

Power level

Compass, steel tape, ranging poles

**34. Weekly Progress Report and Photographs**

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

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

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

**35. Constructor to Notify Delays Etc.**

Any delay which will affect the completion of Works shall be detailed by the Constructor who shall state the action he is taking for effective completion of the Contract program.

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The Constructor shall submit a report in respect of the various sections of the Works, the equipment in use or held in readiness, 'a return of labour and supervisory staff, and details of any matters arising which may generally affect the progress of the work.

The Constructor shall give a summary of the detailed progress report giving the position with regard to the agreed Contract program.

The progress reports shall be set out in a format to the approval of the Consultant/Engineer Incharge, and forwarded promptly so that on receipt the information contained therein is not more than 21 days out of date.

If during execution of the Contract, the Employer considers the progress position of any section of the work to be unsatisfactory, or for any other reason relating to the Contract, he will be at liberty to convene a meeting and the Constructor's Representatives are to attend such meeting.

The Constructor's Site Office shall prepare and submit 6 copies of a weekly progress report to the Employer and Engineer's Site Office. This report shall summarize site activities and record and details where difficulties in maintaining the agreed program are being experienced or are likely to cause subsequent delay.

The Constructor's Site Office shall also prepare and submit to the Engineer's Site Office 2 copies of Daily Activity Report summarizing the main activities to be undertaken each day, noting special activities such a tests, alignment checks, etc. The Constructor shall be responsible for expediting the delivery of all material and equipment to be provided by him and his subConstructor.

### 36. Photographs

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

The negatives of all photographs shall be held at the Constructor's Site Office, numbered and handed over to the Employer at the completion of the Contract.

### 37. Facilities for the Engineer

#### 37.1 Site Office

The Constructor shall construct, provide and maintain Consultant's Site Office of about 100-125 square feet covered area as per the specifications. A preliminary layout of the site office shall be provided by the Consultant/Engineer Incharge. After receiving letter of award the Constructor will submit to the Engineer detailed shop drawings for review and approval. Specifications for construction of site office shall be the same as provided in Volume-II of the tender documents.

The Consultant's site office shall be furnished and equipped with new and unused furniture, equipment, air-conditioners, electrical fittings etc., as per the list given below:



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1	Wooden office table with drawers and side racks	1 (One) No.
2	Office Chairs	3 (Three) No.
3	Wooden sitting visitors chairs with arms (standard size)	0 (Zero) No.
4	Steel filing cabinet (standard size)	1 (One) No.
5	Split type (1 ton)	1 (One) No.
6	Electric Kettle	0 (Zero) No.
7	Laptop Core i7, 7th generation 8gb ram, 500Gb Hard Disk (Samsung, Dell or Hp).	0 (Zero) No.
8	Internet DSL Facility	0 (Zero) No.
9	A3 size printer and Mobile / Landline	0 (Zero) No.
10	Conference Table (1.5 meter x 1.0 meter) & chairs 12Nos.	0 (Zero) set.

Mobile & Landline Telephone with connections 0 (Zero) No. Each Engineer. The Constructor shall furnish Rupees 0,000/= per month to the Engineer for the Mobile Cards.

If any equipment, furniture and installations become unserviceable for any reason whatsoever the Constructor shall promptly replace the same as and when directed by the Consultant/Engineer Incharge. The Consultant's Site office with fittings, fixtures and all other equipment/accessories shall be maintained and operated for the entire duration of construction period as well as for the duration of subsequent defects liability period.

The Site Office including fittings, fixtures, furniture, furnishing and all other equipment/accessories shall be the property of the Employer on completion of the Contract.

### 37.2 Transport

~~The Constructor shall provide, operate and maintain One brand new, 1000CC, (with AC) & One Brand New 800CC, (with AC) or the equivalent facility will be provided on Rental car facility for the use of the Consultants' site supervision/ monitoring team to meet his transportation needs for the entire duration of actual construction period as well as for the duration of subsequent defects liability period. The use of such transport facility shall be under the control of the Engineer, and the Constructor shall be wholly responsible for providing at all times satisfactory operating services for the Engineer. The Constructor shall furnish, supply and provide, as may be necessary without specific direction of the Engineer, all fuels, lubricants, tires and other supplies, all maintenance, repairs and running costs and suitably qualified drivers at all times. The Constructor shall furnish Rupees 10,000/= per month per car to the Engineer for the fuel (CNG / Petrol) purposes.~~



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~~Prior to Ordering the Vehicles, the Constructor shall furnish to the Engineer for approval, detailed specification, name of manufacturer and model no. of the vehicles to be supplied. These data shall be presented within one week from the date of Engineer's Order to proceed with the works and the vehicles shall be furnished to the Engineer upon approval within two weeks from the date of Engineer's Order to supply the Vehicle.~~

~~Failure of the Constructor to do so shall make him liable to bear its cost up to Rs. 80,000 per month, per car. The vehicles shall be right hand drive, and shall be brand new, properly serviced and ready for use. The Constructor shall provide vehicle to replace any such motor vehicle that is temporarily or permanently rendered unserviceable for any reason or declared to be beyond repair by the Engineer, at no additional cost to the Employer. The vehicles shall become the property of the Constructor on completion of the Contract including defects liability period. If the Constructor fails to provide the facilities as per tender documents then deductions as specified in tender documents will be made from Constructor running bill and same will be compensated / paid to consultant/Engineer.~~

### 37.3 Constructor's Employees

The Constructor shall provide and employ on the Site for the purpose of or in connection with the Contract:

S. No	Staff to be Employed with Qualification	No.	Experience
1	Project Manager – B.E. in Civil	1	Minimum 10 years experience
2	Project Engineer / Site Engineer – B.E in Civil /B.Tech Civil	1	Minimum 3 years experience
3	Site Supervisor - D.A.E. (3 years) in Civil	2	Minimum 3 years experience.
4	Site Supervisor - D.A.E. (3 years) in Electrical	1	Minimum 3 years experience.
5	Surveyor – D.A.E. (3 years) in Civil	1	Minimum 5 years experience.
6	Material Engineer – B.E in Civil / M.Sc. in Geology	1	Minimum 3 years experience.
7	Quantity Surveyor – D.A.E. (3 years) in Civil	1	Minimum 10 years experience.
8	Work Superintendents	3	Metric / non-metric with 10 to 15 years experience in the construction of RCC work and can understand drawings well
Remaining staff be employed by the Constructor as required at site as per schedule of Work and also as per instruction of Consultant/Engineer Incharge whenever needed for execution in work.			

### 38. Payment of Work

No payment shall be made for the works involved within the scope of this section of specification. The cost thereof shall be deemed to have been included in the quoted unit rate of other items of the Bills of Quantities.

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## SECTION – 2 CONSTRUCTOR'S CAMP

### 1. Scope

The work to be done under this item consists of construction, erection, installation and maintenance of the Constructor's Project Site Offices or main camp and the Constructor's sub-camps or temporary camps, if any, and shall include all offices, shops, warehouses, and other operational buildings; all housing and related facilities including accommodations for the Constructor's personnel.

The location of the Constructor's camps, including all buildings, utilities and facilities there for, and of the camps or establishments of all persons/parties in the vicinity operating or associated with the Constructor shall be subject to approval of the Engineer.

The work to be done under this item will terminate upon the actual Completion Date. However, if directed by the Consultant or the Employer, the Constructor shall continue such work to the extent required by the Constructor's personnel during the period of maintenance. No compensation shall be paid for the continued operation and maintenance of the Constructor's Camps during the period of maintenance.

Upon completion of the Works, or at such time within the period of maintenance as directed by the Consultant/the employer, the Constructor shall remove all buildings utilities and other facilities from the Site and restore all camp areas to a neat and clean condition.

The construction, operation and maintenance of all camps of the Constructor shall comply with all applicable provisions of current Pakistan Labour Camp Rules.

Adequately equipped and properly staffed portable first aid stations or dispensaries shall be provided by the Constructor at camps and other strategic locations to administer first aid treatment at any time required and free of charge to all persons on the Site, including employees of the Consultant and the Employer.

### 2. Payment of Work

No payment shall be made for the works involved within the scope of this section of Specifications unless otherwise specifically stated in the Bills of Quantities or herein.

The cost thereof shall be deemed to have been include in the quoted unit rate of other items of the Bills of Quantities.



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## SECTION – 3 STAKE-OUT SURVEY

### 1. Scope

Under this item the Constructor shall make the stakeout survey for construction purposes with competently qualified men, consistent with the current practices. The work shall proceed immediately upon the award of the contract and shall be expeditiously progressed to completion in a manner and at a rate satisfactory to the Engineer. The Constructor shall keep the Engineer fully informed as to the progress of the stakeout survey. The scope of this section of specifications is covered by detailed specifications as laid down herein.

### 2. Material and Equipment

All instruments, equipment, stakes and other material necessary to perform all work shall be provided by the Constructor. These instruments and equipment shall be available to Engineer at all times for the purpose of checking the work of the Contract.

All stakes used shall be of a type approved by the Engineer, clearly and permanently marked so as to be legible at all times. It shall be the Constructor's responsibility to maintain these stakes in their proper position and location at all times. Any existing stakes or markers defining property lines and survey monuments which may be disturbed during construction shall be properly tied into fixed reference point before being disturbed and accurately reset in their proper position upon completion of the work.

### 3. Construction

The Constructor shall trim trees, bushes and other interfering objects, not consistent with the plan, from survey lines in advance of all survey work to permit accurate and unimpeded work by his stake-out survey crews and the Engineer's survey crews. The exact position of all work shall be established from control points, which are shown on the plans or modified by the Engineer. Any error, apparent discrepancy in or absence of data shown or required for accurately accomplishing' the stakeout survey shall be referred to the Engineer for interpretation or furnishing when such is observed or required.

The Constructor shall be responsible for the accuracy of his work and shall maintain all reference points, stakes, etc. throughout the life of the contract. Damaged, destroyed or inaccessible reference points, bench marks or stakes shall be replaced by the Constructor. Existing or new control points that will be or are destroyed during construction shall be re-established and all reference ties recorded thereon shall be furnished to the Engineer. All stakeout survey work shall be referenced to the centerlines shown on the Plans. All computations necessary to establish the exact position of the work from control points shall be made and preserved by the Constructor. All computations, survey notes and other records necessary to accomplish the work shall be kept neatly and made available to the Engineer upon request and furnished to the Employer upon Contract completion.

The Engineer may check all or any portion of the stakeout survey work or notes made by the Constructor and any necessary correction to the work shall be immediately made. Such checking by the Engineer shall not relieve the Constructor of any of his responsibilities for the accuracy or completeness of his work.

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Reference points, base lines, stakes and benchmarks for borrow pits shall be established by the Constructor.

All required right-of-way and easement limits shall be established, staked and referenced by the Constructor concurrent with the construction stakeout survey.

The Constructor shall place at least two offset stakes or references at each centre lines station and at such intermediate stations as the Engineer may direct. From computations and measurements made by the Constructor, these stakes shall be clearly marked with the correct centre line, station number, offset and cut or fill so as to permit the establishment of the true centre line location during construction. He shall locate and place all cut, fill, slope, line grade or other stakes and points as the Engineer may direct to be necessary for the proper progress of the work.

#### 4. Payment of Work

No payment shall be made for the Works involved within the scope of this section of Specifications unless otherwise specifically stated in the Bills of Quantities or herein.

The cost thereof shall be deemed to have been included in the quoted unit rate of other items of the Bills of Quantities.



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## SECTION – 4 CLEARING AND GRUBBING

### 1. Scope

The clearing and grubbing shall consist of clearing the designated area of all trees, down timber, snags, bush, other vegetation, rubbish and all other objectionable material, and shall include grubbing stumps, roots, and matted roots, and disposal of all spoil material resulting from the clearing and grubbing. It shall also include the removal and disposal of structures that protrude, encroach upon, or otherwise obstruct the work, except when otherwise provided for on the plans or directed by the Engineer to be saved. The scope of this section of specifications is covered with detailed specifications laid down herein.

### 2. Limit of Area

#### 2.1 Location of Works

The Engineer will define the limit of areas where clearing and grubbing is to be done. Normally it will include all land within the right of way and all other construction area including ditches, detours, minor road crossings and other areas shown on the plans or as specified or as directed by the Engineer. The Engineer will designate the fences, structures and debris and trees and bushes to be cleared where grubbing is not required. It shall not include clearing and grubbing of borrow or other pit areas from which material is secured. It shall include the leveling or removal of all bunds or mounds within the right of way unless otherwise directed by the Engineer.

#### 2.2 Grubbing and Cutting

All roots and stumps within the limits of the site shall be grubbed and excavated unless otherwise specified or approved by the Engineer.

#### 2.3 Disposal

All wood and bush shall be burned or otherwise disposed off within fifteen (15) days after cutting or felling unless otherwise approved. No tree trunks, stumps or other debris shall be left within Site unless approved in writing by the Engineer. The location of disposal areas shall be within or outside the limits of the project or as approved in writing by the Engineer and shall be acquired by the Constructor at his own expense. Any useable material shall remain the property of the Employer.

#### 2.4 Protection and Restoration

The Constructor shall prevent all damage to pipes, conduits, wires, cables or structures above or below ground. No land monuments, property markers, or official datum points shall be damaged or removed until the Engineer has witnessed or otherwise referred their location and approved their removal. The Constructor shall so control his operations as to prevent damage to trees and shrubs, which are to be preserved. Protection may include fences and boards lashed to trees to prevent damage from machine operations. The existing covered or open benchmarks should be relocated as directed by the Engineer. In the event that anything specified herein to be saved and protected is damaged.

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## SECTION – 5 DISMANTLING WORKS

### 1. Scope

The work covered by this Section of the Specifications consists of furnishing all plant, labour, equipment, appliances and performing all operations in connection with demolition! dismantling and removal of existing building components, walls, floors, skirting, plaster and removing of doors, windows and ventilators, removal / re-routing of utility services of the building with accessories, removal of existing roof finishes and disposal/stacking of material to designated places. Whole work shall be done in accordance with these and other relevant specifications and as directed by the Engineer.

### 2. Procedures

- 2.1 The Engineer will define the limits where demolition/ dismantling and removal activity is to be done and shall approve the procedures/methods to be adopted by the Constructor.
- 2.2 Whole work shall be performed in an orderly manner and the Constructor shall take all necessary precautions and expedients to prevent damages to the adjacent structures, installed equipment/machinery, pipes, conduits etc. Any damage caused to the structures and installations due to negligence of the Constructor during demolition dismantled and removal operations shall be repaired/replaced by the Constructor at his cost and to the satisfaction of the Engineer.

### 3. Demolition of Building Components

- 3.1 The Constructor shall demolish walls, floors skirting, cutting of plaster, removing of doors, windows, ventilators, concrete/ masonry works and other associated parts to the line and depth as shown on the Drawings or as directed by the Engineer. Explosives shall not be used to remove the plain and reinforced cement concrete or any other material whatsoever. Manually or where required mechanically operated breakers, concrete saws, chipping hammers or other approved methods shall be employed for cutting. Care shall be taken that existing services and structures are not damaged. It shall be the responsibility of the Constructor to replace at his cost any services, Structures damaged by the Constructor due to his negligence during cutting operations or thereafter until the whole of cut parts areas are restored to original condition to the satisfaction of the Engineer.

### 4. Removal of Existing Services/ Utilities/Finishes

- 4.1 The Constructor shall mark all the services/ utilities falling within the Contract area. After getting approval from the Engineer, the Constructor shall remove all such Services/utilities/finishes as per the requirement specifications of the relative department whose utilities/services finishes are being removed/ shifted.

### 5. Disposal

- 5.1 All debris materials resulting from demolition / dismantling works shall be disposed off to places designated by the Engineer in the manner of disposition required and directed by the Engineer.

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- 5.2 All useable materials resulting from demolition and removal shall remain the property of the Employer and shall be stacked at designated places.

## 6. Measurement and Payment

### 6.1 General

Except otherwise specified herein or elsewhere in the Bill of Quantities/Contract Documents no measurement and payment will be made for the under mentioned items related to this section. The cost thereof shall be deemed to have been included in the quoted unit rate of the other items of the Bill of Quantities under this section.

- 6.1.1 Temporary diversion and safety measures.
- 6.1.2 Loading, unloading, transportation and disposal of demolished dismantled/removed/useable material to the place designated by the Engineer.
- 6.1.3 Permissions/approvals, if required, from the relative department.
- 6.1.4 Stacking of all useable material to the place designated by the Engineer.
- 6.1.5 Earth work
- 6.1.6 Shifting of Existing lines, Sewer line, and water supply lines or rerouting the same as per new design and drawing.
- 6.1.7 Shifting of Existing Generators, Transformers, Panels, Switch boards and all electrical / plumbing accessories including motors / pumps as per new design and drawing.

### 6.2 Dismantling of Tile Floors/Dado/Skirting / Wall fly proof jali

#### 6.2.1 Measurement

Measurement for acceptably completed works of dismantling and removal of existing tile floors/dado/skirting/wall/fly proof jali and staking of useable material at designated places will be made on the basis of actual area in square foot of dismantled floor/dado/skirting/wall/fly proof jali as directed by the Engineer.

#### 6.2.2 Payment

Payment will be made for acceptably measured quantity of dismantled tile floor/dado/skirting/wall/fly proof jali on the basis of unit rate per square foot quoted in the Bill of Quantities and shall constitute full compensation for all the works related to the item. If this item is not covered in the BOQ the cost thereof shall be deemed to have been included in the quoted unit rate of other items of bill of quantities.

### 6.3 Removal of Doors and Windows with Chokhats

#### 6.3.1 Measurement

Measurement for acceptably completed works of removal of existing doors/windows with chokhats and staking of useable material at designated places will be made on the basis of actual number of removed doors/windows with chokhats as directed by

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the Engineer.

#### **6.3.2 Payment**

Payment will be made for acceptably measured quantity of removal of existing doors/windows with chokhats on the basis of unit rate per number quoted in the Bill of Quantities and shall constitute full compensation for all the works related to the item. If this item is not covered in the BOQ the cost thereof shall be deemed to have been included in the quoted unit rate of other items of bill of quantities.

### **6.4 RCC Slab**

#### **6.4.1 Measurement**

Measurement for acceptably completed works of removal of existing RCC slab will be made on the basis of actual volume in cubic feet of dismantled concrete as directed by the Engineer.

#### **6.4.2 Payment**

Payment will be made for acceptably measured quantity of dismantling of existing RCC slab on the basis of unit rate per cubic feet quoted in the Bill of Quantities full compensation for all the works related to the item.

### **6.5 Removing / Chipping of Plaster (Int. / Ext.) at any level at any height.**

#### **6.5.1 Measurement**

Measurement for acceptably completed works of removing and chipping of existing Plaster and debris to be shifted out side the premises / at designated places will be made on the basis of actual area in square foot of removed plaster as directed by the Engineer.

#### **6.5.2 Payment**

Payment will be made for acceptably measured quantity of removing / chipping of existing plaster on the basis of unit rate per square foot quoted in the Bill of Quantities and shall constitute full compensation for all the works related to the item. If this item is not covered in the BOQ the cost thereof shall be deemed to have been included in the quoted unit rate of other items of bill of quantities.

### **6.6 Removing / Electrical / Plumbing fitting and fixtures at any level at any height.**

#### **6.6.1 Measurement**

Measurement for acceptably completed works of removing of Electrical / Plumbing fitting and fixtures and stacked at designated places will be made on the basis of actual in Nos. of removed items as directed by the Engineer.

  
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### 6.6.2 Payment

Payment will be made for acceptably measured quantity of removed fittings and fixtures on the basis of unit rate per Nos. quoted in the Bill of Quantities and shall constitute full compensation for all the works related to the item. If this item is not covered in the BOQ the cost thereof shall be deemed to have been included in the quoted unit rate of other items of bill of quantities.



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## SECTION – 6 EARTH WORK

### 1. Scope of Work

The work under this section of the specification consist of furnishing all plant, labor equipment, appliances and materials and in performing all operations in connection with earthworks of all underground services and structural units, stock piling of suitable excavated material, disposal of unsuitable and surplus excavated material in accordance with this section of specifications, the applicable drawings and subject to terms and conditions of the Contract.

### 2. General

2.1 The Constructor shall be deemed to have made local and independent inquires as to, and shall take the whole risk of, the nature of the ground subsoil or material to be excavated or penetrated and the Constructor shall not be entitled to receive an extra or additional payment nor to be relieved from any of his obligations by reasons of the nature of such ground subsoil or material.

2.2 All excavations, cut and fills shall be constructed to the lines, levels and gradients specified with any necessary allowance for consolidation, settlement and drainage so that at the end of the Period of Maintenance the ground shall be at the required lines, levels and gradients. During the course of the Contract and during the Period of Maintenance any damage or defects in cuts and fills, in structures and other works, caused by slips, falls of wash-ins or any other ground movement due to the Constructor's negligence shall be made good by the Constructor at his own cost.

### 3. Site Preparation

3.1 The Constructor shall set out the works and shall be responsible for true and perfect Setting out of the same and for correctness of the positions levels, dimensions and alignments of all parts thereof. If at any time any error in this respect shall appear during the progress of the works, the Constructor shall at his own expense rectify such error, to the satisfaction of the Engineer.

3.2 The Constructor shall construct and maintain accurate bench marks so that the Lines and Levels can be easily checked by the Engineer.

3.3 The Constructor shall perform a joint surely with the Engineer's Representative, of the area where earth work is required, plot the ground levels on the drawings and obtain approval from the Engineer before starting the earth work and shall supply a copy to the Employer duly checked, signed and authenticated by the Engineer before start of work.

### 4. Excavations

4.1 Excavation shall include the removal of all material of every name and nature. It is expected that rock and other hard material will be encountered during excavation, The rate of excavation shall include the removal of all sub-surface material of every name and nature and no classification of sub-surface material shall be made nor any additional payment shall be made.

4.2 The major portion of excavations shall be carried out by mechanical

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excavators and excavated materials disposed off to stock on spoil as directed by the Engineer. The excavation may be done by normal means, unless otherwise specified by the Engineer, leveling, trimming and finishing to the required levels and dimensions shall be done manually. The material suitable for fill and backfill if approved by the Engineer shall be stockpiled within the limits of whole of the Site as directed by the Engineer. Excavated material unsuitable for use as fill and backfill shall be disposed off by the Constructor at locations approved by the Engineer within specified free haulage limit.

4.3 The Constructor shall give reasonable notice that he intends to commence any excavation and he shall submit to the Engineer full details of his proposals. The Engineer's approval shall not relieve the Constructor of his responsibility with respect to such work.

4.4 The Constructor shall preserve the completed excavation from damage due to slips' and earth movements, ingress of water from any source whatsoever and deterioration by exposure to the sun and the effects of the weather.

All excavations shall be kept free of water and shall be maintained dry to the satisfaction of the Engineer. Prevent surface water and sub-surface water and sub surface ground water from flowing into the excavation and flooding the project site and surroundings.

Do not allow water to accumulate in excavations, remove water from excavations to prevent softening of foundation bottoms, under cutting footings and soil changes determined to the stability of sub-grades and foundations. Provide and discharge lives necessary to convey the water away from the excavations convey water removed from excavation and rain water to outside the limits in manner that no damages is caused to the surrounding services properties.

4.5 Excavation for pits, cable trenches, equipment-foundations and other structures shall be taken out to the levels and dimensions shown on Drawings or such other levels and dimensions as the Engineer may direct.

4.6 Excavation shall extend to adequate distance from walls and footings to allow for placing and removal of forms, installations of services and for inspection, except where the concrete for walls and footings is authorized to be deposited directly against excavated surfaces. Undercutting will not be permitted. The additional excavation for placing and removal of forms, installation of services, for inspection and generally for working area on slopes for stability shall not be measured for payment and shall be deemed to be included in the rates for excavation as measured net.

4.7 All' excavations in foundations shall be taken to 6 inch above the final excavation elevations shown on the drawings and the 6-inch shall be trimmed carefully to a smooth and level surface. Immediately after trimming to the final elevation, a layer of blinding concrete shall be placed to the thickness shown on the drawings. All excavations for foundations which have been trimmed and disturbed shall be compacted and covered by lean concrete by the end of the day.

4.8 No excavation shall be refilled nor any permanent work commenced until the foundation has been inspected by the Engineer and his permission to

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proceed is given.

- 4.9 If excavation for sub-structures is carried below the required level, as shown on the Drawings or as directed by the Engineer, the surplus depth shall be filled in with concrete of same grade as of blinding concrete at the sole cost of the Constructor.
- 4.10 All excavation shall be performed in the dry. The placing of blinding concrete, placing of reinforcement and casting of the permanent works in the excavation shall be carried out in the dry.
- 4.11 Shoring, where required during excavation, shall be installed to protect workmen and the bank, adjacent paving, structures and utilities. The term shoring shall also be deemed to cover whatever methods the Constructor elects to adopt, with prior approval of the Engineer, for upholding the sides of excavation and also for planking and strutting to excavation against the side of roadways and adjoining properties in existing hardcore of any other material. The Constructor will be held responsible for upholding the sides of all excavations and no claim for additional excavation, concrete or other material will be considered in this respect.
- 4.12 Existing utility lines that are shown on the drawings or the locations of which are made known to the Constructor prior to excavation and that are to be retained, as well as utility lines constructed during excavation and backfilling, and if damaged, shall be repaired by the Constructor at his own expense. Any existing utility lines which are not known to the Constructor in sufficient time to avoid damage, if inadvertently damaged during excavation, shall be repaired by the Constructor and adjustment in payment will be made as approved by the Engineer. When utility lines which are to be removed, are encountered within the area of operations the Constructor shall notify the Engineer in ample time for the necessary measures to be taken to prevent interruption of the service.
- 4.13 Where applicable the excavation work shall include the excavation in above water table and excavation below water table. The Constructor shall provide all plant, equipment, pumps, sheeting, well points as required to keep the water table 3.0 feet below the deepest foundation as shown on the drawings till the completion of foundation works.
- 4.14 4.14 Before starting the excavation for pipelines, the Constructor shall ensure the correct alignment of the pipeline on the ground the depth and width of excavation of the trench, all in accordance with the Drawings and instructions of the Engineer. The Constructor shall make profile with cement concrete pillars.
- 4.15 Excavation shall be carried out true to lines, levels, grades and widths as shown on the drawings or as directed by the Engineer ensuring proper laying of the pipe line, the bedding fill, construction of chambers for appurtenances and any other structures. The trench bottom shall be graded to provide even and substantial bearing over the specified bedding and of the structure.

Without the written permission of the Engineer, not more than 600 feet of the trench shall be opened in advance of the completed pipeline.

- 4.16 The Engineer may require the Constructor to excavate below the elevations shown on the drawings or he may order him to stop above the
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elevations shown depending upon the suitable foundation material encountered,.

- 4.17 If for any reason, the levels, grades or profiles of the excavations are changed adversely by the Constructor, the Constructor shall at his own cost, be liable to bring the excavations to the required levels and profiles as shown on the drawings or as directed by the Engineer.

## 5. Excavation Tolerances

Excavation shall be performed within the tolerances for excavation limits indicated on the drawings, where no tolerance limits are indicated excavation shall be performed to tolerances established by the Engineer as acceptable for the design and type of work involved.

## 6. Fill and Backfill

- 6.1 The backfilling shall include filling under the floors, around the foundation trenches, pipes, conduits, ducts and channels.

The backfilling shall include loading, unloading, transporting, placing, stacking, spreading of earth, watering, rolling, ramming and compacting, etc., complete as specified herein.

- 6.2 The excavated material if found suitable shall be stockpiled within the free haulage limit of the Project Boundary. This material shall be used for filling/back-filling if approved by the Engineer and shall be transported by the Constructor anywhere required for the purpose of filling/back-filling work in this Contract.

The Constructor shall provide the approved quality of backfill and fill material required to complete the fill and back-filling work from the places /borrow areas as designated by the Engineer. All necessary permissions from any authority for excavation within Borrow areas/ designated places shall be of Constructor's responsibility. Deep filling shall be predominantly granular material and free from slurry mud, organic or other unsuitable matter and capable of compaction by ordinary means.

- 6.3 Material for backfilling shall be as approved by the Engineer and shall be placed in layers not exceeding 6 inches measured as compacted material with sufficient water and compacted to produce in-situ density not less than 80% of the maximum dry density at optimum moisture content.
- 6.4 Depending on the depth of fill the Engineer may instruct increased thickness of successive layers to be placed. The filling shall be compacted by mechanical means as approved by the Engineer.
- 6.5 Filling around pipes and cables shall be carefully placed with fine material to cover the pipe or cable completely before the normal fill is placed.
- 6.6 Backfilling of trenches/foundations shall be carried out only after the pipe line/structural works within the excavations have been inspected, tested and approved by the Engineer.

Fill shall not be placed against foundation walls prior to approval by the Engineer. Fill shall be brought up evenly on each side of the walls as far as practicable. Heavy equipment for spreading and compacting the fill shall not be operated closer to the wall than a distance equal to the height of

  
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the fill above the wall.

## 7. Tolerances

The stabilization of compacted backfill / fill surface shall be smooth and even and shall not vary more than 3/8 inch in 10 feet from true profile and shall not be more than 1/2 inch from true elevation.

## 8. Disposal of Surplus Excavated Material

8.1 The rejected unsuitable material and surplus excavated material shall be disposed off at designated place or as directed by the Engineer. No compensation of any lead/lift is admissible and rates quoted shall be deemed to include the same.

8.2 The disposal of surplus/unsuitable excavated material shall include loading, unloading, transporting, stacking, spreading and leveling as directed by the Engineer.

## 9. Measurement and Payment

### 9.1 General

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

9.1.1 Timber shoring, planking, strutting and providing slope for upholding the sides of excavations.

9.1.2 Any fill with approved material necessitated by over excavation due to fault or convenience of the Constructor except under structural members.

9.1.3 Stockpiling the excavated material at approved location within free haulage limit of the Project Boundary and transporting back suitable material to places requiring fill or backfill.

9.1.4 Specified foundation bed preparation.

9.1.5 Excavation involved in providing adequate working space around sides of foundation and service line trenches.

9.1.6 Providing approved quality fill/backfill material obtained from excavated material as designated by the Engineer.

9.1.7 Rolling, leveling, watering & compacting the fill and backfill to required density.

9.1.8 All laboratory and field tests stipulated in these specifications.

9.1.9 Disposal of rejected surplus and unsuitable excavated material at designated place or as directed by the Engineer. No compensation of any lead/lift is admissible and rates quoted shall be deemed to include the same.

9.1.10 De-watering to keep the foundations dry during construction.

9.1.11 All cost inclusive of borrow area's royalty charges



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9.1.12 Testing of Sub-grade material equal to or greater than CBR value 05%

9.1.13 Providing and testing of sweet earth.

## 9.2 Excavation

### 9.2.1 Measurement

Quantities of excavation shall be, circulated / measured from the pre-work levels of leveled and graded ground taken jointly by the Constructor and the Engineer before commencement of the work.

The quantities set out for excavation and its subsequent disposal shall be deemed to be the bulk quantity before excavating and no allowance shall be made for any subsequent variations in bulk or for any extra excavation.

Unless otherwise shown on the Drawings quantities of excavation shall be measured of acceptably completed works on the basis of vertical excavations required in accordance with lines of concrete.

Quantities of excavation for laying service line trenches shall be measured for payment on the basis of vertical excavation faces for the specified width for the trench as shown on the drawings.

Measurement for acceptably completed excavation works shall be made on the basis of number of cubic feet of material excavated for foundation and service trenches as shown on the Drawings or as directed by the Engineer.

### 9.2.2 Payment

Payment will be made for acceptably measured quantity of excavation on the basis of unit rate per cubic feet quoted in the Bills of Quantities and shall constitute full compensation for all the works related to the item, including but not limiting to back filling.

## 9.3 Backfill/Fills

### 9.3.1 Measurement

Measurement for acceptably completed backfill/fill works will be made on the basis of number of cubic feet of compacted back fill / fill in position in accordance with the lines, levels and grade as shown on Drawings or as directed by the Engineer.

### 9.3.2 Payment

Payment will be made for acceptably measured quantity of backfill/fill on the basis of unit rate per cubic feet quoted in the Bills of Quantities and shall constitute full compensation for all the works related to the item.



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## SECTION – 7 FORM WORK

### 1. Scope

The work under this section of the Specifications consists of furnishing all plant, labor, equipment, appliances and materials and in performing all operations in any floor and roof and floor and at any height in connection with the supply and installation of formwork for the purpose of shuttering in concreting work, complete in strict accordance with this section of the specifications and the applicable drawings and subject to the terms and conditions of the Contract. The works include all formwork required at any floor and at any height required for the completion of the work as per drawings/specifications.

### 2. General

It shall be the responsibility of the Constructor to perform the work by engaging well-trained & experienced staff or by the sub-Constructor who shall have enough number of well-trained and experienced staff to coordinate his activities with the other operations. However the Constructor shall be responsible for the quality of work performed by the sub-Constructor -as per the requirements of these specifications.

### 3. Materials

The Constructor shall use the following formwork materials for different purposes as stated below:

#### 3.1 Timber

Form framing, sheathing and shoring.

#### 3.2 Plywood

Form sheathing and panels.

#### 3.3 Steel

Heavy forms and false Work Column and joint forms Permanent forms  
Welding of permanent forms

#### 3.4 Form Ties Anchors and Hangers

For securing formwork against. placing loads and pressures.

#### 3.5 Coatings

To facilitate form removal.

#### 3.6 Steel Joists

For formwork support.

#### 3.7 Steel frame shoring

For formwork support.

### 4. Delivery And Storage

#### 4.1 Delivery

The delivery of formwork materials shall be done in such a manner that damage can be prevented.

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#### 4.2 Storage

Formwork should be stored, after cleaning and preparing for re-use if used before, in such a manner that access to all different materials is available.

Material which can be affected by weathering shall be stored in appropriate building or under covers and shade.

#### 5. Workmanship

- 5.1 Forms shall have sufficient strength to withstand the pressure resulting from placement and vibration of the concrete and shall have sufficient rigidity to maintain specified tolerances.

Where required details and locations of special forms to be used are set out on the drawings. The Engineer shall refuse any formwork in any part of the building, which has been constructed with a non-approved formwork. The Engineer shall refuse any concreting which will not be perfect or may not conform to the approved model.

- 5.2 Earth cuts shall not be used as forms for vertical surfaces of reinforced concrete work unless required as such or permitted by the Engineer.

- 5.3 Mud centering shall not be permitted without the prior approval of the Engineer.

- 5.4 Formwork shall be of wrought timber steel, plywood, proprietary building boards and such special materials, as may be shown on the drawings or approved by the Engineer, which give the required finish to the surface of concrete. Wooden formwork shall be free from loose knots and shall be well seasoned.

The responsibility of the safe design of the formwork shall be entirely that of the Constructor.

- a) No wooden props, bamboo, ballies etc., shall be used as supports to beams or roofs and floors. Only steel pipe scaffoldings (tubular) to be used for all works.
- b) Formwork (As per specification) shall be allowed to be used in columns, roofs and floors and beams etc.
- c) Only wooden planks of approved quality and thickness of 2 inches minimum on the sides of beams shall be allowed.
- d) All the erected formwork shall be inspected and approved in all respects by the Engineer or his representative prior to concreting.
- e) Where concrete will be exposed to view, special care shall be taken in the selection of the form material and the construction of the forms, to the end that the concrete will be smooth, uniform in texture, true in line and face and free from honey-combing and other projections. All sides and joints on the forms shall be flush (without lipping) and inconspicuous, wood used for such work shall be thoroughly cleaned before each reuse and shall be free from cracks, splinters, nails, or other defects effecting the appearance of the concrete.



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- 5.5 The formwork shall conform to the shape, lines and dimensions 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 Constructor. 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. The Constructor shall establish and maintain in an undisturbed conditioned until final completion and acceptance of the project, sufficient control points and benchmarks to be used as references for checking upon tolerances.
- 5.6 Forms for architectural concrete shall be designed to produce the required finish or finishes. Deflection of facing materials between studs as well as deflection of studs and wailers shall be limited to 0.0025 times the span or as otherwise specified. Forms shall be designed to permit easy removal. Prying against the face of the concrete shall not be allowed. Only wooden wedges shall be used.
- 5.7 Where natural plywood-form-finish, grout-cleaned-finish, smooth-rubbed-finish, scrubbed-finish or sand-floated-finish is required, forms shall be smooth (faced with plywood, liner sheets, or pre-fabricated panels) and true to line, in order that the surfaces produced will require little dressing to arrive at true surfaces. -Where any as-cast finish is required, no dressing shall be permitted in the finishing operation.
- 5.8 Whereas-cast surfaces, including natural plywood-form-finish are specified, the panels of material against which concrete is cast shall be orderly in arrangement, with joints between panels planned in approved relation to openings, building corners, and other architectural features.
- 5.9 Where panels for as-cast surfaces are separated by recessed or otherwise emphasized joints, the structural design of the forms shall provide for locating form ties, where possible, within the joints so that patches of tie holes will not fall within the panel areas.
- 5.10 Forms shall not be re-used if there is any evidence of surface wear and tear or defect, which would impair the quality of the surface finish. Forms shall be thoroughly cleaned and properly coated with form oil before re-use.
- 5.11 The formwork shall be designed so that the soffits of slabs and sides of beams, columns and walls may be removed first, leaving the forms to the soffits of beams and their supports in position.
- 5.12 Forms shall be sufficiently tight to prevent loss of mortar from the concrete. Unless otherwise specified in the Contract Documents chamfer strips shall be placed in the corners of forms to produce beveled edges on permanently exposed surfaces. Interior corners on such surfaces and the edges of formed joints will not require beveling unless required by the Contract Documents.
- 5.13 Positive means such as wedges or jacks for accurate adjustment and for proper removal of shores and struts shall be provided and all settlement shall be monitored during concrete placing operation. Forms shall be securely braced against lateral deflections.

  
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- 5.14 Where concreting of thin members is required to be carried out within formwork of considerable depth, temporary openings in the sides of the formwork shall be provided where necessary to facilitate the placing and consolidation of concrete. Small temporary openings shall also be provided at the bottom of the formwork for columns, walls and deep beams to permit the cleaning out of debris and observation immediately before concrete is deposited.
- 5.15 Form ties shall be constructed so that the ends or end fasteners can be removed without causing appreciable spalling at the faces of the concrete. After the ends or end fasteners of form ties have been removed, the embedded portion of the ties shall terminate not less than 2 diameter or twice the minimum dimension of the tie from the formed faces of concrete to be permanently exposed to view except that in no case shall this distance be less than 3/4 inch. When the formed face of the concrete is not to be permanently exposed to view, form ties may be cut off flush with the formed surfaces. Precaution shall be taken not to rotate form ties. Through bolts may be permitted provided that they are greased to allow for easy withdrawal and the holes subsequently made good. Through bolts are not to be used on water-retaining structures and basement walls.
- 5.16 At construction joints contact surface of the form sheathing for flush surfaces exposed to view shall overlap the hardened concrete in the previous placement by no less than 1. Inch. The forms shall be held against the hardened concrete to prevent offsets or loss of mortar at the construction joint so as to maintain a true surface.
- 5.17 Wood forms for wall opening shall be constructed to facilitate loosening, if necessary to counteract swelling of the forms.
- 5.18 Wedges used for final adjustment of the forms prior to concrete placement shall be fastened in position after the final check.
- 5.19 Formwork shall be so anchored to shores or to other supporting surfaces or members that upward or lateral movement of any part of the formwork system during concrete placement will not occur.
- 5.20 Runways or planks for moving labour and equipment shall be provided with struts or legs and shall be supported directly on the formwork or upon the structural member without resting on the reinforcing steel.
- 5.21 All surfaces of forms and embedded materials shall be cleaned of any accumulated mortar or grout from previous concreting and of all other foreign material before placing fresh concrete.

Forms shall be sufficiently tight to prevent leakage of grout or cement paste. Board forms having joints opened by shrinkage of the wood shall be removed and replaced. Plywood and other wood surfaces not subject to shrinkage shall be sealed against absorption of moisture from the concrete by either:

1. A field applied, approved form oil or sealer, or
2. A factory applied non-absorptive liner .

When forms are coated to prevent bond with concrete, it shall be done prior to placing of the reinforcing steel. Excess coating material shall not be allowed to stand in puddles in the forms nor allowed to come in contact

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with the concrete against which fresh concrete will be placed. Care shall be taken that such approved composition is kept out of contact with the reinforcement. Whereas-cast finishes are required, materials, which will impart a stain to the concrete shall not be applied to the form surfaces. Where the finished surface is required to be painted, the material applied to form surfaces shall be compatible with the type of paint to be used.

- 5.22 For reinforced concrete, in no circumstances shall forms be struck until the concrete attains 75% of ultimate strength.

The strength referred to shall be that of concrete using the same cement and aggregates, with the same proportions, and cured under conditions of temperature and moisture similar to those obtaining in the work. Where possible, the formwork should be left for longer time as it would assist the curing.

In normal circumstances (generally where temperatures are above 20° C and where ordinary cement is used, forms may be struck after expiry of the following periods. Walls, columns and vertical sides of beams. 48 hours or as may be decided by the Engineer.

Side of slab (shores of props left under)	7 days.
Beams soffits (shores or props left under)	14 days.

**Removal of shores or props to slabs.**

Spanning up to 12 feet.	10 days.
Spanning over 12 feet.	17 days.

**Removal of shores or props to beams.**

Spanning up to 18 feet.	18 days
Spanning over 18 feet.	21 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 a minimum of 48 hours.

The number of shores or props, their sizes and disposition shall be such as to be able to safely carry the full dead load of the slab and beams, as the case may be.

Proper allowance shall be made for the decrease in rate of hardening of concrete in cold weather and the above minimum duration must be increased when the mean daily temperature is below 20° C.

- 5.23 When repair of surface defects or finishing is required at an early age, forms shall be removed as soon as the concrete has hardened sufficiently to resist damage from removal operations.

- 5.24 Top forms on sloping surfaces of concrete shall be removed as soon as the concrete has attained sufficient stiffness to prevent sagging. Any needed

  
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repairs or treatment required on such sloping surfaces shall be performed at once and be followed by the specified curing.

- 5.25 Wood forms for wall openings shall be removed as soon as this can be accomplished without damage to the concrete.
- 5.26 All formwork shall be removed without such shock or vibration as would damage the reinforced concrete. Before the top plank and struts are removed, the concrete surface shall be exposed where necessary in order to ascertain that the concrete has sufficiently hardened. Proper precautions shall be taken to allow for the decrease in the rate of hardening that occurs with all cement in the cold weather.
- 5.27 When reshoring or repropping is permitted or required, the operations shall be planned in advance and shall be subject to approval. While reshoring is underway no live load shall be permitted on the new construction. In no case during reshoring shall concrete in beam, slab, columns or any other structural member be subjected to combined dead and construction loads in excess of the load permitted by the Engineer for the developed concrete strength at the time of reshoring.
- Reshores shall be placed as soon as practicable after stripping operations are complete but in no case later than the end of working day on which stripping occurs.
- Reshores shall be tightened to carry their required loads without overstressing the construction. Reshores shall remain in place at least until tests representative of the concrete being supported have reached the strength specified in sub-clause 5.23 hereof.
- 5.28 Floors supporting props or shores under newly placed concrete shall have their original supporting props or shores left in place or shall be reshored. The reshoring system shall have a capacity sufficient to resist the anticipated loads and in all cases shall have a capacity equal to at least one half the capacity of the shoring system above. The reshores shall be located directly under a shore position above unless other locations are permitted.
- The reshoring or re-propping shall extend over a sufficient number of storey's to distribute the weight of newly placed concrete, forms, and construction live loads in such a manner that the design superimposed loads of the floors supporting shores or props are not exceeded.
- 5.29 It is generally desirable to give forms for reinforced concrete an upward camber to ensure that the beams or slabs (specially cantilever slabs) do not have a sag when they have taken up their deflection, but this should not be done unless permitted by the Engineer.
- 5.30 No loads, other than man and light plant required in connection with the actual work in hand, shall be allowed on suspended floors until 28 days after concreting where ordinary Portland Cement is used and 14 days when rapid hardening Portland Cement is used.
- 5.31 Prior to placing concrete, all forms shall be inspected and all debris and extraneous matter removed. The form oil or release agent shall not react with concrete to affect the strength nor shall it give any color.



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**6. Measurement and Payment**

No payment will be made for the works involved within the scope of this section of the specifications unless otherwise specifically stated in the Bills of Quantities or herein.

The cost thereof shall be deemed to have been included in the quoted unit rate of relevant items of the Bills of Quantities.



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**The Benazir Bhutto Shaheed**  
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Khairpur Mirs

## SECTION – 8 REINFORCEMENT

### 1. Scope

The work under this section of specifications consists of furnishing, cutting, fabricating, bending and placing steel reinforcement in concrete structures or elsewhere as shown on the drawings or as directed by the Engineer. The scope of this section of specification is covered with detailed specifications as laid down herein.

### 2. Applicable Standards

Latest editions of the following Pakistan, British and ASTM Standards are relevant to these specifications wherever applicable.

#### British Standard

- B.S 4449 Carbon steel bars for the reinforcement of concrete.  
B.S 4466 Specifications for bending dimensions and scheduling of bars for the reinforcement of concrete.

#### ACI Standard

- ACI 315 Details and detailing of concrete reinforcement.  
ACI 318 Building Code Requirements for Reinforced Concrete and commentary.

#### ASTM Standard

- A 82 Cold - Drawn steel wire for concrete reinforcement.  
A 305 Minimum requirement for the deformations of deformed steel bars for concrete reinforcement.  
A 615 Deformed Billet Steel Bars concrete Reinforcement.

In addition to the above, the latest editions of other Pakistan Standards, British standards, American Concrete Institute Standards, American Society for Testing and Materials Standards and other standard as may be specified by the Engineer for Special Material and construction are also relevant.

### 3. Material

- 3.1 Unless otherwise specified, all steel bars for reinforcement of concrete shall be conforming to ASTM A615, Grade 60 deformed hot rolled billet steel bars with minimum yield strength of 60,000 Psi (414Mpa).  
3.2 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 bond.

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#### 4. Compliance With Specifications

The Constructor shall submit certificates of compliance from the manufacturer stating that the supplied reinforcement conforms to the specifications. In addition, wherever and as directed by the Engineer, conformance of the supplied reinforcing bars with the specifications shall be demonstrated by the Constructor through laboratory tests, in accordance with the relevant standards.

#### 5. Delivery & Storage

##### 5.1 Delivery

Steel reinforcement bars shall be kept in bundles firmly secured and tagged. Each bar or bundle of bars shall be identified by marks as per relevant BS standards.

##### 5.2 Storage

The method of storage shall be approved by the Engineer. Reinforcing bars shall, be stored in racks or platforms above the surface of ground and shall be protected against scaling, rusting, oiling, coatings, damage, contamination and structural defects prior to placement in works. Bars of different diameters and grades shall be so labeled and kept separately.

#### 6. Bar Bending Schedules

The Constructor shall prepare bar bending schedules of all the reinforcing steel bars and these bar bending schedules shall be submitted to the Engineer for his approval. The Constructor shall obtain approval of the bar bending schedules before starting actual bar bending works.

The Engineer's approval, however, will not relieve the Constructor of his responsibility in this regard.

#### 7. Fabricating, Bending & Placing

7.1 Reinforcement is to be accurately placed as shown in the drawings, and secured against displacement by using 16 gauge G.I 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.

Where the concrete surface will be exposed to the weather in the finished structure, the portions of all accessories in contact with the form work shall be galvanized or shall be made of plastic.

7.2 Bars used for concrete reinforcement shall be fabricated in accordance with the dimensions shown in the bar bending schedule approved by the Engineer.

7.3 The cutting tolerance for all bars shall be + 25 mm

7.4 Fabrication tolerances shall be as per ACI-315

7.5 Placing tolerances shall be as per ACI-318 & 317.

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- 7.6 Bars may be moved as necessary to avoid interference with other reinforcing steel, conduits, or embedded items. If bars are moved more than one bar diameter or enough to exceed the above tolerances, the resulting arrangement of bars shall be subject to approval of Engineer.
- 7.7 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 columns dowels.
- 7.8 Reinforcement shall not be bent or straightened in a manner that will injure the material. No bars shall be bent twice in the same place, nor shall they be straightened after bending. Unless permitted by Engineer, reinforcement shall not be bent after being partially embedded in hardened concrete.
- 7.9 No splice of reinforcement shall be made, except as shown on the working drawings.
- 7.10 Welding of reinforcement shall not be done unless permitted and approved by the Engineer.
- 7.11 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 part is to be built into later concrete.
- 7.12 No concreting is to be carried out until the reinforcement has been checked and approved by the Engineer.
- 7.13 All detailing shall be done as per ACI-315, ACI-318 and ACI-350R, as and where required.
- 7.14 Standard or actual weight whichever is lesser shall be used for calculation of weight.

## 8. Measurement & Payment

### 8.1 General

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

8.1.1 Providing and installing chairs, supports, hooks, hangars, spacers, binding wires, corrosion protection and laps not shown on Drawings including wastage and rolling margin.

8.1.2 Testing of mild and deformed steel bars.

### 8.2 Reinforcing Bars

#### 8.2.1 Measurement

Measurement for acceptably completed works of reinforcement bars shall be made by weight according to bar bending schedules approved by the Engineer.



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### 8.2.2 Payment

Payment will be made for access table measured quantity of reinforcement on the basis of unit rate per metric ton quoted in the Bill of Quantities and shall constitute full compensation for all the works related to the item.



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## SECTION – 9 PLAIN AND REINFORCED CONCRETE

### 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 the supply, and installation of plain and reinforced concrete work complete in any floor and at any height as per drawings except where specifically stated in the relevant item of Bill of Quantities, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the Contract. The scope of this section of specification is covered with detailed specifications as laid down herein.

### 2. General

- 2.1 Full co-operation shall be given to trades like electrical, mechanical and other services.
- 2.2 Suitable templates or instructions or both shall be provided for setting out items not placed in the forms. Embedded items and other materials for mechanical and electrical operations shall have been completed, inspected, tested and approved before concrete is placed.
- 2.3 For special concrete finish and for special methods of construction (e.g. slip forms), formwork shop drawings shall be designed and prepared by the Constructor, at his own cost. Approval of shop drawings as well as that of actual samples of concrete finish shall be obtained before work is commenced.

### 3. Applicable Standards

Latest editions of the following Pakistan, British and ASTM Standards are relevant to these specifications wherever applicable.

#### 3.1 Pakistan Standards

PS 177 PS 232 PS 243 PS 279	Compaction proctor test. Portland Cement (ordinary & rapid hardening). Natural aggregates for concrete.
PS 280	Abrasion of coarse aggregates by the use of Los Angeles machine
PS 281	Determination of aggregate/crushing value.
PS 282	Organic impurities in sand for concrete aggregates.
PS 283	Material finer than No. 200 B.S. test sieve in aggregates, method of test for. Soundness test for aggregates by the use of sodium sulphate or magnesium sulphate. Sampling aggregates for concrete.
PS 284	Sampling aggregates for concrete.

  
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PS 285	Sieve or screen analysis of fine and coarse aggregates. Description and classification of mineral aggregates. Sampling fresh concrete.
PS 286	Sampling fresh concrete.
PS 421	Slump test for concrete.
PS 422 PS 560	Making and curing concrete compression test specimen in the field. Sulphate-resistant Portland cement type 'A' and sampling fresh concrete in the laboratory.
PS 612	Mixing and sampling fresh concrete in the laboratory.
PS 716	Compacting factor test for concrete.
PS 717	Definitions and terminology of cements.
PS 746 PS 849	Making and curing concrete compression test cubes.

### 3.2 ASTM (American Society for Testing and Materials)

#### B 370 C 33 Copper sheet and strip for building construction. Concrete Aggregates.

C40	Organic impurities in sand for concrete.
C87	Effect of organic impurities in fine aggregates on of mortar. Soundness of aggregates. Ready mixed Concrete.
C88	Compressive strength of hydraulic cement mortars.
C94	Material finer than NO.200 (0.075mm) sieve. Light-weight pieces in aggregates.
C109	Concrete and concrete aggregates.
C117	Specific gravity and absorption of coarse aggregate.
C123	Specific gravity and absorption of fine aggregate.
C125	Resistance to abrasion of small size coarse aggregates.
C127	Sieve or screen analysis of fine and coarse aggregate. Clay lumps and friable particles in aggregates.
C131	Slump of Portland Cement Concrete.
C136	Aggregate for masonry mortar.
C142	Portland Cement.
C143	Water retention by concrete cunng material
C144	Sheet material for curing concrete.
C150	Air content or hydraulic cement mortar.
C156	Density of hydraulic cement.
C171	Time of setting of hydraulic cement by vicat needle.
C185	Air entraining admixtures for concrete.
C188	Potential reactivity of aggregate.
C191	Liquid membrane-forming compounds for curing concrete.
C260	Lightweight aggregates for structural concrete.
C289	Lightweight aggregates for concrete masonry.
C309	Lightweight aggregates for insulating concrete.
C330	Chemical admixtures for concrete.
C331	Resistance to abrasion of large size coarse aggregates.
C494	Unit weight of structural lightweight concrete.

  
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C535	Aggregate sampling.
C567	Preformed expansion joint filler for concrete.
D75	Concrete joint sealer (hot poured elastic type).
D994	Preformed expansion joint filler for concrete paving and structural construction.
D1190	
D1751	Preformed sponge rubber and cork expansion joint fillers for concrete paving and structural construction.
D1752	
D1850	Concrete joint sealer (cold application type).
E11	Wire cloth sleeves for testing purposes.
E96	Water vapor transmission of materials in sheet form.
E154	Materials for use as vapor barrier under concrete slabs.
E337	Relative humidity by wet and dry bulk psychomotor.

### 3.3 ACI (American Concrete Institute)

- 3.3.1 Recommended practice for selecting proportions for normal and heavy weight concrete.
- 214 Recommended practice for evaluation of strength test result of concrete
- 301 Specifications for structural concrete for buildings.
- 304 Recommended practice for measuring, mixing, transporting and placing concrete.
- 305 Hot weather concreting.
- 308 Recommended practice for curing concrete.
- 309 Recommended practice for consolidation of concrete.
- 318 Building code requirements for reinforced concrete.
- 347 Recommended practice for concrete for work.
- 512 Precast structural concrete in building.
- 517 Low pressure steam curing.
- 533 Fabrication, handling and erection of Precast concrete wall panels.

### 3.4 British Standards

BS 12 BS	Portland cement, ordinary and rapid hardening.
410	Test Sieves.
BS 812 BS 882	Methods for the sampling and ~sting of mineral aggregates, sands and fillers.
BS 1305	Coarse and fine aggregates from natural sources.
BS 1881	Batch Mixer.
BS 3148	Methods of testing and sampling concrete.
BS 3837	Tests for water for making concrete.
BS 5328	Expanded polystyrene boards.
BS 3869	Structural Concrete.
BS 3927	Rigid expanded polyvinyl chloride for thermal insulation.
BS 4027	Phenolic foam materials for thermal insulation and



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BS 8110	building applications. Sulphate-resisting Portland cement.
CP 114	Structural use of concrete.
CP 116	Structural use of reinforced concrete in buildings.
CP 5337	Structural use of Precast concrete.
	The structural use of concrete for retaining aqueous liquids

In addition, the latest editions of other Pakistan and British Standards, American Concrete Institute Standards, American Society for Testing and Materials Standards and other Standards as may be specified by the Engineer for special Materials and Construction are also relevant.

#### 4. Materials

##### 4.1 Aggregates

- 4.1.1 The sources of supply of all fine and coarse aggregates shall be subject to the approval of the Engineer.
- 4.1.2 All fine and coarse aggregates shall be clean and free from clay, loam, silt and other deleterious matter. If required, the Engineer reserves the right to have them washed by the Constructor at no additional expense. Coarse and fine aggregates shall be delivered and stored separately at site. Aggregates shall not be stored on muddy ground or where they are likely to become dirty or contaminated.
- 4.1.3 Fine aggregate shall be hard coarse sand, crushed stone or gravel screenings shall conform to requirements of PS 243 and/or BS 882 and/or ASTM C 33. Only fine aggregate of grading zones 1 to 3 (BS 882) shall be used.
- 4.1.4 Coarse aggregate shall be gravel or crush stone of hard, durable material free laminated structure and conforming PS 243 and/or BS 882 and/or ASTM C 33 graded as follows for use in mass concrete as in foundations:

Total Pressure B.S.Sieve	Percent by weight
3 inc. (76.2mm)	100
1.5 inc. (38.10mm)	95-100
0.75 inc. (19.05mm)	30-70
0.38 inc. (9.52mm)	10-35
0.19 inc. (4.76mm)	0-5

Coarse aggregate for all cast-in-place concrete other than mass concrete as for foundations shall be graded with the following limits:

Total Passing B.S. Sieve	Percent by weight
1.5 in. (38.10 mm)	100
0.75 in. (19.05 mm)	95-100

- 4.1.5 Wherever feasible, the nominal maximum size of aggregate for cast- in- place reinforced concrete slabs and other members shall

  
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be 3/4 inch. If there are difficulties in placing such a concrete the maximum size may be restricted to 1/2 inch provided the requirements for strength are satisfied. The grading requirements of 1/2 inch or 3/8 inch down aggregate shall be agreed to with the Engineer as per relevant ASTM/BS standards.

4.1.6 The nominal maximum size of the aggregate for Precast concrete shall not be larger than one fifth of the narrowest dimension between sides of forms, or one-third of the depth of slabs or 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.

4.1.7 Coarse aggregates in Precast concrete of normal weight may be of one maximum size for all concrete placed in 1 day when quantities to be placed are too small to permit economical use of more than one mix design.

When a single mix design is so used, the maximum nominal size shall be as required for the most critical condition of concreting, in accordance with the requirements of clause (4.1.6) above.

4.1.8 Except where it can be shown to the satisfaction of the Engineer that a supply of properly graded aggregate of uniform quality can be maintained over the period of the work, the grading of the aggregates shall be controlled by obtaining the 3/4" maximum nominal size, the different sizes being stocked in separate stock piles and recombined in the correct proportion for each batch at the batching plant. The materials shall be stock-piled for a period before use so as to drain nearly to constant moisture content (as long as site and other conditions permit, preferably for at least a day). The grading of the coarse and fine aggregates shall be tested at least once for every 100 tons supplied, to ensure that the grading is uniform and same as that of the samples used in the preliminary tests.

4.1.9 For use in fire proof concrete, the aggregates shall be fire clay and semi-acidic fine ground. The use of broken fire clay bricks as coarse aggregate and waste of semi-acidic refractory particles as fine aggregate can be allowed.

## 4.2 Cement

4.2.1 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.

Ordinary or Rapid Hardening Portland cement complying with the requirements of PS 232 or BS 12 or ASTM C 150.

Sulphate Resisting Portland/Cement complying with the requirements of PS 612 or BS 4027 or ASTM C 150.

4.2.2 Unless otherwise specified, ordinary Portland Cement complying with the requirements of BS 12 shall be used.

4.2.3 For all fair faced concrete it will be necessary to use approved

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cement with a view to obtain light shade concrete as approved by the Engineer.

- 4.2.4 The Constructor shall supply to the Engineer at fortnightly intervals, test certificates with the appropriate standard in respect of the samples of cement from the work-site. These tests shall be carried out in a laboratory approved by the Engineer.
- 4.2.5 Only one brand of each type of cement shall be used for concrete in any individual member of the structure. Cement shall be used in the sequence of receipt of shipment, unless otherwise directed.
- 4.2.6 There shall be sufficient cement at site to ensure that each section of work is completed without interruption.
- 4.2.7 Cement reclaimed from cleaning of bags or from leaky containers shall not be used.
- 4.2.8 The Constructor shall provide and erect (at his cost) a suitable plain, dry, well ventilated, weatherproof and water proof shed of sufficient capacity to store the cement.
- 4.2.9 Cement shall be used as soon as possible after delivery and cement which the
- 4.2.10 Engineer considers 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 Constructor's expense. Any cement in containers damaged so as to allow the contents to spill or permitting access of the atmosphere prior to opening of the container at the time of concrete mixing shall be rejected and removed immediately from the site at the Constructor's expense.
- 4.2.11 The mixing together of different types of cement will not be permitted.

#### 4.3 Water

Only clean water from the city supply, tube well installed at the site or from other sources approved by the Engineer shall be used. The Constructor shall supply sufficient water for all purposes, including mixing the concrete, curing, and cleaning plant and tools. Where doubt exists as to the suitability of the water, it shall be tested in accordance with BS 3148. Where water can be shown to contain any sugar or an excess of acid, alkali or salt, the Engineer may refuse to permit its use.

In case of doubt, the Engineer may require that concrete mixed with water proposed to be used should not have a compressive strength lower than 90 percent of the strength of concrete mixed with distilled water.

#### 4.4 Additive

All additives such as foaming and water proofing agents shall be from a manufacturer approved by the Engineer.

Air Entraining Admixtures shall conform to APM C 260. Other Admixtures shall conform to ASTM C494.



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## 5. Nominal Concrete Mixes

### 5.1 Proportions of Mix

#### 5.1.1 Cement and aggregates:

Cement, fine aggregate and the coarse aggregate shall be weighed separately. The proportions of cement to fine aggregate and coarse aggregate shall be adjusted so as to provide the concrete of the required crushing strength when tested as set out in Table 1.

5.1.2 The Constructor shall regulate and arrange mixing of the ingredients for the designed mix of the concrete by weight batching. The cost of designing the mix shall be borne by the Constructor.

#### 5.1.3 Water / Cement ratio:

The quantity of water used shall be just sufficient to produce dense concrete of adequate strength and workability for its purpose. For all external work and foundations the water/cement ratio should not exceed 0.55 for concrete Class A, B and C.

#### 5.1.4 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 available means.

'Workability' shall be determined by either the slump or compaction factor tests as directed by the Engineer and these shall be performed in accordance with the methods given in PS 422 to PS 177 or ASTM C 143.

The slump or compaction factor for each class 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. Unless otherwise permitted or specified, the concrete shall be proportioned and produced to have a slump of 3 inch or less for consolidation by vibration. A tolerance of up to 1 inch above- the indicated maximum shall be allowed for individual batches provided the average for all batches or the most recent 10 batches tested, which ever is fewer, does not exceed the maximum limit. Concrete of lower than usual slump may be used provided it is properly placed and consolidated.

### 5.2 Strength requirements for concrete :-

5.2.1 Portland cement concrete when aggregates comply with BS 882.

5.2.2 Concrete made with Portland cement shall comply with the strength Table 1 columns 4&6 (Works Test).

  
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Table 1: Strength requirements for Portland concrete with aggregates complying with BS. 882.

Class Min Cement per of concrete	Min Cube Crushing of Strength at 28 days (psi) (lb)	Min. water per 110 lb. bag of (gallon)	Class Min Cement per of concrete
1	2	3	4
A	30.00	4350	4.40
B	22.00	3750	5.06
C	18.00	3000	5.28
D	13.00	1550	7.05
E	9.50	1000	7.27

Note: Conversion Factors. 1 psi = 0.06897 MPa 1 gal = 4.54 liter

1 lb. = 0.4537 Kg. 1cu.ft. = 0.028 cum.

5.2.3 The strengths given in Table 1 are based on the assumption that average temperature is 20 degree C. Where accurate records of temperature are kept, allowance may be made for change of temperature or the cubes may be tested at the equivalent maturity.

5.2.4 Unless otherwise stated, the types of concrete shall be classified on the basis of compressive strength requirements. The Constructor shall provide Mix design by weight for each class of concrete.

Manufacture 12 test cubes for each 3 mix design batches (6 x 6 x 6) inches in accordance with the Mix design batching by weight and test 3 cubes each at 3,7,14 & 28 days intervals in the presence of Engineer's Representative and submit all relevant data and results of tests for approval of the Engineer. The Constructor shall obtain approval from the Engineer in writing for each Mix design before producing the actual concrete for the Works.

No payments for producing the Mix design, manufacture of test cubes and testing shall be paid. The Constructor shall include this cost in the relevant item of concrete.

### 5.3 Batching

5.3.1 All cement, including cement supplied in bulk, shall be batched by weight. A bag of cement may be taken as weighing 110 lb. with the prior approval of the Engineer.

5.3.2 Aggregates shall be batched by weight, due allowance being made for water content. Aggregates may be batched by volume through conversion of weigh batching, only with the prior permission of the Engineer. The apparatus for weight batching may be an integral part of the mixer or a separate unit of a type approved by the Engineer. It shall be accurate within 2% and shall be checked for accuracy at least once a week.

5.3.3 The quantity of additives i.e. foaming and water proofing agents etc. shall be as prescribed by the manufacturer or as directed by the Engineer.

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5.3.4 Where the batching plant is of the type in which cement and aggregates are weighed in the same compartment, the cement shall be introduced into the compartment between two sizes of aggregates.

5.3.5 Each batch shall be so charged into the mixer that some water will enter in advance of the cement and aggregates. Water shall continue to flow for a period, which may extend to the end of the first 25 percent of the specified mixing time. Controls shall be provided to prevent batched ingredients from entering the mixer before the previous batch has been completely discharged.

#### 5.4 Mixing

The concrete shall be mixed in an approved batch mixer conforming to the requirements of BS 1305. It shall be fitted with the manufacturer's plate stating the rates, capacity and the recommended number of revolutions per minute and shall be operated in accordance therewith. It shall be equipped with a suitable charging mechanism and an accurate water-measuring device. The mixer shall be capable of thoroughly combining the aggregates, cement and water into a uniform mass within the specified mixing time and of discharging the concrete without harmful segregation.

5.4.1 Mixing shall continue for the period recommended by the mixer manufacturer or until there is apparently a uniform distribution of the materials and the mass is uniform in color, whichever period is longer. If it is desired to use a mixing period of less than 1-1/2 minutes, the Engineer's approval shall be obtained in writing.

5.4.2 Controls shall be provided to ensure that the batch cannot be discharged until the required mixing time has elapsed. At least three quarters of the required mixing time shall take place after the last of the mixing water has been added.

5.4.3 The interior of the mixer shall be free of accumulations that will interfere with mixing action. Mixing blades shall be replaced when they have lost 10 percent of their original height.

5.4.4 Concrete shall be mixed only in quantities for immediate use. Concrete which has set shall not be re-tempered, but shall be discarded.

#### 5.5 Transporting:

5.5.1 The concrete shall be transported from the place of mixing to the place of final deposit as rapidly as practicable by means, which will prevent segregation or loss of ingredients. All skip vehicles, or containers used for transporting the concrete shall be thoroughly cleaned.

5.5.2 During hot or cold weather, concrete shall be transported in deep containers, on account of their lower ratios of surface area to mass, which reduces the rate of loss of water, by evaporation during hot weather and loss of heat during cold weather.

#### 5.6 Placing

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- 5.6.1 Before placing of concrete, formwork shall have been completed; water shall have been removed; reinforcement shall have been secured in place; expansion joint material, anchors and other embedded items shall have been kept in position; and the entire preparation shall have been approved by the Engineer.

No concrete is to be placed into the foundation trenches until the ground to receive the same has been examined and approved by the Engineer for this purpose.

- 5.6.2 Concrete shall be deposited continuously, or in layers of such thickness that no concrete will be deposited on concrete, which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. If a section cannot be placed continuously, construction joints shall be located as shown in the Contract Documents or as approved by the Engineer. Placing shall be carried out at such a rate that the concrete which is being integrated with fresh concrete is still plastic. Concrete which has partially hardened shall not be deposited. Temporary spreaders in forms shall be removed when the concrete placing has reached an elevation rendering their services unnecessary. They may remain embedded in the concrete only if made of metal or concrete and if prior approval has been obtained.

- 5.6.3 The actual sequence of construction proposed by the Constructor shall be subject to the Engineer's approval before construction starts on any part of the structure, and this sequence shall not be varied without the Engineer's approval.

- 5.6.4 The concrete after it has been mixed shall be placed as soon as it is practicable. Once the concrete has left the mixer, no more water shall be added, although the concrete may be mixed or agitated to help maintain workability. The concrete shall not be used if, through any cause, the workability of the mix at the time of placing is too low for it to be compacted fully and to an acceptable finish by whatever means available.

The time between mixing and placing should be reduced, if the mix is richer or the initial workability of the mix is lower than normal, or if a rapid hardening cement or an accelerator is used, or if the work is carried out at a high temperature or exposed to a drying atmosphere.

The Constructor shall ensure that the delay between mixing and placing including consolidation does not exceed 45 minutes under any circumstances. Any concrete which does not satisfy this requirement shall be rejected.

- 5.6.5 Concrete shall be deposited as nearly as possible in its final position to avoid segregation due to re handling or flowing. In no circumstances may concrete be railed or made to flow along the forms by the use of vibrators. Concreting shall be carried on as a continuous operation using methods, which shall prevent segregation or loss of ingredients.

- 5.6.6 The free fall of concrete shall not be allowed to exceed 6 feet.

  
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Where it is necessary for the concrete to be lowered more than this depth, it is not to be dropped into its final position, but shall be placed through pipes fed by a hopper. When a pipe is used for placing concrete the lower end shall be kept inside or close to the freshly deposited concrete. The size of the pipe shall be not less than 9 inch in diameter.

- 5.6.7 'Mass-concrete' shall be placed in layers approximately 18 inch thick. Vibrator heads shall extend into the previously placed layer.
- 5.6.8 The workmen carrying concrete to the site, and all other workmen moving about on the reinforcement before the concrete is placed, shall move only along runways or planks placed for the purpose and no person shall be allowed to walk on the reinforcement itself.
- 5.6.9 Prior to the laying of concrete on load bearing masonry walls, bearing plates and at other points, as may be directed by the Engineer, the surface will be brought to a true, hard and smooth level surface using cement sand mortar in the ratio of 1 volume of cement to 3 volumes of sand. Two layers of building paper weighing .082 lb./will then be laid flat to separate the concrete from the surface on which it is to be laid.

## 5.7 Construction Joints

- 5.7.1 Concreting shall be carried out continuously up to construction joints, the position and arrangement of which shall be predetermined by the Engineer.
- 5.7.2 Joints not shown on the drawings shall be so made and located as to least impair the strength of the structure and shall need prior approval of the Engineer. In general, they shall be located near the middle of the spans of slabs and beams unless a secondary beam intersects a main beam at this point, in which case the joint in the main beam shall be offset a distance equal to twice the width of the secondary beam. Joints in walls and columns shall be at the underside of floors, slabs or beams and at the top of footings or floor slabs. Beams, brackets, columns capitals, haunches and drop panels shall be placed at the same time as slabs. Joints shall be perpendicular to the main reinforcement.
- 5.7.3 All reinforcing steel shall be continued across joints. Keys and inclined dowels shall be provided as directed by the Engineer. Longitudinal keys at least 1-1/2 inches deep shall be provided in all joints in walls and between walls and slabs or footings.
- 5.7.4 When the work has to be resumed; on a surface which has hardened, such surface shall be roughened in an approved manner which will expose the aggregate uniformly and will not leave laitance, loosened particles of aggregate or damaged concrete at the surface.
- 5.7.5 The hardened concrete of construction joints and of joints between footings and walls or columns, between walls or columns and beams or floors they support, joints in un-exposed walls and all others not mentioned herein shall be dampened (but not saturated) immediately prior to placing of fresh concrete.

  
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- 5.7.6 The hardened concrete of joints in exposed work, joints in the middle of beams, and slabs; and joints in work designed to contain liquids shall be dampened (but not saturated) and then thoroughly covered with a coat of cement grout similar in proportions to the mortar in the concrete. The grout shall be as thick as possible on vertical surfaces and at least 1/2 inch thick on horizontal surfaces. The fresh concrete shall be placed before the grout has attained initial set.
- 5.7.7 Where the concrete has not fully hardened, all laitance shall be removed by scrubbing the wet surface with wire or bristle, and brushed, care being taken to avoid dislodgment of particles of aggregate. The surface shall then be coated with neat cement grout. The first layer of concrete to be placed on this surface shall not exceed 6 inch in thickness, and shall be well rammed against old work, particular attention being paid to corners and closed spots. 5.7.8 Stop ends for movement joints or construction joints shall be made by splitting them along the lines of reinforcement passing through them, so that each portion can be positioned and removed separately without disturbance or shock to the reinforcement or the concrete. Stop ends made of expanded metal or similar material may only be left permanently in' the concrete with prior written approval of the Engineer. Where such stop ends are used, no metal may be left permanently in the concrete closer to the surface of the concrete than the specified cover to the reinforcement.

#### 5.8 Expansion Joints

Expansion joints shall be provided wherever indicated on the Drawings or as directed by the Engineer. In no case shall the reinforcement, corner protection angles, or other embedded' items be permitted to extend continuously through any expansion joint.

All expansion joints shall be carefully placed so as not to be displaced during concreting. The method of placing the expansion joints shall be strictly in accordance with the Drawings and/or as directed by the Engineer. All materials for use in the expansion joints shall have prior approval of the Engineer before placing order for supply.

#### 5.9 Embedded Items


- 5.9.1 The material, design and location of water stops in joints shall be as indicated in the Contract Documents. Each piece of pre molded water stop shall be of maximum practicable length in order that the number of end joints will be held to a minimum. Joints at intersections and at ends of pieces shall be made in the manner most appropriate to the material being used. Joints shall develop effective water-tightness fully equal to that of the continuous water stop material, shall permanently develop not less than 50 percent of the mechanical strength of the parent section and shall permanently retain their flexibility.

- 5.9.2 Electric conduits and other pipes which are planned to be embedded shall not, with their fittings, displace more than four percent of the area of the cross section of a 'column on which

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Stress is calculated or which is required for fire protection. Sleeves, conduits, or other pipes passing through floors, walls, or beams shall be of such size or in such location as not to impair unduly the strength of the construction; such sleeves, conduits, or pipes may be considered as replacing structurally in compression the displaced concrete/ provided that they are not exposed to rusting or other deterioration, are of uncoated or galvanized iron or steel not thinner than standard steel pipe, have a nominal inside diameter not over 2 inch and are spaced not less than three diameters on centers. Except when plans of conduits and pipes are approved by the Engineer, embedded pipes and conduits other than those merely passing through, shall not be larger in outside diameter than one third the thickness of the slab, wall, or beams in which they are embedded nor so located as to impair unduly the strength of the construction. Sleeve pipes, or conduits of any material not harmful to concrete and within the limitations of this section may be embedded in concrete with the approval of the Engineer provided they are not considered to replace the displaced concrete.

- 5.9.3 All sleeves, inserts, anchors, and embedded items required for adjoining work or for its support shall be placed prior to concreting. All Constructor whose work is related to the concrete or must be supported by it shall be given ample notice and opportunity to introduce and/or furnish embedded items before the concrete is placed.
- 5.9.4 Expansion joint material, water stops and other embedded items shall be positioned accurately and supported against displacement. Voids in sleeves, inserts and anchor slots shall be filled temporarily with readily removable material to prevent the entry of concrete into the voids.

## 2.2 Pre-Cast Concrete

Pre-cast concrete units shall be fair faced, cast to the sizes and dimensions as indicated on the Drawings. The concrete used for pre-cast units shall conform to the specifications laid down for cast in situ reinforced cement concrete unless otherwise required and directed by the Consultant/Engineer Incharge.

The Constructor shall be required to submit a sample of pre-cast unit for the approval of the Engineer; all pre-cast units shall strictly conform to the approved sample.

Pre-casting platform of the size and at the location approved by the Engineer shall be constructed. The concrete in one pre-cast unit shall be placed in one operation, in accordance with the details shown on the Drawings.

The material and design of formwork and the method of pre-casting the units shall be approved by the Engineer. The erection/installation and removal of the pre-cast units from the pre-casting platform shall not be permitted until and unless they are properly cured to the satisfaction of the Engineer.



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All pre-cast units shall be smoothly finished to the required lines, grades, angles, etc. Holes, grooves, pockets and hooks shall be provided as shown and/or as directed by the Engineer. The units shall be properly stacked on a platform without causing any cracks and damages. Curing of all the pre-cast units shall be done in accordance with the relevant BS code/approval of the Engineer.

#### **2.2.1 Erecting Pre-cast Units**

All the pre-cast units shall be transported and erected into position in a manner as approved by the Engineer.

The Constructor shall submit his proposal in this regard and obtain approval from the Engineer in advance.

#### **2.2.2 Lifting Beams**

The Constructor shall use lifting beams at his own cost for erecting pre-cast members where the Engineer so directs. Lifting beams shall be supplied and erected by the Constructor, at his own cost, at all points where lifting is necessary for maintaining the plant but is inaccessible to mobile/cranes or, alternatively, covered by overhead traveling cranes. The Constructor, however, is to supply the trolleys and erect them on the lifting beams, and to test operation of installed equipment.

### **3. Cement Concrete Pavements**

For all concrete work relevant specifications of this section shall apply.

#### **3.1 Side Forms and Construction**

Side forms shall be of steel or any other suitable material and of a design as approved by the Engineer.

In general, only materials and methods that have proved their acceptability by past performance will be considered. All form shall be constructed so that they can be removed without hammering or prying against the concrete.

Horizontal joints in the forms will not be permitted. Forms shall be thoroughly cleaned and oiled with linseed/mineral oil shall be given two coats of niter-cellulose lacquer each time they are used.

The forms shall be set on a thoroughly compacted base true to line and level and firmly secured in position by appropriate methods. Conformity with the alignment and levels shown on the Drawings shall be checked as and when required by the Engineer. Where necessary corrections shall be made immediately before placing the concrete; where any form has been disturbed it shall be reset and rechecked.

Pavements shall be constructed in panels of sizes as shown on the Drawings. The panels shall be laid alternately, the adjoining panels being concreted when the side forms are struck and the jointing materials placed, inspected and approved by the Engineer. Each panel is to be concreted in one operation and no interruptions shall be permitted during the operation. The concrete shall be tipped from the trolley slightly in advance of the working place and then shoveled into position. The spreading shall



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be carried out very carefully. Compaction shall be done by means of vibrators compactors of approved surface vibrators. If a vibrators compactor is used, it shall be operated on the concrete and will not be allowed to strike or displace the forms. The spreading and compacting of the successive layers shall proceed without interruptions and as quickly as practicable so as to ensure that the slab is monolithic throughout its depth.

The wearing surface shall be laid while the base concrete is still wet and screeded to line and level. When the initial set takes place the surface shall be troweled smooth with a steel trowel to provide a dense closed surface.

All the joints shall be carefully formed as shown on the Drawings or as directed by the Engineer. The joint filler together with performed groove shall provide complete separation of adjacent slabs. The joints shall all be sealed with bitumen as shown on the Drawings and as directed by the Engineer.

### 3.2 Protection and Curing

#### General Requirements:

Concrete shall be protected adequately from injurious action by sun, rain, flowing water and mechanical injury, and shall not be allowed to dry form the time it is placed until the expiry of the minimum curing periods specified hereinafter. Water curing shall be accomplished by keeping the surface of the concrete continuously wet by covering with water or with approved water saturated covering. Where wood forms are left in place for curing, they shall be kept sufficiently damp at all times to prevent openings at the joints and drying out of the concrete. All portions of the structure shall be kept moist for the full curing periods, specified hereinafter.

When liquid membrane curing compound is used the surface of the concrete shall be protected from traffic or other abrasive action, that may break the membrane, for the full period of curing. The membrane curing compound shall be colorless or light colored and shall be approved by the Engineer and shall comply with ASTM Designation C 309.

#### Curing Periods:

The curing period shall be at least 10 days, or as directed by the Engineer.

#### Removal of Forms:

The Constructor shall exercise great care in avoiding damage to joints, arises, dowel bars etc., while removing the forms. Under no circumstances will the use of pry bars between the forms and pavement be permitted. Side forms shall not be removed until at least 40 hours have elapsed from the time of completing the concreting of the slab, which they contain. In no case shall forms be removed until the concrete has hardened sufficiently to permit removal without damage to the concrete. Concrete work shall be protected from injury resulting from the storage or movement of material during construction.

### 3.3 Finishing

All unformed surfaces shall be finished with a wood float except as otherwise specified. Visible vertical surfaces shall have all projections and



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irregularities removed. The entire surface shall be rubbed if required by the Engineer, with a No. 16 carborundum brick, or other abrasive until even, smooth and of uniform appearance, and shall be shed clean. Plastering of surface, application of cement or other coating will not be permitted.

All exposed corners shall be chamfered, 1"x 1" (2.5 cms x 2.5 cms) unless otherwise mentioned or shown on the plans or directed by the Engineer. Concrete surfaces which will be covered with other materials shall be screeded without floating.

### 3.4 Spreading, finishing and floating of concrete in pavements General Requirements

The striking of, compacting and floating of concrete shall be done by mechanical methods, if approved by the Engineer. Where the Engineer determines that it is impracticable to use mechanical methods, manual methods of spreading, finishing and floating may be used on pavement lines as indicated on the Drawings.

#### Mechanical Methods

The concrete shall be spread uniformly between the forms, immediately after it is placed, by means of an approved spreading machine. The spreader shall be followed by an approved finishing machine equipped with two oscillating or reciprocating screeds. The spreading machine or the finishing machine shall be equipped with vibrating equipment that will vibrate the concrete for the full paving width. internal vibrators shall be used adjacent to the longitudinal edge of the pavement. These vibrators shall be attached to the rear of the spreading machine or to the finishing machine. Vibrators shall not rest on new pavements or side forms or in contact with any dowel bars and the arrangement of power supply to the vibrators shall be such that when the motion of machine is stopped, vibration shall cease. The rate of Vibration shall be not less than 8000 vibrations per minute. The concrete shall be spread to full width before being struck of and compacted so that the surface will conform to the finished grade and cross-section as shown on the plans and at the same time leave sufficient material for the floating operation. The spreading & finishing machine shall move over the pavement as many times and at such intervals as may be required by the Engineer to ensure thorough compaction.

Except as otherwise specified, after the pavement has been struck of and compacted, it shall be finished with an approved longitudinal float. The Constructor may use a longitudinal float composed of one or more cutting and smoothing floats suspended from and guided by rigid frame. The frame shall be carried by four or more visible wheels riding on and constantly in contact with the forms.

The Constructor may use a longitudinal float which works with a sawing motion, while held in a floating position parallel to the road centre line and passing gradually from one side of the pavement to the other. Movements ahead, along the centre line of the road, shall be in successive advances of not more than half the length of the float.

Instead of using other type of longitudinal float a single machine, which will affect satisfactory compaction, finishing and floating may be used. This

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machine may be towed by a spreading machine. This combination, finishing floating machine shall be equipped with screeds and vibrators as hereinafter specified for spreading and finishing machine. Floating shall be accomplished by means of a non-oscillating float held in a suspended position from the frame.

If any spreading, finishing and floating equipment is not maintained in full working order or if the equipment as used by the Constructor proves inadequate to obtain the results prescribed, such equipment shall be improved or satisfactory equipment substituted or added at the direction of the Engineer.

### Manual Methods

When striking-off and compacting by manual methods is permitted, the concrete shall be leveled and then struck-off to such an elevation that, when properly compacted, the surface will conform to the required grade and cross-section. The strike board shall be moved forward with a combined longitudinal and transverse motion, the manipulation being such that neither end is raised from the side forms during the process. While striking off, a slight excess of concrete shall be kept in front of the cutting edge at all times. Prior to tamping, the concrete along the forms shall be thoroughly spaded or vibrated. The entire area of pavement shall be tamped or vibrated in a manner that will ensure maximum compaction. The concrete shall be brought to the required grade and shape by the use of a tamper consisting of a heavy plank whose length exceeds the width of the pavement by 1 foot or by the use of a mechanical vibrating unit spanning the full width of the spread. The tamper shall be constructed with properly trussed roads to stiffen it and prevent sag and shall be shod with a heavy strip or metal for a tamping surface. The tamper shall be moved with a combined tamping and longitudinal motion, raising it from side form and dropping it so that the concrete will be thoroughly compacted and rammed into place. A small surplus material is compacted and rammed into front of the tamper or vibrating unit and tamping or vibrating shall continue until the true cross-section is obtained and the mortar flushes slightly to the surface.

On grades in excess of 5 percent where hand methods are permitted, a little strike board shall follow at a speed of 25 ft to 50 ft per hour back of the heavy strike board, and shall be used in the same way, so as to remove waves caused by flow of concrete.

Where hand tamping is permitted, not less than two strike boards or tampers shall be used for production in excess of 350 CU.ft. After the concrete has been compacted, it shall be smoothed with a wooden float where necessary, as directed by the Engineer.

### Longitudinal Floating

Manual floats shall be at least 12 ft. in length not less than 6 inches in width and shall be properly stiffened to prevent bending or warping. In using the float, it shall be held parallel to centre line of the pavement at all time and shall be moved laterally across the pavement from one side or edge to the

  
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other until all high areas are cut down and floated into depressions, leaving a surface that is smooth and true to grade. Batch transverse passage of the longitudinal manual float shall lap the proceeding passage by half.

#### **First Straight Edge Testing**

Immediately following final floating the entire area of the pavement shall be tested with a 10-ft. (approx. 3. meters) straight edge. Any depressions found shall be immediately fillet." with fresh concrete which shall be struck off compacted and finished. High areas shall be worked down and refinished. The straight edge testing and refloating shall continue until the pavement has the required surface contour.

After the first straight edge testing and when most of the water sheet has disappeared from the surface, and just before the concrete becomes non-plastic, the surface shall be dragged with a strip of burlap (coarse canvas) 3 ft. to 10 ft. wide and having a length 4 ft. more than the width of the slab. The burlap shall be dragged along the surface of the pavement in a longitudinal direction. Burlap shall be clean and kept free from coatings of hardened concrete. It shall be moist at the time of use.

#### **Second Straight Edge Testing:**

After the concrete has hardened sufficiently to permit walking on it, the surface of the pavement shall again be tested with a 1 a-ft. straight edge. 'Any portion of the pavement which shows a variation from the testing edge of more than 1/8 inch shall be corrected by cutting, or shall be removed and replaced at the expense of the Constructor.

### **3.5 Expansion and Construction Joints**

- i) All the expansion and contraction joints shall be carefully formed as shown on the Drawings or as directed by the Engineer. As regards dowel bars and joint assemblies, such stakes, brackets or other devices shall be used, as necessary to keep the entire joint assembly in true vertical and horizontal position. The joint filler together with the preformed groove shall provide complete separation of adjacent slabs. The joints shall all be sealed with the specified non-extruding sealing compound set in a 3/4 inch wide preformed chase as shown on the Drawings. The preformed chase shall be thoroughly cleaned of all dust, debris, stones or other hard material prior to its sealing. The riser of all joints shall be rounded to a radius as shown on the Drawings before the concrete hardens.
- ii) The joints sealing compound shall be hot poured bitumen or approved sealing compound for concrete pavements complying with BS-2499 for hot tropical climates and heavy duty industrial site subject to severe exposure. All joints )o be filled with flex cell expansion joint filler, or an approved elastic, compressible, durable and rot-proof equivalent of sufficient rigidity to enable it to be satisfactorily installed in the joint and resist deformation during the passage of the concreting equipment. The filler is to be of the same thickness as the joint Width. Holes to accommodate the dowel bars shall accurately be drilled or punched out. Where shown on the Drawings, dowel bars of required diameter shall be placed at the

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specified spacing. The bars shall be lubricated with an approved lubricant. One end of the dowel bar at expansion joints shall be provided with a closely fitting sleeve 3 inch long, consisting of bitumen coated plastic or other approved material to permit expansion. A loose plug 1 inch deep of approved compressible filling material shall be inserted into the sleeve as shown on the Drawings at the end of the bar. All the dowel bars shall be mild steel bars of the size shown on the Drawings and shall conform to the requirements as specified in the section 'Concrete.

- iii) Contraction joints shall be provided as shown on the Drawings. The assembly and method of constructing the expansion joints/contraction joints shall be subject to the approval of the Engineer.

### 3.6 Consolidation

3.6.1 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 pockets which may cause honeycombing, pitting, or planes of weakness. Internal vibrators shall have a minimum frequency of 8000 vibrations per minute and sufficient amplitude to consolidate the concrete effectively. They shall be operated by competent workmen. Use of vibrators to transport within forms shall not be allowed. vibrators shall be inserted and withdrawn at points approximately 18 inch apart. At each insertion, the duration shall be sufficient to consolidate the concrete but not excessive so as to cause segregation, generally from 5 to 15 sec. A spare Vibrator shall be kept on the job site during all concrete placing operations.

Where the concrete is to have an as-cast finish, a full surface of mortar shall be brought against the form by the vibration process, supplemented, if necessary, by spading to work the coarse aggregate back from the formed surface.

- 3.6.2 If there is any tendency for the mix to segregate during consolidation, particularly if this produces excessive laitance, the mix proportions shall be modified to effect an improvement in the quality of the concrete to the satisfaction of the Engineer and in conformity with the provisions of Clause 5.
- 3.6.3 Vibrator shall not be allowed to contact the formwork for exposed concrete surfaces.
- 3.6.4 Mechanical vibrators shall be of a type suited in the opinion of the Engineer to the particular conditions.
- 3.6.5 Over-vibration or vibration of very wet mixes is harmful and should be avoided.

### 3.7 Curing and Protection

3.7.1 Beginning immediately after placement, concrete shall be protected from premature drying, excessively hot or cold temperatures and mechanical injury and shall be maintained with minimum moisture loss at a relative constant temperature for the

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period necessary for hydration of the cement and hardening of the concrete. The materials and methods of curing shall be subject to approval of the Engineer.

- 3.7.2 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 fabric kept continuously wet. Application of waterproof sheet materials approved by the Engineer. Application of other moisture-retaining covering as approved. Application of a curing compound conforming to ASTM C 309. The compound shall be applied in accordance with the recommendations of the manufacturer immediately after any water sheen, which may develop after finishing has disappeared from the concrete surface. It shall not be used on any surface against which additional concrete or other material is to be bonded unless it is proved that the curing compound will not prevent bond, or unless positive measures are taken to remove it completely from areas to receive bonded applications.
- 3.7.3 Moisture loss from surfaces placed against wooden forms or metal forms exposed to heating by the sun shall be minimized by keeping the forms wet until they can be safely removed. After form removal the concrete shall be cured until the end of the time prescribed for curing.
- 3.7.4 Curing in accordance with sub-clause 5.13.1 & 5.13.2 above shall be continued for at least 10 days in the case of all concrete except concrete with rapid-hardening Portland Cement for which the period shall be at least 3 days. Alternatively, if tests are made of cubes kept adjacent to the structure and cured by the same methods, moisture retention measures may be terminated when the average compressive strength has reached 70 percent of the minimum specified works cube strength. If one of the first four curing procedures of sub-clause 5.13.2 is used initially, it may be replaced by one of the other procedures of that sub-clause any time after the concrete is one day old provided the concrete is not permitted to become surface dry during the transition.
- 3.7.5 When the mean daily outdoor temperature is less than 5 degree C (41 deg. F) temperature of the concrete shall be maintained between 10 and 20 degrees C (50 to 68 deg. F) for the required curing period of sub-clause 5.13.4.

When necessary, arrangements for heating, covering insulation or housing t/ie. Concrete work shall be made in advance of placement and shall be adequate to maintain the required temperature without injury due to concentration of heat. Combustion heaters shall not be used during the first 24 hours unless precautions are taken to prevent exposure of the concrete to exhaust gasses, which contain carbon dioxide.

- 3.7.6 During hot weather when necessary, provision for wind-brakes, shading for spraying, sprinkling, ponding or wet covering with a light colored material shall be made in advance of placement. Such



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protective measures shall be taken as quickly as concrete hardening and finishing operation will allow.

- 3.7.7 Changes in temperature of the air immediately adjacent to the concrete during and immediately following the curing period shall be kept as uniform as possible and shall not exceed 3 deg. C (37 deg. F) in anyone hour or 10 degree C (50 deg. F) in any 24 hour period.
- 3.7.8 During the curing period, the concrete shall be protected from damaging mechanical disturbances, such as load stresses, heavy shock and excessive vibrations. All finished concrete surfaces shall be protected from damage by construction equipment, materials or methods by application of curing procedures, and by rain or running water. Self-supporting structures shall not be loaded in such a way as to over stress the concrete.

### 3.8 Works in Extreme Weather

- 3.8.1 Unless adequate protection is provided and approval is obtained from the Engineer, concrete shall not be placed during rain. Rainwater shall not be allowed to increase / ease the mixing water nor to damage the surface finish.
- 3.8.2 When the temperature of the surrounding air is expected to be below 5 deg. C during placing or within 24 hours thereafter, the temperature of the plastic concrete, as placed, shall be no lower than 13 deg. C for sections less than 12 inch in any dimension nor 10 deg. C for any other sections.

When necessary, concrete material should be heated before mixing and carefully protected after placing, in general, heating or mixing water alone to about 60 deg. C may be sufficient for this purpose. Dependence should not be placed on salt or other chemicals for the prevention of freezing. No frozen material or materials, containing ice shall be used. All concrete damaged by frost shall be removed. It is recommended that concrete exposed to the action of freezing weather should have entrained air and the water content of the mix should not exceed 5.5 gallon/bag of cement.

If water or aggregate is heated above 38 deg. C the water shall be combined with the aggregate in the mixer before cement is added.

Cement shall not be mixed with water or with mixtures of water and aggregate having a temperature greater than 38 deg. C.

- 3.8.3 During hot weather, the temperature of the concrete as placed shall not be so high as to cause difficulty from loss of slump, flash set, or cold joints and should not exceed 32 deg. C. For massive concrete, this temp. should not exceed 21 degree C. When the temp. of the concrete exceeds 32 degree C, precautionary measures approved by the Engineer shall be put into effect. When the temperature of the steel is greater than 50 deg. C, steel forms and reinforcement shall be sprayed with water just prior to placing the concrete. The ingredients shall be cooled before mixing, or flaked ice or well crushed ice of a size that will melt completely



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during mixing may be substituted for all part of the mixing water if, due to high temperature, low slump, flash set or cold joints are encountered. Other precautions recommended by ACI Standard 305-72 shall also be adopted.

#### 4. EST of Concrete Quality

- 4.1 The Constructor shall provide samples of concrete for testing at the Engineer's direction. Proper facilities shall be provided for making and curing the test specimens in accordance with PS 560 and PS 849. A competent person shall be employed by the Constructor whose first duty shall be to supervise all stages in the preparation and placing of the concrete. All Test specimens shall be made and site tests carried out under his direct supervision. .
- 4.2 Preliminary cube tests and works cube test shall be performed in accordance with PS 560 and PS 849 at the discretion of the Engineer. Works transverse tests shall be performed in accordance with sub-clauses 208 c and 610 d of CP 114. The standard of acceptance for preliminary and works tests shall be as given below.
- 4.3 The usual test for concrete with maximum size of aggregate up to 1-1/2 inch is the 6 inch cube tested in compression. Details of making and curing compression test cubes are given in PS 560, PS 849 and BS 1881 and details of the testing are given in Part 8 of BS 1881.

For all grades of concrete, preliminary cube strength test with the mixes and materials to be used shall be performed in accordance with PS 560, PS 849 and BS 1881 before the work is begun and subsequently whenever any change is to be made in the materials or in the proportions of materials to be used, or as required by the Engineer. The strengths shall comply with the standard of quality specified in accordance with. Table 1 for preliminary tests. The cost of such testing shall be borne by the Constructor.

- 4.4 Test sample shall be taken at the mixer or as directed by the Engineer. The test specimens shall be cured in accordance with PS 560, PS 849 and BS 1881. Records shall be kept of all test cubes identifying the mix used the section of work for which the concrete was used and the date poured. !
- 4.5 Five test cubes are to be tested for compressive strength as specified in BS 1881. These tests shall be carried out at site or in a laboratory approved by the Engineer. Two cubes shall be tested at the age of seven days and three at 28 days and the strengths determined are to comply with the standard of quality specified. The laboratory tests shall be carried out by an independent organization, such as Government Testing Laboratory or such other undertakings approved by the Engineer. The original test reports received from the above authorities should be submitted to the Engineer.

- 4.6 For all grades of concrete, the appropriate strength requirement shall be considered to be satisfied if none of the strengths of the cubes is below

  
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the specified cube strength or if the average strength of the three cubes is not less than the specified cube strength and the difference between the greatest and the least strength is not more than 20% of the average.

- 4.7 When the results of works cube tests show that the strength of any concrete is below the minimum specified, the Engineer may give instructions for the whole or part of the work concerned to be removed and replaced at the expense of the Constructor. The Constructor shall bear the cost of any other part of his, or any other Constructor's work, which has to be removed and replaced as a result of the defective concrete. If any concrete is held to have failed, the Engineer may order the proportions of that class of concrete to be changed in order to provide the specified strength.

## 5. Finishing of Formed Surfaces

### 5.1 General

- 5.1.1 After removal of forms, the surfaces of concrete shall be given one or more of the finishes specified below in locations designated by the Contract Documents.
- 5.1.2 When finishing is required to match a small sample furnished to the Constructor, the sample finish shall be reproduced on an area at least 100 Sq. ft. in an inconspicuous location designated by the Engineer before proceeding with the finish in the specified location.
- 5.1.3 Allowable deviations from plumb or level and from the alignment profile grades, and dimensions are specified in clause 9. Tolerances for concrete construction and defined as tolerances that are to be distinguished from irregularities in finish as described herein. The finish requirements for concrete surfaces shall be as generally specified in this clause and as indicated on the Drawings. Finishing of concrete surfaces shall be performed or, by workmen who are skilled in concrete finishes. The Constructor shall keep the Engineer advised as to when finishing of concrete will be performed. Unless inspection is waived in each -specific case, finishing of concrete shall be performed only in the presence of the Engineer. Concrete surfaces will be tested by the Engineer where necessary to determine whether surface irregularities are within the limits herein after specified. Surface irregularities are classified as abrupt or gradual.

Offsets caused by displaced or misplaced form sheeting or lining or sections, or otherwise defective form lumber will be considered as abrupt irregularities, and will be tested by direct measurements. All other irregularities will be considered as gradual irregularities, and will be tested by use of a template, consisting of a straight edge or the equivalent thereof for curved surfaces. The length of the template will be 6.5 ft. for testing of formed surfaces and 10ft. for testing of unformed surfaces.

### 5.2 As-cast Finishes

Unless otherwise specified or indicated on the Drawings the classes of finish shall apply as follows:

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**5.2.1 Rough form finish:**

No selected form facing materials shall be specified for rough form finish surfaces. Tie holes and defects shall be patched. Fins exceeding 1/4" in height shall be chipped off or rubbed off. Otherwise, surfaces shall be left with the texture imparted by the forms.

**5.2.2 Fair face finish:**

Fair face finish applies to concrete formed surfaces, the appearance of which is considered by the Engineer to be of special importance, such as surfaces of structures prominently exposed to public inspection. Surfaces of concrete structures requiring fair face finish is shown in the Drawings. Surface irregularities, measured as described in sub-clause 7.2.1, 'Rough form finish', shall not exceed 1/4 inch for gradual irregularities and 1/8 inch for abrupt irregularities, except that abrupt irregularities will not be permitted at construction joints. Abrupt irregularities at construction joints and elsewhere in excess of 1/8 inch and gradual irregularities in excess of 1/4 inch shall be reduced by grinding so as to conform to the specified limits. Abrupt irregularities at construction joints shall be ground on level of 1 to 20 ratio of height to length.

Unless otherwise approved, repair of imperfections in formed concrete shall be completed within 24 hours after removal of forms. The form facing material shall produce a smooth, hard, uniform texture on the concrete. It may be plywood, temperate concrete-form-grade hardboard, metal, plastic paper, or other approved material capable of producing the desired fair face finish. The arrangement of the facing material shall be orderly and symmetrical, with the number of seams kept to the practical minimum. It shall be supported by studs or other backing capable of preventing excessive deflection. Material with raised grain, torn surfaces, worn edge, patches, dents, or other defects which will impair the texture of the concrete surface shall not be used. Tie holes and defects shall be patched. All fins shall be completely removed.

**5.2.3 Architectural Finish Concrete:**

Architectural finish concreting formed surfaces as shown on the Drawings IS required by. The Engineer where the architectural appearance of surfaces of structures exposed to public view is of special consideration and importance. The Constructor shall use approved special material for formwork and design the forms in conformity with the specified architectural patterns, textures and finishes in order to obtain first class architectural finish on formed concrete surface without any defect, irregularities, blemishes, imperfections and encrustation's.

**Samples:**

Submit to the Engineer a minimum of two units or portions of units of each precast item required. Each pair of samples when accepted

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will describe the allowable limits between which variations can be acceptable.

Similar samples of in-situ concrete for approval by the Engineer submit two samples, 2 Sq. ft. of each type of exposed in-situ concrete. All in-situ samples will remain at the construction site.

**Sample approvals of precast & in-situ concrete:**

These samples will be reviewed and approved on the basis of color, dimensional accuracy, and finish of surfaces and general appearance. The same requirements for sample approval will be required for both precast and in-situ concrete exposed surfaces.

**Forms:**

The Constructor must maintain the forms unusually tight and braces to prevent movement, mal-alignment and bleeding that will result in sand streaks, honeycomb, fins, stain or unsightly appearance. / .

If wood forms are chosen to be used by the Constructor they shall be constructed of 3/4 inch minimum thickness plywood constructed in a fashion to allow many re-uses with all surfaces sealed with a polyurethane varnish.

Edges, surfaces and corners of forms shall be sealed to prevent loss of any matrix or unequal absorption of water. Corners of wood forms shall be filled with suitable compound and all contact surfaces sealed with a polyurethane varnish.

Re-use of forms shall be subject to approval by the Engineer.

**Curing:**

Curing shall be done in shade (out of direct sunlight) and shall be for a minimum period of 4 days.

**Finishing Procedures:**

"Finishing procedures for filling air void smooth finished concrete developed by a formed surface":

While the concrete surface is still damp (not more than three days after removal of forms), apply a thin coat of medium consistency neat cement slurry by means of bristle brushes to provide a bonding coat within any pits or blemishes in the parent concrete; avoid coating large areas of the finished surface. Before slurry has dried or changed color, apply a dry (almost crumbly) grout comprised of one part cement, of the type and brand of cement used in the original concrete, to one and one-half parts clean masonry sand with f3 fineness modulus of approximately 2.25 and complying with the graduation requirements of the ASTM Specifications C 144. Mix proper amounts of white cement and coloring with the parent mortar to produce a satisfactory color match with the parent concrete after hardening. Use samples previously prepared.

Apply the finishing grout uniformly with damp (neither dripping wet nor dry) pads of coarse burlap approximately 6 inch square used as



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a float. Scrub the grout well into ' the pits to provide a dense mortar in all the imperfections to be filled. Allow the mortar to partially harden, from one to two hours, depending upon the weather. Avoid direct hot sunlight. If the air is hot and dry, keep the concrete surface damp during this period using a fine fog spray. When the grout has hardened sufficiently so it can be scraped from the surface with the edge of a steel trowel without damaging the grout from the small pits or holes, cut off all that can be removed with a trowel without delay; next allow the surface to dry thoroughly and rub it vigorously with clean, dry burlap to completely remove any dried grout. No visible film of grout shall remain after this rubbing. Complete the entire cleaning and grouting operation for the grout to dry after it has been cut with the trowel, so it can be wiped off clean with the burlap.

On the day after the repair work, the concrete surfaces should again be wiped off clean with dry burlap to remove any inadvertent dust; leave no built-up surfaces on the parent surfaces. Employ, if possible, a used piece of burlap containing old hardened mortar to act as a mild abrasive. Use of fine abrasive stone if needed to remove any remaining built-up film without breaking through the surface film of the original concrete. Such scrubbing should be light and sufficient only to remove excess material without working up a lather of mortar or 'changing the texture of concrete.

Following the final b?l9.9ing or stoning operation, provide a thorough wash down with stiff bristle brushes 10 remove all extraneous materials and spray the concrete surface with a fine fog spray periodically to maintain a continually damp condition for at least three days after application of the pit repair grout.

#### **Rust Stains:**

All rust stains are to be removed employing the following procedure:

The rust stain shall be soaked for 10 minutes with a solution of 0.055 lb. of sodium citrate in 0.33 lb. water "(brushing the solution at short intervals is satisfactory). Then the surface is sprinkled with crystals of sodium hydrosulfite and covered with a paste of Fuller's Earth and water. On a vertical surface, the paste is applied with a trowel, with the crystals first sprinkled on the paste so they will be in direct contact with the stain. The paste is allowed to dry for 10 minutes then scraped off and the treatment repeated if necessary.

#### **Repairing of Formed Surfaces:**

It is the intention of Specification to require form mixture of concrete and workmanship so that concrete surfaces, when exposed, will require no patching. Any concrete which is not formed as required and conforming to approved samples or for any reason is out of alignment or level or shows a defective surface, shall be removed from the job by the Constructor at his expense unless the Engineer grants permission to repair the defective area. Permission to patch any such area shall not be considered a waiver of the Engineer's right to require a complete removal of defective work if

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the repair does not, in his opinion, satisfactorily restore the quality and appearance of the surface. The Engineer shall be the sole judge of acceptability of appearance.

### 5.3 Finishes of Unformed Surfaces:

#### 5.3.1 Monolithic Concrete Floor Finish

Where monolithic concrete floor finish is shown on the Drawings, placing shall proceed continuously for the full thickness of the course or RCC slab without change in concrete mix. Mixing water shall be the minimum required for proper placing, and will be as specified by the Engineer. After placing, floors, and other surfaces shall be floated with a wood float to a true surface and to elevation as shown on the Drawings. Where indicated on the Drawings, floor surfaces shall be steel trowel finished. Troweling shall be the minimum amount consistent with maintaining a smooth dense surface, and shall not be done until the mortar has hardened sufficiently, to prevent excess fine material from being worked to the surface, and shall produce a dense uniform surface, free from blemishes and trowel marks.

Gradual surface irregularities shall not exceed 1/16 inch. The addition of water, dry cement, or dry cement mortar, to the surface of the concrete to facilitate finishing will not be permitted.

#### 5.3.2 Equipment Foundations'

Unless otherwise specified, exposed, surfaces of equipment foundations shall be given steel trowel finish to produce a surface similar to the specified concrete floor finish.

## 6 Repair of Surface Defects

### 6.1 General

6.1.1 Any concrete failing to meet the specified strength or not formed as shown on drawings, concrete out of alignment, concrete with surfaces beyond required tolerances or with defective surfaces which cannot be properly repaired or patched in the opinion of the Engineer shall be removed at Constructor's cost. The Engineer may reject any defective concrete and order it to be cut out in part or in whole and replaced at the Constructor's expense. All ties and both less and all repairable defective areas shall be patched immediately after form removal.

### 6.2 Repair of Defective Areas

6.2.1 All honeycombed and other defective concrete shall be removed down to sound concrete. The area to be patched and an area at least 6 inch wide surrounding it shall be dampened to prevent absorption of water from the patching mortar. A bonding grout shall be prepared using c. mix of approximately 1 part cement to 1 part fine sand passing NO.25 BS Sieve and shall then be well brushed into the surface.

6.2.2 The patching mixture shall be made of the same material and of

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approximately the same proportions as used for the concrete, except that the coarse aggregate shall be omitted and the mortar shall consist of not more than 1 part cement to 2-1/2 parts sand by damp loose volume. White Portland cement shall be substituted for a part of the gray Portland cement on exposed concrete in order to produce a color matching the color of the surrounding concrete, as determined by a trial patch.

- 6.2.3 The quantity handling of mixing water shall be no more than necessary for allowed and placing. The patching mortar shall be mixed in advance and of to stand with frequent manipulation with a trowel, without addition placing water, until it has reached the stiffest consistency that will permit
- 6.2.4 After surface water has evaporated from the area to be patched, the bon coat shall be well brushed into the surface. When the bond coat begins to loose the water sheen, the premixed patching mortar shall be applied. The mortar shall be thoroughly consolidated into place and struck off so as to leave the patch slightly higher than the surrounding surface. To permit initial shrinkage, it shall be left undisturbed for at least 1 hour before being finally finished. The patched area shall be kept damp for 7 days. Metal tools shall not be used in finishing a patch in a formed wall, which will be exposed.
- 6.2.5 Whereas-cast finishes are specified, the quantity of patched area shall be strictly limited. The combined total of patched areas in as cast surfaces shall not exceed 2 sq.ft. in each 1000 sq. ft. of as-cast suri'3ce. This is in addition to form tie patches, if the project design permits ties to fall within as-cast areas.
- 6.2.6 Any patches in as-cast architectural concrete shall be indistinguishable from surrounding surfaces. The mix formula for patching mortar shall be determined by trial to obtain a good color match with the concrete when both patch and concrete are cured and dry. After initial set, surfaces of patches shall be dressed manually to obtain the same texture as surrounding surfaces.
- 6.2.7 Patches in architectural concrete surfaces shall be cured for 7 days. Patches shall be protected from premature drying to the same extent as the body of the concrete.

### 6.3 Tie and Bolt Holes

After being cleaned and thoroughly dampened, the tie and bolt holes shall be filled solid with patching mortar. If architectural appearance requires, these holes may be filled partially creating the desired round clear holes pattern on surfaces exposed to view.

### 6.4 Proprietary Materials

If permitted or required by the Engineer, proprietary compounds for adhesion or as patching ingredients may be used in lieu. of or in addition to the foregoing patching procedures. Such compounds shall be used in accordance with the manufacturer's recommendations with prior approval of the Engineer.



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Where tolerances are not stated in the specifications or drawings for any individual structure or feature thereof, maximum permissible deviations from established lines, grades and dimensions shall conform to the following. The Constructor is expected to set and maintain concrete forms so as to ensure complete work within tolerance limits. These allowable tolerances shall not relieve the Constructor of this responsibility for correct fitting of indicated materials. These tolerances are not cumulative.

**6.5 Variation from the plumb (or the specified batter for inclined walls.)**

6.5.1 In the lines and surfaces of columns, piers, walls and in arises: In any 10 feet of length or height In any storey or 20 feet length Maximum for the entire length or height. In any bay or 20 feet maximum 1/4 inch Maximum for the entire length or height 1/2 inch

6.5.2 Variation from the level or from the grades indicated on the drawings.

6.5.3 In floors, ceilings, beams soffits and in arises measured before removal of supporting shores.

In any 10 feet of length 1/4 inch

In any bay or in any 20 feet length 3/8 inch

Maximum for the entire length 3/4 inch

6.5.4 For exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines.

In any bay or 20 feet length 1/4 inch

Maximum for the entire length 1/2 inch

6.6 Variation of the linear building lines from established position in plan and related position of columns, walls and partitions.

In any bay or 20 feet of length Maximum for the entire length 1/2 inch 1 inch

6.7 Variation in the sizes and locations of sleeves, floor openings and wall openings. Variation in cross-sectional dimensions of columns and beams and in the thickness of slabs And walls.

Minus 1/4 inch

Plus 1/2 inch 9.6 Footing

6.7.1 Variation in dimensions in plan Minus 1/2 inch


Plus (plus variation applied to concrete only, not to reinforcing bars or dowels). 2 inch

6.7.2 Misplacement or eccentricity

2 percent of the footing width in the direction of misplacement but not more than (applies to concrete only, not to reinforcing bars or dowels). 1/2 inch 2 inch

6.7.3 Thickness Decrease in thickness 5%

6.7.4 Increase in Specified thickness No limit

  
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## 6.8 Variation in Steps

### 6.8.1 In a flight of stairs

Rise	+1 / 8 inch-
Tread	+1 / 4 inch-

### 6.8.2 In consecutive steps

Rise	+1 / 16 inch-
Tread	+1 / 8 inch-

## 6.9 'Tolerances for Precast concrete construction'

Forms must be true to size and dimensions of concrete members shown on the plans and be so constructed that the dimensions of the finished products will be within the following limits at the time of placement of these units in the structure, unless otherwise noted' on structural-architectural drawings:

### 6.9.1 Overall dimensions of members

1/16 inch per  
10 feet

### 6.9.2 Cross-sectional dimensions Sections less than 3 inch.

1/16 inch

Sections over 3 inch and less than 18 inch.

1/8 inch 1/4

Sections over 18 inch.

1/8 inch

### 6.9.3 Deviations from straight line in long sections.

1/16 inch per

10 feet

Not more than  
per

+1/16 inch

10 feet span

Maximum differential between adjacent units in  
erected position

1/4 inch

## 7 Acceptance of Structure

### 7.1 General

7.1.1 Completed concrete work which meets all applicable requirements will be accepted subject to the other terms of the Contract Documents.

7.1.2 Completed concrete work which fails to meet one or more of the requirements and which has been repaired to bring it into compliance will be accepted subject to the other terms of the Contract Documents.

7.1.3 Completed concrete work which fails to meet one or more of the requirements and which cannot be brought into compliance may be accepted or rejected as provided in these Specifications or in the Contract Documents. In this event, modifications may be required to assure that remaining work complies with the requirements.

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## 7.2 Dimensional Tolerances

- 7.2.1 Formed surfaces resulting in concrete outlines smaller than permitted by the tolerances of clause 9 shall be considered potentially deficient in strength and subject to the provisions of sub clause
- 7.2.2 Formed surfaces resulting in concrete outlines larger than permitted by the tolerances of clause 9 may be rejected and the excess material shall be subject to removal. If removal of the excess material is permitted, it shall be accomplished in such a manner as to maintain the strength of the section and to meet all other applicable requirements of function and appearance. Permission is required if excess material is to be removed in accordance with this clause.10.2.3 Concrete members cast in the wrong location may be rejected if the strength, appearance or function of the structure is adversely affected or if misplaced items interfere with other construction.
- 7.2.3 Inaccurately formed concrete surfaces exceeding the limits of Clause 9 or of Clause 5.6 of Section 'Formwork' and which are exposed to view, may be rejected and shall be repaired or removed and replaced if required.

## 7.3 Appearance

- 7.3.1 Architectural concrete with surface defects exceeding the limitations of Sub-clause 5.6 of Clause 5 of the Section, 'Formwork' shall be removed and replaced.
- 7.3.2 Other concrete exposed to view with defects which adversely affect the appearance of the specified finish may be repaired only by approved methods.
- 7.3.3 Concrete not exposed to view is not subject to rejection for defective appearance.

## 7.4 Strength of Structure

- 7.4.1 The strength of the structure in place will be considered potentially deficient if it fails to comply with any requirements" which control the strength of the structure, including but not necessarily limited to the following conditions. Concrete strength requirements not considered to be satisfied in accordance with Clause 6 hereof.
- 7.4.2 Reinforcing steel size, quality, strength, position or arrangement at variance with the requirements as listed under specification of 'Reinforcement' or in the Contract Documents. Concrete which differs from the required dimensions or location in such a manner as to reduce the strength. Curing less than that specified. Inadequate protection of concrete from extremes of temperature during early stages of hardening and strength development. Mechanical injury, construction fires, accidents of premature

  
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removal of formwork likely to result in deficient strength. Poor workmanship likely to result in deficient strength.

Structural analysis and/or additional testing may be required when the strength of the structure is considered potentially deficient.

Core tests may be required when the strength of the concrete in place is considered potentially deficient.

- 7.4.3 If core tests are inconclusive or impractical to obtain or if structural analysis does not confirm the safety of the structure, load tests may be required and their result evaluated in accordance with British Standard BS 8110 or ACI Standard 318.
- 7.4.4 Concrete work judged inadequate by structural analysis or by results of a load test shall be reinforced with additional construction if so directed by the Engineer or shall be replaced, at the Constructor's expense.
- 7.4.5 The Constructor shall pay all costs incurred in providing the additional testing and/or analysis required by this section.
- 7.4.6 The Employer will pay all costs of additional testing and/or analysis which is made at his request and which is not required by these Specifications, or by the Contract Documents.

## 8 Testing of Material

- a) A site laboratory shall be established by the Constructor for all the required testing of concrete, aggregates and other materials etc. All tests shall preferably be done at site. Only the test which are not possible to be carried out in the site laboratory shall be referred to the laboratory approved by the Engineer. All testing charges thereof shall be borne by the Constructor. For testing of reinforcement steel bars, the samples shall be referred to the laboratory approved by the Engineer at the cost of the Constructor.
- b) Cement shall be tested as prescribed in -STM C -150.
- c) Aggregates shall be tested as prescribed in British Standard BS 812 - 882. addition fine aggregate shall be tested for organic impurity in conformance with ASTM Standard CAO.


## 9 Measurement and Payment

### 9.1 General

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

The rates quoted by the Constructor in the Bill of Quantities shall include work to be executed under these specification in any floor and at any height except where otherwise specifically stated in the relevant item of Bill of Quantities and the Constructor shall not be entitled to any claim or claim any compensation on this account.

9.1.1 Providing, fixing, striking, etc. of formwork.

  
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- 9.1.2 Providing, placing and fixing of anchor bolts or any other embedded parts.
- 9.1.3 Providing and installing all type of joints in concrete structure, including expansion joints.

## 9.2 Plain and Reinforced Concrete

### 9.2.1 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 10 square inches each in cross-sectional area.

Voids not exceeding 4 square inch in work given in square feet. If any void exceeds 4 square inch, total void shall be deducted.

Voids, which are not to be deducted as specified above, refer only to openings or vents which are wholly within the boundaries of measured areas. Openings or vents which are at the boundaries of 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. Junction between straight and curved works shall in all cases be deemed to be included with the work in which they occur.

Measurement of walls shall be taken between attached columns piers or pilaster. The thickness of attached columns, piers or pilaster shall be taken as the combined thickness of the wall and the columns, piers or pilaster.

Attached or isolated columns, piers, pilaster, and the like (except where caused by openings) having a length on plan not exceeding four times the thickness shall be classified as columns. Those having a length over four times the thickness and are caused by openings in wall shall be classified as walls.

Columns shall be measured from the top of footing/footing beams or floor surfaces to the underside of beams or slabs as the case maybe. Where the width of beams is less than the width of columns, the extra width at the junction shall be included in the beams.

The depth of the beams shall be measured from bottom of the slab to the bottom of the beams except in case of inverted beams where it shall be measured from top of slab to the top of beam. The cross-section of the beam shall be the actual cross-section below or above the slab. .

Measurement of acceptably completed works of plain and reinforced cement concrete will be made on the basis of number of cubic feet concrete placed and compacted in position within the neat lines of the structure as shown on the Drawings or as directed by the Engineer.

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### 9.2.2 Payment

Payment will be made for the acceptable measured quantity of plain and reinforced cement concrete on the basis of unit rate per cubic feet quoted in the Bills of Quantities and shall constitute full compensation for all the works related to the item.

## 9.3 M16 Hilti System Dowels

### 9.3.1 Measurement

Measurement of acceptably completed works of drilling and fixing of anchoring dowels as per M16 Hilti's System HIT-HY150 injection adhesive with HAS rod will be made on the basis of number of dowels drilled and fixed in position as shown on the Drawings or as directed by the Engineer.

### 9.3.2 Payment

Payment will be made for the acceptable measured quantity of drilling and fixing of anchoring dowels as per M16 Hilti's System HIT-HY150 injection adhesive with HAS rod, on the basis of unit rate per number quoted in the Bills of Quantities and shall constitute full compensation for all the works related to the item.

## 9.4 For Mortar

### 9.4.1 Sand

Sand for mortar shall comply with the requirements for BS-1200. It shall be graded in accordance with the following table and the various sizes of particles shall be uniformly distributed. Sand that has been in contact with seawater shall not be used unless it has been thoroughly washed to the satisfaction of the Engineer.

Sieve Size (No.)	Percent Passing by weight	
	Min.	Max.
#4	100	
#8	95	
#16	70	100
#30	40	75
#50	10	35
#100	2	15
#200		

Sand up to .0025 inch shall not be more than 8% by weight of the total.

### 9.4.2 Cement:

Cement shall be Sulphate Resistant conforming to BS-12.

### 9.4.3 Water:

Water shall be clean and free from any harmful impurity. Where the quality of the water is doubtful, it shall be tested in accordance with BS- 3148.

  
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**9.4.4 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.

**9.4.5 Mortars and Grout:**

Materials for mortar, sand binding agent and water, shall be mixed by volume or by weight 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 shall be as strong, but no stronger than the materials it bonds together:

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.

**9.4.6 Reinforcement:**

For reinforcement refer specification section of reinforcement.

**10 Concrete Block Making**

- 10.1 The Solid and Hollow blocks shall be machine molded. The block making machines shall be of the standard approved by the Engineer. They shall be operated according to the instructions laid down by the manufacturers.
- 10.2 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 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.
- 10.3 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 Care shall be exercised in the handling of all concrete blocks. No damaged blocks shall be used in the work. .
- 10.4 The hollow blocks shall be manufactured as per pattern shown on the drawing. These block units shall be provided by the Constructor for use where required in building structures from approved type of materials. Units shall have uniformly fine smooth surfaces of uniform color. These shall be free of any honey combing or other imperfections or deformations, all edges true and straight, and at right angles with each other and without any chipped or otherwise broken edges.
- 10.5 The blocks cast on different dates shall be stacked separately and must be labeled showing the date on which they were cast.

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- 10.6 Reinforced cement concrete hollow block masonry shall be provided where shown on the drawings. Hollow block manufactured by moulding machine shall have well formed cavities, sharp and well defined edges and corners, smooth surfaces without any imperfections or deformations.

## 11 Properties of Blocks

- 11.1 All blocks shall be of the size and shape required to complete the work shown in the Drawings or as instructed by the Engineer.
- 11.2 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 in accordance with clause 5.4 of the section 'Plain and Reinforced Concrete'.
- 11.3 All blocks shall comply with ASTM C145 198,8 edition. The compressive strength of various solid and hollow block shall be as follows:

S. No	Type of Concrete Masonry ASTM 1988 Edition	Compressive Average of 3 Units	Strength Psi Individual Unit (MPa)	Location
1	Solid load bearing	1800 (12.4)	1500 (10.4)	Exposed to frost action
2	Masonry Unit	1200 (8.30)	1000 (6.90)	
3	(ASTM-C-145) Solid/Hollow non	600(4.14)	500 (3.45)	Not exposed to moisture & weather
4	load bearing Masonry units (ASTM-C-90) Hollow load bearing masonry	1000 (6.90)	800 (5.50)	Exposed to moisture & weather
5	(ASTM-C-90)	700 (4.80)	600 4.10	Not exposed to moisture &

- 11.4 The Constructor shall provide test certificates providing the average minimum crushing strength of the blocks prior to the commencement of the construction. Further test certificates shall be provided as required by the Engineer, to ensure that all batches of blocks have the minimum specified crushing strength.
- 11.5 A laboratory approved by the Engineer shall carry out the test. Evidence shall be produced that the block manufacturer has an efficient method of quality control. The Engineer will require to test samples of blocks periodically and the Constructor shall make necessary arrangements accordingly. The method of sampling for all tests shall be in accordance with.
- 11.6 All properties or specifications of blocks, not explained in these Specifications shall comply with the requirements of ASTM C145 1988 edition as directed by the Engineer.

## 12 Suction Rate

The Constructor shall, at his own cost, satisfy the Engineer that the suction rate of the block when determined in accordance with Appendix "A" of BS 3921 does not exceed 20 g/dm<sup>2</sup>/ min. or that the Constructor is able to adjust it so that it does not exceed this value on site.

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### 13 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 and 0.03, percent respectively when ascertained in accordance with BS 3921, at the cost of the Constructor.

### 14 Reinforcing and Anchors of Block Masonry

Unless otherwise stated reinforcing and anchors shall conform to under mentioned sizes:

- 14.1 Joint reinforcing shall be 1.32mm (0.05-inch) diameter mild steel wire. Mesh design, galvanized after fabrication. Steel wire woven into 12mm mesh 75mm wide. Reinforcing bar anchors shall be 250mm dia. deformed bar minimum 10 inch long.
- 14.2 Two 6mm dia bar shall be provided at every fourth course for anchoring of block masonry to columns. Two # 10 bars at every fourth horizontal course shall be provided for anchoring masonry walls to plinth beam/floor beam, as shown on the drawings.
- 14.3 Dovetail anchors and slots (if used as an alternate anchorage) shall be not less than 18 gauge galvanized steel.

### 15 Erection

- 15.1 Blocks 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 at corners and at intersections of walls and shall be properly bonded. Courses of block shall be kept plumb throughout and corner reveals shall be true and in plumb.
- 15.2 Standard width of mortar joints for both horizontal and vertical joints shall be 10mm (maximum). Mortar joints in walls shall have full mortar coverage on vertical and horizontal faces between the blocks. Mortar joints on wall including struck joints, shall be thoroughly compacted and pressed tight against the edges of the blocks with proper tools. Blocks terminating against soffits of beam or slab construction shall be wedged tight with wedges and the joints shall be packed solidly with mortar between the top of the block and the bottom of slab or beam. Control expansion joints shall be kept free from mortar or other debris.
- 15.3 Unless otherwise shown on the drawings or specified by the Engineer, the spaces around doorframes and other material or built in items shall be solidly filled with mortar. Spaces around the door and window holdfasts shall be filled in with Class 'C' concrete.
- 15.4 Work required to be built in with masonry including doorframe anchors, wall plugs, and dovetail anchors and accessories shall be built in as the erection progresses.
- 15.5 The block work shall be carried up in a uniform manner and no portion shall be carried more than one meter above the adjoining one at any time. All

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masonry shall be kept strictly true and square and the whole properly bonded together and leveled round each floor.

- 15.6 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.
- 15.7 Walls of blocks indicated, as being non-load bearing shall be constructed on the concrete floor slab unit after the floor formwork is struck and the concrete has obtained sufficient strength to support their weight Too thing into load-bearing walls shall not be permitted.
- 15.8 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.
- 15.9 Walls or partitions abutting concrete columns or walls shall be securely anchored and tied with metal anchors or ties at not more than 450mm vertical centres. Wall ties cast in with concrete shall be bent down after the removal of formwork and shall be securely jointed into the mortar beds of walling.
- 15.10 Care shall be taken during construction of cavity walls so as to avoid the filling up of cavity with mortar. G.1. flashing and weep holes shall be provided where ever specified on the drawings or as per the instructions of the Engineer. Weep holes will be formed by oiled rods, removed after the mortar is set, at specified locations.

## 16 Scaffolding

Constructor shall provide safe scaffolding of adequate strength for use of 00rkmen at all levels and heights at his own expense. Scaffolding which is unsafe in the opinion of the Engineer shall not be used until it has been strengthened and made safe for use of workmen. Cost of scaffolding etc., shall be included by the Constructor in the unit rate for masonry items.

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

## 17 Jointing

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

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

## 18 Tolerances

All block/Pacca Brick 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 meter. The maximum tolerance in the length, height or width of any single masonry unit shall be! 3mm.

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**19 Damp Proof Course**

Damp-proof course shall be laid on an even mortar bed, free from projections, which may puncture the material. Where the damp-proof course is to be stepped only flexible membrane shall be used.

All damp proof courses, unless otherwise specified, shall consist of class 'C' cement concrete 50mm thick, mixed with 2.5 kg. of pudlo per bag of cement or other approved quality water proofing compound as per manufacturers specifications and shall be laid at required levels as per drawings and instructions of the Engineer. The D.P.C shall be tamped consolidated, leveled, edges and corners made to the requirements of concerned drawings including finishing and curing complete.

**20 Solid Block Work Around Opening of Hollow Masonry**

Around all openings in hollow block masonry, the Constructor shall provide solid block work c:f same thickness as that of hollow block masonry wall and of width as indicated on the Drawings .. Solid block shall be laid around openings in such a manner that these are bonded integrally with hollow block masonry.

**21 Reinforced Hollow Block Masonry**

Where specified on the Drawings, reinforced hollow block masonry shall be provided. Horizontal and vertical reinforcement shall be cold worked deformed bar. Two bars of No. 8 (8mm) diameter shall be provided at every third horizontal course at 600mm centers, while the vertical reinforcement shall be two bars of No. 12 (12mm) diameter at 800mm centers. Bars shall be anchored and held firmly vertical in respective beams and columns in the manner shown in shop Drawings. The reinforced hollow part of 'he block wall shall be solidly filled with Class 'D' concrete at intervals of one meter maximum height as the laying of block masonry work proceeds. The filled concrete shall be consolidated thoroughly by rodding to avoid formation of voids. Constructor shall submit shop drawings of anchoring and placing of reinforcement in hollow block masonry for approval of the Engineer.

**22 Curing and Repairs**

22.1 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 the specifications for water used in the manufacture of blocks.

22.2 If, after the completion of any block masonry, the work 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 Constructor at his expense unless the Engineer grants permission in writing, to patch or replace the defective area.

**23 Masonry Short of Height**

In case of different thickness of slab in different areas or rooms or for any other reasons, whatsoever if chiseling of masonry is required, the Constructor shall do so at his own cost. Where for any reason whatsoever, the height of the wall is short of ceiling height the actual height shall be made good with Class 'C' nominal mix concrete. This concrete shall neither be measured nor be paid under item of concrete but will be paid for under the item of wall masonry. Similarly where the lintel heights' are such that the Constructor has to chisel the masonry or provide

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cast-in-place concrete to make up the height of the course, no payment will be made for chiseling, but where such cast-in-place concrete is provided, payment for the same will be made at the unit rate of masonry.

## 24 Measurement and Payment

### 24.1 General

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

#### 24.1.1 Chiseling of masonry, wherever required

Providing and fixing all joints reinforcing bars dovetail anchors, Cement sand mortar used in laying blocks, curing of masonry works and making of weep holes, Wastage of material etc.

Providing and filling Class 'D' Concrete in the cavity of hollow block masonry.

Providing and laying damp proof courses including damp proof materials and GI sheet flashing within cavity wall.

### 24.2 Solid Block Masonry

#### 24.2.1 Measurement:

Measurement for acceptably completed works of respective type of solid block masonry will be made' on the basis of number of cubic feet provided and installed in position as shown on the drawings or as directed by the Engineer. Each measurement shall be taken to the nearest W'. All opening\$ left in the masonry wall shall be deducted.

#### 24.2.2 Payment:

Payment will be made for acceptable measured quantity of respective type of solid block masonry work on the basis of unit rate per cubic feet quoted in the Bills of Quantities and shall constitute full compensation for all the works related to the item.

  
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## SECTION – 10(a) BLOCK MASONRY

### 6.1 SCOPE

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

The work under this section includes the block masonry in foundations, walls and partitions both load bearing and non-load bearing.

### 6.2 MATERIALS

#### 6.2.1 BLOCKS.

All blocks shall be sound, of well burnt clay, uniform in shape and size, when struck , the block should produce ringing sound. The block shall be free from flaws, cracks, shipped corners, nodules of lime, kankar, other blemishes and salt. When the block is soaked in water for one hour, it should not absorb more than one sixth of its own weight. Blocks of only one size shall be used in the works. Blocks from different kilns not having the same size and color shall not be accepted. The minimum compressive strength of the blocks tested in accordance with B.S. 1257 shall be 1300 psi subject to the condition that average compressive strength of five blocks tested shall not be less than 1500 psi.

#### 6.2.2 Cement

Cement shall be Ordinary Portland Cement as specified in respective section.

#### 6.2.3 Aggregates

Aggregates used shall meet the requirements specified under respective concrete section. All the aggregates dry and properly screened from approved source, shall also be acceptable for block making.

#### 6.2.4 Block Masonry Units

- i) Concrete masonry blocks shall be made on the project site and shall be of the sizes required as per drawings and/or as directed by the Consultants/Engineer Incharge and shall generally conform to the requirements of British Standard 2028, 1364:1968 until and unless specified or otherwise in the specifications.

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- ii) The block shall be solid as required and shall be carefully made so that they are true in line and face with square corners and free from all defects. The ends of the blocks, masonry, shall be double grooved or a directed by the Consultants/Engineer Incharge.
- iii) The blocks shall be cured by keeping moist continuously for a period of atleast ten (10) days and then shall be allowed to dry in shade for least twenty (20) days before used in masonry.
- iv) All blocks shall have clean cut straight and true edges, smooth dense faces of uniform appearance without voids, honeycombs, projections and shall be free from cracks spalls, chips, rugged edges or other defects detrimental to their use.
- v) Where blocks are to be plastered or rendered, the blocks surface shall have a coarse texture suitable for bonding the plaster as approved by the Engineer.
- vi) All blocks shall be stacked at site in a quantity not exceeding 5,000 blocks in each stack. The stacking shall be done in such a manner as to avoid smearing of the blocks in the lowest part of the stack with clay. Blocks smeared with clay show very poor bond with mortar sand, therefore, any blocks thus affected be rejected out of hand without recourse. When transported to the site the blocks shall not be dumped from the vehicle, the blocks shall be manually unloaded and stacked as aforesaid.

#### 6.2.5 CEMENT MORTAR FOR MASONRY

##### Proportion

Cement Mortar shall be composed of one part of Ordinary Portland Cement to 6 (six) parts of all block masonry walls. Hand mixing, when permitted by the Engineer shall be done on clean hard platform as much as required for immediate use with only just sufficient water, to produce mortar of a proper consistency. If directed by the Engineer, the mixing shall be done by mechanical mixers. Sand shall be of an approved quality and shall pass 100% through 3/16 inch sieve.

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## SECTION – 10(b) BRICK MASONRY

### 1. Scope

The work covered by this section of the specifications consists of furnishing all plant, labour, equipment, appliances, and materials and in performing all the operations in connection with masonry work, complete in strict accordance with the specifications herein and the applicable drawings subject to the terms and conditions of the contract. The work under this section includes the brickwork in foundations, walls and partitions both load bearing and non-load bearing.

### 2. Materials

#### 2.2.1 Bricks

All bricks shall be sound, of well burnt clay, uniform in shape and size, when struck, the brick should produce ringing sound. The brick shall be free from flows, cracks, and shipped corners, nodules of line, kankar, other blemishes and salt. When the brick is soaked in water for one hour, it should not absorb more than one sixth of its own weight. Bricks of only one size shall be used in the works. Bricks from different kilns not having the same size and color shall not be accepted. The minimum compressive strength of the bricks tested in accordance with B.S. 1257 shall be 1300 psi.

#### 2.2.2 Cement

Cement shall be Ordinary Portland Cement as specified in respective section.

#### 2.2.3 Aggregates

Aggregates used shall meet the requirements specified under respective concrete section. All the aggregates dry and properly screened from approved source, shall also be acceptable for block making.

#### 2.2.4 Brick Masonry Units

- i) The brick shall be solid as required and shall be carefully made so that they are true in line and face with square corners and free from all defects. The ends of the bricks, masonry, shall be double grooved or a directed by the Consultants/Engineer Incharge.
- ii) All bricks shall have clean cut straight and true edges, smooth dense faces of uniform appearance without voids, honeycombs, projections and shall be free from cracks spalls, chips, rugged edges or other defects detrimental to their use.
- iii) Where bricks are to be plastered or rendered, the bricks surface shall have a coarse texture suitable for bonding the plaster as approved by the Engineer.
- iv) All bricks shall be stacked at site in a quantity not exceeding 5,000 bricks in each stack. The stacking shall be done in such a manner as to avoid smearing of the bricks in the lowest part of the stack with clay. Bricks smeared with clay show very poor bond with mortar sand, therefore, any bricks thus affected be rejected out of hand without recourse. When transported to the site the bricks shall not be dumped from the vehicle, the bricks shall be manually unloaded and stacked as aforesaid.

  
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## SECTION – 11 CARPENTRY AND JOINERY

### 1. Scope

The work covered under this section of Specifications consists of providing all material, labour, plant, equipment, appliances and performing all operations in any floor and at any height. connected with the fabrication and erection of all woodwork, mill work, construction assembly, surface finish treatment and building in of all cabinet type items, supports etc. of wood or metal and incidentals, associated woodwork appurtenances, procuring and applying preservatives, installation of "Finish Hard Ware" in connection with finish woodwork as per details shown on the Drawings or as directed by the Engineer.

### 2. Materials

#### 2.1 Timber

##### 2.1.1 Hard Wood:

Hard wood shall comprise of Oak, beech, Walnut Mahogany, Teak, Iroko and Sheesham.

##### 2.1.2 Soft Wood:

All soft wood shall consist of pines, spruce, hemlock and douglas fir or cedrous deodar (referred in the document as deodar), wood locally known as 'Partal' to be used in shutter core where specified.

##### 2.1.3 General Characteristics:

All the timber shall be in accordance with the requirements of BSI No: 1186, 'Quality of Timber and Workmanship in Joinery.

The whole of the timber shall be from the heart of sound and fully grown tree, uniform in substance, straight first class quality properly seasoned, free from large or loose dead-knots, open shakes and excessive sapwood. The scantlings of all timbers shall be brig t: sound and square edged. The moisture content of timber shall not be more. than 10 (ten) percent in case of soft wood and 7 (seven) percent in case of hard wood.

##### 2.1.4 Preservation of Wood:

Prior to installation of all finish wood works in their respective positions, preservatives shall be applied to safeguard the wood work against fungus, termite and bores.

The Preservatives shall be of the best available quality as approved by the Engineer. The method of application shall be strictly in accordance with the manufacturer's instructions. The treatment and application of all the preservatives shall comply with the requirements of BS-CP 98:1964.

##### 2.1.5 Adhesive:

The adhesives shall conform to the requirements of BSI No. 745 "Animal Glues for Wood" manufactured by M/s Host shall be considered approved for this Project or as directed and approved by (he Engineer.

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#### 2.1.6 Nails and Screws:

All nails and screws shall comply with requirements of BSI NO. 1202 and BSI NO. 1210 respectively.

#### 2.1.7 Ply Wood

The ply wood shall comply in all respects with BSI No. 1455:1963. All the ply wood shall only be obtained from KDC Board (Pvt.) Limited, Jhelum as approved by the Engineer.. All plywood shall be manufactured with phenol pharamaldihide or any other approved water proof adhesive but not with urea pharamaldihide.

Ply wood used for doors, and other similar works shall be to the thickness and size as shown on the Drawings or as directed by the Engineer. The grade shall be first quality and the face and back shall be free from end joints, dead knots, overlaps, patches and other similar defects. The surfaces shall be free, smooth for painting or polishing.

#### 2.1.8 High Density Fibre (MDF) Board

Medium density fibre board to be used on the project shall be LASANI of thicknesses as specified in the drawings. Board shall be manufactured with water proof resinous glues and shall be guaranteed by the manufacturer. All boards required for the exterior surfaces of cabinets shall be laminated with farmica in approved color and texture in factory as specified elsewhere.

### 3. Samples

All samples of the material used for the work under this Section of Specification shall be approved by the Engineer and same type of material shall be used throughout the work. If the Engineer desires to get the material tested, this will be got done by the Constructor at his own cost from a laboratory approved by the Engineer.

### 4. Fabrication

Unwrought' timber shall be used. Sawing shall be done with sufficient oversize margin to finally meet the requirements of specified sizes and dimensions of the finished work.

All framing shall be joined and glued properly as shown n on the Drawings or as directed by the Engineer. All joints shall be secured with sufficient number of nails. The Constructor shall perform all necessary mortising, tenoning, grooving, matching, tangoing, housing, rebating and all operations required for the correct jointing. The Constructor shall also provide all metal plates, screws, nails and other fixing material that may be ordered by the Engineer for the proper execution of the joinery work. Fabrication that develop defects due to bad workmanship or unsound materials not conforming to these specifications and the directions of the Engineer, shall be cut out and replaced at Constructor's own expense before the expiry of the maintenance period.



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## 5. Protection Of Materials

All materials and assembled units shall be protected from weather and stored in such a way as to prevent decay, warping and attack by fungus and termites.

## 6. Wooden Doors

### 6.1 Materials

6.1.1 First class Deodar wood as approved by the Engineer shall be used for door frames and door shutters except the core of shutters which shall be partial wood as specified and shown on drawings.

6.1.2 Architraves, beads, lippings shall be of Deodar wood of specified sizes and fixed as per details shown on Drawings.

### 6.2 Ground, Blocking & Nailing Strips

6.2.1 Ground, blocking and nailing strips shall be provided as necessary to receive the work included herein and as required for the work of other trades.

Except as otherwise shown or specified, ground blocking and nailing strips shall be secured in place as follows:

6.2.2 To steel--- by means of 3/8" diameter bolts spaced not over 3 feet.

6.2.3 To brick wall ---- by the use of cut nails spaced not more than 1.5 feet apart and driven directly into the block. .

6.2.4 To poured concrete --- by means of 1/4" diameter galvanized expansion bolts spaced not more than 1.5 feet part or by any approved method.

### 6.3 Exterior and Interior Door Frames

All exterior and interior door frames shall be fabricated of wooden sections of first class deodar wood frame as shown on drawings.

All exposed surfaces of frames and architraves/beads shall be painted with synthetic matt finished enamel paint of approved shade as per the instructions of the Engineer.

The door frames shall be secured in place by means of 4 inches screws and matching Rawal plugs and built into the plastered masonry after the same has dried 4 number screws in each jamb and 2 number for upto 3.5 feet width and 3 number for upto 5 feet width of doors in the head shall be used.

### 6.4 Door Shutters

The shutters will be fixed to the frames with approved quality fittings as per hardware schedule.

6.5 Squareness Maximum diagonal difference 1/8" (between length of diagonal measured on face of door from upper right corner to lower left corner and length of diagonal measured from upper left corner to lower right corner).

Doors, shutters shall be fabricate in a workman like manner strictly to the correct sizes and shapes as shown on the Drawings or as directed by the Engineer.

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### **Manufacturer's Qualifications:**

The manufacturer of doors herein specified shall have been in business of manufacturing doors of type specified for minimum period of five years. The door shutters shall be built in sections, properly jointed and glued together.

The surfaces shall be prepared for painting or polishing. All door shutters shall be paneled, fabricated from first class deodar wood as shown on drawing . Fitting, Hanging and trimming All the doors shall be fitted, hung and trimmed as Here in after specified and as indicated on the Drawings.

Doors shall have a clearance of 1/8" at sides and top unless otherwise directed by the Engineer and shall have 3/16" clearance at bottom. Doors shall be hung and trimmed with hardware as specified. All the locks shall be installed at the same height and shall be located at height as directed by the Engineer. Where directed by the Engineer margin for carpet shall be incorporated in the door shutter.

### **6.6 Hardware**

Hardware shall be of best quality local make extra heavy duty and first class finished material except door locks and door closures which shall be imported of Japanese origin as per attached hardware schedule. The Constructor shall obtain prior approval from the Engineer for quality, shape, pattern, and brand of all the hardware materials by providing samples and catalogues, etc., and shall provide and fix only the approved hardware materials.

Completed doors shall be sound, rigid and free from defects and warp. All edges shall be aligned and smooth, joints shall be close fitting, hard wood doweled or mortised framed and of a strength to maintain frame and of strength to maintain the structural properties of the member connected. All adjoining faces and edges shall be flush and smooth. Edges shall be rectangular and solid.

### **6.7 Quality Assurance**

6.7.1 Tolerances: Doors shall be fabricated to following tolerances Size: Plus or minus 1/16 in overall dimensions Maximum Warp: 1/8"

### **6.8 Submittal**

- 6.8.1 Provide manufacturer's literature completely describing products.
- 6.8.2 Provide shop drawings showing door types, details and locations, referred to the door type and hardware group shown on door and hardware schedules.
- 6.8.3 Provide certificates stating that doors were constructed with timber of the Species specified having moisture content and meeting equilibrium and relative humidity requirements.
- 6.8.4 Submit samples of plywood for selection of color and grain.
- 6.8.5 Procurement of materials shall be made only after the shop drawings and samples have been approved by the Engineer.

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## 6.9 Product Delivery, Storage and Handling

- 6.9.1 Deliver and store products in waterproof, protective containers with seals unbroken and labels intact until time to use.
- 6.9.2 Keep products dry, stack products off ground on level platforms, fully protected from weather, including direct sunlight.
- 6.9.3 Identify type, size and location of each door before delivery in order to permit installation at correct location.

## 6.10 Installation

- 6.10.1 Install doors at correct openings and assure smooth swing and proper closer with frames.
- 6.10.2 Install finish hardware in accordance with manufacturer directions.
- 6.10.3 Hardware shall be carefully and securely fitted. Upon handing over the work, hardware shall be demonstrated to operate freely. Keys shall be placed into a respective locks and upon acceptance of the work keys shall be tagged and delivered to the Engineering work at site.

## 7. Wooden Railing

Material for wooden hand railing in stairs shall be superior quality teak wood/ deodar wood & 1/2 inch dia mild steel pipes. It shall be fabricated and installed in accordance with the design shown on the drawings/details and as per the instructions of the Engineer. Sample of railing shall be fabricated & mock up samples installed at locations designated by the Engineer for approval, prior to s

Shop/detail drawing indicating the basic details at various locations including details at turnings shall be submitted by the Constructor for Engineer's approval. Hand railing shall be installed to line level and plumb. The surface of railing in stairs shall be prepared for polishing. The railing shall be polished/painted with clear lacquer and the steel surfaces shall be painted with matt finished enamel paint.

## 8. SS & Glass Railing

Material for hand railing in stairs shall be 3" dia stainless steel pipe handrail, 1" dia stainless steel balustrades, W' thick unbreakable Security glass and clamps including all fixing accessories complete in all respect as shown on the drawings, It shall be fabricated and installed in accordance with the design shown on the drawings/details and as per the instructions of the Engineer. Sample of railing shall be fabricated & mock up samples installed at locations designated by the Engineer for approval, prior to starting work at site. Shop/detail drawing indicating the basic details at various locations including details at turnings shall be submitted by the Constructor for Engineer's approval. Hand railing shall be installed to line level and plumb.

## 9. Defective Work

In the event of non-conformance to specification and drawings, the wood works shall be rejected by the Engineer and the Constructor shall remove and replace the rejected work by new work of same specifications.



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## 10. Surface Preparation

The surfaces of all wood works shall be prepared in the ( manner as directed by the Engineer for polishing or painting.

## 11. Mock-Up Sample

After approval of shop drawings and tests etc., the contract shall submit at his own cost one mock-up sample of each type of wood works complete with all fixing, fixtures accessories prior to the actual fabrication of the bulk.

The samples shall be returned to the Constructor for incorporation in the works after installation of at least 80% of the works.

## 12. Measurement & Payment

### 12.1 General

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

The rates quoted by the Constructor in the Bill of Quantities shall include work to be executed under these specification in any floor and at any height except where otherwise specifically stated in the relevant item of Bill of Quantities and the Constructor shall not be entitled to any claim or claim any compensation on this account.

12.1.1 Glazing where required and all finished hardware fittings in carpentry and joinery works, including locks, kick and push plate, architrave, beading, handles, locking arrangements etc.

12.1.2 Prime coat, painting with synthetic enamel paint/lacquer polish in carpentry and joinery works/hand railing.

12.1.3 Anti termite treatment to wood works and adhesives

12.1.4 SS / Steel balusters, steel base and steel strip for wooden railing.

12.1.5 Deodar wood blocking, shipping & base frame work in cabinets/hand railing.

12.1.6 SS Plate in the door bottom.

### 12.2 Wooden Door

#### 12.1.1 Measurement

Measurement of acceptably completed works of all types of wooden doors will be made on the basis of net actual area in square feet fabricated and installed in position as shown on the Drawings or as directed by the Engineer. Net area will be measured in accordance with plastered masonry opening in between jambs and plastered head and bottom of shutter.



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### 12.1.2 Payment

Payment will be made for acceptable measured quantity of all types of wooden doors on the basis of unit rate per square feet quoted in the Bill of Quantities against respective item and shall constitute full compensation for all the works including all hardware & fittings like locks, tower bolts, push plates etc. as per details mentioned in Volume III & IV of Tender & Contract Document related to the item.



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## SECTION – 12 ALUMINIUM WORKS

### 1. Scope

The work covered under this section of the specifications consists of providing all material, labour, equipment, performing all operations required for providing and installation of aluminium. doors, windows, ventilators & louvers including all related items such as sealants, gasket, netting, rollers, hinges, latches, fastenings, anchor bolts, door locks, locking devices and glass complete in strict accordance with this section of specifications, the applicable drawings and as scheduled. Any additional information required in this connection and not stated in these specifications, shall be obtained from the Engineer's Representative.

### 2. Applicable Standards

Latest editions of following ISO and British Standards are relevant to these Specifications wherever applicable.

#### 2.1 ISO (International Organization for Standardization)

1804	Doors Door	Terminology
6442	Leaves	Measurement of defects of general flatness
6443	Door	
	Leaves	Measurement of dimensions and defects of squareness.
6444	Door	
	Leaves	
6613	Windows & Doors	Test of behaviour under humidity variations (successive uniform climates) wind resistance tests. Air permeability test.

#### 2.2 BSI (British Standard Institution)

1227 Hinges  
4873 Aluminum alloy windows.

### 3. General

- 3.1 Door, Windows, ventilators, louvers and other items to be provided shall be aluminium, of profile pattern and design shown on drawings and shop drawings manufactured by reputable manufacturer approved by the Engineer. The Constructor shall provide manufacture literature completely describing the product instructions for installation and maintenance.
- 3.2 All the sections used for doors, windows, ventilators & louvers fly screens shall be of best quality aluminium products such as equal and unequal angles, channels, tubes, corrugated strips, mouldings etc., in accordance with International standards conforming to ASTM B 308 & B 221.
- 3.3 All doors, windows. Ventilators and louvers shall be of type and size indicated on drawings and shall conform to the requirements shown and specified herein.

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3.4 Constructor shall arrange tests and analysis if directed by the Engineer of scaled models of each door, window, ventilator and louvers type at the maker's works or any laboratory specified by the Engineer for the material supplied by him to be tested in the presence of the Engineer's Inspector, to whom test certificates, proof sheets, etc. shall be furnished. The models shall be submitted to the Engineer for approval prior to testing. Nevertheless, neither the fact that the materials have been tested in the presence of the inspector nor that the Engineer may have been furnished with test certificates in lieu of sending an inspector to the works shall affect the liberty of the Engineer to reject, after delivery of materials found not in accordance with these specifications.

3.5 The Constructor shall submit shop drawings conforming to design concept which shall show full construction details, quantities and locations, fastenings, stiffening members and attachments to adjacent construction and materials. Shop drawings and calculations shall be submitted at the proper time to allow for checking, revisions, and agreement and to permit manufacturer's product delivery and start of site work to suit the building program. The Constructor shall submit representative samples of finished doors, windows, anchoring mechanism, embedded parts, fastenings, glass panes, accessories and other materials for the Engineer's approval.

After approval of shop drawings and tests etc., the Constructor shall submit at his own cost one mock-up sample of each type of aluminium works complete with glazing, all components assembly method and required fittings and accessories prior to the actual fabrication of the bulk. The samples shall be returned to the Constructor for incorporation in the works after installation of at least 80% of the works.

Fabricate and assemble all work in the shop of the approved manufacturer to reduce field fabrication to a minimum unless otherwise directed by the Engineer.

The glass shall conform to specification laid down under chapter 'Glazing' and shall free from all blemishes, bubbles, distortions and other flaws of any kind and shall be properly cut to size as shown on drawings, so as to fit the grooves in window members.

3.6 The structural shape of the Aluminium members shall be of uniform quality, color temper, clean, round, commercially straight and free from injurious defects.

3.7 All doors, windows, ventilators and louvers shall be fabricated as a complete unit, fully airtight and watertight, including rubber gasket for glazing, hinges, stays, rollers, latch, locking arrangement, handles, etc anodized in specified color, inclusive of glass sheet, necessary holes for fixing, door locks, door closures and window locking requirements, all as approved by the engineer.

Constructor shall, provide certificate signed by the manufacturer stating that each lot has been sampled, tested and respected and has met the requirements in accordance with these specifications and the same shall be furnished to the Engineer.

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- 3.8 The shop drawings shall clearly show that there shall be no penetration of rainwater from the exterior to the interior in case of severe wind and rainstorm. This has to be specially ensured in bill section.

#### 4. Material

##### 4.1 Frames/shutters

The frames of aluminium door, windows and ventilator shall be formed from rolled, strip or extruded aluminium. The thickness of sectional members shall be at least 1.6 mm. All outer / frame sections of open able / fixed windows. Ventilators and louvers curtain wall shall be 95 mm minimum in width. The Frames for doors and door/windows curtain wall shall be at least 97 mm in width.

- 4.2 As shown on the drawings, aluminium frames shall be provided as per international standard approved by the Consultant/Engineer Incharge.
- 4.3 Fasteners shall be stainless steel of a type selected to prevent galvanic action with the components fastened.
- 4.4 Gaskets shall be vinyl glazing channel gasket to commercial standard CS-230-60.
- 4.5 Hardware shall be manufacturer's standard hardware. Flush to match doors, windows, ventilators and louvers finish. Floor mounted concealed type double action/swing imported door closures shall be provided to all doors. Heavy duty in-matching finish stays shall be provided to all open able windows, ventilators and louvers. Stays shall be attached to the window frame so as could be replaced easily.
- 4.6 Joint sealant shall be approved elastomer.
- 4.7 All Aluminium sections shall be powder coated in accordance with the standards of Aluminium Association of USA. The anodisation shall be of not less than 70-90 microns. The anodic oxide surface shall be properly sealed.
- 4.8 For powder coated finish aluminium sections to be coated shall be mill finish. The sections shall be firstly degreased with a degreasing chemical to remove all/any stains. The sections will then be given a chromating coating and electro static powder coating in the desired color with a powder-coating machine. After color coating the sections will be baked at baking temperature of 220 degree Centigrade for 25 minutes.
- 4.9 All sliding/open able windows shall be sliding/open able wire/fly screen shutters in window matching finish with wire/fly screen of size so as not to permit the entry of flies and mosquitoes. The wire mesh shall be 30 SWG. 14 mesh (14 x 14 openings per square inch).

#### 5. Design Requirement

The Constructor shall design the installation to meet or excel the following requirements,



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### 5.1 Tolerances

The Constructor shall be responsible for agreeing to all dimensions with the Engineer before proceeding with the manufacture and for making provision to allow for building tolerances required by the Engineer. Constructor shall also take site measurements of the structure completed before manufacturing.

### 5.2 Thermal & Seismic Movements

The window and glazing assemblies are to be constructed and installed in the openings with sufficient tolerance and, where necessary, to provide for Joints incorporated in couplings, to provide for expansion and contraction as will be caused by the local seismic and climatic conditions and temperature changes, winter to summer - day to night without buckling, distortion of joints, or other harmful effects.

## 6. Workmanship

The Constructor shall be responsible for the protection and installation of all items furnished. All items shall be installed plumb and square and shall be solidly anchored in a good workman like manner in accordance with the manufacturer's instruction and as specified herein. The Constructor shall be responsible for the protection of installed items from damage by other trades. All items shall be left in operating, neat and clean condition, free from dirt, finger marks, etc. The Constructor shall be responsible for final cleaning before the final acceptance.

The glass panes shall firmly be secured in the rebates with the rubber gasket. Ensure that the beads and grooves are clean, dry and unobstructed at the time of glazing. The complete unit shall be airtight and watertight on completion. No doors, windows and ventilator shall be considered complete until and unless the fingerprints and other stains and marks have been removed from the surface of glass and aluminium.

## 7. Product Delivery and Storage

7.1 Deliver doors, windows, ventilator and louvers in a manner preventing damage to units,

### 7.2 Applicable Standards

Latest editions of following British Standards are relevant to these Specifications wherever applicable.

Store materials off the ground under cover in a manner preventing deterioration or All embedded parts and anchor bolts shall be delivered to the site carefully and keeping the fabricated shape and configuration. All these parts shall be suitably marked for identification.



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## SECTION – 13 GLAZING

### 1. Scope

The work under this section of the Specifications consists of furnishing all labour, equipment, tools, appliances, scaffolding and providing in any floor and at any height glass, gaskets, sealants, compound and other materials required for performing all operations in connection with the installation and setting of all types of glass and glazing complete in every respect in accordance with the Drawings or as directed by the Engineer. The scope of this section of Specifications is covered with detailed Specifications as laid down herein.

### 2. Applicable Standards

Latest addition of following British Standards are relevant to these specifications where ever applicable:

#### 2.1 BSI (British Standards Institution)

952	Glass for glazing
5051	Security glazing part I & II
CP.152	Glazing

### 3. General

- 3.1 Each type of glass shall have the manufacturer's label on each pane, and the labels shall remain on the glass until final cleaning.
- 3.2 Glazing sealant shall be as recommended by the manufacturer for the particular application.
- 3.3 Spacer shims distance (pieces) shall be plasticized polyvinyl chloride (PVC). Thickness shall be equal to space shown on drawings between glass and rebates bead or cleat. Depth shall give not less than 1/4" cover of glazing sealant.
- 3.4 Constructor shall submit samples for each type of glass, minimum 4' x 4' in size with protective edges. Samples of glazing sealant minimum 0.1 liter of specified types shall be submitted.
- 3.5 Constructor shall submit 1 feet long sample c; each type of glazing gasket.
- 3.6 Constructor shall also submit printed materials manufacturer's installation instructions for specified glazing gaskets, compounds sealants and accessories including description of required equipment and procedures and precautions to be observed.

### 4. Delivery Storage and Handling

- 4.1 Constructor shall deliver materials in manufacturer's original, unopened containers clearly labeled with manufacturer's name and address, material, brand, type, class and rating as applicable.

Constructor shall store the materials in original unopened containers with labels intact/protected from ground contact and from elements which may damage glass.

Constructor shall handle the materials in a manner to prevent breakage of glass and damage to surfaces.

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Examine each piece of glass and discard and replace glass with edge damage or face imperfection. All glazing shall be wind tight and fully water tight on completion.

Clean glazing channels and other framing members indicated to receive glass. Remove coatings which are not firmly bonded to the substrate, Remove lacquer from metal surfaces wherever elastomeric sealants are to be used. Apply primer and sealer to joint surfaces wherever recommended by the sealant manufacturer and as shown on the drawings.

Trim and clean excess glazing materials from surrounding surfaces immediately after installation and eliminate stains and discolorations.

Cure glazing sealants and compounds in compliance with manufacturer's instructions to obtain high early bond strength internal cohesive strength and surface durability.

While glazing operation is in progress great care shall be taken to avoid breakage or damage to the glass and adjoining glazing. The Constructor shall make good at his own cost, all glass broken by his workmen while cleaning or carrying out other operations. On the completion of the glazing work, all glass that has been set by the Constructor shall, if it becomes loose, within the maintenance period, be refixed at Constructor's expense.

No glazing shall be considered complete until and unless paint and other stains have been removed from the surface of the glass and checked by the Engineer for water tightness.

## 5. Protection and Cleaning of Glazing

5.1 Remove all smears labels and excess glazing sealant, leave clean inside and outside free from scratches. The Constructor shall be responsible for the protection of installed glass. Before final acceptance, damaged or broken glass shall be removed and replaced with the new glass at no additional expense to the Employer and replaced with new glass at no additional aged or broken glass shall be removed.

5.2 All glass surfaces shall be washed clean both inside and outside within two weeks prior to final acceptance by the Consultant/Engineer Incharge.

## 6. Measurement and Payment

No payment shall be made for the works involved within the scope of this section specifications unless otherwise specifically stated in the Bill of Quantities or herein. The cost there of shall be deemed to be included in the quoted unit rate of the relevant item of the Bill of Quantities.



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## SECTION – 14 BITUMEN COATING

### 1. Scope

The work under this section of the Specifications consists of furnishing all plant, labor, equipment, appliances and materials and in performing all operations related to water proof treatment to foundations and basement structures complete in strict accordance with this section of the specifications and the applicable drawings and subject to the terms and conditions of the Contract.

### 2. Submittal

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

### 3. Materials

3.1 Bitumen 10/20 grade.

### 4. Delivery Storage and Handling

Materials shall be protected from damage during loading shipment delivery and storage Non staining materials shall be used for blocking and packing

### 5. Preparatory Work

5.1 All surfaces to be treated shall be dust free and dry. Application of finishes shall not start unless the preparatory work has been inspected and approved by' the Engineer.

### 6. Bitumen Coating/Painting In Foundation Sub-Structures, Under Floors

#### a) Bitumen Painting:

All surfaces to be bitumen painted shall be thoroughly cleaned of any accretion, dust, dirt etc. by scraping, wire brushing or as directed by the Engineer. The surface shall be primed with a coat or asphalt oil used at the rate of not less than 1.08 gallon /10 square meter. Two coats of hot bitumen paint shall be applied at the rate of 1.0 kg/ Sq.m. each coat. The first coat shall be allowed to dry for about 6 hours before applying the second coat. During operation of painting great care shall be taken to avoid air bubbles. The manufacturers shall be taken to avoid air bubbles. The manufacturer's instructions and Engineer's directions shall be followed.

### 7. Measurement and Payment

#### 7.1 General

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

7.1.1 All preparatory work, scrapping, scratching, cleaning, cant strips, gravel strips, etc.

7.1.2 Coats of bitumen.

#### 7.2 Bitumen Painting/Coating

##### 7.2.1 Measurement

Measurement of acceptably completed works of bitumen painting/coating will be made on the basis of net actual area in square foot as shown on the Drawings or as directed by the Engineer.

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### 7.2.2 Payment

Payment will be made for acceptable measured quantity of bitumen painting/coating on the basis of unit rate per square foot quoted in the Bills of Quantities. The unit rate shall include all cost of surface preparation and shall constitute full compensation for all the works related to the item.

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## SECTION – 15 CEMENT PLASTER

### 1. Scope

The work under this section of the Specifications consists of furnishing all plant, labour, equipment, appliances, and materials and in performing all operations in any floor and at any height 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 conditions of the contract.

### 2. General

- 2.1 Except as may be otherwise shown on surfaces specified, all plaster work, both internal and external shall be ordinary Portland Cement plaster of the required thickness as shown on the drawings.
- 2.2 Plastering shall not commence until all electric conduits, drainage and sanitary pipes, inlets to tanks, brackets, clamps, doors and window frames and all sort\$ of inserts and embedded items are fixed in position. It shall be the responsibility of the Constructor to make sure that all such work is carried out by other Constructor before starting of plaster work. Chiseling and repairing of cement plaster shall not be permitted without the approval of the Engineer.
- 2.3 Sample of materials shall be submitted to the Engineer for his approval prior to use in the works.

### 3. Material

- 3.1 Cement for plaster shall be Ordinary Portland Cement (B.S 12 or P.S 232) or Sulphate resisting cement (B.S 4027 or P.S. 612) as specified 'and shall conform to requirements specified in the section "Plain and Reinforced Concrete".
- 3.2 Sand for plaster shall coy with the requirements of BS 1199, BS 1200 or the draft Pakistan Standard "Sand for Plaster" as directed by the Engineer.
- 3.3 Water for plaster shall conform to requirements specified in the section for "plain and reinforced concrete".
- 3.4 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.

### 4. Proportioning and Mixing

- 4.1 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. Mixing shall be continuous until all ingredients are evenly distributed and thoroughly mixed.
- 4.2 Only limited water shall be added for proper workability and such quantity of ortar 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. Retempering shall not be permitted and all mortar which has begun to stiffen shall be discarded.
- 4.3 Plaster ingredients shall be thoroughly mixed either by hand on a clean cement concrete platform or by a mechanical mixer, as directed by the Engineer.

### 5. Preparation of Surface to be Plastered

- 5.1 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

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concerned. The surface of all-concrete ceilings, beams and columns shall be lightly hacked by approved means to give the required key for plastering.

- 5.2 All masonry surfaces to be plastered shall be cleaned to remove all matter, which will otherwise adversely affect the adhesion of plaster to the surface concerned. The surface shall be washed with clean water and kept damp for 24 hours before further treatment. The surface thus prepared shall be treated uniformly with cement and sand slurry. The slurry to be used shall be one part cement to one part sand by volume with water added to make a stiff creamy mix. The slurry shall be applied with a stiff brush on surface, which has previously been well wetted. The surface so treated shall be left to cure for 3 days.

## 6. Application of Plaster

- 6.1 The plaster of thickness less than the specified thickness shall be rejected. If the plaster is to be more than 1/2" 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 Constructor. The plasterwork is to cover all conduits, pipes etc fixed in the walls and ceiling. Wherever specified, metal lath shall be nailed firmly before plastering is commenced. The plaster surface shall be tested frequently with a 10 feet straight edge and plumb bob.
- 6.2 Plaster containing cracks, blisters, pits, discoloration or any defects shall not be acceptable. Any such plaster or loose plaster shall be removed & replaced with plaster in conformity with these specifications and as additionally directed by the Engineer. Constructor shall cut out and patch all defective work at his own cost. All damaged plaster shall be patched as directed by the Engineer. Patching plaster shall match appearance of and shall be finished level with adjoining plaster.

## 7. Metal Lath

Metal lathing shall be fabricated from sheet steel and shall be of uniform quality and free from flaws broken strands, cracks and corrosive pitting, shall be rectangular and true to shape and shall comply with BS-1369.

All lathing shall be galvanized. Where plastering material depends entirely on the lathing for its key, these shall be not less than two complete mesh openings per 1-1/8" in one direction and the width of the aperture shall not be less than 3/16".

Sheets shall not be less than 1.6 kg/sq.m when fabricated, using 0.7 mm thick steel sheet. Where used on smooth surfaces to form a key it shall be not less than 1.2 kg/sq.m when fabricated, using 0.5 mm thick steel sheet. Tying wire shall be 1.2 mm diameter galvanized annealed iron wire.

Sheets shall be welded to angle iron frame as shown on drawings. 8.

## 8. Angle and Beads

Angle beads, stop beads, depth gauge beads, edging profiles, plaster dividing profiles, interior angle profiles, plaster borders and the like shall all be manufactured from sheet steel and galvanized after fabrication, all beads shall be perforated at edges to ensure good adhesion of the plaster work. Thickness and dimensions shall suit particular locations and plaster thickness.

All angle beads, stop beads, depth gauge beads and the like are to be fixed in accordance with the manufacturer's instructions, at all corners, stops, joints, etc. as per directions of Engineer In charge.

## 9. Internal / External Plaster

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- 9.1 Where specified in the Drawings external surface shall have an average 20mm thick. plaster finish, consisting of a base coat of 1:4 cement sand mortar in Grey cement and the finish coat of smooth plaster as shown on the Drawings and as directed by the Engineer.
- 9.2 Where specified in the Drawings all internal plaster shall have an average 12mm thick consisting of base coat of 1 :3:1:4 cement sand mortar in grey cement and finish coat of smooth plaster as shown on the Drawings and as directed by the Engineer.
- 9.3 Wire mesh should be used in joints where an RCC member such as Columns, Beams, slabs etc meets masonry in Plaster.

### 9.3 Stucco Plaster

Wherever specified in the drawings external stucco plaster shall consist 'of 1 :2, one part white cement & 2 parts approved shade of marble chips zero size mixed with approved pigment to achieve desired shade. Wherever shown on drawings, groves shall be provided with aluminum U/Y channels. The Constructor shall prepare mockup samples of stucco plaster for the approval of Engineer. The plaster shall be applied with machines and the final rough surface/texture/shade shall be as per the approved sample, direction and approval of the Engineer-In charge.

## 10. Cleaning and Protection

- 10.1 Rubbish and debris shall be removed as necessary to make way for work of other trades and as directed by the Engineer. As each room or space is completed all rubbish, debris, scaffolding and tools should be removed to leave the room clean.
- 10.2 Prior to plastering all aluminum windows, finished metals should be covered by sheet of plastic or tarpaulin to protect it from damage.
- 10.3 Protect finished plaster from injury by any source. Constructor shall also protect walls, floors and work of other trades from Plastic materials.

## 11. Tolerances

Surfaces of plaster work shall be finished with a true plane to correct line and level with all angle and corners to a right angle unless otherwise specified and with walls and reveals plumb and square.

Maximum permitted tolerances shall not exceed 1/8" in 6 feet variation from plumb or level in any exposed line or surface and 1/16" variation between planes of abutting edges or ends.

## 12. Measurement and Payment

### 12.1 General

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

The rates quoted by the Constructor in the Bill of Quantities shall include work to be executed under these specification in any floor and at any height, otherwise specifically stated in the relevant item of Bill of Quantities and the Constructor shall not be entitled to any claim or claim any compensation on this account.

12.1.1 Metal lath over reinforced concrete and masonry joint.

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- 12.1.2 Joints, junctions, corners, beads, drip course edge, roundings, and aluminum UN channels in groves. Etc.
- 12.1.3 More than one layer due to any unevenness in the finished works and base coat plaster in stucco plaster including marble chips/color pigments.
- 12.1.4 Cutting & patching of all defective works.
- 12.1.5 Surface preparation, cleaning and protection as specified.
- 12.1.6 Marble chips & pigments in stucco plaster.
- 12.1.7 Roughning of first coat of plaster before application of 2nd coat incase where overall required plaster thickness exceeds 1/2 inch.

## 12.2 Plain Plaster/Stucco plaster Measurement

Deductions shall not be made for ends of joints, beam posts, etc., and openings not exceeding 5 square feet each and no addition shall be made for reveals, jambs, soffits, sills, etc. of these openings non for finishing the plaster around ends of joints, beams posts, etc.

In case of opening of area exceeding 5 square, feet each, deduction shall be made for the openings and also no addition shall be made for reveals jambs, soffits, sills, etc., of these openings.

Measurement of acceptably completed works of plaster will be made on the basis of number of square feet of the surface area plaster as shown on the Drawings, or as directed by the Engineer.

## 12.3 Payment

Payment will be made for acceptable measured quantity of plaster on the basis of unit rate per square feet quoted in the Bill of Quantities and shall constitute full compensation for all the works related to the item.



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## SECTION – 16 MARBLE

### 1. Scope

The work under this section of specifications, consists of providing all material, labour, plant, equipment, appliances in any floor and at any height and performing all operations required for providing and installing marble natural stone slab for toilet counters, where shown on the drawings, complete in strict accordance with this section of the specification and the applicable Drawings.

### 2. Submittals

The Constructor shall submit manufacturer's specifications and other product data for each type of marble stone and fixtures required, including instructions for handling, storage, installation and protection.

Shop Drawings shall be submitted showing sizes, dimensions, sections and profiles of slab, arrangement and provisions for jointing, anchoring, fastening and supports and other necessary fixing details. Indicate locations, layouts and pattern arrangements for each stone type and color.

Submit three ranges samples 300mm x 300mm in size of each type of stone showing color, grade, finishing and texture for approval of the Engineer.

### 3. Delivery, Storage and Handling

Materials shall be protected from damage during loading, shipment, delivery and storage. Non staining materials for blocking and packing shall be used. Stack marble at site in accordance with manufacturer's recommendations and as required to prevent staining, scratching, etching or breakage.

### 4. Materials

#### 4.1 General

Marble shall be compact, dense, metamorphic rock of lime stone origin obtained from quarries within Pakistan. It shall have a specific gravity of 2.7 and hardness number on Moh's scale shall range from 3 to 4.

Obtain each marble stone type from a single quarry and ensure consistent color range and texture throughout the work. All pieces shall be of uniform thickness and truly square in shape.

Provide marble slabs/sills and tiles of specified sizes in floors, stair tread & risers and counter tops as shown on drawings.

Provide marble slabs/ sills and tiles of type, color and finish for each area as directed by the Consultant/Engineer Incharge.

Provide stone of specified thickness. Saw cut the back surfaces that are meant to be concealed in finished work.

Provide irregular shaped units, staircase units and skirting base units to the profiles of required shapes & sizes and polished exposed surfaces wherever specified.

#### 4.2 Marble Stone Type

All marble stone types are to be selected and approved by the Engineer for quality, color and texture.

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Marble: Marble of approved type and color of local origin, first class quality and high class finish acceptable to the Engineer.

#### 4.3 Beds and Backings

Where applicable, standard cementitious screed and mortar beds and backings, mixed and proportioned by volume shall be as follows: -

Grey ordinary Portland : 1 part

Cement Sand Water : 3 parts

: Clean, fresh and free from deleterious substances

#### 4.4 Adhesives, Grouts and Sealants

Proprietary adhesives, joint grouts and sealants of approved type as required and recommended by the manufacturer for specific application shall be used. The color of the joint grout and the sealants shall match with the color of stone.

### 5. Execution

#### 5.1 Flooring, Skirting/dado and Stair

Apply cement slurry coat over surfaces of concrete substrate immediately prior to placing setting bed. Limit area of application to avoid premature drying out. Install setting bed of required thickness and set stone units before initial set occurs. Apply a thin layer of cement paste to bottom of each unit. Set tamps and level units immediately. Set units in required pattern with uniform joint widths.

Point joints as soon as possible after initial set. Force grout into joints, strike flush and tool slightly concave.

Remove mortar and grout from surfaces well still moist and as the work progresses.

Do not permit traffic on finished surface during setting and for a minimum of 24 hours after final pointing of joints.

#### 5.2 Marble Toilet Counters

Marble toilet counter tops of the specified size shall be installed in areas shown on Drawings with M.s. angle framing and fixing accessories in accordance with approved shop drawing. Joints shall be cement grouted with matching color or with matching color sealant.

#### 5.3 Repair and Cleaning

Remove and replace stone units which are broken, chipped, stained or otherwise damaged. Where directed, remove and replace units which do not match adjoining stonework or are not in line and level as shown on Drawings. Provide new matching units, install and point joints to eliminate evidence of replacement. Repoint defective and unsatisfactory joints to provide neat, uniform appearance.

### 6. Product Delivery, Storage and Handling

6.1 Material shall be delivered in original; unopened, protective packaging, with manufacturer's labels indicating brand name, pattern, size, thickness and fire rating.

6.2 Material shall be stored in original protective packaging to prevent soiling, physical damage or wetting.

6.3 Cartons shall be stored in the installation area, opened at each end to stabilize moisture content and temperature, for 48 hours prior to installation.

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## 7. Job Site Conditions

- 7.1 Work which will be concealed by false ceilings shall be completed, tested, inspected and accepted before ceiling work is started.
- 7.2 False ceiling installation shall not begin until the area has been closed in, and temperature and humidity approximate occupancy conditions. Wet work shall be cured and dry before ceiling work is started.
- 7.3 Surface which will support the ceilings, and those to which the ceiling abut, shall be inspected and accepted for completeness and adequacy to receive the ceilings before the work begins.

## 8. Installation and Workmanship

False ceiling suspension system and panels shall be installed in accordance with the requirements of BSI-CP.290 and with the manufacturer's recommendations as approved by the Engineer.

### 8.1 Suspension System

The hangers as specified shall be evenly disposed as per drawings, details and place and position as indicated. The suspension system should be installed by making holes in the roof and shall be made good as directed by the Engineer. Their lengths clear of roofing slab shall be as per shop drawing details.

The framing of the specified section and run at spacing as per shop drawings. The jointing of runners to hangers shall be as per approved shop drawing details. The extra framing if required shall be provided for light receptacles as per approved shop drawing details.

Wall hangers shall be positively and rigidly connected to the structure and to cross runners.

### 8.2 False Ceiling tiles.

Tiles shall be installed in the grid system after completion of installation of the suspension of lighting and air conditioning fixtures.

Forming ceiling panels shall be laid out in pattern including border of uniform width around all sides of each ceiling area. The pattern shall be as per shop drawings approved by the Engineer.

All panels shall be furnished and installed in an approved manner and as per approved types, sizes and surface design.

## 9. Fixtures

Light fixtures shall be installed as per approved pattern and supported in accordance with manufacturer's recommendations.

## 10. Finishing

After installation, dirty, soiled or discolored surfaces shall be cleaned and left free from defects and ready to receive any painted finish if required.

The panels which are damaged or improperly installed shall be removed and replaced by the Constructor at his cost.

## 11. Measurement and Payment

### 11.1 General

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

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The rates quoted by the Constructor in the Bill of Quantities shall include work to be executed under these specification in any floor and at any height except where otherwise specifically stated in the relevant item of Bill of Quantities and the Constructor shall not be entitled to any claim or claim any compensation on this account.

Aluminum approved suspension system including main channels, main tee/cross tee bars, wall moulding and edge trims, hanger strips and accessories hold down clips, Aluminum tiles / strips etc. complete for aluminum tile / strips ceiling.

## **11.2 False Ceiling**

### **11.2.1 Measurement**

Measurement of acceptably completed works of respective types of false ceiling will be made on the basis of net actual area in square feet of false ceiling provided and installed in position as shown on the Drawings or as directed by the Consultant/Engineer Incharge.

### **11.2.2 Payment**

Payment will be made for acceptable measured quantity of respective type of false ceiling on the basis of unit rate per square feet quoted in the Bill of Quantities and shall constitute full compensation for all the works related to the item.

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## SECTION – 17 FLOOR AND WALL FINISHES

### 1. Scope

The work under this section of the Specification consists of furnishing all plant, labour, equipment, appliances and materials and performing all operations in any floor and at any height in connection with the installation of cement concrete floors and floor finishes including bases, skirting and external surface treatments, complete in strict accordance with this section of the specifications and the applicable drawings and subject to the terms and conditions of the Contract.

### 2. Material

#### 2.1 Cement

Cement shall be ordinary Portland cement conforming to B.S. 12 or PS 232.

#### 2.2 Sand

All fine sand shall be obtained from sources approved by the Engineer. The grading shall conform to B.S 882 Grading Zone 1 and 2 of which the gradation limits are as follows:

Percentage (by weight) passing

B.S. Sieve	Grading Zone 1	Grading Zone 2
3/8" (9.53 mm)	100	100
3/16" (4.765 mm)	90-100	90-100
No. 7	60-95	75-100
No. 14	30-70	55-90
No. 25	15-34	35-59
No. 52	5-20	0-10
No. 100	0-10	

#### 2.3 Coarse Aggregate

Coarse aggregate shall be crushed or uncrushed gravel or crushed stone, angular or rounded in shape and shall have granular, crystalline or smooth surface free from friable, flaky and laminated pieces, mica and shale. It shall not contain matters injurious to concrete. All coarse aggregate shall conform to BSS NO.882 and shall be graded as follows:

B.S. Sieve	% Passing by weight
1" (25.40 mm)	100
3/4" (19.05 mm)	90-100
3/8" ( 9.53 mm)	20-55
3/16"(4.765 mm)	0-10

The aggregate shall be stored on properly constructed paving or as directed by the Engineer.

There shall be a physical partition between the stockpiles of coarse and fine aggregate. If required aggregates shall be washed and screened to the satisfaction of the Engineer. Sieve analysis of all the aggregates to be used in the works shall be carried out as and when required by the Engineer. All aggregate shall be subject to the approval of the Engineer.

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Any aggregates not found to be of the specified/approved standard shall be rejected by the Engineer and all such rejected material shall be removed from site with-out delay.

Floors, sub-base or base constructed with rejected aggregates shall be dismantled and rebuilt at the expense of the Constructor.

#### 2.4 Stone Ballast

Stone ballast to be used as soling shall comprise of strong, hard, durable stone of approved size. The stone shall be obtained from approved quarry and shall be sound, free from laminations and weak cleavages and shall conform to specifications of "Stone Soling".

#### 2.5 Water

Water used for mixing concrete, curing or any other operation of the works specified herein shall be fresh, clean and free from organic or inorganic matters in solutions or in suspension. Only water of the approved quality shall be used for all constructional purposes:

#### 2.6 Ceramic/Porcelain tiles

Ceramic tiles shall be imported, premium quality, plain white/ colored or printed. Porcelain tiles shall be imported Italian or Spanish or Granitto. The tiles shall be of sizes as specified on the drawings and shall conform to BS 1281 as per samples.

#### 2.7 Cleaning Compound

The compound used for all cleaning of terrazzo shall be an approved neutral chemical cleaner free from acid and alkali or any other material that will affect the color or otherwise damage the terrazzo and shall not affect the conductivity of terrazzo floors.

#### 2.8 PVC Vinyl Tiles

PVC vinyl tiles shall be imported best quality of size 300mm X 300mm Color and shade shall be as per sample to be submitted by the Constructor and approved by the Engineer.

#### 2.9 Division Strips

Division strips shall be of marble as approved by the Engineer. Standard division strips for floor finishes shall be not less than 5mm (3/16") in thickness and shall not be less than 1-3/4" in depth.

#### 2.10 Marble Chips

Marble chips shall have an abrasive hardness of not less than 16, as determined by the test of wear resistance in National Bureau of Standards Reports MBS 98. Size shall vary from No. zero to 8.

#### 2.11 Preservative Material

Preservative treatment for terrazzo floor shall produce a water-proof finish which will not be impaired by immersion in water at room temperature for a period of 2-1/2 hours, approximately 18 hours after the floor is finished by buffing, as specified. The preservative material shall not discolor the terrazzo nor leave a tacky or sticky finished film on the surface after buffing.

### 3. Cement Concrete Flooring

The materials for C.C flooring shall be same as already specified under clause 3, "Materials".

#### 3.1 Composition of Concrete

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Concrete shall be composed of Portland Cement, sand, coarse, aggregate and water, all well mixed and brought to the proper consistency. The Constructor shall mix the ingredients as indicated on the Drawings. The proportions of the various ingredients shall be determined from time to time during the progress of the work and tests shall be made of samples of the aggregates and the resulting concrete. The mix proportions and appropriate water-cement ratio will be determined on the basis of the production of concrete having required workability, density, impermeability, durability and required strength.

### 3.2 Mixing Concrete

The concrete ingredients shall be mixed in a batch mixer for not less than 1-1/2 minutes after all ingredients, except the full amount of water, are in the mixer. The Engineer reserves the right to increase the mixing time when the charging and mixing operations fail to produce a concrete batch in which the ingredients are uniformly distributed and the consistency is not uniform. The concrete shall be uniform in composition and consistency from batch to batch except when changes in composition or consistency are required. Water shall be added prior to, during and following the mixer charge. Excessive over-mixing requiring addition of water to preserve the required concrete consistency will not be permitted. The concrete ingredients shall be mixed by volumetric measurement in purpose made boxes approved by the Engineer.

### 3.3 Construction

The base course of the floor shall comprise of stone ballast of 2 inches (approx: 50 mm) mesh size. The base course shall be thoroughly compacted by suitable power rammers to the total consolidated thickness as shown on the Drawings and as approved by the Engineer. The interstices shall be filled with smaller size stones. The base course shall be blinded with sand and the whole surface watered. Over the well compacted base course, a layer of concrete of the required grade and thickness shall be laid, in panels of the sizes as indicated on the Drawing and as approved by the Engineer.

After the C.C bed has been cured, as directed by the Consultant/Engineer Incharge, it shall be roughened and well watered before floor finishing is laid. The floor finish shall comprise of cement concrete of required grade and shall be laid in panels to the required thickness as shown on the Drawings or as directed by the Engineer. The concrete after laying will be thoroughly rammed and mortar worked up to the top and smoothed with a steel trowel. The edge of each section into which the floor is divided should be defined by wooden screeds of the approved width and of a depth equal to the depth of the floor concrete.

Freshly placed concrete floor and completed floor portions as finished shall be protected to prevent loss of water by covering with damp hessian, water proof paper, damp sand or other approved material, and shall be kept constantly damp for a period of four days or longer after concreting as directed by the Consultant/Engineer Incharge. The concrete shall be allowed to dry out slowly over a period of three days after wet curing is completed.

The expansion joints shall be filled in with hot bitumen, of the approved grade, as directed by the engineer.

## 4. Terrazzo Flooring

### 4.1 Mix

The terrazzo mixes shall be composed by weight as follows:

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Plain terrazzo for all floors and bases indicated as terrazzo and not otherwise specified, shall be composed of one part cement, white or grey, and 2 parts of marble chips of the sizes and colors hereinafter specified.

#### 4.2 Preparation for Terrazzo

The grade and thickness of concrete as shown on the Drawings shall be laid as under bed to receive terrazzo. The surface of the bed shall be roughened for bonding with the terrazzo finish. If the surface is too smooth it shall be roughened with a toothed chisel and, prior to laying the terrazzo the bed shall be cleaned of all dirt, oil grease and extra loose material.

#### 4.3 Division Strips

Terrazzo floors and bases shall be divided up by marble strips of specified thickness and depth. The division strips between field work and borders shall have exposed tops in full width of the strips. The division strips shall be set immediately after the spreading of the under bed, the strips being partially embedded therein, securely anchored to the subfloor and grouted solid.

All division strips shall be set, straight to lines and to the proper level to ensure that the tops of the strips will show uniformly after grinding and smoothening operations are completed and joints and intersections shall be fitted tight. Strips shall be braced to prevent bulging during the placing of terrazzo.

Unless otherwise shown on the drawings, the divisions in field work of large areas shall not exceed 4 feet x 4 feet and in small areas shall not exceed 2 feet x 2 feet.

Edging strips shall be placed at doorways between terrazzo and other types of flooring and along the edges of all terrazzo bases or borders and adjoining other types of floor finishes or floor covering. The edging strips at doorways shall be placed in line with the step face of doors. All edging strips shall be anchored and grouted solid in the under bed or to the concrete sub-floor and braced to prevent bulging as specified for division strip.

#### 4.4 Laying Terrazzo

4.4.1 The sub-surface shall be swept clean, thoroughly moistened, but not saturated, and slushed with a coating of neat cement grout approximately 1/8" in thickness. The under bed consisting of class 'C' cement concrete screed shall be spread and brought to a level not less than 3/4" below the finished floor level. The dividing strips shall be installed in the green under bed. The terrazzo mix shall be spread, tamped and rolled into a compact mass not less than 3/4" thick. After rolling additional aggregate mix shall be sprinkled over the surface to fill up all depressions, to take up excess moisture and to permit the terrazzo to be trowelled to a level, dense and even surface, slightly above the finish line of floor. This level, shall allow for the surface grinding necessary to expose the specified area of aggregate, and to produce smooth, level floors free of waves and depressions.

##### 4.4.2 Seasoning

The completed terrazzo shall be allowed to season for 6 days during which time it shall be kept moist by (1) covering with approximately 1" thickness of sand; or (2) covering with building paper or mats; or (3) sprinkling with water at every 10 hour interval.

##### 4.4.3 Surface

Following the curing period, the terrazzo shall be machine ground to a true, even surface using a No. 24 grit followed by a No. 80 grit or finer abrasive stone. After the first grinding, the floors shall be thoroughly grouted with the same cement and color composition as specified for the matrix of the terrazzo mix. The grout shall be of the

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consistency of thick cream, and shall be brushed over the floor to eliminate all pits and thoroughly fill the surface for final grinding.

#### 4.4.4 Finishing

Not less than 72 hours after application, the grouting coat shall be removed by grinding. In the later stages of grinding, the grit stones or other abrasive used in the grinding machine shall be of a grain or fineness that will give the surface smooth finish. Small areas, inaccessible portions and corners which cannot be reached by the grinding machine shall be ground and rubbed by hand.

#### 4.4.5 Protection

The walls and all surfaces of the finished work of other trades shall be properly protected from damage and spoiling during the process of grinding and washing of the terrazzo. After the finish grinding has been completed and the surface treatment applied, the terrazzo work shall be covered and protected with material approved by the Engineer until completion of the work of all other trades.

#### 4.4.6 Cleaning and Coating

Prior to placing the protective covering, the terrazzo floor shall be approved by the Engineer. After the work of all other trades has been completed and the protective covering removed, all terrazzo work shall be washed with cleaning compound, mixed with warm water and using a fine abrasive where necessary to remove any stains or cement' smears. The terrazzo' shall be allowed to dry thoroughly and shall be given a sealing application of preservative material. The sealing material shall be applied in accordance with the manufacturer's directions, leaving all terrazzo work in clean condition as approved by the Engineer.

#### 4.4.7 Dado/Skirting

The ingredients of dado/skirting shall be one part of cement and two parts of marble chips varying from Nos. zero to 2. Striking shall be laid over a base of plaster of specified thickness. The thickness of dado/skirting layer shall be as specified. The surface shall be grinded and polished to the satisfaction of the Engineer.

### 5. Installation of Tile Flooring

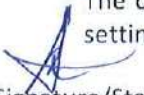
When setting out the tiles, care shall be taken to establish the correct elevation for the floor. A gauge rod shall be used, indicating the overall measurement of a given number of tiles with specified joint width to reduce cutting.

After the floor has been machine finished, it should be covered with white, non-staining sand or rags to protect it while other work is being done. After removal, the floor shall be thoroughly scrubbed.

#### 5.1 General

The base shall be prepared by laying cement concrete of specified grade and of thickness as shown on the drawings, or specified in the Bill of Quantities.

The curing period of the setting bed shall be as directed by the Engineer. As large an area of setting bed shall be spread at one time as can be covered with tiles before the mortar has set.

  
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Surplus mortar shall be removed. The thickness of setting bed in any space shall not be less than 1/2".

Floor and wall surfaces to receive the tiles shall be thoroughly cleaned of all dirt, dust, oil and other objectionable matters. Tiles shall be laid out from the centre line of each space in an outward direction and the pattern should be made symmetrical with a minimum number of cut tiles as directed by the engineer.

Joints between the tiles shall be of uniform width. Tiles shall be cut with a suitable cutting tool and rough edges shall be rubbed smooth. Tiles shall be laid to the straight edges.

## 5.2 Ceramic/Porcelain Tiles

The ceramic/porcelain tiles shall be laid to the required lines, levels and grades over a setting bed of cement sand mortar comprising of one part of cement and 4 parts of sand by volume and the joints filled with neat white or grey cement including vertical and horizontal covers. The tile floor shall be kept wet for at least 72 hours and no traffic should be allowed on the tiles during curing period.

## 6. Measurement and Payment

### 6.1 General

Except otherwise specified herein or elsewhere in the Contract Documents, no measurement and payment will be made for the under mentioned specified works related to the relevant items of the Bill of Quantities.

The cost thereof shall be deemed to have been included in the quoted unit rate of the respective items of the Bill of Quantities.

- 6.1.1 Loss and wastage of material due to consolidation, erosion and settlement.
- 6.1.2 All type of joints (expansion, contraction and construction joint etc.).
- 6.1.3 Class 'C' cement concrete screed base and 1:4 cement sand mortar under floor.
- 6.1.4 Rough plaster base under skirting / dado.
- 6.1.5 Finishing/grinding, washing & polishing works of ceramic, concrete, terrazzo tile, terrazzo floors and marble tiles.
- 6.1.6 Marble strips in terrazzo floors
- 6.1.7 1 :2 and 1:4 cement sand rough cast plaster.
- 6.1.8 Sand cushion under concrete pavers
- 6.1.9 Adhesives used in the laying of PVC flooring.
- 6.1.10 Bedding / Jointing Material of Envicrete jali
- 6.1.11 Pigmented grouting
- 6.1.12 Cleaning of tiles after installation.
- 6.1.13 Bull-nozing, chamfering of edges of marble tops including base mortar and making holes for wash basin including all necessary fixing accessories.

### 6.2 Cement Concrete Floor

#### 6.2.1 Measurement

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Measurement of acceptably completed works of cement concrete floor steel trowelled finish will be made on the basis of net actual area in square feet laid in position as shown on the Drawings or as directed by the Engineer.

**6.2.2 Payment**

Payment will be made for acceptable measured quantity of cement concrete floor steel trowelled finish on the basis of unit rate per square feet quoted in the Bills of Quantities and shall constitute full compensation for all the works related to the item.

**6.3 Ceramic/Porcelain Tile Floor**

**6.3.1 Measurement**

Measurement of acceptably completed works of ceramic/porcelain tile in floor will be made on the basis of net actual area in square feet-of floor laid in position as shown on the drawing or as directed by the Engineer.

**6.3.2 Payment**

Payment will be made for acceptable measured quantity of ceramic/porcelain tile floor on the basis of unit rate per square feet quoted in the Bills of Quantities and shall constitute full compensation for all the works related to the item.

**6.4 Ceramic/Porcelain Tile Dado/Skirting**

**6.4.1 Measurement**

Measurement to acceptably completed works of ceramic/Porcelain tile in dado/skirting will" be made on. the basis of net actual area in square feet of dado/ skirting laid in position as shown on the Drawing or as directed by the Consultant/Engineer Incharge.

**6.4.2 Payment**

Payment will be made for acceptable measured quantity of ceramic/porcelain tile in dado/ skirting on the basis of unit rate per square feet quoted in the Bills of Quantities. The unit rate shall include all cost of cement, sand, mortar and shall constitute full compensation for all the works related to the items.

**6.5 Terrazzo Flooring/Skirting**

**6.5.1 Measurement**

Measurement of acceptably completed works of terrazzo flooring/skirting will be made on the basis of net actual area in square feet laid in position as shown on the Drawings or as directed by the Consultant/Engineer Incharge.

**6.5.2 Payment**

Payment will be made for acceptable measured quantity of terrazzo flooring/skirting on the basis of unit rate per square feet quoted in the Bills of Quantities and shall constitute full compensation for all the works related to the item.

**6.6 PVC Vinyl Tile**

**6.6.1 Measurement**

Measurement of acceptably completed works of PVC vinyl tile flooring will be made on the basis of net actual area in square feet laid in position as shown on the Drawings or as directed by the Consultant/Engineer Incharge.

**6.6.2 Payment**

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Payment will be made for acceptable measured quantity of PVC vinyl tile flooring on the basis of unit rate per square feet quoted in the Bills of Quantities and shall constitute full compensation for all the works related to the item.



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## SECTION – 18 PAINTING

### 1. Scope

The work under this section of the Specifications consists of furnishing all materials, plant, labour, equipment, appliances and performing all operations in any floor and at any height in connection with surface preparation, mixing, painting concrete works, gates, frames, walls, ceilings and all such surfaces as shown on the Drawings and/or as directed by the Engineer. The scope of this section of specification is covered with detailed specifications as laid down herein.

### 2. Applicable Standards

Latest editions of following British Standards are relevant to these specifications wherever applicable.

#### 2.1 BSI (British Standards Institution)

- 245 Specification for mineral solvents (white spirits and related hydrocarbon solvents) for paints and other purposes.
- 2521 Lead - based-priming paint for wood work .
- 2523 Lead based priming paint for iron and steel.
- 2569 Sprayed metal coatings.
- 4800 Paint colors for building purposes. Painting of building. CP2

### 3. Cleaning and preparation of metal surfaces

- 3.1 Except as otherwise specified, all painting shall be applied in conformity with BS CP 231 "Painting of Building" as applicable to the work.
- 3.2 The Constructor shall repair at his own 'expense all damaged" or defective areas of shop-painted metal and structural steel work. Metal surfaces against, which concrete is to be placed will be furnished shop-painted and shall be leaned prior to being embedded in concrete.
- 3.3 Except as otherwise specified all concrete and plastered surfaces are to be painted.
- 3.4 The Engineer will furnish a schedule of colors for each area and surface. All colors shall be mixed in accordance with the manufacturer's instructions.
- 3.5 Colors of priming coat (and body coat) where specified, shall be lighter than those of finish coat. The Engineer shall have unlimited choice of colors.

Samples of all colors, and finishes shall be prepared in advance of requirement so as not to delay work and shall be submitted to the Engineer for approval before any work is commenced. Any work done without such approval shall be redone to the Engineer's satisfaction, without additional expense to the Employer. Samples of each type of paint shall be on separate 12" x 12" x 1/8" tempered hard board panels. Manufacturer's color chart shall be submitted for color specifications and selection.

### 4. Materials

- 4.1 All materials shall be acceptable proven first grade products and shall meet or exceed the minimum standards of reputable manufacturers as approved by the Engineer.
- 4.2 Colors shall be pure, non-fading pigments, mildew-proof sun-proof, finely ground in approved medium. Colors used on-plaster and concrete surfaces shall be lime proof. All materials shall be subject to the Engineer's approval.

  
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- 4.3 All synthetic enamel paints and primers for structural steel works, metal work and wood works will be the best available of its type and shall be approved by the Engineer prior to its procurement.
- 4.4 Approved quality Weather Shield Weather Coat paint shall be used for painting the exteriors of the structures or other surfaces where specified on the drawings as directed by the Engineer.
- 4.5 The plastic emulsion paint, vinyl emulsion paint or similar as approved by the Engineer shall be used for interior surfaces.
- 4.6 All material for Bitumen painting shall consist of Bitumen grade 10/20. It shall be used for foundations or wherever recommended by the Engineer.
- 4.7 Only paints manufactured by ICI, Berger or approved equivalent shall be used in this Project. All material shall be delivered to site in their original unbroken containers or packages & bear the manufacturer's name, label, brand & formula & will be mixed and applied in accordance with his directions.

#### 5. Delivery Storage And Container Sizes

Paints shall be delivered to the site in sealed containers, which plainly show the type of paint, color (formula or specifications number) batch number, quantity, date of manufacture, name of manufacturer and instructions for use. Pigmented paints shall be supplied in containers not larger than 20 liters. All materials shall be stored under cover in a clean storage space, which should be accessible at all times to the Engineer. If storage is allowed inside the building, floors shall be kept clean and free from paint spillage.

#### 6. Surface Preparation

- 6.1 All oil, grease, dirt, dust, loose mill scale and any other foreign substance shall be removed from the surface to be painted, polished and white washed by the use of a solvent and clean wiping material. Following the solvent cleaning, the surfaces shall be cleaned by scrapping, chipping, blasting, wire brushing or other effective means as approved by the Engineer.
- 6.2 In the event the surfaces become otherwise contaminated in the interval between cleaning and painting, recleaning will be done by the Constructor at no additional cost.
- 6.3 Surfaces of stainless steel, aluminum, bronze, and machined surfaces adjacent to metal work being cleaned or painted shall be protected by effective masking or other suitable means, during the cleaning and painting operations.
- 6.4 All the surfaces to be painted with approved quality paint shall be free from dust, dirt, fungus, lichen, algae etc. Oil paint, varnish and lime wash should always be removed by scraping and washing.
- 6.5 All surfaces to be bitumen painted shall be thoroughly cleaned of any accretion, dust, dirt etc. by scraping, wire-brushing or as directed by the Engineer. The surface shall be primed with a coat of asphalt oil used at the rate of not less than 0.50 pound per square foot. No work in this section shall be allowed until all surfaces or conditions have been inspected and approved by the Engineer.

#### 7. Application

- 7.1 All paint and coating materials shall be in a thoroughly mixed condition at the time of application. All work shall be done in a workman like manner, leaving the finished surface free from drips, ridges, waves, laps, and brush marks. All paints shall be applied

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under dry and dust free conditions. Unless approved by the Engineer paint shall not be applied when the temperature of the metal or of the surrounding air is below 7 degrees centigrade. Surfaces shall be free from moisture at the time of painting.

All primary paint shall be applied by brushing. The first coat of paint shall be applied immediately after cleaning. When paint is applied by spraying, suitable measures shall be taken to prevent segregation of the paint in the container during painting operation.

Effective means shall be adopted for removing all free oil and moisture from the air supply lines of the spraying equipment. Each coat of paint shall be allowed to dry or harden thoroughly before the succeeding coat is applied. Surfaces to be painted that will be inaccessible after installation shall be completely painted prior to installation.

Coats of Weather Shield Weather Coat paint shall be applied in accordance with the manufacturer's instructions or as directed by the Engineer.

Only as much material should be mixed as can be used up in one hour. Over thinning will not be permitted. After the first coat the surfaces will be soaked evenly four or five times and the second coat shall be applied after leaving for at least overnight.

7.2 Where shown on Drawings all exterior finishes shall be painted with Weather Shield/weather coat paint in approved colors as per manufacturer's specifications. The number of coats shall be as shown on the drawings or as directed by the Engineer.

7.3 All wooden doors shall be painted with approved synthetic enamel paint as per manufacturer's recommendation and instructions or after approval of the Engineer.

7.4 Plastic emulsion paint vinyl emulsion paint or matt enamel paint of the approved make and shade shall be applied to surfaces as shown on Drawings as per manufacturer's instructions. The number of coat shall be as indicated on the Drawings or as directed by the Engineer.

7.5 Two coats of hot bitumen paint shall be applied to exposed concrete surfaces in contact with earth. The first coat shall be allowed to dry for about six hours before applying the second coat. During the operation of painting great care should be taken to avoid air bubbles. The manufacturer's instructions and Engineer's directions shall be complied with.

#### 8. Job Conditions

8.1 Observe manufacturer's recommended minimum and maximum temperature but do not apply paint or finish to any surface unless ambient temperature is 10 degree C or above and less than 43 degree C. No painting shall be done above 90% relative humidity.

8.2 Place drop cloths to adequately protect all finished work.

8.3 Remove and replace all items of finish hardware, device plates, accessories, lighting fixtures or other removable items.

8.4 In no case shall any finish hardware or other finished item that is already fitted into place be painted, unless otherwise specified.

#### 9. Quality Assurance

All paint for anyone surface shall be top quality, of one manufacturer and approved by the Engineer. Deep tone accent colors shall be used and the unavailability of final coat colors may be the basis for rejecting materials for anyone surface.

#### 10. Schedule of Measurement Of Paint Area

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10.1 Irrespective of prime coats and number of paint coats applied to exposed painting surface area of column, walls, projections, ceilings, false ceilings and other surfaces (Except gates, doors windows and ventilators) shall be measured as per actual paint surface area for single time only and paid in accordance with quoted rate of Bill of Quantities.

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## 11. Measurement And Payment

### 11.1 General

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

The rates quoted by the Constructor in the Bill of Quantities shall include work to be executed under these specification in any floor and at any height except where otherwise specifically stated in the relevant item of Bill of Quantities and the Constructor shall not be entitled to any claim or claim any compensation on this account.

11.1.1 Preparatory works, including preparatory materials, scraping, scratching, sand blasting, clearing, prime coating, priming, protection of finished works etc.

11.1.2 Polishing works, including preparatory materials, scraping, cleaning, sanding etc/

11.1.3 Painting work on steel & wooden surfaces.

11.1.4 Before application of paint on existing surface the old paint surface shall be removed existing paint filling of cracks, surface preparation and application of primer coat, if any.

### 11.2 Measurement

11.2.1 Measurement of acceptably completed respective type of painting works will be made on the basis of net actual areas in square feet of the surface painted as shown on the Drawings or as directed by the Engineer.

11.2.2 Payment will be made for acceptable measured quantity of respective type of painting on the basis of unit rate per square feet quoted in the Bill of Quantities and shall constitute full compensation for all the works related to the item.

  
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## SECTION – 19 TEXTURED GRAFFITO WALL COATING

### 1. Scope

The work under this section of the Specifications consists of furnishing all materials, plant, labour, equipment, appliances and performing all operations in connection with surface preparation, mixing, and application of graffito wall coating as shown on the Drawings and/or as directed by the Engineer. The scope of this section of specifications is covered with detailed specifications as laid down herein.

### 2. General

- 2.1 Except as otherwise specified, all painting shall be applied in conformity with BS CP 231 "Painting of Building" as applicable to the work.
- 2.2 The Engineer will furnish a schedule of colors for each area and surface. All colors shall be mixed in accordance with the manufacturer's instructions.
- 2.3 Samples of all colors/coating, stains and finishes shall be prepared in advance of requirement so as not to delay work and shall be submitted to the Engineer for approval before any work is commenced. Any work done without such approval shall be redone to the Engineer's satisfaction, without additional expense to the Employer. Samples of each type of coating shall be on separate 300 x 300 x 3 mm tempered hard based panels. Manufacturer's color chart shall be submitted for color specifications.

### 3. Material

- 3.1 Material shall be acceptable, proven, top-grade products and shall meet or exceed the minimum standards of reputable manufacturers as approved by the Engineer.
- 3.2 The material for textured graffito coating shall be variable granular material and shall composed of Acrylic Copolymer Emulsions spherodial quartz various additives, metallic oxides, inerts of different granulemetries coloring agent, antibacterial and antibacterial agents.
- 3.3 All materials shall be delivered to site in their original unbroken containers or packages and bear the manufacturer's name, label, brand and formula and will be mixed and applied in accordance with his directions.

### 4. Surface Preparation

- 4.1 All oil, grease, dirt, dust, loose mill scale and any other foreign substance shall be removed from the surface to be coated. Following the solvent cleaning, the surfaces shall be cleaned by scraping, chipping, blasting, wire brushing or other effective means as approved by the Engineer.

In the event the surfaces become otherwise contaminated in the interval between cleaning and costing, recleaning will be done by the Constructor at no additional cost.

No work in this section shall be allowed until all surfaces or conditions have been inspected and approved by the Engineer.

The graffito coating material should be applied with stainless steel trowel and finished with plastic trowel in thickness as per manufacturer's specification. To get straight texture plastic trowel should be moved vertically and the trowel is to be rotated to obtain swirl texture.

### 5. Measurement And Payment

#### 5.1 General

Except otherwise specified herein or elsewhere in Contract Documents, no measurement and payment will be made for the under mentioned specified works related to the relevant items

  
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of the Bills of Quantities. The cost thereof shall be deemed to have been included in the quoted unit rate of the respective items of Bills of Quantities.

5.1.1 Preparatory works, including preparatory materials, scraping, scratching, sand paper rubbing, cleaning, protection of finished works etc.

5.1.2 Providing and applying rough plaster base Corner, pattas, rounding&, arches, borders, grooves etc.

## 5.2 Measurement

Measurement of acceptably completed works of graffiti coating to specified surfaces will be made on the basis of actual area in square foot of the surface coated as shown on the Drawing or as directed by the Engineer.

### Payment

Payment will be made for acceptable measured quantity of coating to specified surfaces on the basis of unit rate per square foot quoted in the Bill of Quantities & shall constitute full compensation for. all the works related to the item

  
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## SECTION – 20 HEALTH AND SAFETY MEASURES

### 1. Start with safety training

All workers must hold a current white card before they commence work on-site. Site-specific induction training should also be completed by each worker, to point out any high risk areas and provide instructions for emergency management.

### 2. Minimise and manage risk

Due to the nature of construction work, it's impossible to eliminate all safety risks. However, many common safety issues can be avoided by conducting regular safety audits and having procedures in place to report, assess and address potential risks.

### 3. Site security

Restricted site access should not only be put in place to simply protect equipment from damage or theft. Security in and outside of work hours is integral to protect pedestrians from potential construction hazards. This includes supervision or authorised site visitors.

Strict security and safety protocols will also protect Constructor from liability and negligence in the case of a safety incident or security breach.

### 4. Safe work method assessment

A safe work method statement (SWMS) must be prepared for all high risk construction projects, before work commences. The SWMS should outline the scope of work involved, any potential safety issues, and how risks will be prevented and managed. By law, construction work must not commence until SWMS standards are met.

### 5. Use clear signage throughout the site

The site SWMS should be clearly displayed at the construction site, so that all safety protocols are readily available - including a 24 hour emergency contact number and a map or directions to the site office. Visible signage should also indicate site amenities (such as toilets), entry and exit points, and first aid or emergency fire equipment.

### 6. Entry and exit points

Separate entry and exit points should be established for heavy machinery/vehicle access, to strengthen pedestrian safety at high traffic points.

### 7. Compliant chemical storage

Chemicals need to be stored very carefully to minimize fires, explosions, asphyxiation, chemical injury and pollution on worksites. Use high quality, compliant outdoor storage solutions such as explosive storage

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cabinets to segregate chemicals and reduce spillage.

### 8. Environmental conditions

Extreme weather conditions can cause serious safety hazards. Your on-site emergency plan should provide clear guidelines for workers who need to stop work in the event of natural disaster, severe environmental conditions or other emergency circumstances.

### 9. First aid

For the construction industry, it's best practice to provide one first aid officer per 25 workers. First aid kits and equipment must be placed in an easily accessible area on site.

### 10. Provide personal protective (PPS) equipment

In many situations an employer is obligated to provide PPS such as high vis vests, safety goggles and safety harnesses to construction site workers. To find what PPS you are required to provide for a specific project, contact Safe Work Australia.

### 11. Dropped objects

It is your responsibility to secure objects onsite and minimise the risk of them falling. This video explains the risks and how they can be avoided by putting preventative safety measures in place.

Construction safety doesn't end once the project is completed, and your workers have gone home. All parties involved in the construction process have a responsibility in ensuring that the the right equipment and quality materials are used, so that safety risks are avoided long into the future.

  
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## Section-21

### Other terms & conditions

- i. No cartage of any material arranged by the contractor himself /themselves will be paid in any shape.
- ii. Only palatable water of approved quality will be used and Contractors shall have to make their own arrangement of palatable water for use in work at his / their own cost.
- iii. Concrete shall be mixed with mechanically operated Concrete Mixer with due concentration to aggregate and water ratio.
- iv. If any wherever nomenclature or any item is elaborated or not clear or any typographical error occurs in the schedule for the tender it should be read strictly as per composite schedule of rates of standing rates committee Govt. of Sindh.
- v. All material shall confirm the standard specifications.
- vi. No any premium shall be allowed on non-scheduled items / offered rates.
- vii. All the debris and surplus stuff shall be removed from the site / disposed of by the contractor for which no any extra cost of cartage etc shall be paid.
- viii. All RCC / PCC cost in Situ shall be mechanically vibrated by the contractor for which no any extra cost will be paid.
- ix. Work will be carried out as per P.W.D. specification.
- x. All materials / mixes used in structure shall be tested from recognized laboratory and test report shall be submitted without any delay for which no any extra cost etc shall be paid.
- xi. Electricity used shall be the responsibility of contractor for which no any extra cost etc shall be paid.
- xii. Camp office / stock / go-down constructed at site shall be the responsibility of contractor for which no any extra cost etc shall be paid.
- xiii. All workers within the execution area should wear protection helmets and full boots and ensure all security measures for lives of labours / inhabitants shall be the responsibility of contractor for which no any extra cost etc shall be paid.
- xiv. Inspection request shall be submitted before 24 hrs of execution of any new trade.
- xv. Pour slip to be submitted for approval of any CC and RCC work well before execution of pouring.
- xvi. The contractor shall have to visit the site before filling the bidding documents.

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## SECTION – 22 LIST OF MATERIALS

### CIVIL WORKS

- ORDINARY PORTLAND CEMENT Lucky Cement of approved quality or equivalent
- SULPHATE RESISTANT CEMENT Lucky Cement of approved quality or equivalent
- STEEL Amreli Steel of approved quality or equivalent
- SAND Bholari hill sand of approved quality from Bholari quarry will be used.
- CRUSH AGGREGATES AND STONE MATEL Good Quality Crush from Ubhan Shah quarry, stone matel of approved quality from Ubhan shah quarry will be used.
- TERMITE PROOFING WORK Aghenda / Bi Flex FMC or equivalent
- ALUMINIUM DOORS/WINDOWS Pakistan Cables or equivalent
- DOUBLE TEE RCC ROOF PANEL M/s. Izhar Concrete Pvt Ltd, Izhar Group of Companies or equivalent
- GLAZED TILES Master Tiles, Shabbir Tiles or equivalent
- PORCELAIN TILES Shabbir Tiles of approved (Nano Polish) or equivalent
- INDUSTRIAL TILES National Tiles or equivalent
- BOND FOR TILES STILE BOND or equivalent
- PAINT WEATHER SHIELD, SPD DISTEMPER, SYNTHETIC ENAMEL PAINT, MATT FINISH PAINT. ICI / Berger or equivalent
- PAINTS / PRIMER & PUTTY ICI / Berger or equivalent
- ALUMUNIUM EXPANSION, JOINT COVER.STRIP FOR FLOORS/WALLS ETC Balco, M/s. Chemi Tech. or equivalent
- HARDWARE & HANDLES Bonco Brand or equivalent
- GLASS Tinted Glass imported Ghani Glass or

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	equivalent
• TEMPERED GLASS	Pakistan Safety Glass or equivalent
• LOOKING MIRROR	Imported Belgium Glass or equivalent
• VENITIAN BLINDS	Protector, MI Décor or equivalent
• FIBER GLASS SHEET (Hollow / Solid)	Toughlite Brand or equivalent
• GALVANISED IRON (GI) PIPE	M/s. I.I.L. or equivalent
• RCC PIPE	M/s. RAZIA Brand or equivalent
• UPVC PIPE	Dadex, Pak Arab, AGM.,EURO GULF Pipes or equivalent
• JUMBOLON	M/s. Diamond Foam or equivalent
• CONSTRUCTION CHEMICALS	M/s. FOSROC , Mitchels & Co or equivalent
• STEEL GROUTING	M/s. Fischer , M/s. Hilti or equivalent
• ALUMINIUM COMPOSITE PANEL (ACP) SHEETS	M/s. Dadex, M/s. Aluco MASTER or equivalent
• ALUMINIUM SUSPENDED FALSE CEILING	MDF/DFB brand or equivalent
• BITUMEN / ASPHALT	National Refinery/ Pak Hy Oils or equivalent
• BITUMINOUS MEMBRANE	Pak Hy Oils or equivalent
• MANHOLE COVER	C.M.P. or equivalent
• UPVC DOORS	M/s. Framez, / M/s. Auvitronics Pvt. Ltd or equivalent
• CONCRETE KERB BLOCKS	M/s. Envicrete, M/s. Izhar Crete, M/s. Magna Crete, or equivalent
• CONCRETE HOLLOW BLOCKS / SPLIT BLOCKS	M/s. Envicrete/ M/s. Magnacrete, or equivalent
• GRANITE / MARBLES	Marina Marble, POPULAR Marble or equivalent
• CONCRETE BLOCKS	M/s. Envicrete / M/s. Bes Block Hub or equivalent

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- CONCRETE PAVERS

M/s. Envicrete, M/s. Izhar Crete, M/s. Magna Crete, or equivalent

- BURNT PACCA BRICKS

Burnt Bricks of approved quality from Karamabad Khairpur or equivalent

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Constructor.

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Engineer In-charge.



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# ELECTRICAL WORKS

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Section	Description
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Section – B	Low Voltage switchgear.
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Section – D	Conduits & Pipes.
Section – E	Wiring Accessories.
Section –F	Light Fixtures.
Section –G	Earthing Systems.
Section – H	Underground Trench & pipes
Section –I	Cable Tray System
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## SECTION – A

### TECHNICAL SPECIFICATIONS

The specification describes the requirements for the supply and installations of electrical/ low current systems.

#### 1. SCOPE OF WORK

The works under these specifications includes providing of all materials & equipments and performing the work necessary for completion of work as shown on the drawings, specified in specification & bill of quantities. The work also include to obtain clearances, certificates etc. from the relevant authorities and also to give the required notices to local electrical authorities and assist the owner in getting electrical connections. The work shall by include but not limited to the following:

a) Electrical Works

- |       |                             |               |
|-------|-----------------------------|---------------|
| i.    | Low Voltage Switchgear      | (Section - B) |
| ii.   | Low Voltage Cable and Wires | (Section – C) |
| iii.  | Conduits and Pipes          | (Section – D) |
| iv.   | Wiring Accessories          | (Section – E) |
| v.    | Light Fixtures              | (Section – F) |
| vi.   | Earthing System             | (Section - G) |
| vii.  | Underground Trench & pipes  | (Section – H) |
| viii. | Cable Tray System           | (Section – I) |

#### 2. MATERIALS ORIGIN

- All material and equipment supplied by the Contractor shall be new and shall be in accordance with the details described in BOQ and/or shown on drawings. If the contractor desires to use different materials other than specified, he shall obtain the approval from Engineer Incharge in writing before using the materials.
- The Contractor shall also be responsible to supply any other equipment not mentioned in specifications but which is necessary for completion of works, it shall be provided by the Contractor as part of the Contract.
- Material shall be in accordance with high standard specifications. The contractor shall submit the samples of materials with complete specifications etc for the approval of Engineer Incharge, before ordering or installation of materials. Approval of materials/installations shall not relieve the contractor of any of his obligations or liabilities under the contract. The Engineer Incharge ./Owners or Representatives reserve the right to inspect the materials in store or in installed at site and to reject any material not complying with specifications without any extra cost.
- When choice of manufacturers is allowed for any material/equipment, the contractor shall obtain the whole quantity required to complete the job from one manufacturer otherwise he shall provide evidence to the Engineer Incharge for non-availability of material/equipment in market.

  
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### 3. RULES, REGULATION AND STANDARDS

The entire electrical installation / work shall be carried out by licensed electrical contractor, issued by Electric Inspector. The work shall be carried out by qualified & experienced workers having permits/certificates issued by Electric Inspector to undertake such a job. The contractor's license number and supervisors competency certificate shall be submit before commencement of work.

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

The Contractor shall be responsible to complete all the formalities/requirements and get the installations passed by the Electric Inspector and submit the test certificates to Owner/Electric Company without any extra cost.

All installations/equipment and materials shall conform to the following standards:

- a) International Electro-technical Commission (IEC)
- b) British Standards (BS)
- c) National Electric Code (NEC)
- d) National Standards
- e) Any other international standards

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

Whenever any electrical equipment is to be installed, which does not hold national standards, the Contractor shall take into account the specific standards chosen by the Owner and make sure that the equipment he has to install, meets any one of the above mentioned standards.

### 4. INSTALLATION AND SERVICE CONDITIONS

#### 4.1 Site Conditions

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

- |    |                                     |   |                 |
|----|-------------------------------------|---|-----------------|
| a. | Maximum outdoor ambient temperature | : | 45 <sup>0</sup> |
| b. | Minimum Indoor ambient temperature  | : | 15 <sup>0</sup> |
| c. | Maximum relative humidity           | : | 90 %            |
| d. | Minimum relative humidity           | : | 26 %            |

#### 4.2 Service Conditions

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

### 5. MAIN ELECTRICAL CHARACTERISTICS

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### 5.1 Power Supply System

Unless otherwise specified elsewhere, all equipment and material shall be designed to operate and function satisfactorily with the following minimum requirements without any de-rating:

- Voltage 400V + 10%
- Phase 3phase, 4 wires system
- Frequency 50 Hz. +2 Hz.

### 5.2 Degree of Protection of Enclosures

For indoors, IP31 minimum degree of ingress protection of the enclosures against contact with line or moving parts and against ingress of solid foreign bodies or liquids, shall be selected, in accordance with IEC 60529.

## 6. GUARANTEE

- a) The Contractor shall furnish written grantee that the material & installations meet with this specification and the electrical systems are free from all grounds and all defective workmanship and materials and will remain so far a period of one year after handover of project. Any defect appearing within one year, shall be rectified by the contractor at his own cost.
- b) The contractor shall indemnify and save harmless the owner and Engineer Incharge from and against all liabilities for damages arising from injuries to persons or property occasioned by any act or commission of the worker/sub-contractor/contractor including any or all expenses, legal or otherwise, which may be incurred, any and all expenses, legal or otherwise by the owner in the defense of any claim, action or suit

## 7. SPECIFICATIONS & DRAWINGS AT SITE

The Contractor shall have for ready access and refer a complete set of drawings/design, BOQ specification at site. He shall incorporate all changes, additions/ alterations made at site during installations and shall prepare a set of drawings indicating the work as actually and finally installed.

## 8. DISCREPANCIES IN TENDER DOCUMENTS AND DRAWINGS

The Contractor shall carefully examine the documents and drawings and if he finds any discrepancies or omissions from the specifications, bill of quantities or drawings, or is in doubt as to the meaning, he shall consult with the Engineer Incharge. before starting the work. If such defective or modified work is carried out by the Contractor, he shall rectify the same at his own cost.

## 9. MEASUREMENT OF WORKS


The quantities set out in the bill of quantities are estimated quantities and they shall not be taken as actual and correct quantities of work to be executed by the Contractor. The Contractor shall carry out actual measurement of works at site and prepare bill accordingly

## 10. INSTALLATIONS/PROTECTIONS/CO-OPERATION

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- A. The locations, routings, installation heights, and other details etc. for installations are shown on the drawings. If any information is not stated on the drawings or wherever modifications are required the Contractor shall obtain prior instructions from the Owner or Engineer Incharge ...
- B. The contractor shall protect his own work from damage and he shall likewise protect adjoining works of other trades during or after installations.
- C. The contractor shall co-operate and work as a team with all other contractors during the installation.

**11. DRAWINGS AND WORKMANSHIP**

The Contractor shall provide dimensional outline drawings, arrangement drawings and technical data to fit with architectural details as per instructions given to him.

- a. The plans are drawn on the basis of architectural drawings. The plans are diagrammatical and do not necessarily show all details to fit the building conditions. The location of outlets, fittings, fixtures & equipments are approximate and may be accommodate to site conditions.
- b. No major change shall be made without the approval of Engineer Incharge. The contractor shall examine all approved shop drawings of other trades in detail and he shall frequently consult to ascertain any change that may have been made.
- c. The work shall be executed in the best and most thorough manner under the direction of Engineer Incharge. The Engineer Incharge. reserved the rights to reject any installation/material, which is not in accordance with the drawings & specifications.

**12. IDENTIFICATION**

- a. For each of the equipment, identification label shall be fitted in front of the casing. The label shall have block letter 7mm high, black on white back ground of trifoliate and fixed with screws.
  - b. All DB's shall be provided with detail circuit sheet fixed inside the front cover indicating the function and circuit numbers. Spare circuit space shall be left blank.
  - c. On AC system the phase sequence shall be maintained in the order of Red, Yellow and Blue from top to bottom and/or left to right. Neutral and earthing wires to be connected on respective link or bus-bars.
- 6.3 Where 400 volts or above exists the equipment shall be marked "DANGER 400V" engraved in front of the equipment with the requirements of electricity rules and according to engineering practice.

**13. SWITCHGEAR TESTS**

All switchgear installed by the Contractor etc shall be fully tested at the manufacturer's place to meet the requirements of appropriate standards without any extra cost.

The Contractor shall inform the Engineer in writing about the date and time of test at least 3 days in advance. The witnessing of test by the Owner or his representative shall not absolve the Contractor from his responsibility for the proper functioning of the equipment and for furnishing the guarantees. All test results in the form of certificate/record certificates, signed by all the witnesses, shall be submitted to the Engineer 3 days before delivery to the site.

**14. STORAGE**

The Contractor shall store the equipment in dry warehouse and protect from damages. Fragile components shall be stored on shelves in their original packing, marked with identification labels.

The Contractor shall handle, store and fix each of the equipment as per the manufacturer's recommendations. He shall inform the Engineer if these conflicts with any other specified requirement and submit copies of manufacturer's recommendations to the Engineer if required.

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## 15. LABOR AND STAFF

The Contractor shall provide all labor materials, tools and equipments for installation and testing of work as detailed below:

- Skilled and unskilled labor required for performing the works as per specifications and drawings.
- Experienced supervising staff with requisite expertise to ensure quality of work in time.
- Administrative staff to ensure smooths functioning of site activities.
- Construction equipment, measuring tools, apparatus and working tools in good working conditions.

The Contractor shall be responsible for the performance of any sub-contractors, worker and manufacturer at his own cost and risk.

## 16. SMALL INSTALLATION MATERIAL

The Contractor shall supply and install all small installation and consumable materials such as nuts, screws, anchor, bits, bolts, washers, shims, angles, leveling materials, insulation tape, solder, PVC strap-on or heat shrinkable type cable tags, cable ties, bushes, sealing compound, lugs etc, required to complete the job without any extra cost.

## 17. INSTALLATION INSTRUCTIONS - GENERAL

The Contractor shall set out the works himself as per specifications and drawings and shall properly install the equipment on specified foundation / location as per manufacturer's instructions. Any defective or faulty operation of equipment the Contractor shall change/repair the same at his own cost.

## 18. ASSOCIATED CIVIL WORKS

The Contractor shall be carried out associated civil works under the direction of the Engineer.

The Contractor shall prepare drawings giving details of all associated civil works without any extra cost.

The following work to be carried out by the Contractor during installations:

- a. The cutting and forming of holes or conduits/pipe fixings in walls, floors, ceilings, partitions, roofs, etc., and bringing back the finish to the position that it was before.
- b. Formation of concrete bases or foundation pads.
- c. Excavation forming for underground services of ducts and courses and then covers it.
- d. Excavation for and lying of cables or pipes etc.
- e. The painting of all pipes, tube and conduits etc. after fixing unless specified to the contrary.
- f. Sleeves through floors/walls, flush with walls/ceilings or finished floors of a size to accommodate the raceways.

All required holes through walls, floors and beams for pipes and ducts will be left out by the Contractor during the process of building and he should workout in advance the position of holes channels etc to the civil contractor where it's not possible for cutting or chipping etc.

Cutting, fitting, repairing, patching of plaster and finishing of carpentry work shall be done by skilled workers in their respective trades, when cutting is required it shall be done in such a manner as not to weaken structure, partitions or floors. The holes required to be drilled

  
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without breaking out around the holes. Where patching is necessary in finished areas of building, the Engineer shall determine the extent of such patching or refinishing.

## 19. TESTING

Upon completion of installations, the Contractor shall perform all static, semi-dynamic (by simulation), and dynamic field testing on all the equipment and systems.

All tests shall be conducted in the presence of the Engineer for the purpose of demonstrating equipment or system compliance with specifications. The Contractor shall submit for Engineer's approval complete details of tests to be performed describing the test procedure, test observations and expected results.

The Contractor shall furnish all tools, instruments, test equipment, materials, etc., and all qualified personnel required for the testing, setting and adjustment of all electrical equipment and material including putting the same into operation.

All tests shall be made with proper regard for the protection of the personnel and equipment and the Contractor shall be responsible for adequate protection of all personnel and equipment during such tests. The cost of any damages or rectification work due to any accident during the tests shall be the sole responsibility of the Contractor. The Contractor shall record all test values and submit the same to the Engineer Incharge.

The witnessing of any tests by the Engineer does not relieve the Contractor of his guarantees for materials, equipment and workmanship, or as any obligations of Contract.

In addition to installation testing, the Contractor is to carry out operation testing of all sections to ensure that the entire installation is sound, complete and safe and will function properly and as intended.

The acceptance shall be made by the Owner.

The Contractor shall formally engage his direct responsibilities to the Owner or his representative, and likewise, shall assume all responsibility for work performed by sub-contractors and materials he has supplied and installed.

### 19.1 Insulation Resistance Test

Insulation resistance test shall be made on electrical equipment and wiring by using a meager of 1000 volts for circuits between 250 and 500 volts. The insulation resistance of distribution boards, cables, etc., shall be as per IEC, IEEE, BSS and Pakistan Electricity Rules.

The distribution boards shall be tested before wire connections. Insulation tests shall be made between open contacts of circuit breakers, switches and between each phase and earth.

If the insulation resistance of the circuit is less than specified values, the cause of the low reading shall be determined and removed. Corrective measures shall include dry-out procedure by means of heaters, if equipment is found to contain moisture. Where corrective measures are carried out, the readings shall be taken and repeated twice at 12 hours interval. The maximum range for each reading in the three successive tests shall not exceed 20% of the average value. After all tests have been made, the equipment shall be reconnected as required.

  
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### 19.2 Earth Resistance Test

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

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

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

### 19.3 Phase sequence test

Each circuit breaker shall be operated electrically and mechanically. All interlocks and control circuits shall be checked for proper connections in accordance with the wiring diagrams given by the manufacturer.

The Contractor shall properly identify the phases of all switchgear and cables for correct rotation of all motors and entire installation before final connection to supply line.

Trip circuits shall be checked for correct operation and rating of equipment served. The correct size and function of fuses disconnect switches, number of interlocks, indicating lights and alarms shall be in accordance with approved manufacturer drawings. Name plates shall be checked for proper designation of equipment served. Protective relays shall be tested and set at site prior to commissioning of the equipment.

### 19.4 Low Current Systems Tests

The testing of Low Current systems shall be carried out as per procedures or recommended by the manufacturer/supplier.

### 19.5 Complete Tests

After any equipment has been tested, checked for operation, etc., and is accepted by the Engineer, the Contractor shall be responsible for the proper protection of that equipment so that subsequent testing of other equipment do not cause any damage to the already tested equipment.

## 20. ELECTRICAL CONNECTION

Electrical connection shall be provided by Electric Supply Company but necessary but necessary arrangement coordination to be done by the Contractor. The temporary arrangements (including materials and labor) for installation/testing purpose to be made by the contractor without any extra cost.

## 21. DRAWINGS, SAMPLES AND MANUALS



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1. The contractor shall prepare shop drawings showing all routes, switches, sockets, DBs and junction/pull boxes locations etc. and submit to the Engineer Incharge for approval before starting the work without any extra cost.
  - a. Single line diagram indicating all cables, with sizes and types, and rating of circuit breakers, fuses, etc.
  - b. Lighting, power, telephone, fire alarm, nurse call, public address, CCTV, queue management and data/voice systems, as applicable.
  - c. Control and Data/Voice wiring diagrams for the equipments installed by the Electrical Contractor
2. All changes/additions/alterations shall be carefully recorded during the work and the Contractor shall prepare as built drawings. On approval of drawings the Contractor shall provide two set of drawings to the Engineer Incharge and owner before final payments. The Contractor shall submit for approval of the manufacturer's instructions for installation, testing, commissioning, operation and maintenance manuals of the equipment before installation. Upon acceptance, the Contractor shall supply a copy to the Owner. The contractor shall also submit for approval the samples of materials to be used in the project, before starting the installations and approved list of materials/equipments to be handed over to owner.

## 22. WORK COMPLETION

The Contractor shall further repair/replace all defective works on completion and leave all installations in perfect working order up to the satisfaction of the Owner and Engineer Incharge. The contractor shall meet all the requirements/instructions given in specifications.

The contractor shall complete each and every work as described and included in these specifications and BOQ as per owner's/Engineer Incharge instructions.

## 23. PAYMENT

As per conditions of contract.



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## SECTION - B

### LOW VOLTAGE SWITCHGEAR

#### 1. GENERAL

##### 1.1 Purpose

This section describes the minimum requirement for the design, construction and performance of factory assembled LV switchboard.

##### 1.2 Scope of Work

The job consists of supply, installation, testing, connecting and commissioning of switchboards as specified in BOQ or shown on the Drawings.

##### 1.3 Installation

Switchboard shall be installed indoor. The equipment shall be capable of operation under the prevailing ambient conditions without any deleterious effect of any kind. Switchboard shall be suitable for continuous operation at full load rating under combined variation of both voltage and frequency.

#### 2. MAIN ELECTRICAL CHARACTERISTICS

##### 2.1 Power Supply System

Main characteristics of power supply system applicable to all switchboards are:

- Voltage	400 V + 10%
- Phase	3 phase, 4 Wires.
- Frequency	50 Hz. + 2 Hz.
- Neutral system	firmly grounded.

Main characteristics of auxiliary supply system are:

- Control / Command system	24 VDC.
- Space heater system	230 VAC.

##### 2.2 Ratings

The equipment shall be capable of carrying the specified current continuously 24 hours per day, without exceeding the permitted temperature.

The current ratings must be guaranteed at the specified design temperature. Equipment shall be fully rated and constructed for withstanding, making and breaking the specified short circuit duty.

Pins of auxiliary circuits shall be sized for a rated circuit of minimum 10 Amp.

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### 3. ENCLOSURES

The Switchboard shall be prefabricated metal clad cubicle(s), floor standing type, or concealed in wall or surface mounted as mentioned in BOQ totally enclosed, dust tight and vermin proof and front access only. It shall complete in all respects with material and accessories, factory assembled, tested and finished all according to the specifications and to normal requirements. For indoor installations the international classification shall be IP42.

- a) The short service breaking capacity, ICs at 400 VAC, conforming to IEC 60947-2 unless otherwise stated on the drawings.
- b) To provide with adequate clearance from live parts so that flash over cannot be caused by switching, vermin, pests, etc.
- c) All components shall be rated for insulation class 600-volt minimum.
- d) It shall be designed for flush mounting of all instruments on the front side only.
- e) All incoming or outgoing connections from top or bottom shall be completed. The components mounted so as to facilitate ease of maintenance from the front. Common lamp test facility for all lamps.
- f) The wiring diagram on the inside of door. Be labeled with name plate on the front side of door.
- g) To provide 25% space for extension in future.

#### 3.1 Cable Accessibility

Switchboard shall preferably be arranged for bottom cable entries. Adequate space must be provided for cable entries and termination. It shall be possible to work easily and safely on cable of a main or control outgoing circuit in OFF position with the remainder of the board alive.

Adequate system shall be provided for installation and clamping of cables inside the cable compartment. Position of terminals and cables shall allow use of clamp ammeter.

Power and Control cable termination shall avoid obstruction to other cable termination and provide easy access for terminating cables. Cable supports shall be provided to avoid undue strain on cable termination. Easily accessible locations shall be reserved in the compartment for measuring transformers.

#### 3.2 Heaters

Space heaters shall be provided for prevention of moisture in each cubicle. Heaters shall be wired together and shall be automatically controlled to avoid over heating the equipment. Heater shall be suitable for operation on 230 VAC supply from an external source (to be provide in main Distribution Board)

#### 3.3 Name plates

On the front side, a name plate shall be provided at the top to indicate the name of manufacturer, system voltage and frequency and the current carrying capacity of switchboard.

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Each breaker shall have a circuit identification label fitted below the breaker aperture or as suitable.

Drawing indicating the branch circuit names, breaker elements, cable sizes and connecting services shall be placed in a clear plastic pocket provided at the back of the front access.

Labels described shall have block letters 7 mm high on a white back ground, to be made from trifoliate and be fixed with screws.

Each incoming and outgoing circuit shall also be labeled with name plate 75 mm x 15 mm, as described above on the front side of door.

#### 4. CONSTRUCTION

- 4.1 The switchboard shall be fabricated, welded; grinded, finished with angle iron frame work and clad with 2MM MS sheet, to form a rigid, free standing, flush mounting fronted assembly.

It shall be suitably divided into panels and compartments for accommodating the required number of circuit components, instruments and accessories. Each compartment shall be fully partitioned from its neighbor both horizontally and vertically, allowing safe cable routing / termination without shutting the switchboard down.

All live parts within cubicles, compartments or modules, which have to accessible during normal maintenance operations, shall be adequately protected and / or buried to ensure protection of works and to avoid accidental contact. Barriers may be rigid, transparent, insulating material fitted with warning labels.

The doors shall be provided with hinges on the left-hand side and locking handles on the right hand side for fastening the door. The front assembly shall be fastened to the enclosure by means of self locating fasteners for quick and easy fixing.

All holes, cutouts shall be tool or jib manufactured and free from burrs and rough edges. All structural components shall be of standardized design to provide complete uniformity and inter change ability of common parts. Removable gland plated shall be provided at top and / or bottom as required.

The switchboard shall be supplied complete with foundation bolts and other installation materials as recommended by the manufacturer. Proper size cable clamping channels with galvanized steel clamps and brass cable clamps respectively for PVL/PVC and SWA cables shall be provided.

The cabling inside the Switchboard shall be suitably numbered and harnessed by means of straps or cords. Wiring to door mounted components shall be in flexible PVC conduit. All indicating, control and selecting equipment shall be suitably arranged and clearly labeled with indelible labels indicating the rating of fuses, switches, etc.

All metal work of the switchboard shall be cleaned down to bare shining metal, phosphate and the surfaces chemically prepared for powder coating. Then these shall be coated with powder of color RAL 7032 and then baked in oven. The thickness of powder coating shall not be less than 120 microns.

  
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#### 4.2 Bus Bars

Bus bars and droppers supported on non - hygroscopic material are to be high conductivity electrolytic tinned copper, completely isolated and mechanically braced and rated to withstand the specified short circuit currents for one second duration.

Bus bars and droppers shall be housed in a separate compartment and shall be clearly marked with Red, Yellow and Blue colors. Bus bars shall be provided for three phases, neutral and multi - terminal earth. The temperature rise shall not exceed 50 degree centigrade at rated current. Neutral bus assembly shall consist of outgoing screw terminals with one terminal for every MCCB / MCB.

Removable metal covers on the bus bar chamber shall be provided with suitably sized labels at regular intervals, fixed with self tapping screws and warning of live metal work.

All bus bars connectors shall be tinned plated connections and joints. Horizontal bus bars shall be of the same current rating throughout their length.

#### 4.3 Earthing

A copper earth bar of suitable section for the specified fault level shall extend the entire length of the Switchboard. Provisions shall be made for possible future extensions at both ends.

Earthing facilities shall be provided on each incoming and outgoing unit to permit earthing of the connections.

All metallic non-current carrying parts of the Switchboard shall be bonded together and connected to the Switchboard's earth bar.

Each circuit wiring shall be green / yellow color. Earthing mass continuity between withdraw able parts and fixed frame shall be correctly ensured whatever withdraw able part position.

Provision shall be made adjacent to cable termination for earthing cable armor to the earth bus bar.

Earthing switch shall be provided wherever mandatory as per rules and regulations / codes and standards and shall be manually operated. An interlocking system shall provide the following locking and safety functions:

- Impossibility of closing the earth switch if the switching device is closed.
- Visual check of earthing switch positions to be possible.
- Possibility of locking the earthing switch operating handle in open and closed position.
- The earthing of the bus bar shall be done manually by the operator without provision of general earthing system.

#### 5. DISTRIBUTION BOARDS

The enclosure of the LV Distribution Board shall be fabricated from electro-galvanized / zinc coated sheet steel.

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The LV Distribution Board shall be fabricated with 1.6mm sheet steel recess or surface mounting. All components shall be installed on a component mounting plate inside the enclosure and protected from the front with screwed sheet steel safety plate. The door shall be fully gasket with hinges on the left hand side and locking handle on the right hand side for fastening the door. The locking handle should be detachable. The dead / front assembly shall be fastened to the enclosure by means of self - locating fasteners for quick and easy fixing.

The incoming and outgoing cable connections shall be according to the wiring requirements. If required, an adapter box of same material & finish shall be provided for accommodating the cables and conduits.

An earth bar or terminal strips shall be provided for connection of incoming and outgoing earth conductors. The earth bar or terminals shall be permanently connected to the body of Distribution Boards at two points. Flexible copper strip shall be provided for earthing of the door.

Neutral bus assembly shall consist of outgoing screw terminals with one terminal for each MCB. All holes, cutouts, etc., shall be tool or jib manufactured and free from burrs and rough edges. Removable gland plates shall be provided at top/bottom, as required.

The cabling inside the distribution board shall be suitably numbered and harnessed by means of straps or cords. Wiring to door mounted components shall be in flexible PVC pipe. All indicating, control and selecting equipment shall be suitably arranged and clearly labeled with indelible labels indicating the rating of components etc.

All metal work of the distribution board shall be cleaned down to bare shining metal, phosphate and the surfaces chemically prepared for powder coating. Then these shall be coated with powder of color RAL 7032 and then baked in oven. The thickness of powder coating shall not be less than 120 microns.

## 6. COMPONENTS

The switchboards shall be provided with all components as specified or shown on the Drawings and as necessary for the satisfactory operation of the Switchboard and electrical system. Typical specifications are given here under:

### 6.1 Circuit Breakers

The circuit breakers shall be panel mounted, compact modular design, trip shall be standard and shall have built in overload and short circuit protection. The breakers shall have high performance, multifunctional type under modern design concept. The breakers should confirm international standards.

The breakers shall have inverse time limit characteristic, instantaneous magnetic trip element for short circuit and thermal overload protection.

#### a) Molded Case Circuit Breakers (MCCB)

The MCCB shall be three pole 400 / 500 volts rating. The breakers shall have both time delay over current and instantaneous short circuit protection.

The MCCB's shall be installed such that their switching levers are accessible through the dead front plate for operation. Circuit numbers / designation on all circuits shall be clearly marked to facilitate connection and maintenance.



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The breakers shall have quick make - quick break toggle mechanism with positive 'ON', 'OFF' color indication and intermediate 'Tripped' positions.

Trip mechanism shall be trip free on overload or short circuit ensuring that the breaker will not close / remain close even if the close command is given while the circuit breaker has tripped due to short circuit or continuing overload.

**b) Miniature Circuit Breaker (MCB)**

The MCB's with current rating from 1 to 125 Amps shall be conforming to BS EN 60-898 or IEC 60947-2. The circuit breakers shall be suitable for DIN-rail mounting, maintenance-free and fully tropicalised.

The MCB's shall be designed for horizontal or vertical mounting, or reverse feeding, without any adverse effect on electrical performance.

The operating mechanism shall be quick make, quick break type, trip free, with all poles opening and closing simultaneously (except for the neutral pole, which if required shall be of the advance-closing and late-opening type). The operating toggle shall clearly indicate the ON and OFF color indications.

The individual operating mechanism of each pole of a multiple MCB shall be directly linked within the MCB casing and not by the operating handle.

Each pole of the MCB's shall be provided with bimetallic thermal element for overload protection and a magnetic element for short circuit protection.

**c) Earth Leakage Circuit Breakers (ELCB)**

ELCB's shall be four pole, current operated type with tripping current of 0.3A and tripping time not more than 0.1 seconds.

**6.2 Transformers/Meters etc.**

**a) Current Transformers**

Current transformers shall comply with the requirements of IEC 60185 (or equivalent).

Current Transformers shall be polyester resin insulated, ring type, air cooled having transformation ratio as indicated on the drawings. The current Transformers shall be of suitable burden having accuracy class 1.0. The Current Transformers shall have rated secondary current 5A / 1A as required.

Current Transformers shall mechanically and thermally withstand the specified short circuit capacity. Test terminal blocks shall be provided for current Transformer secondary circuits having short circuiting provisions to allow portable apparatus to be connected.

**b) Voltage Transformers**

Voltage transformers shall comply with the requirements of IEC 60186 (or equivalent) and shall be of accuracy class 1.0.

Voltage Transformers shall be equipped with primary fuses with an interrupting capacity of the incoming circuit breakers. Test terminal block shall be provided for each Voltage Transformer system.

**c) Ammeters and Voltmeters**

  
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Indicating instruments shall be semi-flush Switchboard type, moving Iron, spring controlled with standard scale having white background and black graduations and markings. The front dimensions shall be 144 x 144 mm for instruments on incoming side and 96 x 96 mm on all outgoing circuits.

Indicating instruments shall be 1.0 class percent of full scale basic accuracy class in accordance with IEC 60051.

The ammeter shall be suitable for connection to 5 Amp. Secondary of current transformer or directly through shunt as shown on the drawings. The instruments shall have measuring range indicated on the drawings. A red mark shall be provided at the working voltage on the scale of all voltmeters.

**d) Selector Switches**

Ammeter and voltmeter selector switches shall be complete with front plate, grip handle, R-Y-B and OFF position for ammeter and RY-YB-BR-RN and OFF positions for voltmeters.

The selector switches for controls shall be rotary cam type and shall be provided complete with knob and front plate, showing all positions as required.

**e) Push Buttons**

The push buttons shall be momentary make / break contact type (normally open / normally close) and suitable for flush mounting. The push button for ON and OFF switching shall be red and green respectively.

**f) HRC Fuses**

HRC Fuses shall be provided complete with fuse bases, fuse, etc. The fuses shall have a fusing factor as specified for class QI in accordance with BS 88.

**g) Pilot Lamps**

Switchboard shall be provided with phase indicating pilot lamps. The lamps shall be rated for 250 volts supply and suitable for flush mounting. The front of the lamps shall have colored rosettes for identification of phases.

**h) Line up Terminals**

Line up terminals wherever provided for Control or Power circuits shall be suitable for voltage and size of conductors as indicated on drawings. The Line up terminals for controls shall be suitable for channel mounting. All necessary accessories such as end-plates, fixing clips, transparent label holder caps and label sheets with marking shall be provided.

**i) Secondary Wiring**

All wiring shall be copper conductor, thermoplastic insulated, at least 1.5 sq. mm flexible, neatly arranged and clipped in groups.

Each conductor and its termination are to be identified and marked with numbered ferrules. All live terminals are to be shrouded.

Secondary wiring for Current Transformers shall be carried out with not less than 2.5 sq. mm. Terminals shall be specially marked to avoid opening of the circuit by accident.



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## 7. POWER FACTOR IMPROVEMENT PLAN (PFI)

The power factor improvement plant shall be used for improving the power factor of the system. The plant shall be automatic cum manual.

The PFI plant shall be aligned with main LT switch board and it shall be a part of that LT switchboard as shown on the drawing. The capacitors shall be suitable for three phases, 415 volts 50 Hz system and shall be self cooled, designed for indoor use in tropical climate for maximum ambient temperature of 45 degrees centigrade and relative humidity 90%. The capacitors shall be in the form of banks divided for 12 stages, 6 stages and 4 stages. Each capacitor bank unit shall be 12.5/25 and 50 KVAR. The total KVAR capacity shall be as indicated on the drawings. Each capacitor unit shall be complete with discharge resistors and internal fuses and shall be connected with control panel with proper size of single core PVC insulated cables.

The panels shall be supplied complete with a set of 3-phase, full capacity, isolated tinned copper bus bars, interconnections, risers, designation labels, cable sockets, holding down bolts, wiring with cleats and ferrules, earthing sockets and studs, etc. Each control panel shall comprise.

1 No. Multi stage power factor correction relay for automatic/manual control.

1 No. 3-phase, 4 wire, 415 volts, unbalanced load power factor indicator.

1 No. Auto-off-Manual selector switch

1 No. Current transformers with 5 amps secondary current having suitable output burden and accuracy.

3 Nos. Instrument protection fuses.

Following equipment shall be provided for every 250 KVAR capacitor bank:

1 No. 630 amps, triple pole 415 volts air break contractor with auxiliary contacts (2 N.O+2 NC) Contractor shall be suitable for AC 3 duty.

1 Set of 2 Nos 630 Amps H RC back-up fuses with base and carrier.

1 Set of ON and OFF push buttons.

1 No. Red lamp for "ON" indication to the contractor.

### **Requirement of Capacitor Banks**

According to IEC-83 1 -1 and 831-2.

Fully insulated terminals to be shielded by a cover.

Dielectric: Plastic poly-propylene, impregnated.

Electrodes: Aluminum coating vacuum metalized.

Safety features: Self healing. Over pressure tear-off fuse.

Withstand switching operations safely.

Maximum in rush current 200 times rated current.



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Loading capacity: 1.1 times rated voltage. 1.3 times rated current at delta max.

Overloading capacity 1.5 times rated output at delta max.

Acceptable tolerances - 5/+ 10% of rated output at rated frequency.

Static life expectancy > 100,000 operating hours.

Test Specifications: Terminal versus terminal with an AC voltage 2.15 times rated voltage for 10 seconds duration. Terminals to casing with an AC voltage of 3 KV for 10 seconds duration.

## 8. INSTALLATION

The LV Switchboard shall be installed at location shown on the drawing. The Contractor shall coordinate with civil & allied works for providing any openings, holes, etc. to avoid any breakage. In case the provisions in civil works for the installation of electrical equipment are not made or made incorrect the same shall be rectified by the Contractor at his own cost and to the satisfaction of the Engineer. The Contractor shall provide foundation bolts and grout them in cement concrete floor using non-shrinkable material with the approval of Engineer.

All installation material for physically erecting the switchboard, such as bolts, nuts, washers, supporting steel, etc., shall be provided and installed by the Contractor. The Switchboard shall be installed upright and in level and shall be firmly and rigidly bolted to the floor and concrete supports.

The switchboard shall be completely erected as per manufacturer's instructions and as approved by the Engineer. Loose parts dispatched by the manufacturer shall be installed and connected as per assembly drawing provided by the manufacturer. Any safety locking provided by the manufacturer for safe transportation shall be released only after the switchboard is erected in position.

The incoming and outgoing cables shall be connected as recommended by cable manufacturer.

The cable armor shall be connected effectively to ground.

The Switchboard enclosure shall be connected to earth terminal. The Switchboard shall be tested before energizing in the presence of the Engineer.

  
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## SECTION - C

### LOW VOLTAGE CABLES AND WIRES

#### 1. SCOPE OF WORK

The work under this scope consists of supply installation, testing, connecting and commissioning of all material and services of low voltage cables and wires and the accessories as specified herein or shown on the Drawings and given in the Bill of Quantities.

The Contractor shall discuss the electrical layout with project Engineer and coordinate at site with other trades for exact route, location and positions of electrical cables and equipments etc.

#### 2. GENERAL

All multi-core and single core wires for light circuits, socket outlets and circuits operating up to 250 volts shall be 300 / 500 volts grade. All single core sheathed cables shall be of 450 / 750 volt grade. Power cables for main feeders, main to sub-main feeders, power equipment, etc., armored or unarmored shall be of 600 / 1000 volts grade. Armoring of cables shall be done with appropriate size galvanized steel wire as per codes.

The conductors shall be stranded or solid, high conductivity, soft annealed copper. Conductor of single core cables shall be circular, whereas of multi-core cables may be circular or shaped according to standard practices and codes. The PVC insulation shall be extruded with a PVC compound having good flexibility, resistance to aging and ability to withstand the ambient temperatures. Cable should be capable of running 125% of full load current without any damage.

#### 3. STANDARDS

All Cables & Wires shall be manufactured to confirm the following standards as given below:

BS 6004 / 6346	PVC insulated cables for lighting and power.
BS 6746	PVC insulation for electrical cables.
BS 6360	Copper conductors
BS 6500	Insulated flexible cords.

#### 4. MATERIAL

##### 4.1 General

The power, lighting and control cables shall be furnished and installed in accordance with the routes and requirements shown on the drawings. The single core cables shall be delivered as complete coils with wrapping & seal intact.

All cables shall have phase identification colors on insulation of each core. The color code for three phase circuits shall be red, yellow and blue for phases, and green for earthing.

Single phase circuits shall have insulation of red color for phase / line, black color for neutral and green color for earth conductor.

  
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All DC circuits shall have insulation of red color for positive, black color for negative and green for earth conductor.

The ends of each length of multi-core armored or unarmored cables shall be properly marked for clock-wise and anti clock-wise sequence of core colors.

#### 4.2 Cables for Conduit Wiring

All cables / wiring in concealed or surface mounted PVC or MS conduits shall be single core PVC insulated of specified grade and size, unless specifically shown on the drawings or given in BOQ.

#### 4.3 Cables on Surface / Concrete Trenches

Cables for distribution system to be installed on surface, in cable ducts, in concrete trenches or on trays shall be single or multi-core PVC insulated and PVC sheathed of specified voltage grade and size, unless specifically shown on the drawings or given in BOQ.

#### 4.4 Underground Installation

Cables for laying directly underground shall be PVC insulated, PVC sheathed and armored with galvanized steel wire. Cables fully installed in underground ducts / pipes and mechanically protected from end to end shall be PVC insulated and PVC sheathed unless specifically shown on the drawings or given in BOQ.

#### 4.5 Cable Accessories

All cable accessories such as lugs, ties, tapes, glands, flexible pipes, connectors, duets, clips, tags, bushes, etc shall be provided for the complete cabling and wiring system without any additional cost.

### 5. INSTALLATION

#### 5.1 General

When the laying is effectuated by others, the contractor shall test the cable characteristics insulation and continuity, at all phases of these and communicate them in a report to the Engineer, as per recommendations of the standards according to which the cable is manufactured.

The cables shall be spaced by categories along their entire length as well as upon penetration into buildings and in their interiors, according to their following rated voltages:

- 30 cm at least between a cable carrying 1 KV - 30KV and other cables.
- 20 cm at least between a cable carrying voltages between 50V - 500V, and any power or control 10 cm at least between a cable carrying voltages lower than 50V and telephone or these possible being grouped.

All installation material, labor, tools and accessories for cable installation shall be furnished by the Contractor. The cable and accessories shall be installed as described in accordance with these specifications, drawings and manufacturer's instructions.

The wiring must be strict in accordance with layouts, details, schematic diagrams given in the drawings.

  
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The light circuit and power circuits shall be run in separate pipe. The circuits/sub-circuits shall be provided identifications by numbers permanently attached. The wiring shall be done to maintain color coding.

## 5.2 Conduit Wiring

The wiring in conduit shall be started only after the conduit system is completely installed and all outlet boxes, junction boxes, etc., are fixed in position. The filling rate inside the conduits shall not exceed 50 %. Cables directly embedded in the masonry are not accepted.

The wires shall be pulled in conduit with care to prevent damaging the wires, preferably without the use of any lubricant like soap, oil or grease. Where necessary and if approved by the Engineer, the cable manufacturer's recommended lubricant may be used. Where several wires are to be installed in the same conduit, they shall be pulled together along with the earth conductor. All wires of same circuit shall be run in one conduit.

The wires shall not be bent to a radius less than 10 times the overall diameter of the wire, or more if otherwise recommended by the manufacturer.

The wiring shall be continuous between terminations and looping-in system shall be followed throughout. Any joint in wires shall not be allowed. The use of connectors shall only be allowed at locations where looping-in is rendered difficult. The consent of the Engineer shall be required for using connectors. The connector shall be of suitable rating having porcelain body with sunk-in screw terminals. The connector shall be wrapped with PVC insulation tape after its installation. A minimum of 150 mm extra length of cable / wire shall be provided at each termination to facilitate repairs in future.

The size & quantity of cables contain in one pipe shall not be excess in accordance with IEE regulations.

## 5.3 Cables on Surface / Trenches

All cables for installation on surface of wall, column, ceiling, trenches, etc., shall be fixed to the surface by means of galvanized steel clips, secured to a steel channel using suitable stud plate, nuts and washers.

The erection of cables and position of support shall be agreed by the Engineer on site, having taken into consideration the accessibility of all such routes. These shall be so arranged that cable crossing one another be minimized If cannot be avoided.

Cables shall be fixed throughout their length by means of approved saddles, clips, etc., at every 600 mm vertically and 900 mm horizontally.

Cables and equipment fixed to a building fabric, i.e., brickwork, concrete, etc., shall be fixed by means of appropriate fixing devices, i.e., Raw bolts, Hilti fixing devices, etc. Contractor shall be responsible for all drilling of steel work, brick work and masonry where necessary for fixing clamps and brackets for supports.

Cables shall not be pulled into conduit until the conduit system has been completed, cleared and free from obstruction and sharp edges cables shall be put into conduits in such a manner that there will be no cuts or abrasions in the cable insulation, protective braid and jackets. There shall be no link in the conductors.



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Distance of saddles shall be used for installation of cables in defined condition of the surface of wall etc.

Grease or other injurious lubricants shall not be used in pulling cables. The use of talc or non injurious lubricants is permissible, if desirable.

The number of wires installed in any conduit shall be such that the resulting space factor does not exceed 50 %. Spliced wires shall not be pulled through conduits.

All conduit wiring shall be carried out in the loop - in principle from outlet box to outlet box and in no circumstances shall joints be used except in fixed base connection blocks housed in outlet boxes.

The vertical clearance between two adjacent cables at any point is 50 mm minimum. Common mounting, channels are to be furnished for cable along the same route. The Contractor can offer alternate cable fixing arrangement, which shall be approved by the Engineer before commencement of installation.

The wall crossings where the outdoor cables penetrate in the building shall be carefully obstructed by means of polyurethane foam. The Contractor shall be fully responsible for the perfect tightness of these cable penetrations.

#### 5.4 Underground Cables

The Contractor shall plan and take special care to prevent any damage to existing underground facilities such as piping, cables, foundations, etc. The Contractor shall notify the Engineer of any obstruction encountered and shall provide protective support or removal of such obstructions as instructed by the Engineer. Excavation adjacent to existing facilities, such as foundations manholes, ducts, underground pipelines and paving shall be braced and / or shored properly to protect those facilities during excavation and construction.

Sufficient slack shall be left in cables for this purpose that cut lengths of cables shall allow about 3% more in the measured lengths between terminations.

Cables, whether installed underground or in concrete trenches, shall not be bent to a radius less than 10 times the diameter of the cable or as recommended by the cable manufacturer, whichever is higher.

All cables shall be marked at least at each end, switch gear and equipment termination, where cable enter or leave underground cable trenches or channels, where cable rises from one level to another, at 30M intervals with predetermined identification numbers, by means of proprietary non-deteriorating type, PVC, heat shrinkable, strap-on type or equivalent, for the identification of cable and circuit. These shall be indelibly marked with cable number and securely fixed to the cable. Where conductors are left to be terminated by another party or left to be connected later, they shall be identified. The earth continuity conductor shall be laid in the trench with the cables.

Cables entering the buildings shall also be laid in protective pipes. The protective pipe ends, after installation of cables, shall be plugged water tight by means of polyurethane foam / bituminized Hessian or equivalent method as approved by the Engineer.

#### 5.5 Cable Termination and Joints

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Cables shall be terminated in a safe, neat and approved manner at the associated equipment, included that erected by others.

Compression type connectors (lugs) shall be of the correct size and approved type for the conductors concerned. Compression tools shall be supplied for specific use and shall be maintained in good order. After compression the conductor and terminal shall form a solid mass ensuring good conducting properties and mechanical strength. The compression jointing system used throughout the installation must be approved by the Engineer.

The Contractor shall be responsible for all drilling and if necessary, tapping entries where these have not been provided by others.

When preparing cables prior to fitting glands, the gland manufacturer's instructions for cable preparation shall be observed. In all cases where armored cables are used, care shall be taken to ensure that the lay of the armor is maintained after the gland is completely fitted.

Termination and joints shall be suitably insulated for the voltage of the circuits in which they are used.

Every compression joint shall be of a type, which has been the subject of a test certificate as described in BS 4579.

Cable ends, which are not terminated immediately after cutting, shall be sealed effectively to prevent ingress of moisture and shall be protected from damage until termination.

For all cables above 6 sq. mm in section, if a substantial mechanical clamp is not provided a compression type lug or socket shall be provided. At all equipment, cable shall be installed and terminated so that no strain is imposed on the cable or gland and due allowance made to counter the effect of vibration. At all termination an ample length of 'tail' shall be left.

Where joints in cable conductors and bare conductors are required, they shall be mechanically and electrically sound and they shall be accessible for inspection. Joints in non-flexible cables shall be made either by soldering or by means of mechanical clamps or compression type socket, which shall securely retain all the wires of the conductors.

Any joint in flexible cable shall be affected by means of cable coupler. Cable couplers and connectors shall be mechanically and electrically sound and shrouded in metal, which can be earthed. Where the apparatus to be connected require earthing every cable coupler shall have adequate provision for maintaining earth continuity.

The insulation of cables must be brought into DB's switch boards or fixtures to which the cables are connected. All openings shall be sealed properly. The outdoor apparatus shall normally be connected by means of cables with conduit termination down to about 30 cm below ground level or concrete foundation. The conduit shall be firmly secured down to their penetration into the trench or channel.

  
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**SECTION - D**  
**CONDUITS AND PIPES**

**1. SCOPE OF WORK**

The job includes supply and installation of all Conduits, Pipes and Accessories as specified herein and / or shown on the Drawings and given in the Bill of Quantities.

The Contractor shall discuss the electrical layout with the Engineer and coordinate at site with others for exact route, location and positions of electrical conduits.

**2. GENERAL**

The extent of works shown on the drawing does not indicate the exact position of conduit and pipes. The Contractor shall ensure exact location and route of conduit and pipes in coordination with other services drawings, as per site requirements and as directed by the Engineer.

The quality and material for the accessories of conduits and pipes such as sockets, elbows, bushes, bends, inspection / pull boxes, round boxes, etc., necessary for the completion shall be similar to that of conduit or pipes.

**3. STANDARDS**

The conduits, pipes and accessories shall confirm the following standards:

BS 31	MS Conduit and accessories
BS 1378	Galvanized Iron Pipes and accessories.
BS 3595	PVC Pipes and accessories.
BS 4607	PVC Conduits and accessories.

**4. MATERIAL**

**4.1 PVC Conduits, Pipes and Accessories**

The PVC conduits and accessories for lighting and power circuits shall be standard manufactured length of high tensile strength and sufficiently flexible to provide resistance against breakage. It should not dent or flatten under pressure and it should be chemical resistant to chemical action of the atmosphere. The conduit shall be self extinguishing and should not support combustion.

The PVC conduit withstand against concrete additives, electrolysis, corrosive atmosphere, soils, salts or excessive humidity and should be non-magnetic to reduce voltage drop and minimize power loss. The conduit should be non-conductive & non-sparking.

The PVC bends shall have enlarged ends to receive conduit without any reduction in the internal diameter at joint. Manufactured smooth bends shall be used where conduit changes direction.

The round PVC junction boxes for ceiling light or fan points shall have minimum dimensions of 64 mm diameter and 64 mm depth. The junction boxes for wall light points shall have minimum dimensions of 57 mm diameter and 40 mm depth. Round

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junction boxes shall be provided with one piece Bakelite cover plate fixed to the box by means of galvanized screws.

The PVC pipe shall be rigid and shall be minimum d class, unless otherwise stated on Drawings or Bill of Quantities. For jointing of pipe, all precautions and procedures recommended by manufacturer shall be followed.

#### 4.2 PE Conduit & Accessories

The PE conduits & accessories shall be corrosion resistant, non-toxic, light weight, impact strength, weld ability and abrasion resistance. It should be manufactured as per ISO 4427 and other international standards.

#### 4.3 MS Conduit and Accessories

All conduits shall be of 16 SWG steel, manufactured and tested in accordance with latest relevant standards.

The conduit shall be protected by two base coats of red oxide (antirust paint) and finished in first quality black enamel paint. The coating shall be of heavy enamel, which shall not flake or crack during installation and handling. Each conduit length shall be furnished with threaded ends and a threaded coupling at one end. Soft metal bushes shall be provided at conduit termination to prevent damage to cable during pulling operation.

Junction boxes shall be 100 mm square, having minimum depths of 38 mm or 65 mm as required for accommodating the number of wires. The junction box shall be 16 SWG sheet steel provided with anti-corrosion paint and finished in heavy black enamel paint. The cast Iron outlet boxes for light points shall be round having 50 mm diameter and 63 depth. The above dimensions are given as minimum only, and the exact size shall be determined by the Engineer Incharge Keeping in view the ease of Installation and maintenance. All outlet boxes and junction boxes shall be provided with one piece Bakelite cover plate of suitable design.

#### 4.4 Galvanized Iron Pipes and Accessories

The G.I. pipes shall be galvanized from inside and outside by hot dip galvanizing method. The pipes shall be free from stains, burrs or any other defect. The accessories for G.I. pipes shall be galvanized from inside and outside. The conduit shall be NPT threaded, with at least 5 complete threads and assembled with TEFLON tape.

#### 4.5 Inspection Boxes / Pull Boxes

The rectangular inspection boxes or pull boxes shall be of 16 SWG heavy gauge, sheet steel having nipples welded to box at entry holes to receive PVC conduit with force fit. The box shall be painted inside and outside with black enamel paint over a base coat of red oxide primer paint. The minimum length of inspection box shall not be less than six times the cable manufacturer's recommended bending radius of the cable. All concealed type pull boxes shall have ebonite sheet of appropriate size fixed to the box by means of galvanized screws.

#### 4.6 Pull Boxes

  
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Pull boxes shall be made of 16 SWG sheet steel box, painted and finished to the same quality as the light Distribution Board. The boxes shall be 50 mm in depth for conduits up to 25 mm diameter, 63 mm in depth for conduits up to 40 mm diameter and 87 mm in depth for conduits up to 50 mm in diameter. For conduits more than 50 mm in diameter, the minimum depth shall be two times the diameter.

#### 4.7 Conduit / Pipe Accessories

Bushes, plugs, glands, etc., shall be of brass and all male bushes shall be of long thread pattern. Covers for boxes shall be screw fixed and finished as the boxes. Gaskets shall be fitted only when finish is galvanized unless otherwise specified.

### 5. INSTALLATION

The contractor shall provide all conduits & accessories for the installation as required. The drawings shows the approximate & terminal points of conduits. However if for any reason the contractor desire to use any alternative route, he may do so at his own responsibility without interference with other installations and get the prior written permission from Engineer.

Conduits shall be run atleast 150mm from flues, steam or water pipes. Where multiple conduits runs, these shall be arranged symmetrically to present a uniform and neat arrangement. The minimum size of conduit shall be 20mm diameter unless notified otherwise. Conduits are installed to confirm the location of conduit to avoid obstructions, furnaces, hot lines & other places of high temperature.

#### 5.1 PVC Conduits - Concealed

The conduit shall be installed concealed in roof, wall, column, etc.

At all joints and bends, PVC jointing solution of approved make must be used to strengthen and to seal the joint.

Manufactured smooth bends shall be used. Bending of conduits by heating or otherwise will be allowed in special situations only, for which the consent of the Engineer shall be required. The use of 90 degree bends and tees will not be allowed.

The conduit shall have a minimum of 38 mm cover of concrete. The conduit shall be laid above the steel of the slab and shall be firmly secured by tying to steel. Under any circumstances RCC structures chiseling not to be made.

All outlet boxes to be firmly supported and installed such that they finish flush with the soffit of slab or beam.

Where conduits have to be concealed in cement concrete work or in block masonry, the chiseling shall be made with appropriate tools and shall not be made deeper than required. The conduit shall than be fixed firmly in the recess and covered with cement concrete mixture to have to at least 25 mm cover before plastering. The work of curing in the cement concrete work or block masonry work shall be coordinated with the civil work. The Contractor shall obtain approval from Engineer for the route, to suit the site conditions before starting chiseling and cutting.

The termination of conduits at or near the Switchboard / Distribution Board is shown diagrammatically on the drawing. The exact locations of the termination shall be confirmed with the Switchboard / Distribution Board to be installed. Conduit ends

  
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pointing upwards or downwards shall be properly plugged in order to prevent the entry of foreign materials. All openings through which concrete may leak shall be carefully plugged and boxes shall be suitably protected against filling with concrete. At all termination of concrete, soft bushes shall be fixed to prevent sharp edges of conduit ends from cutting or damaging the wires or cables to be pulled through them.

The entire conduit system shall be installed and tested before plastering. Any obstruction found shall be cleared by use of cutting mandrel or other approved device and the conduit shall be cleaned out. Water that has entered in conduit shall be removed by drawing swabs through the conduit. No cable shall be pulled until the water has thoroughly dried out.

Pull boxes / Adaptable boxes shall be provided in conduit runs wherever required to facilitate pulling operation. The drawings are diagrammatic and do not indicate the position and spacing of pull boxes or adaptable boxes. However, these shall meet the following requirements:

- Pull boxes.  
For straight runs the spacing shall not be more than 30 meters.  
  
For runs with one 90 degree bend, the spacing shall not be more than 15 meters.
- Adaptable boxes.  
For conduits up to 25 mm diameter, the boxes shall be 50 mm in depth.  
For conduits up to 40 mm diameter, the boxes shall be 63 mm in depth.  
For conduits up to 50 mm diameter, the boxes shall be 87 mm in depth.

Wherever the conduit lengths cross the expansion joint either along the column or slab, suitable arrangement shall be provided so that when the conduit lengths in the expansion joint are stressed, the conduit neither develops any cracks nor breaks down.

Bending, offsetting and similar operations shall be performed through the help of proper bending tool to give a perfect bend of required angle without Desha ping of conduit to the least.

## 5.2 Conduits on surface

- a. The conduits accessories shall be firmly held with the surface of walls by means of PVC saddles, clamps, brackets etc. Rawal plugs or Phil plugs must be used for fixing such saddles etc. The saddles shall be fixed at an interval of 750mm, depending upon the size & weight of conduit. The MS clamps, brackets etc shall be painted anti-corrosion paint before and after fixing.
- b. In all areas where the conduit is exposed to damp or wet conditions, brass or stainless steel screws must be used for fixing.

  
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**SECTION - E**  
**WIRING ACCESSORIES**

**1. SCOPE OF WORK**

The job consists of supply, installation and commissioning of switches, switch sockets, etc., and miscellaneous items as specified herein and / or shown on the Drawings and given in the Bill of Quantities.

**2. GENERAL**

The locations of the wiring accessories such as sockets, switches etc. are tentatively shown on the drawings. The Contractor shall ensure exact positions and locations of wiring accessories in coordination with other services drawings, as per site requirements and as directed by the Engineer. The Contractor shall be responsible for proper functioning of wiring accessories after installation and Commissioning.

**3. STANDARDS**

All wiring accessories shall confirm to the following international standards:

- BS 67 Ceiling roses.
- BS 1363:1984 13A fused plugs and un-switched socket outlets
- BS 116 Two and three terminal ceiling roses.
- BS 2135 Capacitors for radio interference suppression
- BS 3676 Switch for domestic and similar purposes.
- BS 4934 Safety requirements for electric fans and regulators.
- BS 5060 Performance of circulating fans and their regulators.

**4. MATERIAL**

**4.1 Switches**

Switches for controlling light and fan points shall be single pole, rated for 10 Amp, 250 VAC or as mentioned in BOQ. The body of switches shall be made of poly carbonate / urea with white face plate suitable for flush mounting on sheet steel outlet box. The switches shall be gang type having silver tipped contacts and operate with snap action.

The fixing of plates on outlet boxes shall be means of flat head counter sunk galvanized screws with the head of the screw finish flush with the surface of the plate. Except for switches controlling light points, all single switches for fans, sockets, etc., shall have identification symbols on the operating levers.

Two way switches shall be used to control lights from two different locations as shown on the drawings.

**4.2 Switch Socket Outlets**

Switch socket units shall be conformed to BS 1363. 2 and 3 Pin rated for 5 Amps. or 2 Pin rated for 5 Amps, 250V. 3 Pin 5 Amps./15 Amps switch sockets shall be mould type having white plastic face plate, suitable for mounting on a sheet steel box of appropriate dimensions. Switch sockets shall have shrouded live contacts such that the earth pin is engaged to socket earth before making with the live contacts. Where

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specified, the switch socket unit shall have spring loaded dust tight cover for mechanical protection.

#### 4.3 Sheet Steel Boxes

The outlet boxes for installation of switches, fan dimmers and socket outlets shall be 16 SWG sheet steel having appropriate dimensions. The boxes shall have suitable knockouts or welded nipples for receiving the conduits. An earth terminal shall be provided for connecting at least three earth wires of 4 sq. mm. The outlet boxes shall be given two coats of anti-corrosion red oxide and one coat of enamel before installation. The boxes shall be suitable for mounting flush with the surface of wall or on the surface of wall as may be required. The boxes shall not be less than 75 mm x 75 mm (3" x 3"). All boxes shall be water tight where installed in the vicinity of liquids.

#### 4.4 Ceiling Rose

The ceiling rose shall be suitable for 5 Amps. 250V AC. It shall have white plastic molded base plate, copper or brass terminals for connecting at least two wires of 2.5 sq. mm size. The ceiling rose shall have a cover with cable inlet hole for multi-core PVC insulated and PVC sheathed cable.

#### 4.5 Fans

The fans shall comply with BS 380 as far as constructional requirements, range of fan speed, speed regulator starting, radio interference silent operation and temperature rise is concerned. For testing BS 848 as amended 1 960 shall be complied with.

##### 4.5.1 Ceiling Fans

The ceiling fans shall be three blades capacitor type, mounted with ceiling by means of pre-installed fan hook. The fan shall be suitable for operation on 250V AC with  $\pm 10\%$  tolerance.

The sweep of the fan shall be as given in BOQ drawings. Fans shall be supplied complete with fan coil unit, capacitor, suitable fan rod, canopy etc.

##### 4.5.2 Bracket Type

The bracket type fans shall be suitable for mounting on the wall and suitable for operation semi-horizontally. These shall operate satisfactorily on 250 volts, single phase, 50 Hz, A.C. supply with + 10 % tolerance.

The sweep of the fan shall be as given in BOQ/drawings.

##### 4.5.3 Exhaust Fan

The exhaust fans shall be three blade types, mounted on the steel/plastic structure of its own, which will be fixed to the structure by means of suitable grouted foundation bolts. The fan shall be suitable for operation on 250 VAC with + 10 % tolerance.

The sweep of the fan shall be as given in Bill of Quantities/drawings. Fans shall be direct driven and supplied complete with electric motor, back draft dampers and anti-vermin screen. The bearings shall be ball, roller or sleeve type of permanently lubricated and sealed type. Wheels shall be heavily and rigidly constructed and accurately balanced both statically and dynamically and free from objectionable vibration or noises.



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**SECTION - F**  
**LIGHT FIXTURES**

**1. SCOPE OF WORK**

The job consists of supply, installation and commissioning of all light fixtures as specified herein and / or shown on the Tender Drawings and given in the Bill of Quantities.

The Contractor shall discuss the electrical layout with the Engineer and coordinate at site with other services for exact location/positions of light fixtures.

**2. GENERAL**

The Contractor shall submit samples of each and every light fixture specified and obtain approval of the Owner/Engineer before purchasing. The quality and finishes of local make light fixtures (if mentioned in BOQ) shall be same as that of standard manufacturer.

All fixtures shall be finished in standard color schemes as mentioned in the manufacturer's catalogue for respective fixtures, unless specifically stated in the Specifications, Drawings or Bill of Quantities or directed by the Engineer.

**3. STANDARDS**

The light fixtures shall confirm the following standards:

- IEC 81 Tubular fluorescent lamps.
- IEC 82 Ballast for tubular fluorescent lamps.
- IEC 155 Starters for fluorescent lamps.
- IEC 400 Lamp holders and starter holders for fluorescent lamps.
- IEC 566 Capacitors for use in TL, HP Mercury and LP sodium vapor.
- IEC 598 Luminaries.
- BS 3677 Discharge lamp circuits.

**4. MATERIAL**

**4.1 Fluorescent Light Fixtures**

The fluorescent light fixtures shall have lamps and ballast of proper rating as shown on the drawings. Each lamp shall be provided with independent ballast.

The fluorescent lamps shall be tubular type and 36/18 watts. The fluorescent color shall be warm white characteristics with an average output of 3350 lumens (+5%) for 36 watts and 1350 lumens (+5%) for 18 watts after 100 burning hours. The ballast shall be polyester filled type, totally enclosed and suitable to operate up to 250 VAC. The power loss shall not be more than 9 / 6 watts for watts ballast. A wiring, diagram, wattage, voltage and current figures shall be printed on the body of the ballast.

The lamp holders shall be rotary lock-in type. The starters shall be glow type with radio interference suppressor / by-pass capacitor. The internal wiring of the fluorescent light fixtures shall be done with heat resistant wires at the manufacturer's factory. All light fixtures shall be provided with power factor improvement capacitor to give a minimum power factor of 0.90.

  
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The body of the fluorescent light fixtures shall be minimum 22 SWG sheet steel, de-rusted, degreased, finished in heat resistant paint, stove enameled. Appropriate size bushed wire entry holes, fixing holes and earth terminals shall be provided. Connectors suitable for connecting 2.5 sq. mm cable connectors shall be provided for supply connections. An earth terminal for connection to 2.5mm sq. wire shall be provided.

The light fixtures shall be furnished with perpex diffusing panels " 040 opal acrylic" (minimum sheet thickness 3 mm), polystyrene louvers or metal grid louvers or mirror optic reflectors, etc. as specified on the drawings or in BOQ. The louvers shall be secured firmly and in level. The polystyrene louvers shall be white Egg Crate or as approved. The louvers shall be in one section and not in pieces.

The design of light fixture for recess mounting shall be coordinated with the design of false ceiling prior to commencement of manufacture.

#### 4.2 Incandescent Light Fixtures

The light fixture shall be finished in standard colors unless otherwise stated on drawings or directed by Engineer. All incandescent light fixtures shall be of international standard and quality. This type of fixtures with manufacturer catalogue reference are given on the fixture schedule and in Bill of Quantities. Equivalent fixture may be acceptable provided that the Contractor submits for review all necessary data indicating photo-metric curves to show that the fixture proposed are of the same type, construction and quality.

The lamps for incandescent light fixtures shall be GLS/EPLC lamps and shall be supplied and installed according to the wattage as indicated on drawings.

Weather proof bulk head incandescent light fixture shall comprise of cast aluminum body and gas-kitted clear glass cover secured to the body by means of galvanized nuts / screws to give a weather proof and water tight fit. A wire guard shall be provided for protection of front glass against mechanical injury. The gasket shall be weather resistance type. A G.I. wire guard shall be provided on the glass cover. The lamp holder shall be of bi-pin brass having porcelain outer ring.

The glass shade of light fixtures shall be opal white or clear and free from any air bubbles or voids. The shade may be spherical, cylindrical, flattened bottom or any other shape as specified in the drawings or BOQ. The glass shall be opal white or clear as furnished by the manufacturer with the light fixture unless specified.

#### 4.3 water proof light fixtures

The underwater lights shall be suitable for 24V, 80Hz Dc. The DC supply shall be available from a step down transformer. The fixture shall be completely water tight and shall have scaled reflector flat lamps.

#### 4.4 flood light fixtures

The flood light fixtures shall have cast aluminum body, angle adjustable stand, polished mirror reflector and clear front glass. The flood light fittings for outdoor use shall be weather proof type having rubber gas-kit ring to fit of the front glass.

  
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## 5. INSTALLATION

### 5.1 General

The mounting heights of light fixtures are indicated on the drawings, and position of fixtures according to the mentioned scale.

The Contractor must ensure that the light fixtures are installed uniformly with respect to the dimensions of the area. Any modifications due to site conditions may be made with the approval of Engineer. All fixtures shall be carefully aligned before fixing in position. All fixing accessories such as ceiling rose, flexible cord, lamp holder, suspension rod; pipe or chain with suitable canopy, etc., shall be provided and installed.

The wiring between ceiling rose or terminal box of the fixture shall be carried out with 3 core 0.75 sq. mm, PVC / PVC cable. The wiring inside light fixture body shall be done with heat resistant cables or PVC insulated cable in heat resistant sleeves as approved by the Engineer.

Glasses, shades, reflectors, diffuses, etc., must be in a clear condition after installation.

All light fixtures shall be earthed by an earth wire connected to the earth terminal in the fitting.

### 5.2 Fluorescent Light Fixtures

The fluorescent light fixtures on the surface of ceiling shall be installed with the back of the body flush with the ceiling surface, and in a manner so as to facilitate wiring. Nylon plugs and galvanized steel bolts or screws shall be used for fixing the light fixture to the ceiling. The recessed type shall be light fixtures installed on false ceiling, the installation method detail shall be coordinated with ceiling design and submitted for approval of Engineer. The installation shall include cutting and making of holes in false ceiling. Care shall be taken to prevent the weight of the fixture from being transferred to the false ceiling.

Pendent light fixtures shall have two holes in the top of each casing by a 1/4" diameter galvanized pipe or any other standard method as approved by the Engineer. Wiring from ceiling rose to the fixture shall be installed through the pipe. Proper arrangements such as long threads with check nuts, etc. for minor adjustment in the mounting heights of the fixtures shall also be provided.

### 5.3 Incandescent Light Fixtures

The incandescent light fixture shall be installed on the surface of ceiling or wall by means of nylon plugs and galvanized steel screws, such that their back finish flush with the surface for exposed conduits and flush with outlet box for concealed conduit system. Wherever convenient, screws for fixing light fixtures shall be screwed into the holes of the outlet box. The light on false ceiling shall be installed in a manner as described for fluorescent light fixture.

### 5.4 Outdoor Lighting

For illumination around buildings during dark hours, light fittings in various arrangements shall be provided in accordance with these specifications. The items



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not shown on drawings or called for, but which are necessary for a complete working system as required, these shall also be provided and deemed to have been considered as such.

In case, the specified materials and equipment are not used, the Contractor shall then essentially use the standard products of a manufacturer, regularly engaged in the manufacturer of the product and shall meet the requirement of the specifications.

#### 5.5 Emergency lights:

- The emergency light fixtures shall be IP 65 polycarbonate construction suitable for interior/exterior applications. The florescent lamps shall be 2x8Watt, T-5, and batteries shall be self contained version – sealed nickel cadmium.
- The fixtures shall be suitable for ceiling/wall mount.
- The duration for emergency lights shall be 3 hours, maintained and non-maintained operation.



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**SECTION - G**  
**EARTHING SYSTEM**

**1. SCOPE OF WORK**

The job consists of supply, installation and commissioning of all material and services of the complete earthing system as specified herein and / or shown on the Drawings and given in the Bill of Quantities.

**2. GENERAL**

All exposed conductive non-current carrying parts of switchgear, boxes, trays, fixtures etc should be efficiently earthed. It should be separate with the earthing of transformer or generator. The earthing system consists of earth electrodes, earthing leads, earth connecting points, earth continuity conductors and all accessories necessary for the satisfactory operation of the associated electrical system.

**3. STANDARDS**

Following standards should be applicable:

BS 951 Earthing Clamps

BS 1433      Hard drawn bare copper conductor for earthing.

BS 2874      Nuts, Bolts, Washers and Rivets for use on copper.

BS 6346      PVC Insulated Cables.

CP 1013      Earthing

Any other standard referred to in above standards or these specifications.

**4. MATERIAL**

**4.1 Earth Rod Electrodes**

Drive extensible rods of the same diameter into the ground, either manually or by power driven hammer, to a suitable depth to obtain low resistivity in the particular soil. Weld earth connectors to the top of the rods, in sufficient number to take all incoming cables.

**4.2 Earthing Lead**

The earthing lead shall connect the earth electrode to earth connecting point or equipment in the building. It shall be round hard drawn bare electrolytic copper of size shown on the drawings.

**4.3 Earth Continuity Conductor**

Earth continuity conductor (E.C.C) shall be hard drawn bare copper wire or single core PVC insulated copper conductor cable of sizes Indicated on the drawings. All thimbles, lugs, sockets, nuts, washers and other accessories necessary for the complete installation of ECC shall be provided & installed.

The earth continuity conductor should form a continuous path from any point of installation to the earthing sets. When two earthing sets are provided for same

  
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mains, these shall be at least 6m apart. The earthing lead shall be taken up to the earthing electrodes in a 32mm of G.I. pipe irrespective of wiring system, and shall be efficiently bounded to the earth electrodes by means of sweating socket, brass nut, bolts, etc. to make a permanent and positive connection with the earthing electrodes. The other end of the earthing lead shall be sweated into a cable lug of a correct size for the wire for its connections to the main apparatus to be earthed.

## 5. INSTALLATION

The earthing system shall give earth resistance, including resistance of soil, earth leads and E.C.C. equal to less than one ohm, without ground pits water spraying.

The fastening of the earthing conductors shall be made on a sufficient length so as to prevent crushing or cross section weakening. The parts on which they are connected shall be conveniently cleansed and surface.

Leads sheaths or steel tape amours are not permitted as earthing conductors. The earthing system shall be installed to ensure that when any part of the earthing system is disconnected for the purpose of carrying out periodic testing an alternative path to earth is available.

At all connections of earth continuity conductor to any metallic body, proper size or brass sockets, thimbles or lugs shall be used to which the copper wire shall be connected by copper brazing. The soldering of copper wire at joints or termination shall not be allowed. All tee-off connections shall be by copper brazing using suitable socket and clamps. After brazing, the jointed surface shall be protected by oxide inhibiting compound of low electrical resistance. For connections to metallic body, the surface shall be thoroughly cleaned before bolting the lug or socket.

The earth continuity conductor shall be generally run in cable trench or in conduits / pipes or in cable trays as shown on the drawings. For under floor runs, these shall be installed in pipe / conduit of appropriate sizes. Where laid along underground cables, these shall be laid directly under ground in unpaved areas and in pipes under paved areas.

The electrode plate shall be installed at a minimum depth of 5 meters from finished ground level or 1 meter below permanent water level, whichever is less. The minimum horizontal distance between earth electrodes shall be 3 meters. Proper mixture of lime and charcoal in the ratio of 1:3 shall be made and buried along with the copper plate in the ground to increase the soil conductivity. The electrode shall be installed as per details shown on the drawings. The inspection chambers shall be constructed at locations approved by the Engineer.

A 50 mm diameter UPVC pipe shall be provided from inspection chamber to earth plate for watering purposes. The pipe shall have 10 mm diameter holes at 500 mm center to center all along the length. At the ground level an inspection chamber with cast iron cover shall be constructed having dimensions as shown on the drawings. The inspection chamber shall have a copper supported on angle iron frame. The cover shall be hinged type, as approved by the Engineer and shall finish flush with the ground level.

The earth connecting point shall be installed at locations shown on the drawings. It shall be fixed on wall surface by means of brass screws with nuts, washers and other insulating material as instructed by the Engineer.

The earth continuity conductor of sizes shown on the drawing shall be installed all along the cable runs and connected to the earthing bar / terminals provided in the equipment.

At any joint or termination, the E.C.C. shall be connected using proper accessories. No connection shall be made by twisting of earth conductors.



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## SECTION – H

### UNDERGROUND TRENCH & PIPES

#### 1. UNDERGROUND TRENCH

- i. The underground trench for installation of underground cables and wires through pipes, etc. shall be provided internally and externally as shown on the drawings. While the routes for external runs are to be followed taking into account clearance from underground sanitary and water supply pipe lines, etc., those required internally are dependent upon the type and size of equipment being installed in the substation and equipment rooms, etc., and hence this shall have to be specially modified on the basis of the requirements of the equipment manufactures or suppliers.
- ii. The layout and the design of the duct shall be approved by the ENGINEER INCHARGE. before actually commencing the work on it. All other trades shall have to be coordinated while deciding the alignment of underground trenches. The construction of the trench shall be totally water proof such that no seepage or leakage of water takes place either from top, bottom, or sides.
- iii. The cables/pipes shall be supported to two horizontally placed metal supports of 37mm x 6mm angle iron and duly clamped at interval not exceeding 750mm. A covering of 3.8mm thick of soft but indestructible by heat material shall be applied to un-served cables. The supports shall be staggered as detailed in Drawings.
- iv. The angle iron shall be buried in the trench masonry at the time of construction.
- v. The trench shall be absolutely clean when the cable is laid.
- vi. Suitable slope shall be provided in the floor of the trench and the lowest point shall be connected to the drainage system so as to ensure self-drainage of water, if any.
- vii. Trench inside the building shall be covered with 5.5mm, M.S. checkered plates.
- viii. The trench outside the building shall be RCC/UPVC pipe of required diameter with watertight joints, and shall be laid at least 2 below grade.
- ix. The main holes of the trench shall be left open till cable is pulled in and positioned. Thereafter the trench shall be covered with RCC slabs and mortar.
- x. The main hole covers outside the building shall be of cast iron water proof type of the size of openings indicated on the drawings. The covers for the inside trench however, shall be of 5.5mm thick checkered plates.
- xi. The CONTRACTOR shall arrange to provide for a water tight entry of cables where these enter in the building. This shall be done by the use of UPVC/CC pipes provided one for each cable in a reverse slope and with bitumen filling of the end.
- xii. Where trenches are left open overnight and where roads are being cut in the day or night; the CONTRACTOR shall exhibit suitable danger signals such as banners, red flags and red lamps at his own cost.
- xiii. If any damage is done, to the existing cables, etc., the cost of making goods such damages or entire replacement shall be recovered from the CONTRACTOR.
- xiv. The road cuts and filling shall be filled up and suitably watered and cement shall not be laid until all subsidence stops and no time shall be lost in putting the cement concrete. Wet gunny bags shall be spared over it for a period of not less than three days in order to allow full setting of the cement concrete.
- xv. All the trenches shall be watered and rammed properly before final dressing. The same applies to lawns public or private but here in place of cement filling some manure of good quality shall be utilized. The turf shall be carefully rammed and preserved in a convenient place before excavation and shall be re-laid after filling up, watering and maturing is completed.
- xvi. The road cuts shall be filled up first with mud concrete in the proportion of 1:2 up to 150mm below the road level and after consolidating it properly 150mm of concrete

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in cement shall be laid over it, but in the case of bitumen surface of road the top dressing are to be adjusted.

- xvii. The trenches shall be dug until the CONTRACTOR is certain that the cable is available for laying in it.
- xviii. Wherever cables are required to be installed inside a Building or in any other masonry or channel work, it shall be done neatly by use of cleats or any other device as directed by the ENGINEER INCHARGE.
- xix. Cement concrete pipes or G.I. pipe whichever is required shall be provided for all road crossings and nothing extra will be paid for these. The size of the pipe will be decided by the ENGINEER INCHARGE. These pipes will be laid direct in the grounds without any bed without pacca joint. No sand cushioning or tiles used in such situations.
- xx. Cables shall always be laid out or laid into the ground through 200mm long C.C. pipe of suitable size. Nothing extra will be paid for this pipe. A reasonable length of cable in the form of coil shall be left at ends of the underground run of the cable for subsequent use.
- xxi. Where road berms have been cut or curb stones displaced, the CONTRACTOR shall repair all damages to the satisfaction of the ENGINEER INCHARGE. and all surplus earth or rock removed to a suitable dumping place which will be indicated by the ENGINEER INCHARGE .. Where in the course of excavation lawns or roads have to be cut it shall be done in such a way that the turf removed can be re-laid. If this condition is not fulfilled the OWNER shall get the work done by other agency and recover the cost from the CONTRACTOR.

If any damage is done to any other service during the execution of the work, the whole cost of making good such damage shall be recovered from him and where such damage is excessive or deliberate, it shall amount to breach of the terms of this CONTRACT, the ENGINEER INCHARGE may at his discretion take appropriate action at the cost of the CONTRACTOR.



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## Section - I

### Cable Tray System:

- i. The cable trays shall be fabricated by prime quality 1.6mm MS sheet steel or GI sheet, solid or perforated and painted powder coated RAIL- 7032. Supply and install all accessories like tees, bands, elbows, risers, etc. to complete the cable tray system.
- ii. The length should be standard of 2.44 meters.
- iii. All fixing or supporting accessories shall also be provided & installed like hangers, brackets, clamps etc.
- iv. The cable trays shall be capable to support all type of wiring like high voltage, medium voltage, low voltage etc. it should be fabricated with the standards laid down by NEMA. For internal areas, it should be mill galvanized.

For external areas, the cable trays and accessories should be hot dip galvanized after fabrication. After fabrication process, all trays, ladders and accessories (bands, elbows, risers etc like nut, bolts, washers, tees) shall be dipped into liquid zinc bath, the surface including all cut edges being coated with a homogenous zinc layer to provide better protection against low chemical stress, marine air, urban air & other low atmospheric influences which activate corrosion.

  
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**SECTION -- J LIST OF MATERIALS**

**Low Voltage Switchboards / Distribution Boards**

- a. Hussain & Company.
- b. Zelon Engineering
- c. Electrech (Pvt) Ltd.
- d. BEST ELECTRIC
- e. Engineers & Engineering
- f. Or Equivalent

**Circuit Breakers**

- a. M & G
- b. TERASAKI
- c. ABB
- d. Or Equivalent

**LV Cables and Wires**

- a. Pakistan Cables Ltd
- b. FAST Cables
- c. NEW AGE Cables.
- d. AGE Cables.
- e. Or Equivalent

**PVC Conduits and Accessories**

- a. Galco
- b. Civic
- c. Jeddah
- d. Pak Arab
- e. Or Equivalent

**Back Boxes**

- a. Hussain & CO.
- b. Ezzi Engineering
- c. Or Equivalent

**Switches & Socket Outlets**

- a. Clipsal E-Series
- b. Orange.
- c. Alfanar
- d. Or Equivalent

**FAN & Accessories**

- a. Pak Fan
- b. GFC Fan
- c. Millat Fan
- d. Khurshid Fan
- e. Or Equivalent

**Lighting Fixtures**

- a. Philips
- b. Britlite
- c. ESP
- d. Pierlite
- f. Or Equivalent

**Cable Tray System**

- a. Unique Engineering
- b. Electrech (Pvt) Ltd.
- c. YUWATECH Engineering
- g. Or Equivalent

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## PLUMBING WORK

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## PLUMBING SYSTEMS

### 1.0 GENERAL REQUIREMENTS

#### 1.1 General

##### Scope:

The work included in this section consists of providing and installing a complete system of Potable Water Distribution System, Sanitary Sewerage System, Storm Water Drainage System, Plumbing Fixtures, Drainage Lift Pump, Pumping equipment, Sewer Appurtenances, Miscellaneous Items, Make-up Water filling System as per drawings and specifications including all labor, materials, equipments, tools and tackles and implements necessary for the execution and completion of the entire system.

##### General:

The work will be carried out to the strict requirements and directions of the Consultant/Engineer Incharge and complete to his entire satisfaction and conform to the good sanitary practices.

The Contractor shall appoint and keep for all times during the currency of this contract qualified plumber holding – license from local bodies and fully competent technicians of the required trades.

The Contractor shall be deemed to have visited and/or inspected the site prior to tendering to apprise himself of the condition under which the work will be executed.

The Contractor will have to coordinate this work with other civil works in such a manner that all works are completed within the accepted time of completion of the civil works.

The Contractor shall be deemed to have thoroughly studied the specifications and drawings.

The Contractor shall allow in his price for all cutting charges and holes and subsequently repairing these in a workmanlike manner. No claim will be allowed on this account.

The Contractor shall include in his price for painting all pipes with one primer and two finishing coats of approved make and shade enamel paint.

The Contractor shall at his own expense, get the entire system tested or retested to the satisfaction of the Consultant/Engineer Incharge.

##### Method of Testing:

Water system shall be tested in the following manner and cost of testing including all damaged pipes shall be deemed to be included in the price of water supply works:

Initial testing (individual testing).

Progressive testing.

Final testing.

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**Individual Testing:**

In initial testing pipes shall be tested individually over a test bed consisting saddles, thrust plate and force pump with a pressure gauge. The thrust plate shall be strong enough to resist a pressure equivalent to double the test pressure i.e. 150 psi pipe shall be placed over test bed with one end inserted into thrust plate groove and the other plugged water-tight and to pump forcing water with pressure.

Pump shall be operated to buildup to required pressure in pipe i.e. 150 psi. After the test pressure is reached the pump shall be stopped and pipe shall be watched for 6 hours for any drop in pressure and any visible leaks. Any pipe showing leaks or pressure drop beyond 5 psi shall be rejected and removed from site.

**Progressive Testing:**

Test shall be made after roughing in and before walls ceiling and floors are finished. Water under pressure shall be used, all the openings in the installation shall closed and pressure of 15 psi shall be developed in the system with the help of a bond force pump. After the required pressure has been obtained and pumps have stopped, the pipes shall be inspected by eye or ear for any leak and also for any pressure drops in the gauge. The test shall be performed in convenient segments during the course of work and provision of sufficient plugging tees and valves in the pipe line shall be made available for the purpose at the cost of the Contractor. The Contractor shall submit a time schedule for such tests.

**Final Test:**

The test shall be made with the same pressure as given above after the fixture has been installed and the system is completed.

**Sewerage:****Method of Testing**Initial Testing

After the completion of lying and jointing of the plumbing system it shall be tested to locate leakage connections or faulty installation the following procedure:

Water Test

For this test all the openings in the drainage pipe shall be closed. The openings shall be closed by – test plug which shall be inserted in the open end of pipe or fitting so that the heavy rubber gasket fits tightly all around. When all openings have been closed water shall be run into the pipes and the test pressure at the lowered end shall be built up by operating force pump. The drop in pressure the water after pumping is stopped, indicates the leakage that shall be subjected to pressure of 4.2 meter of water in pipes. This test shall be performed in convenient segments and provision for plugging etc. shall be done by the Contractor for this purpose.

  
1.2 SPECIAL REQUIREMENTS  
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**General:**

It is the intent of the drawings and specifications that all works, machinery equipment and piping fixtures be provided complete, tested adjusted and made ready for operation. The drawings and specifications shall be taken as a whole and not separately since they are intended to explain and illustrate each other.

Any apparatus, appliances, materials or work not shown on drawings but mentioned in the specifications or vice versa and any incidental accessories necessary to make the work complete in all respects and ready for operation, even if not particularly specified, or shown in the drawings shall be provided without additional expenses.

Minor details not usually shown or specified, but necessary for the proper installation and operation, shall be included in the work and in the Contractor offer, the same as if herein specified or shown.

**Coordination:**

The contact documents have been carefully coordinated to avoid overlapping or conflict, however, should any discrepancies by old between contract documents within a trade or between trades, they shall be immediately reported to the Consultant/Engineer Incharge so that the required revision, or work directive may be issued to all parties concerned, at the earliest possible date.

**Coordination With Other Traders:**

The Contractor shall cooperate with other trades and furnish and/or exchange the information necessary to permit the work of all trades to be installed satisfactory and with the least possible interference or delay.

Contractor shall be responsible for all setting plans, templates, shop drawings, and layout diagrams to assure installation of equipment in proper space relationship to other equipment and Contractor so that the equipment shall be operate-able in accordance with completion schedule as set forth.

**Standard Specification:**

In all cases where standard specifications, such as BSS, ASTM and the like are referred to in these specifications, the latest revision in effect at the time of bidding, shall govern.

**Materials & Equipment:**

Unless otherwise specified, all materials and equipment provided shall be new and shall conform to the grade, quality and standards specified herein.

Materials and equipment provided under these Specifications shall be limited to products regularly produced and recommended by the manufacturer for the service intended. This material and equipment shall have capacities and ratings sufficient to amply meet the requirements of the project. The capacities and ratings shall not be in excess of those published by the manufacturers but must be in accordance with the engineering data or other comprehensive literature made available to the public by the manufacturer and in effect at the time of opening bids.

  
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Sanitary fixtures shall be installed in strict accordance with manufacturer's instructions for type and functioning of each piece if fixture used.

These instructions from the manufacturer shall be considered part of these specifications. Type, capacity and functioning shall be guaranteed suitable and shall operate satisfactory in the system, for the purpose intended.

**Drawings:**

The drawings have been made to scale with the best knowledge of conditions, dimensions and space requirements available at the time of drafting. Any error, or discrepancies detected in the drawings shall be reported to the Consultant/Engineer Incharge immediately upon discovery for the attention and instruction and as to further procedure.

The contractor shall follow drawings in laying out work and check drawings of other trade to verify space, in which the plant will be installed, Maintain maximum headroom and space condition at all points. Where headroom or space condition appear inadequate the drawings shall be modified and approved by the Consultant/Engineer Incharge before proceeding with the installation and if directed by the Consultant/Engineer Incharge before proceeding with the installation and if directed by the Consultant/Engineer Incharge reasonable modifications made in the layout as needed without extra charges; to prevent conflict with the work of other trades or for prior execution of the work. Where variations occur between the drawings and the specifications or either documents itself the item or arrangement of better quality and/or greater quality, shall be included into the contract price. The Consultant/Engineer Incharge will decide on the items and manner in which the work shall be installed.

**Approval of Materials & Equipment:**

The materials, workmanship, design and arrangement of all work installed under the contract shall be subject to the approval of the Consultant/Engineer Incharge. Reference to model, type or figure number of particular manufacturer is done solely for the purpose of indicating the standard of quality, type character and finish desired. Equipment manufactured by other companies of comparable design and configuration, meeting all the specific requirements of the item number may be acceptable when approved by the Consultant/Engineer Incharge.

The Contractor shall submit to the Consultant/Engineer Incharge for approval within fifteen (15) days after the acceptance of the bid, a complete list of manufacturers of sanitary fixtures and materials, along with detailed catalogues. All other items shall be provided in accordance with the detailed specifications. The Contractor's intent to use the exact marks specified does not relieve him of the responsibility of submitting such a list. Where any equipment, materials process or method of construction of manufactured article is specified by name or by reference to the catalogue number of manufacturer, use the specifications as a guide and not to take precedence over the basic duty and performance specified, as noted on the drawings. In all cases verify the duty specified with the specific characteristics of the materials offered for approval, if materials is installed before it is approved, the Contractor shall be liable for its removal and



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replacement at no extra charges to the Client if in opinion of the Engineer the material or equipment does not comply with the drawings and specifications.

**Samples:**

The Contractor shall submit samples of any and all materials for approval at the instructions of the Consultant/Engineer Incharge.

**Accessibility:**

The Contractor shall locate all equipment which must service operated or maintained in fully accessible positions, include, but do not limit access to valves, traps, clean out, drain points and controllers, if required for better accessibility, furnish access doors for the purpose.

**Open Ends:**

Plug or cap shall be provided at all open ends in the piping, conduit and duct work system as the work is erected, in the order to keep out all foreign objects and water.

Contractor shall be responsible for removing from the system any foreign materials which could adversely affect the operation of the system.

**Record Drawings:**

The contractor shall during the progress of work keep a careful record of all changes where actual installation differs from that shown on the drawings. Upon completion of work the contractor shall furnish at this cost a completion set of tracings on which the contractor shall in neat and accurate manner make at complete record of all changes and revisions of the original design and as installed in the completed work.

The completion drawings shall be scrutinized and finalized by the Consultant/Engineer Incharge and two sets of prints handed over to Consultant/Engineer Incharge.

**Other Works:**

**Builder's Works**

Builder's work including foundations, cutting, patching and redecorating of construction is included in this contract. This work will be carried by the contractor at his own cost and arrangement. All cutting in the construction shall subject to the approval of the Consultant/Engineer Incharge and shall subject to the approval of the Consultant/Engineer Incharge and shall make good after completion on work to the entire satisfaction of the Consultant/Engineer Incharge.

**2.0 POTABLE WATER DISTRIBUTION SYSTEM**

**2.1 GENERAL**

- Scope

  
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The extent of the potable water distribution system is shown on the drawings and includes pipe work, valves, fittings and miscellaneous appurtenances, chambers, related structures and testing and disinfecting the entire system.

#### **Quality Assurance**

##### **Quality Control**

Establish and maintain quality control to assure compliance with the specified requirements for all work to the satisfaction of the Engineer.

##### **Codes and Standards**

Comply with the applicable requirements of the following Codes and Standards:

IPC – International Plumbing Codes.

AWWA – American Water Works Association

ASTM – American Society for Testing and Materials

#### **Submittals**

Manufacturer's Data: Submit manufacturer's data, test certificates, specification and installation instructions for pipe, pipe fittings, valves and other accessories.

#### **- Material Delivery, Storage and Materials**

##### **General**

At every point of loading or unloading, provide suitable means for lifting and loading. Do not unload by means of rolling down plank or other form of inclined ramp. Ensure that pipes, fittings and other items are kept dry, clean and adequately stored. Perform work in accordance with manufacturer's instructions and to approval of the Engineer.

##### **Handling of PPR Pipes**

- Store PPR pipes in covered areas and protect from direct sunlight.
- During storage, ensure that PPR pipes are not distorted. Stack pipes on a level surface off the ground or in suitable racks. Ensure that sockets are situated at alternate ends. Install bearing timber at appropriate spacing and to sufficient width to prevent denting of pipes. Stack pipes only to the extent recommend by manufacturer. Provide adequate protective measures for pipes and other items in transit.
- Distorted, buckled or defective pipes shall not be used in the work.

## **2.2 MATERIALS**

### **Polypropylene Random (PPR) Pipes and Fittings**

#### **i. Pipes and Fittings**

Provide PPR pipes and fittings that comply with DIN 8077-8078 PS45339-98 & 4534-99 Standard. Provide pipes that are suitable for installation depths, bedding and loading conditions and working pressure to which they will be subjected.

  
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#### **ii. Joints**

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For pipe jointing, comply with DIN 8077-78.

#### Testing

Provide manufacturers certificate that testing of pipes and fittings complied with the specified requirements.

#### Gate Valves

Provide gate valves, conforming to BSS-1952 flanged or threaded ends and suitable for a working pressure of not less than 7 bar.

Provide valves designed to turn counter clockwise to open with indication arrows. Valves in chambers with hand-wheel or with operating nut and key as indicated and buried valves with operating nut and key. Provide not less than one (1) tee bar for every five (5) valves.

Carryout protection of surfaces of valves in chambers by the application of two (2) coats of approved oil paint to a total dry film thickness of not less than 0.15 mm.

#### Concrete Works

Concrete and all related works shall conform to Specification of Concrete. Provide anchor blocks, valve chambers, encasement concrete, etc. where required and indicated on drawings.

#### Pipe Embedment

Provide fine aggregate complying with ASTM C33 consisting of natural sand, manufactured sand or a combination thereof.

#### Equipment

All equipment necessary and required for the proper construction of water supply lines shall be on the project in first class working condition and shall have been approved by the Engineer before construction is permitted to start.

### 2.3 EXECUTION

#### Inspection

The Contractor shall examine the substrates and the conditions under which the potable water system shall be carried out and correct any unsatisfactory conditions.

Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Engineer.

#### Excavation

The width of the pit or trench for the structure shall be sufficient to permit satisfactory jointing of the pipe and / or pouring of concrete and

  
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thorough tamping of the bedding material under and around the structure, but it shall not be less than the external diameter of the pipe. Where a firm foundation is not encountered at the design grade, due to unsuitable material, this soil shall be removed and replaced with approved fill material for the full trench width. The Engineer shall determine the depth of removal. The fill material shall be compacted to provide adequate support for the pipe.

Excavate trenches to the depth indicated or required and carry the excavation to a depth below the bottom of pipes for pipe embedment, or concrete encasement as indicated or directed.

Employ hand excavation methods when machine digging will cause damage to buildings or other structures, above or below ground. Wherever necessary to prevent caving, trench excavations in soils such as but not limited to sand, gravel and sandy soil shall be adequately sheeted and braced. Withdraw sheeting in increments of not more than 300 mm and fill and compact resulting void by the withdrawn sheeting. Pile all excavated material in a manner that will not endanger the work or obstruct walkways and roads.

Provide and maintain adequate barricades, construction signs, warning lights, and guards to protect persons from injury and to avoid property damage during the progress of the work until the site is safe for traffic use. Rules and regulations of the Government regarding safety provisions shall be observed.

#### Pipe Laying

##### General

Install the potable water system generally in compliance with the lines and grades indicated on drawings and as herein specified.

##### *PPR Pipes*

Install in accordance with the manufacturer's instructions concealed/surface type as per direction of Consultant/Engineer Incharge.

##### *Valves*

Install in accordance with manufacturer's written instructions unless otherwise specified or directed.

#### Alignment and Grade

Lay and maintain pipes to the required lines and grades. Provide fittings, valves, hydrants, etc. at the required locations with joints centered and all valve and hydrant stems plumb. No deviations shall be made from the required lines for grade except with written consent of the Engineer.

#### Maintenance

  
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Restoration and Cleanup: Restore and replace any removed or damaged paving, curbs, etc. or other disturbed surfaces and structures, to the satisfaction of the Engineer.

Removal all surplus pipe material, tools, temporary structures etc. Dispose of all dirt, rubbish, excess excavated material to approved dumping area, and leave construction site clean to the satisfaction of the Engineer.

#### **Disinfection**

Before the Engineer places in service and before certification of completion the pipeline, flush and disinfect the potable water system in accordance with AWWA C601, "Disinfection Water Mains".

### **2.4 CONNECTION FROM THE EXISTING SWEET WATER MAINS**

The Contractor is required to conduct the survey of the proposed route from the point indicated on the drawing up to the existing mains from where water connection will be permissible. This item of bill of quantities includes survey, design and connection with water mains for sweet water from the water mains. The Contractor will submit his proposal for this work to the Engineer for approval, which shall include taking connection from the mains, providing and laying PE Schedule-80 water pipelines of appropriate diameters including all valves and specials, as required and connect with project pipelines.

## **3.0 SANITARY SEWERAGE SYSTEM**

### **3.1 GENERAL**

#### **Scope**

The sanitary sewerage system shall consist of all piping, manholes, sewage lift pumps and all ancillaries including connecting to the existing system as shown on the drawings.

#### **Quality Assurance**

Establish and maintain quality control to assure compliance with contract requirements and local codes for all construction operations required under this Section.

Prior to shipment from factory, test all types of pipes and fittings at the place of manufacture. Submit to the Engineer for each consignment or shipment authenticated certificates to indicate that the manufacturer satisfactorily tests the pipes and fittings and found to comply with these specifications.

#### **Codes and Standards**

Comply with the applicable requirements of the following codes and standards:

- h. IPC – International Plumbing Codes:

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i. Pipes for Potable Water of Un plasticized Plastic (Polyvinyl Chloride).  
Methods of Testing of Pipes for Potable Water of Un plasticized Plastic (Polyvinyl Chloride).

ASTM - American Society for Testing and Materials  
A 48 Specification for Gray Iron Castings  
A 126 Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings  
C 33 Specification for Concrete Aggregates  
C 270 Specifications for Mortar for Unit Masonry

#### **General Requirements**

Connections to manholes shall be watertight after installation.  
All piping shall conform accurately to the lines and grades shown on the Drawings.

Any connections for existing systems shall be made with a minimum amount of disturbance to the existing lines.

Any existing pipelines or structures which are damaged while making connections shall be replaced or reconstructed to the satisfaction of the Engineer without cost to the Employer.

All piping shall be examined for defects. Any defective piece discovered after installation and test shall be removed and replaced by the Contractor at no expense to the Employer.

System shall be inspected and joints approved before any backfilling is placed over pipes.

All pipe and fittings shall be kept clean until final acceptance of work. The exposed ends of all uncompleted lines shall be closed with wooden plugs adequately secured at all times when pipe laying is not actually in progress.

All piping shall be installed on a good foundation and adequate means taken to prevent settlement.

The Contractor shall trim the bottom of trenches to receive the pipes and shall round out bottoms so that the pipe will rest firmly on 200 mm undisturbed sand at proper line and grade.

All piping laid in trenches shall be provided with a solid uniform bearing throughout the entire length.

Trenches shall be kept free from water by pumping; use of well points, under drains or other approved means during pipe laying operations so that all pipe joints are made in dry areas.

Precautions shall be taken to protect incomplete work from flooding due to storms or other causes. All pipe lines or structures not stable against uplift during construction shall be thoroughly braced or otherwise protected.

All work under this section shall conform to the requirements of the National Plumbing Code Handbook, International Plumbing Codes and Uniform Plumbing Code, unless otherwise specified hereinafter.

#### **Submittals**

If an inspection of the completed sewer or any part thereof shows any structures, pipes or joints which are defective, the defective work shall be replaced or repaired immediately and to the satisfaction of the Engineer.

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The Contractor shall perform, at his own expense, any tests or inspections required by local authorities. The Engineer shall witness the tests.

All joints shall be inspected and an inspection of the line as a whole shall show pipes to be true to line and grade with full circles visible at all manholes.

#### **Material Delivery, Storage and Handling**

##### **i. General**

At every point of loading or unloading, provide suitable means for lifting and loading. Do not unload by means of rolling down planks or other form of inclined ramp. Ensure that pipes, fittings and other items are kept dry, clean and adequately stored. Perform work in accordance with manufacturer's instructions and to the approval of the Engineer.

##### **ii. Handling of UPVC Pipes**

- Store UPVC pipes in covered areas and protect from direct sunlight.
- During storage, ensure that UPVC pipes are not distorted. Stack pipes on a level surface off the ground or in suitable racks. Ensure that sockets are situated at alternate ends. Install bearing timber at appropriate spacing and of sufficient width to prevent denting of pipes. Stack pipes only to the extent recommended by manufacturer. Provide adequate protective measures for pipes and other items in transit.
- Distorted, buckled or defective pipes shall not be used in the work.

### **3.2 MATERIAL**

#### **a) Un plasticized Polyvinyl Chloride (UPVC), Pipes and Fittings**

##### **i. Pipes and Fittings**

Unless otherwise indicated provide UPVC pipes and fittings that comply with British Standard. Provide pipes that are suitable for installation depths, bedding and loading conditions and working pressures to which they will be subjected.

##### **ii. Joints**

For pipe jointing provide rubber rings that comply with ASTM D 1869. Provide 2 rubber rings for each pipe joint.

##### **iii. Testing**

Provide manufacturer's certificates that testing of pipes and fittings complied with the specified requirements of BSC 15.

#### **b) Pipe Embedment**

Provide fine aggregate complying with ASTM C33 and consisting of natural sand, manufactured sand or a combination thereof.

#### **c) Concrete Works**

Concrete and all related works are to conform to Specifications of "Concrete".

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**d) Thermal and Structure Protection**

Bituminous damp-proofing and joint fillers and sealants and all related works shall conform to British Standards.

**e) Manholes**

- Manholes shall have the minimum inside dimensions shown on the Drawings.
- Manhole walls shall be as per BoQ and drawings. Top section must be cast such as to suit elevation and accommodate size of manhole frame and cover.
- Manhole floor shall be as per BoQ and drawings and inverts stream lined with cement and mortar into a semi-circular path with sanitary turns and have their corners filled and sloped towards the water path to prevent any settlements of solids as detailed on the Drawings.
- Concrete foundation and benching for manholes shall be constructed in accordance with details as shown on the Drawings.
- All pipes or castings to be embedded in the manhole walls shall be accurately set, and if so required, headers shall be laid round the casting so embedded.
- All work must be carried out in a manner to ensure watertight work, and any leaks shall be caulked, repaired, or the entire work shall be removed and rebuilt. Attention is particularly called to the necessity of keeping the water level below all parts of the foundation and walls until the concrete has obtained adequate setting.

**f) Frames, Covers and Gratings**

- The Contractor shall furnish and set level and to the proper grade, a cast iron frame and cover or frame and grating of the form and dimensions shown on the Drawings. The concrete shall be neatly and accurately brought to the dimensions of the base of the frame. The frames shall be thoroughly embedded in mortar. All covers and frames shall be heavy-duty quality.
- All castings for frames, covers, and gratings shall be of gray iron unless specified in the BOQ/drawings. All castings shall be made accurately to dimensions and shall be machined to provide even bearing surfaces. Covers and gratings must fit the frames in any position and if found to rattle under traffic, shall be replaced. Filing to obtain tight covers will not be permitted. No plugging, burning-in or filling will be allowed. All castings shall be carefully coated inside and out with coal tar pitch varnish of approved quality.

**3.3 EXECUTION**

**a) Inspection**

The Contractor shall examine the substrates and the conditions under which the sanitary sewerage system shall be carried out and correct any unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Engineer.



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**b) Excavation and Preparation of Trench**

- i. Unless otherwise specified herein or directed on drawings, comply with the requirements of Specification of "Site Work", and "Concrete".
- ii. Open trenches only as far in advance of pipe laying in order to maintain continuity of operations. Keep trench and other excavations dry at all times, and lead drainage to natural drainage channels.
  - iii. Trench width varies in respect to depth, nature of soil and pipe diameter. Maintain widths indicated on the drawings for at least 300 mm above crown of pipes. Where the trench crosses under a pavement or floor slab, hold width of the trench to the absolute minimum. Trench width shall be minimum of O.D. + 600.
- iv. Excavate trenches to the depth indicated or required and carry the excavations to a depth below the bottom of pipes for pipe embedment, for the replacement of unsatisfactory soil materials, or for concrete encasement as indicated and specified.
- v. Provide and maintain adequate barricades, construction signs, warning lights, and guards to protect persons from injury and to avoid property damage during, the progress of the work until the site is safe for traffic use. Rules and regulations regarding safety provisions shall be observed.
- vi. Conduct excavations for pipe laying operations to cause the least interruptions to the traffic. Ensure that hydrants under pressure, valve pit cover, valve chambers and other utility controls are unobstructed and accessible during the construction period. Provide adequate provisions for the flow of sewers, drains and watercourses encountered during construction. Restore satisfactorily all structures and any property that has been disturbed to their original conditions.

**c) Pipe Laying**

**i. General**

The entire work of pipe laying and manhole construction shall be carried out in a manner to ensure watertight construction and any leaks shall be repaired as directed by the Engineer. Pipe laying shall proceed upgrade with the spigot ends' of bell and spigot pipes pointing in the direction of the flow.

**ii. Standards**

**- UPVC Pipes**

Unless otherwise directed, install UPVC pipes and fittings in compliance with the manufacturer's instructions. Take adequate care and schedule operations to ensure protection of pipes and fittings against undue deflection and over stressing.

**iii. Alignment and Grade**

Lay and maintain pipes to the required lines and grades. Provide fittings, at the required locations with joints centred and watertight. No deviation shall be made from the required line or grade except with the written consent of the Engineer. Furnish temporary support, adequate

  
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protection and maintenance of all underground and surface utility structures, and other structures encountered during the progress of the work. Where the grade or alignment of the pipe is obstructed by existing utility structures, relocate, remove or reconstruct such obstruction as directed by the Engineer. Whenever necessary to determine the location of existing underground utility structures, after examining the available records, make all explorations and the Engineer may direct excavations for such purpose as. Lay pipes to the depth shown or as directed. Coordinate the levels, and routings of all utilities and services in order to avoid any interference prior to installation of the utilities and services.

iv. **Pipe Laying**

Unless otherwise indicated, lay pipes on a minimum 150 mm pipe embedment material shaped to provide continuous support for the pipe barrel between coupling holes. Before the pipe is lowered into the trench, provide the following:

- Level bottom of trench to the lines and grades indicated and fill in and compact a layer of pipe embedment material to a minimum of 150 mm compacted thickness.
- Excavate and form coupling holes with sufficient length, width and depth to permit assembly as required.

v. **Lowering of Pipe and Fittings into Trench**

Provide implements, tools and facilities satisfactory to the Engineer for the safe and efficient execution of the work. Carefully lower into the trench with suitable and adequate equipment all pipes and fittings and in a suitable manner that will prevent damage to pipes and fittings. Under no circumstances permit pipes and fittings to be dumped into the trench. Inspect pipes and fittings prior to their being lowered into the trench. Repair or replaced as directed all defective, damaged or unsound materials, remove all foreign matter or direct from the interior of pipes and fittings before jointing. Keep pipe clean by approved means during and after laying.

vi. **Pipe Joints**

- *Jointing with Rubber Rings*

Immediately before assembly, clean ends of pipes to be jointed and the coupling grooves and rubber rings. Assembly shall be made as specified and as recommended by the manufacturer. Ensure by suitable gage that rubber rings are in the required position and pipes are well centred.



- Pipes shall not be deflected either vertically or horizontally more than the limits recommended by the manufacturer. When pipe laying is not progress, close the ends of installed pipes by an approved means, to prevent the entrance of foreign bodies, water, soil etc. into the line. No line shall be laid in wet soil conditions that preclude proper bedding or in the opinion of the Engineer, the trench conditions or the weather are unsuitable for proper installation. Seal socketed ends with approved flexible material to prevent entry bedding material.

- vii. Pipes built into structure shall have two (2) flexible joints adjacent to the structure, obtained by the use of two short pieces as indicated.
- viii. Stub out and stopper shall be installed in manhole walls where indicated or required for future connections. Ensure that the stub out is completely sealed by the stopper.

**d) Pipe Embedment and Backfilling**

**i. Pipe Embedment Procedure**

Unless otherwise indicated, provide pipe embedment material as specified. Deposit and compact material in the trench uniformly in layers of 150 mm maximum thickness at both sides of the pipeline for the full width of the trench and up to 300 mm above the top of pipeline. Well compact material below and all around the pipe to provide firm and continuous support. Ensure that the pipeline and protective systems are not displaced or damaged by the embedment operations.

- ii. Provide concrete encasement to pipeline where indicated to dimensions and lengths specified on the drawings. Concrete for encasement shall have compressive strength of not less than 21.0 MPa. Protect pipeline from damage or displacement by the encasement operations. Provide appropriate concrete saddles to support pipes prior to encasement. Concrete encasement shall be discontinued for a length of 150 mm each side of the centreline of each pipe joint, to maintain flexibility of the pipeline.

**iii. Backfill Remainder of Trenches and Around Structures**

Backfill and compact trenches above embedment or encasement and around structures in layers of 200

  
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mm compacted thickness and to a density as per area classification specified.

**e) Leakage, Tests for Gravity Sewers**

**i. General**

Except as otherwise directed, all pipelines shall be given leakage tests in sections of approved length. The Contractor shall carry out such tests after the partial trench backfilling has been carried out over the pipe barrel, excluding pipe joints, in order that pipes are not displaced during testing and that joints are apparent for inspection.

The Contractor may at his option carry out any preliminary tests he considers necessary before trench backfilling in addition to the leakage tests specified herein.

The Contractor shall furnish and install suitable and approved temporary plugs, supports and caps, all necessary pressure pumps, pipe connections, meters, gauges and other necessary equipment and labour required.

**ii.** Air or smoke shall be used for testing gravity sewer pipelines and the Contractor shall provide and, use equipment specifically designed and manufactured for the purpose of testing sewer pipelines using low pressure air or smoke.

**iii. Tests by Air or Smoke**

- Pipes shall be tested in accordance with ASTM C 828. The testing equipment shall be provided with an air regulator valve or air safety valve so set that the internal air pressure in the pipeline cannot exceed a predetermined value approved by the Engineer.
- Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be tested. Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking.
- If the section fails to pass the requirements, the Contractor shall at his own cost do all work of locating and repairing leaks, removal and replacement of defective pipes, joints, couplings or fittings, making good and retesting as the Engineer may require and to his satisfaction. The Contractor shall be responsible for the ultimate tightness of the

  
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pipeline within the test requirements stipulated hereinabove.

**f) Pressure and Leakage Tests for Pressure Lines**

**a) General**

Unless otherwise, directed, comply with the applicable requirements of the general provisions of leakage tests for gravity sewers above.

**b) Test**

- The section of the pipe to be tested shall be filled with potable water and all air shall be expelled from the pipe. If blow offs are not available at high points for releasing air, the Contractor shall carry out the necessary excavation, backfilling, tapping at such high points and plug and make good any damage after completion of the test.
- The section of the pipe under test shall be maintained full of water for a period of 24 hours prior to the start of the pressure and leakage test.
- The pressure and leakage test shall consist of first raising the water pressure (based on the lowest point of the section under test and corrected to the gauge location), to a pressure equal to 0.8 Map. While maintaining this pressure, the Contractor shall make a leakage test by metering the flow of water into the pipe. If the average leakage during two (2) hours period exceeds a rate of 25 litres per 25 mm diameter per 24 hours per kilometre of pipeline, the section shall be considered as having failed the test. Furthermore, the pipeline shall have no visible leakage.
- If the section shall fail to pass the pressure test, or the leakage, test, or both, the Contractor shall at his own cost do all work of locating and repairing the leaks, removal and replacement of defective pipes, joints, couplings, or fittings, making good and retesting as the Engineer may require and to his satisfaction. The Contractor shall be responsible for the ultimate tightness of the pipeline within the test requirements stipulated hereinabove.

**g) Maintenance**

  
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Restoration and Cleanup: Restore and replace any removed or damaged paving, curbs, etc., or other disturbed surfaces and structures, to the satisfaction of the Engineer.

Remove all surplus pipeline material, tools, temporary structures. Dispose of all dirt, rubbish, excess excavated material to approved dumping areas, and leave construction site clean to the satisfaction of the Engineer.

### 3.4 CONNECTING TO THE EXISTING SYSTEM

The Contractor is required to submit his proposal how he intends to connect the sewage generated from the end marked on the drawing to the designated manhole of the existing city sewerage system. The works include survey and pumping machinery with all structures and laying of pipeline to connect with the city existing system, complete. The Contractor is required to submit his proposed design to the Engineer for approval.

### 3.5 EXCAVATIONS

#### a) Trenching out Ground for Pipes and Tunneling:

Excavation for the drains in open trench shall be to the line and depth as directed. Great care shall be taken to excavate only to such depths as are correctly required for regular gradient.

Gap for joint as required shall have sufficient width to allow adequate working space for the pipe jointer and should in no case be less than 375 mm or the external diameter of the pipe plus 300 mm. Trenches are to be kept clear of water including any necessary pumping. Perform all tunneling for pipe when required. In the event of the excavation being made deeper than necessary they shall be filled up to proper level with cement concrete 1:4:8 at the contractor's expense. Cement concrete 1:4:8 is to be laid before the pipes are placed in position.

#### b) Planking, Strutting and Staging:

Excavation materials shall not be deposited within 45 cm of the edge of the trench and sides of the excavation shall be supported by planking and strutting if necessary to ensure proper and speedy excavation works.

#### c) Blasting

No blasting shall be allowed near new works. The rocks shall be excavated by chiseling except where otherwise allowed in writing by the Engineer.

  
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**d) Buried Services:**

All pipes, ducts, cables, main and other services exposed by all excavation shall be effectively supported by timber or other means and protected from all kinds of damage. In case of any damage to the services, these shall be adequately repaired and restored to original condition by the Contractor at his own cost.

**e) Backfilling:**

No trench shall be backfilled until after the sewer pipes therein has been tested and approved by the Engineer. Earth filling to the bottom of the trenches and to a height of 150 mm above the top of the pipes shall be of selected materials, hand packed, watered, if necessary, and well rammed on either sides of the pipe. Special care shall be exercised where pipes are laid direct on the earth or no beds without benching or covers. The remainder of the earth filling shall be in 150 mm layers, each layer wetted, if necessary and well rammed with mechanical rammers or other efficient means for effective of consolidation. Where vegetable soil has been removed it shall be replaced at top of the trench and similarly consolidated. Headings shall be filled with the excavated materials, packed tightly in layers and rammed by hand on concrete of mix 1:3:6 or broken or hard core kept to a stepped face as the work proceeds. Surplus earth shall be disposed off as directed to the Contractor's expense. The trenches under paving shall be backfilled with local sand will compact to 80% density.

**f) Holes & Chases:**

Perform all holes, chases, sinking, cutting, under piping, sealing courses and labor, no extra will be paid for such work.

**g) Sewer Pipe Lying:**

Each pipe shall be carefully examined on arrival. Any defective pipes shall not be used and shall be segregated and marked in a conspicuous manner. Minor damage to the protective coating on iron drain pipes shall be made good by painting with cut bitumen or tar, if major defects in the coating exist, the pipes shall be returned to the works for recreating. Drains shall be laid in straight lines and to even gradients as shown on the drawings or as directed. Great care shall be exercised in setting out and determining the levels of the pipes and the Contractor shall provide suitable instrument to set up and maintain all sight rails, bending and bench marks etc., necessary for the purpose. All drains shall be kept free from earth in a clean condition. Pipes shall be laid with the sockets leading up hill and shall rest on solid and even foundations for the full length of the barrel. Socket holes shall be formed in the foundation, as short as

practicable but sufficiently deep to allow the pipe jointer room to work right round the pipes.

**h) Jointing:**

**i. Joining Concrete Hume Pipe**

All joints or RCC Hume pipes shall, unless otherwise described, be made by wrapping one lap of tarred gas-kitting round the spigot of the pipe and placing it into the collar of previous pipe. It shall then be adjusted, fixed in its correct position and gas-kitting caulked home not so as to occupy more than one quarter of the collar depth, the collar shall then be completely filled with cement sand mortar (1:1) and fillet shall be formed round the joints with a trowel, forming an angle of 45 degree with the barrel of the Pipe. All joints of pipes with bitumen rings shall, unless otherwise described, be made by first smearing them with cement mortar and forming fill round it as described above for standard cement joints. Pipes designed for water logged trenches shall be constructed with push-on rubber ring joints.

**ii. Jointing of API Drain Pipes:**

All joints of MS pipes shall be by electric arc welding. All welding shall be cleaned free from under cut, porosity and slag welding should be done in a manner to produce well penetrated weld.

**iii. Jointing Feet of Vertical Pipes in Concrete:**

The rest beds in the ground at the set of all soil, rain water ventilating and other vertical pipes, to be bedded on solid concrete 150 mm thick.

**3.6 MANHOLE AND CHAMBERS:**

As specified in BoQ.

The manhole shall be provided with iron rings as per drawings or as directed by the Engineer.

**i. Manhole Covers and Gratings:**

Heavy duty C.I. covers with frame shall be provided. The weight of the cover with frame shall not be less than 1 Cwt. The dimensions shall be as indicated on the drawings. If no dimension are provided in drawing and BOQ a minimum of 450mm x 450mm cover shall be installed.

**ii. Testing:**

Immediately after the drains are laid and joined but before launching with concrete (where required) and

  
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the fitting in done, they shall be inspected. tested and passed by the Engineer, as satisfactory. All length of sewer and drains shall be tested for water tightness by water pressure.

### 3.7 CLEAN OUTS:

Clean out shall be of uPVC as shown on drawing. Clean out turning up through floors shall be made by long sweep 'ells' bends with plugs, at face or deck plates to conform to architectural finish in the room.

### 3.8 GULLY TRAPS:

As specified in BoQ.

## 4. STORM WATER DRAINAGE SYSTEM

### 4.1 GENERAL

#### a) Scope

Storm water drainage system is shown on the drawings and consists of the construction of the storm water drainage network complete. Storm water be drained by means of roof drains and leaders will be freely discharged to the surface as indicated on the drawings.

#### b) Quality Assurance

Establish and maintain quality control to assure compliance with contract requirements and local codes for all construction operations required under this Section.

#### c) Prior to shipment from factory, test all types of pipes and fittings at the place of manufacture. Submit to the Engineer for each consignment or shipment authenticated certificates to indicate that the manufacturer satisfactorily tests the pipes and fittings and found to comply with these specifications.

#### d) Codes and Standards

Comply with the applicable requirements of the following codes and standards:

- i. IPC – International Plumbing Codes:
- ii. Pipes for Potable Water of Un plasticized Plastic (Polyvinyl Chloride).

Methods of Testing of Pipes for Potable Water of Un plasticized Plastic (Polyvinyl Chloride).

- i. ASTM – American Society for Testing and Materials
- ii. A 48 Specification for Gray Iron Castings
- iii. C 33 Specification for Concrete Aggregates
- iv. C 270 Specification for Mortar for Unit Masonry

  
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e) **Submittals**

Submit shop drawings, details and descriptive literature showing pipe dimensions, joint and fitting details, recommended methods of installation, testing equipment, bedding details and calculations, recommended methods of cutting pipes and other relevant details.

f) **Material Delivery, Storage and Handling**

i. **General**

At every point of loading or unloading, provide suitable means for lifting and loading. Do not unload by means of rolling down planks or other form of inclined ramp. Ensure that pipes, fittings and other items are kept dry, clean and adequately stored. Perform work in accordance with manufacturer's instructions and to the approval of the Engineer.

ii. **Handling of uPVC Pipes**

- Store uPVC pipes in covered areas and protect from direct sunlight.
- During storage, ensure that uPVC pipes are not distorted. Stack pipes on a level surface off the ground or in suitable racks. Ensure that sockets are situated at alternate ends. Install bearing timber at appropriate spacing and of sufficient width to prevent denting of pipes. Stack pipes only to the extent recommended by manufacturer. Provide adequate protective measures for pipes and other items in transit.
- Distorted, buckled or defective pipes shall not be used in the work.

4.2 **MATERIAL**

a) **Un plasticized Polyvinyl Chloride (uPVC), Pipes and Fittings**

i. **Pipes and Fittings**

Unless otherwise indicated provide uPVC pipes and fittings that comply with BSC 14, Class D. Provide pipes that are suitable for installation depths, bedding and loading conditions and working pressures to which they will be subjected.

ii. **Joints**

For pipe jointing provides rubber rings that comply with ASTM D 1869.

Provide 2 rubber rings for each pipe joint.

  
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iii. **Testing**

Provide manufacturer's certificates that testing of pipes and fittings complied with the specified requirements of BSC 15 3505.

b) **Equipment**

- i. All equipment necessary and required for the proper construction of the structures shall be brought on the project site in first class working condition and shall have been approved by the Engineer before construction is permitted to start.
- ii. The Contractor shall provide hand tampers and pneumatic tampers to obtain the required compaction of the pipe bed and the backfill as specified.

**4.3 EXCAVATION**

- a) The width of the pit or trench for the structure shall be sufficient to permit satisfactory jointing of the pipe and/or pouring of concrete and thorough tamping of the bedding material under and around the structure, but it shall not be less than the external diameter of the pipe or structure plus 0.30m on each side. Trench or pit walls shall be approximately vertical.
- b) Where rock, hardpan, or other unyielding material is encountered, the Contractor shall remove it from below the foundation grade for a depth of at least 0.15 m. The excavation below grade shall be backfilled with selected fine compressive material.
- c) Where a firm foundation is not encountered at the design grade, due to unsuitable material, this soil shall be removed and replaced with approved fill material for the full trench width. The Engineer shall determine the depth of removal. The fill material shall be compacted to provide adequate support for the pipe.
- d) The Contractor shall do such trench or pit bracing, sheeting, or shoring necessary to perform and protect the excavation and structure as required for safety and conforming governing laws, and perform and protect the excavation and the structure as required for safety and conforming governing laws, and perform all grading and pumping, if necessary, to prevent water running into the trench and to keep the trench dry. The Contractor shall remove the bracing, sheeting, or shoring after placing at the structure. Removal shall be done in such a way that it will not disturb the structure.

**4.4 PLACING PIPE**

  
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**a) General**

Proper facilities shall be provided for lowering the pipe when it is to be placed in a trench. The pipe shall be laid carefully and true to lines and grades on a bed, which is uniformly firm throughout its entire length. Any pipe which is not in true alignment, or which shows any undue settlement after being laid, or is damaged, shall be taken up and re-laid or replaced without extra compensation. The laying of the pipe in the finished trench shall be started at the lowest point and laid upgrade. The bed of the trench shall be such that at least the lower quarter of the pipe shall be in continuous contact with the bed.

**b) Pipe Laying**

The Engineer shall inspect all pipes before they are laid, and reject any section that is damaged by handling or is defective to a degree, which will materially affect the function and service of the pipe.

When bell and spigot pipe is used, the bell shall be laid upgrade.

If tongue and groove pipe is used, the grooved end shall be laid upgrade.

The pipe shall be firmly and accurately set to line and grade so that the invert will be smooth and uniform. The pipe shall be protected from water during placing and until the mortar in the joints has thoroughly set.

**4.5 MORTAR**

Mortar shall be mixed in a ratio of 1 part by volume of Portland cement and 2 parts by volume of sand. The mortar shall be of the desired consistency for caulking and filling between the pipe and the drainage structures. Mortar, which is not used within 45 minutes after water has been added, shall be discarded.

**4.6 PIPE JOINTS**

- a) Before any joint is made, the previously installed unit shall be checked to assure that a close joint with the adjoining unit has been maintained and that the inverts are matched and conform to the required grade. The pipe shall not be driven down to the required grade by striking it with a shovel handle, timber or other unyielding object.
- b) All joint surfaces shall be cleaned.

  
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- c) Where any two-pipe units do not fit each other closely enough to enable them to be properly jointed, they shall be removed and replaced with suitable units and new gaskets.
- d) Open ends of pipe and branches shall be closed with stoppers and secured in place in an acceptable manner.
- e) The Contractor shall take all necessary precautions to prevent flotation of the pipe in the trench.
- f) All times when pipe installation is not in progress, the open ends of the pipe shall be closed with temporary watertight plugs or by other approved means. If water is in the trench when work is to be resumed, the plug shall not be removed until suitable provisions have been made to prevent water, earth, or other substances from entering the pipe.
- g) Pipelines shall not be used as conductors for trench drainage during construction.
- h) Care shall be taken to prevent earth, water, and other materials from entering the pipeline. As soon as possible after the pipe and manholes are completed, the Contractor shall clean out the pipe and manholes, being careful to prevent soil, water, and debris from entering any existing pipe.

#### 4.7 WORKMANSHIP

##### Bedding of Pipelines

- a) The minimum thickness of bedding material beneath the pipe shall be 150 mm (minimum 100mm under sockets) for pipes not exceeding 200 mm internal diameter except when bedded on rock.
- b) The time interval between placing bedding material on the trench formation and commencing pipe-laying shall be as short as is practicable.
- c) The bedding material shall be compacted in layers not exceeding 200mm with one pass of a plate vibrator for gravels and two passes for sands or other approved equivalent mechanical method. Hand tamping or punning will only be permitted where insufficient space is available to allow the use of mechanical plant.
- d) Recesses shall be formed in the bedding to accommodate pipe joints while ensuring continuous even support along the pipe length. Bedding material shall be prevented from entering pipe joints. After the joint has been made bedding material shall be carefully placed and hand compacted beneath the joint barrel to close any void left by the recess. Where the formation of the trench is of silt or soft clay and is

below the natural water table a 75mm blinding layer of sand shall be substituted for the specified bedding material directly above formation and carefully compacted if directed on site.

- e) Granular material for pipe bedding shall be free-draining, hard, clean, chemically stable gravel, crushed stir crushed slag, graded in accordance with the following table:

Percentage by Weight Passing Sieve

Test Sieve mm	For Pipes of Diameter 500mm and below
63	---
37.5	---
20	---
14	100
10	85 - 100
5	0 - 25
2.36	0 - 5

- f) The material shall have a Compaction Fraction value not exceeding 0.2 when determined in accordance with the following test:

A representative sample of about 40kg shall be heaped onto a clean surface and quartered to obtain approximately 10kg. The moisture content of the sample should not differ materially from that of the main body of material, at the time of use in the trench.

#### 4.8 LEAKAGE TESTS FOR GRAVITY PIPES

- The pipelines shall be as nearly watertight as practical and leakage tests and measurements shall be made. Tests shall be carried out between each two manholes in the presence and to the satisfaction of the Engineer's Representatives.
- Before commencing with the tests, all pipelines and concrete works shall be clean.
- The Contractor shall furnish suitable test plugs, water pumps and appurtenances, and all labor required to properly conduct the leakage tests on the pipelines.

  
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- d. Upon completion of a section of the storm water bulkheads shall be installed, as required, to permit the test of the storm water pipe.
- e. The storm water pipe shall be subjected to an internal pressure by plugging the pipe at the lower end and then filling the pipelines and manholes with clean water to a height of 60 cm above the top of the pipe at its upper end. Where conditions between manholes may result in test pressures, which would cause leakage at the stoppers in branches, provisions shall be made by suitable ties, braces, and wedges to secure the stoppers against leakage resulting from the pressure. The rate of leakage from the storm water shall be determined by measuring the amount of water required to maintain the level 60cm above the top of the pipe.
- f. Leakage from the storm water pipe under test shall not exceed the requirements 1890 liters per 100mm diameter per km of the storm pipe per 24 hrs.
- g. The Contractor shall construct weirs or other means of measurement as may be required, furnish water and do all necessary pumping to enable the tests to be properly made.
- h. Should the sections under test fail to meet the requirements, the Contractor shall do all work of locating, repairing leaks, and retesting as the Engineer may require without additional compensation.
- j. If the Engineer is in doubt that any damage had occurred in the pipelines in the process of pouring the concrete or backfilling, he shall have the right to order retesting of the doubted part. If the second test proves that the pipeline is not serviceable then the Contractor shall have to locate the damage, make it good, and carry out retesting until he secures satisfactory results. The cost of all such works shall be at the Contractor's expense.
- k. All manholes shall be constructed so as to prevent leakage of water . Normally no testing for the Contractor conducts leakage of water from manholes unless it is in the opinion of the Engineer that the method of construction carried out does not fulfill the requirements.
- l. In such a case, the Engineer shall have the right to ask the Contractor to carry out the testing to the manholes (in connection with water leakage) prior to backfilling and any damage revealed as a result of such testing shall be made good. All these works shall be carried out at the Contractor's expense and in accordance with the direction of the Engineer.
- m. The Contractor shall prepare on site, and at his own expense, all work requirements, i.e. plugs for all diameters of pipes, pumps, etc., which should be acceptable to the Engineer.

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- n. The Contractor shall only use acceptable water for the purpose of testing. The Contractor shall bear all the costs regarding serviceable water used in testing, flushing and satisfactory disposal thereof.
- o. The Contractor shall have to fix the plugs in ends of pipes to be tested and shall have to take necessary precautions to prevent plugs or fixings tools from getting inside the pipes as a result of water flushing.
- p. Should the selections under test fail to meet the requirements, the Contractor shall do all work of locating and repairing the leaks and retesting as the Engineer may require without additional compensation.

**4.9 BACKFILLING OF PIPELINES**

- a. After completion of placement and Compaction of the surrounds to the pipelines and leakage test backfilling shall proceed using selected excavated materials in accordance with the specifications for earthworks.
- b. The use of power rammers will not be permitted over any pipe until the depth of fill above the crown of the pipe is at least 300 mm.
- c. Movement of construction machinery over a pipe drain shall be at the Contractor's risk. Any pipe damaged thereby shall be replaced at the expense of the Contractor.

**4.10 CONNECTIONS**

Where the drawings call for connections to proposed structures, these connections shall be watertight and so made that a smooth uniform flow line will be obtained throughout the system.

**4.11 CLEANING AND RESTORATION OF SITE**

After the backfill is completed the Contractor shall remove all tools, surplus material, dirt, and rubbish from the site. For paved areas the Contractor shall restore all disturbed areas to their original condition.

**4.12 INSPECTION**

Prior to final approval of the drainage system, the Engineer accompanied by the Contractor, shall make a thorough inspection. Any indication of defects in material or workmanship, or obstruction to flow, or poorly constructed joints in the system, shall be further investigated and corrected. Defects due to the Contractor's negligence shall be corrected by the Contractor without additional compensation and as directed by the Engineer.

**4.13 GENERAL REQUIREMENTS**

  
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- All horizontal piping shall be pitched not less than one percent.
- Changes in direction of piping shall be made with long radius fittings.
- PVC non-pressure pipes and fittings for storm drainage should be capable to hold sufficient pressure and to the satisfaction of the Consultant/Engineer Incharge.
- All roof drains shall be set 1 / 8" below normal finished floor, with a gradual pitch extending away from the drain.
- All pipe and fittings shall be kept clean, with the exposed ends of incomplete or unconnected work to be plugged.
- Cleanouts shall be placed at all changes in directions.

#### 4.14 TESTS

When the roughing in work is complete, the entire system shall be subjected to flushing and then to a water test by plugging-up all openings and fillings all of the lines to the roof level. Any apparent defect shall be corrected or removed. The Consultant/Engineer Incharge shall witness the test and inspect the workmanship.

#### 4.15 DRAINS

Shall be PVC with large sump and flange, threaded or caulked bottom outlet, removable non-clogging low silhouette dome strainer, flashing clamping device and integral gravel stop. Each roof drain shall be provided with its own lead flashing.

#### 4.16 MEASUREMENT AND PAYMENT

Measurement for PVC-non pressure pipe shall be in running length and the work to be done shall include earthwork, providing and fixing of pipe, pipe fittings, jointing, cutting, breaking concrete and then making it good applying protective painting, cleaning, testing and the measurement will be made for the full work specified herein.

Payment will be made at the unit rate quoted in the BOQ per running foot length of PVC pipe. The amount bid shall be full payment for the work specified herein.

### 5.0 PLUMBING FIXTURES

#### General

##### a) Scope of Work

The work included in this section of Contract consist of providing and installing complete system of plumbing fixtures, fittings and accessories as per Drawings, Specification and Bill of Quantities, including all labor, equipment and materials required for the satisfactory

  
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operation and installation of plumbing fixtures Complete in all respect.

All model numbers not indicated or approved equal implies that the contractor shall submit for the approval of Engineer a summary of the plumbing fixtures proposed indicating type, manufacturer name, model number. If samples are required by the Engineers then they shall be provided at no additional cost. No materials shall be purchased, before such approval is obtained in writing from the Consultant/Engineer Incharge.

**(b) General Requirements**

All fixtures shall be free from imperfections, true as to line, angles, curves and colors, 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 nonabsorbent and burned so that the whole mass is thoroughly fused and vitrified producing a material white or colored, which when manufactured will show a homogeneous mass, close grained and free from pores. The glazing and vitreous China fixture shall be of color approved by the Consultant/Engineer Incharge thoroughly fused, and united to the body, without discoloration, chips, or flaws and shall be free from craze. Warped or other imperfect fixtures will not be accepted.

All plumbing fixtures and fittings shall be supplied by Contractor, all fixtures should be approved by the Consultant/Engineer Incharge prior to installation.

All fittings, cast brass set screws, escutcheons, faucets, traps, exposed piping etc., shall be brass chrome plated over nickel plate with polish finished. Any hanger nuts visible shall likewise be chrome plate over nickel plate.

After installation 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 external debris. All chrome plated and other metallic fittings shall be provided with a coat of grease to prevent their deterioration. All items prior to handing over must be in perfect condition in the visual and operational sense.

**c) Materials Required**

**i. Lavatory**



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White vitreous china lavatory with pedestal / counter top shall be "PORTA/ICL BOSH MODEL" or equivalent with approved fittings as per BoQ.

Lavatory shall be completed with the following accessories

- O Exquisite Line PORTA/ICL BOSH MODEL".
- O Fix 11, concealed 1 / 2 inch diameter basin mixer with hot and cold brilliant handles, cast spout with mousseure, pop-up waste set.
- O Handles trecorn deluxe.
- O 1 / 2" diameter stop cocks with flexible / chrome plated pipe.
- O 1-1 / 2" diameter C.P Bottle Trap with removable sump, outlet with compression nut.
- O C.P Towel rail of required length.
- O 1-1 / 2" inch diameter stainless steel waste pipe with chain waste and plug.
- O Soap tray of ICL BOSH MODEL".

ii. **Water Closet WWC-1 (WESTREN WATER CLOSET)**

White vitreous china siphon jet water closet with P or S trap shall be "PORTA MODEL" or equivalent with approved fittings as per BoQ.

Water closet shall be complete with the followings accessories.

- O 4" diameter flush pipe of required length
- O Vacuum breaker
- O Solid plastic closed front seat with cover and screws.
- O 1 / 2" diameter C.P. Inlet spout.
- O C.P Toilet paper holder.
- O Floor Flange gasket rubber bumper.
- O 1 inch diameter Flush valve.

iii. **Water Closet AWC-1 (EASTREN WATER SLOSET)**

White vitreous china siphon jet water closet Orissa type, with P or S traps shall be "PORTA MODEL" or equivalent with approval fittings as per BoQ.

  
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Water closet shall be complete with the following accessories.

- O 4" diameter flush pipe of required length.
- O Vacuum breaker.
- O 1 / 2" diameter C.P. Inlet spout.
- O Floor Flange gasket rubber bumper.
- O 1 inch diameter Flush valve.

iv. Shower

Shower accessories will consist of the following approved fittings as per BoQ.

- 1 / 2" diameter concealed valves threaded pipe connection with brilliant handles blue and red.
- 1 / 2" inch diameter 4 way diverter.
- Bath combination 1 / 2" inch.
- Adjustable ball joint shower head 3 inch diameter with 1 / 2 inch shower arm.
- 3 / 4 inch diameter bath spout with mousseur.

v. Kitchen Sink

Kitchen sink shall be "PORTA/ICL BOSH/REGINOX MODEL" or equivalent

approved with "MASTER" or equivalent approved fittings as per BoQ.

Kitchen sink shall consist of the following accessories.

- O Double bowl 20 gauge nickel stainless steel sink with double drain board.
- O PVC waste coupling, and 1-1 / 2" P.V.C bottle trap.
- O C.P 1 / 2 inch. Combination mixer (hot & cold) with pipe.
- O Cabinet fitted, size 55"x900x150" deep and 1100"x 900" x 150 deep.
- O Stain finish, self rim, Back Ledge with holes.
- O 1 / 2 inch single hole mixer.
- O Brilliant handles.
- O Extractable rising spray with diverter.
- O Set / spray metal tube.

  
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O Chain support.

O 1-1 / 2" diameter PVC flush pipe of required length.

vi. **Shower Jet**

- Shower Jet shall be "PORTA" or equivalent approved as per BoQ.
- Shower Jet will consist of the following accessories.
- Double hole mixer.
- Hand spray with trigger control.
- Pressure proof flexible hose of SFS of required length.
- Jet / spray, tube socket.
- 3 / 4 inch diameter extractable spout.

d) **Fixture Supports / Settings**

Provide all hangers, supports, brackets, etc, for the proper installation of water closet, urinals, lavatories, suits etc, requiring supports shall be in accordance with the manufacturers recommendation, as approved and where necessary built into partitions or walls, and shall be set with the Construction progress.

e) **Fixture Settings**

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 the Consultant/Engineer Incharge. Roughing for this work must be accurately laid out so as to conform with finished wall materials. Fixtures are not being set until as directed by the Consultant/Engineer Incharge.

Each fixture and piece of equipment including floor drain, requiring connections to drainage system shall be equipped with a trap. Traps are to be supplied with the fixtures. Each trap shall be placed as near to the fixtures as possible and no fixture shall be double trapped, except as otherwise indicated. Trap installed on bell and spigot pipe shall be cast iron.

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 s-trap or p-trap added wrenches shall be used on chrome 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.



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Plumbing fixtures shall be supplied complete with all required trimming; vitreous china fixtures shall be first class quality with smooth glazed surfaces, free from warp, cracks, discolorations or other imperfections.

Fixture mounting heights and spacing shall be as detailed on the Architectural and Engineer's drawings.

Protect fixtures from damage before and after installation.

Fasten fixture carriers securely to slab construction with power driven expansion shields and bolts.

**f) Cleaning**

Clean and adjust all fixtures and trim before acceptance.

**g) Measurement and Payment**

Measurement for payment of mirrors shall be made as net actual area in square feet of the mirror acceptably provided and installed in position as per drawings and instructions of the Consultant/Engineer Incharge.

Payment for wash basins, kitchen sinks, water closets, urinals, showers, mirrors, and foot rest pairs shall be made at the applicable unit price as bid in the Bill of Quantities. The amount bid shall be full payment for the work specified herein.

**6.0 DRAINAGE LIFT PUMP (not used)**

**6.1 GENERAL**

**a) Scope of Work:**

Install and provide: complete assembled Drainage Duplex Lift Pump submersible type with controls as per drawings, specification and bill of quantities, complete in all respect to the satisfaction of CONSULTANT/ENGINEER INCHARGE.

**b) Material Required**

Complete assemble including motor-driven submersible pump and all necessary auxiliary component, level controller, controls, wiring and interconnecting flexible aero flex rubber piping.

**c) Pumps:**

Pumps shall be Submersible type by Grundfos /KSB/ AMSTRONG. Entirely of stainless steel, wholly submerged in the liquid. The pump shall be capable of handling clean or slightly dirty waste water.

All external bolts and nuts shall be stainless steel. The impeller shall be capable of passing clean or slightly dirty waste water.

  
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**d) Controls:**

Automatic sequence of pump with level controller as indicated in drawings.

The pump manufacturer shall warrant the pump being supplied to the Consultant/Engineer Incharge against defects in workmanship and materials for a period of one year after the system is handed over to the Consultant/Engineer Incharge by the contractor.

All sections of specification in section "Pumping Equipment" shall also apply in this section.

The sequence of control shall be such as stated on the drawings. The relevant electrical specification shall be as per electrical specification and to approval.

**e) Sequence of Drainage Pump**

Furnish and install cellar drainage pump with sufficient electrical cable to control pump operation. The built in switch shall automatically the pump operation to start/stop between two liquid levels. In case of pump failure a water alarm consisting of light and horn shall be suitably mounted on the control panel.

**7.0 PUMPING EQUIPMENT [Pumps to fill Overhead tank]**

**7.1 GENERAL**

**a) Scope of Work:**

Furnish and install pumps for the water filling/drainage & sewerage system as per drawings, specifications, and Bill of Quantities and as approved by the CONSULTANT/ENGINEER INCHARGE.

**b) Materials Required:**

Install best quality Grundfos/KSB pumps complete with Siemens electric motors to CONSULTANT/ENGINEER INCHARGE satisfaction.

**c) Approval:**

Before purchase of any pumping equipment, the Contractor shall submit all relevant data about the equipment to the Engineer for his approval. No equipment to be purchased before such approval is obtained in writing from the Consultant/Engineer Incharge. Also approval given by the Consultant/Engineer Incharge does not relive the Contractor for his responsibility of providing the pumping system complete in all respect, as per drawings, bill of quantities, and specification to the satisfaction of the CONSULTANT/ENGINEER INCHARGE.

**d) Installation:**

  
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Pumps and motors shall aligned in vertical/horizontal and leveled throughout the length and width and wherever necessary suitable support shall be provided to facilitates pipe connections and leveling.

Pumps shall be secured to bases with proper size anchor bolts.

Drains for packing glands etc. shall be piped to the nearest drain.

Pumps shall be located in accessible location for repairing and maintenance.

Grout base plates completely to provide a rigid non deflection support.

**e) Testing:**

Pumping equipment shall be tested for operating characteristics and duration of test shall be set by the CONSULTANT/ENGINEER INCHARGE. Apparent defective equipment shall be repaired or replaced and such adjustments made to the equipment as may be necessary, all to the satisfaction of the CONSULTANT/ENGINEER INCHARGE.

Also provide to the CONSULTANT/ENGINEER INCHARGE the following information.

- i. Pump data Make, Model, number, serial Number Design and Actual GPM, BHP, maximum shut off and design head, rpm suction and discharge pressures.
- ii. Motor data; Make model and serial number, hp, rpm, locked rotor amps, Voltage, phase, frequency and actual volts and amps.
- iii. Starter data: Make, size, model number, heater sizes, ampere reading, live voltage, control voltage frequency.
- iv. The contractor shall also provide equipment catalog/certified performance curves, showing impeller diameter, BHP, and design conditions.

**f) Controls:**

All electrical equipment shall be operated at either 3 phase 380 volts or single phase 220/240 volts, 50 hertz or otherwise approved.

All electrical works, i.e. wiring, pumps starters & controls, etc., shall confirm with the approval of the CONSULTANT/ENGINEER INCHARGE.

**g) Sequence of Water in U/G:**

Furnish & install a mechanical float valve in the U.G and Overhead Water Tanks. This shall cut off incoming water supply once the tank is full.



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## 8.0 SEWER APPURTENANCES

### 8.1 GENERAL

#### a) Scope of Work

The work to be done under this section of the Specifications consists of providing all material, labor, equipment and appliances and in performing all operations including earthwork, concrete, block masonry, plaster, fixing manhole cover and frame, making holes etc. in connection with proper installation of miscellaneous sewer appurtenances i.e. manholes, grease traps, gulley traps etc. complete in strict accordance with this section of the Specifications and the drawings, and subject to the terms and conditions of the Contract. All sewer appurtenances shall be placed at locations to lines and levels as shown in the drawings and as directed by the CONSULTANT/ENGINEER INCHARGE.

#### b) Material and Installation

##### i. Manholes / Inspection Chambers

Manholes and inspection chambers shall be built on sewers of the size, form, thickness and positions shown on the drawings or as directed by the CONSULTANT/ENGINEER INCHARGE. The foundations and bed shall be made of concrete and the walls shall be of block masonry plastered with 1/2" thick 1:4 cement sand plaster. The inverts and benching shall be properly shaped to the forms and dimensions shown and shall be rendered with two coats of granolithic concrete and brought up to a smooth face to the forms and gradients indicated on the drawings. Unless otherwise indicated on the drawings, every manhole shall be provided with a cast iron frame and cover of dimensions shown on the drawings. The frame and cover shall be cast iron from good quality.

All manhole covers shall be true to pattern in form and dimensions, free from faults, cracks and other defects affecting their strength. The cover shall have a continuous and even bearing on the frame, and shall be properly set to avoid knocking. All inequalities, projections or roughness on abutting surfaces of the cover and the frame shall be removed, and the cover fitted into the frame as neatly as possible without jamming.

##### ii. Grease Trap

Grease traps shall be installed on waste line in the kitchen. The size, thickness and position shall be as shown on the drawings or as directed by the



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CONSULTANT/ENGINEER INCHARGE. The grease trap shall be PDI Certified. The inlet and outlet pipes in the grease trap shall have Roding eyes.

Grease trap shall be provided with a G.I. sheet frame and cover of dimensions shown on the drawings.

iii. **Gully Trap**

Cement concrete gully trap with chamber having cast iron frame and cover, shall be used on the downstream side of a manhole for isolating the drainage system from the sewer as shown in the drawings or as directed by the CONSULTANT/ENGINEER INCHARGE. It shall have a water seal and a Roding arm to permit the outgoing pipeline to be rodded. The Roding eye shall have a remarkable air-tight plug which shall be provided with a chain.

c) **Measurement and Payment:**

Measurement for payment of sewer appurtenances shall be made on the basis of actual number of such fixtures acceptably provided and installed; of complete units as specified herein, inclusive of earthwork, concrete work, block masonry, plaster, iron steps, making holes etc. complete as per Contract Documents and/or as directed by the CONSULTANT/ENGINEER INCHARGE.

Payment for sewer appurtenances shall be made at the applicable unit price per number bid in the Bill of Quantities. The amount bid shall be full payment for the work specified herein.

9.0 **MISCELLANEOUS ITEMS**

9.1 **GENERAL**

a) **Scope of Work:**

The work to be done under this section of the Specifications consists of providing all material and labor, equipment, appliances etc. for proper installation of miscellaneous plumbing items of valves, cocks, floor traps, rain water pipes, cleanouts, towel rails, service connections, water heaters, as specified herein or as shown on the drawings and/or as directed by the CONSULTANT/ENGINEER INCHARGE.

b) **Material and Installation:**

i. **Bronze/Malleable/Ductile Valves**

All valves of 4" diameter and below shall be of bronze/Malleable iron/Ductile iron conforming to BSS 1952 and shall be of appropriate class for the



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working pressure. on which they are installed. Open and shut indicators shall be marked on the handle. The ends may be threaded or flanged. The valves are to be installed inclusive of all fittings and accessories.

ii. **Float Valves**

Float valves shall be made of cast iron body, gunmetal leather faced valve and seating, forged Bronze spindle, gunmetal links and pins and gunmetal lined cylinder, wrought iron lever and copper ball, and capable for working pressure 300 psig.

iii. **Foot Valves**

Foot valves shall be made of brass as per PN16 with strainer, and renewable disc ring.

iv. **Taps**

All the fittings shall be of approved model and appropriate class for 125 psig working pressure on which they are installed.

v. **Floor Traps**

Floor traps shall be of PVC. They shall have minimum water seal of 3" and shall be provided with removable stainless steel grating.

The traps shall be of self-cleaning type. The open area of the grating shall be at least two thirds of the cross-section area of the drain line to which it connects. Floor traps shall be well set in position so that there is no leakage at the joint between traps and the floor.

vi. **Cleanouts**

Cleanouts shall be of the same nominal size as that of the pipe on which it is installed. Cleanout shall consist of the same material as pipe i.e. PVC. Cleanouts shall be turned up through floor by long sweep fittings, wherever the space so permits. Top finish of cleanout shall be flush with the floor when located in open area. They may not be flush with the floor when installed near wall levels and not deep enough to make them flush.

Cleanouts shall be so installed that there is a clearance of at least 1'-6". Cleanouts near walls shall be embedded in concrete. All other work of ferrule, plug, concrete work, frame and cover etc, shall be paid under cleanout item.

vii. **Service Connection**

  
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Service connection of water to building shall consist of cast iron saddle clip, gasket, bolts, polyethylene pipe up to plug stop-cock with access pipe and cover etc. All material and equipment shall be suitable for pressure of potable water system.

Complete work including excavations, backfilling, supply and installations of all material as shown in the Contract Documents shall be covered under this item.

## 10.0 BOOSTER PUMPS

### PACKAGED BOOSTER PUMPS

#### 10.1 SUMMARY

Variable -speed, [Triplex], packaged booster pumps for domestic water piping systems.

#### 10.2 QUALITY ASSURANCE

Quality Standard: UL 778 and ASME B31.9.

Packaged Booster Pumps: Listed and labeled by an NRTL as pumping systems.

#### 10.3 PRODUCTS

Variable-Speed, Duplex Booster Pumps:

Pump: Overhung impeller, close coupled, multistage stage, end suction, centrifugal.

Casing: Radically split, cast iron.

Impeller: Stainless Steel/Cast bronze.

Shaft and Shaft Sleeve: Steel shaft, with copper-alloy shaft sleeve.

Seal: Mechanical.

#### Pump Data:-

Capacities and Characteristics:

Capacity: As per Schedule

Discharge Head: As per schedule

Discharge Size: As per schedule

Motor Horsepower: As per Schedule

Volts: <400>

Phases: <3>



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Refer schedules for further details.

Motor: Variable speed, with oil-lubricated bearings.

Piping: PPR PN-20.

Valves: Control, relief, shutoff, and check valves.

Sensors: Pressure and flow switches.

Dielectric fittings.

Control Panel:

High-suction pressure cutout.

High-discharge pressure cutout.

Remote signal contacts.

Hydro pneumatic tank. [As per drawings]

## 11.0 NATURAL GAS PIPING

### 11.1 PIPING MATERIALS

As per BoQ.

### 11.2 SPECIALTY VALVES

Gate and Check Valves, NPS 2 (DN 50) and Smaller: Class 125, bronze body, valves suitable for fuel oil service, with "WOG" indicated on body.

Gate valves shall have solid wedge.

Swing check valves shall have bronze disc.

Lift check valves shall be vertical pattern; two-piece construction with bronze disc.

Ball Valves: UL 842; metal-body ball valve with threaded ends according to ASME B1.20.1 for pipe threads.

Pressure-Reducing Valves: UL listed for fuel oil service. Include bronze body with 150-psig (1035-kPa) minimum pressure rating.

### 11.3 PIPING INSTALLATION

General piping installation requirements are specified for water supply.

Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

Install strainer on inlet side of control valves, pressure-reducing valves, fuel oil pumps, and oil burner connections.

### 11.4 VALVE INSTALLATION



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General valves installation requirements are specified for Water Supply.

Install valves in accessible locations, protected from damage.

Install ball valves at branch connections to supply mains and at equipment.

Install drain valves at piping low points.

### 11.5 CONNECTIONS

Install piping adjacent to equipment to allow service and maintenance.

Connect piping to equipment with ball valve and union. Install union between valve and equipment.

Install flexible piping connectors at final connection to burners or oil-fired appliances that must be moved for maintenance access.

### LIST OF MATERIALS

◦ CERAMICS FIXTURES (local)	MARACHI /PORTA/DURR (Prime Quality) OR equivalent
• FAUCETS & TRIMS (local)	MASTER / SONEX /PORTA/FAISAL OR equivalent
• TOILET ACCESSORIES (local)	MASTER / SONEX/ FAISAL OR equivalent
• uPVC SEWERAGE PIPES AND FITTINGS	DADEX ,PAK ARAB, MASTER OR equivalent
• PP-R	DADEX ,PAK-ARAB,MASTER OR equivalent
• VALVES	DADEX, FAISAL, MASTER OR equivalent
• GEYSERS	VENUS PAKISTAN/ SINGER/ UNIGAS OR equivalent
• KITCHEN SINKS	ASIA MAKE LOCAL OR equivalent
• WATER DISPENSER	LG, WAVES OR LOCAL MAKE OR equivalent
• G.I. PIPES & FITTINGS	IIL, PAKISTAN (Medium Quality) OR equivalent
• PAINTS	ICI, BERGER ) OR equivalent
• FHC WITH HOSE REEL	NAFFCO, ANGUS UK, CHUBB UK KIDDE UK FIGGIE FIRE PROTECTION ) OR equivalent
• M.S. PIPES	UPTO 3", IIL MAKE ABOVE 3" STELLEX MAKE ) OR equivalent
• FIRE EXTINGUISHERS	Fike, Tyko, NOHA) OR equivalent
• FLOOR TRAP	DADEX ,PAK- ARAB,MASTER ) OR equivalent
• PUMP	JAWED, OR Equivalent

Note: Contractor should provide a complete list of all materials with make, model & Country of origin. Before installation /material brought at site.



**THE BENAZIR BHUTTO SHAHEED  
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VOLUME - III

**Bill of Quantities (BOQs)**

**CLIENT**

**THE BENAZIR BHUTTO SHAHEED UNIVERSITY OF TECHNOLOGY AND  
SKILL DEVELOPMENT KHAIRPUR MIRS.**

**NAME OF WORK**

**ESTABLISHMENT OF CENTRE FOR INCUBATION & ENTERPRISE AT THE  
BBSU OF TECHNOLOGY & SKILLS DEVELOPMENT, KHAIRPUR**

Issued to M/s. \_\_\_\_\_

Dated \_\_\_\_\_

**Consultant:**



**M/S. ATIF NAZAR (PVT.) LTD.**  
**PROJECT MANAGERS, PLANNERS**  
**ARCHITECTS & CONSULTING ENGINEERS**  
D-11/A, BLOCK-17, GULSHAN-E-IQBAL,  
KARACHI-PAKISTAN.  
TEL: (+92-21-34982561)  
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EMAIL: mail@atifnazar.com

**Director (Works & Services)**  
**The Benazir Bhutto Shaheed**  
**University of Technology and Skill Development**  
Khairpur Mirs

*Contract*

**ESTABLISHMENT OF CENTRE FOR INCUBATION & ENTERPRISE AT THE BBSU  
OF TECHNOLOGY & SKILLS DEVELOPMENT, KHAIRPUR**

**Summary of Cost Offered by the Contractor/Bidder**

S.No	Item of Works	Amount (Rs.)
<b>A</b>	<b>Civil Works</b>	
	Amount of Scheduled Items	49,696,581.76
	Add/Deduct _____ % above/below on Scheduled Items	
	<b>Total Amount of Scheduled Items</b>	
	Amount of Non-Scheduled Items	
	<b>Total Amount of Civil Works (A)</b>	
<b>B</b>	<b>Electrification Works</b>	
	Amount of Scheduled Items	4,516,637.30
	Add/Deduct _____ % above/below on Scheduled Items	
	<b>Total Amount of Scheduled Items</b>	
	Amount of Non-Scheduled Items	
	<b>Total Amount of Electrification Works (B)</b>	
<b>C</b>	<b>Water Supply &amp; Sanitary Fittings</b>	
	Amount of Scheduled Items	2,012,716.41
	Add/Deduct _____ % above/below on Scheduled Items	
	<b>Total Amount of Scheduled Items</b>	
	Amount of Non-Scheduled Items	
	<b>Total Amount of Water Supply &amp; Sanitary Fittings (C)</b>	
	<b>Grand Total of Bid Price (Parts-A+B+C)</b>	

**Total Amount of Bid (in words)** \_\_\_\_\_

Contractor Signature \_\_\_\_\_

Contractor Name \_\_\_\_\_

Stamp: \_\_\_\_\_

  
 Director (Works & Services)  
**Director (Works & Services)**  
**The Benazir Bhutto Shaheed**  
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ESTABLISHMENT OF CENTRE FOR INCUBATION & ENTERPRISE AT THE BBSU OF TECHNOLOGY &  
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Bill of Quantities

S#	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
A	SCHEDULE ITEMS				
	Part-I				
1	Excavation in foundation of Building Bridges and other structures including dagbelling dressing,refilling around structure with excavated earth Watering and ramming lead upto 5 ft.				
	(S/I No.18(b), Ch/1, P/17)	P.Cft	19,785.19	11.88	235,048.03
2	Dry rammed brick or stone ballast 1 1/2" to 2" gauge.				
	(S/I No.2, Ch/4, P/24)	P.Cft	2,347.21	104.97	246,386.76
3	Cement concrete plain including placing compacting, finishing and curing complete (including screening and washing at stone aggregate without shuttering)				
	(S/I No.5 (i), Ch/4, P/25)				
	Ratio 1:4:8	P.Cft	5,288.91	348.83	1,844,930.82
4	Cement concrete plain including placing compacting, finishing and curing, complete (including screening and washing at stone aggregate without shuttering.				
	Ratio 1 : 3 : 6.				
	(S/I No.5 (h), Ch/4, P/25)	P.Cft	2,112.58	388.67	821,094.77
	Ratio 1 : 2 : 4				
	(S/I No.5 (f), Ch/4, P/25)	P.Cft	2,993.57	443.54	1,327,765.82
5	Erection and removal of centering for R.C.C or plain cement concrete works of Deodar wood (2nd-Class)				
	For partal wood (b) ii, Vertical				
	(S/I No.19 (b) (ii), Ch/4, P/27)	P.Sft	10,562.76	106.48	1,124,722.68
6	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	R.C.C work in roof slab, beams, column, rafts, lintels and other structural members laid in situ or precast laid in position complete in all respects. Ratio 1 : 2: 4 90 Lbs of cement, 2 Cft sand and 4 Cft shingle 1/8" to 3/4" gauge.				
	(S/I No.6 (a) i, Ch/4, P/25)	P.Cft	10,262.10	717.59	7,363,979.44
7	(a) R.C work in roof slab, beams columns rafts, lintels and other structural members laid in situ or precast laid in position complete in all respects.				
	(II) Ratio 1-1 1/2 :3				
	(S/I No.6 (a) ii, Ch/4, P/25)	P.Cft	1,776.63	787.71	1,399,465.28
8	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 removal of rust from bars) i) Grade-60. (S/I No.8 (i), Ch/4, P/25)	P.Cwt	698.68	18,934.02	13,228,744.07
9	Filling, water and ramming earth under floor. With new earth (Excavated from outside) lift upto 5 ft and lead upto 10 miles including cost of earth. (S/I No.22, Ch/1, P/17)	P.Cft	84,079.90	47.02	3,953,436.78

  
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Bill of Quantities

S#	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
10	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 parameter of the foundation trench etc, as per directions of Engineer Incharge.				
	(S/I No.91, Ch/18, P/84)	P.Rft	4,694.42	74.14	348,044.48
11	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 parameter of the foundation trench etc, as per directions of Engineer Incharge.				
	(S/I No.92(A), Ch/18, P/84)	P.Sft	4,694.42	11.46	53,798.08
12	Bitumen coating to plastered or cement concrete surface.				
	(S/I No.9, Ch/11, P/63)	P.Sft	16,128.61	21.83	352,087.45
13	Damp proof course with (cement sand and shigle concrete 1:2:4) including 2 coats of asphaltic mixture 3" thick				
	(S/I No.28(c), Ch/4, P/28)	P.Sft	561.44	148.71	83,491.00
14	Pacca brick work in foundation and plinth in Cement sand mortar 1:6				
	(S/I No.4(e), Ch/5, P/29)	P.Cft	1,730.00	359.20	621,416.00
15	Pacca brick work in ground floor in Cement sand mortar 1:6				
	(S/I No.5(I)e, Ch/5, P/30)	P.Cft	5,280.56	381.18	2,012,844.81
16	Pacca brick work other than building including striking of joints upto 10ft height (3 meter) in Cement sand mortar 1:6				
	(S/I No.7(I)e, Ch/5, P/30)	P.Cft	600.00	362.88	217,728.00
17	Pacca brick work in first floor in:: Cement sand mortar 1:6				
	(S/I No.5(I)c, Ch/5, P/30)	P.Cft	1,272.89	398.41	507,133.10
18	Cement plaster 1:3 upto 12' height. 3/8" thick (S/I No.10a, Ch/9, P/52)	P.Sft	4,909.42	38.61	189,552.80
19	Cement plaster 1:6 upto 12' height. (b) 1/2" thick				
	(S/I No.13 b, Ch/9, P/52)	P.Sft	21,649.49	37.01	801,247.72
20	Cement plaster 1:4 upto 12' height.(a) 3/8" thick.	P.Sft	21,649.49	37.78	817,917.83
	(S/I No.11a, Ch/9, P/52)				
21	Applying floating coat of cement 1/32" thick				
	(S/I No.14(ii), Ch/9, P/52)	P.Sft	21,649.49	22.63	489,928.02
22	Extra Labour for lime mud or cement plaster and pointing from 12' (20') and above (for each additional 10' height).(S/I No.29, Ch/9, P/53)				
	First Floor	P.Sft	4,121.65	5.15	21,226.48
23	Providing and laying full body porcelian Tile in flooring or facing of approved design set in grey cement motor 1:2 or of 3/4" thickness of special bond of shabir tiles or equivalent i/c using colour pigment for matching complete as per specification.(S/I No.28-(x), Ch/8, P/46)	P.Sft	4,462.74	439.57	1,961,684.42

ESTABLISHMENT OF CENTRE FOR INCUBATION & ENTERPRISE AT THE BBSU OF TECHNOLOGY &  
SKILLS DEVELOPMENT, KHAIRPUR

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S#	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
24	Providing and fixing G.I frames /Choukhats of size 7" x 2" or 4 1/2" x 3" for door using 20 gauge G.I sheet I/c welded hinges and fixing at site with necessary hold fasts, filling with cement sand slurry of ratio 1:6 and repairing the jambs. The cost also i/c all carriage , tools and plants used in making and fixin				
	(S/I No.29, Ch/17, P/76)	P.Rft	486.40	690.67	335,941.89
25	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.				
	(S/I No.60, Ch/10, P/61)	P.Rft	452.93	136.40	61,779.65
26	Providing and fixing iron steel grill using solid square bars of size 1/2" x 1/2" placed at 4" I/c and frame of flat iron patti of 3/4" x 3/4" I/c circle shape at 1-0 apart equivalent fitted with screws are pins I/c painting 3 coats with 1st coat of red oxide paint etc.				
	(S/I No.30, Ch/17, P/76)	P.Sft	470.00	833.27	391,636.90
27	Providing and laying 3" thick topping cement concrete (1:2:4 ) including Surface finishing and dividiing into panels: ( d ) 3" thick.				
	(S/I No.16 d, Ch/8, P/45)	P.Sft	6,668.62	145.00	966,949.90
28	Two coats of bitumen laid hot using 34 Lbs for % Sft. Ober roof and blinded with sand at one Cft. Per % Sft.				
	(S/I No.13, Ch/7, P/41)	P.Sft	6,668.62	47.84	319,026.78
29	Priming coat of chalk distemper.				
	(S/I No.23, Ch/9, P/53)	P.Sft	4,958.92	3.59	17,802.53
30	Distempering three coats.				
	(S/I No.24c, Ch/9, P/53)	P.Sft	4,958.92	17.23	85,442.23
31	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 2 coats with matt finish of approved make etc: complete .(new surface)				
	(S/I No.36a+36b+36b, Ch/9, P/54)	P.Sft	12,530.24	100.83	1,263,423.60
32	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.new surface 2coats				
	(S/I No.38a+38b+38b, Ch/9, P/54)	P.Sft	9,909.45	86.58	857,959.96
	Painting new surfaces:-				
33	( c ) Preparing surface and painting of doors and windows any type,(including edges). (i) Priming Coat (one coat) (ii) each subsequent coat of paint (2 coats)				
	(S/I No.5-d,Ch/11,P/63)	P.Sft	1,159.00	25.52	29,577.68
34	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" centre to centre and 3" steel tube with round balls as directed by engineer Incharge.				
	(S/I No.110, Ch/18, P/86)	P.Rft	106.50	6,598.80	702,772.20

Director ( Works & Services)  
The Benazir Bhutto Shaheed  
University of Technology and skill Development  
Khairpur Mirs

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Contractor

ESTABLISHMENT OF CENTRE FOR INCUBATION & ENTERPRISE AT THE BBSU OF TECHNOLOGY &  
SKILLS DEVELOPMENT, KHAIRPUR

Bill of Quantities

S#	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
35	Reinforced cement concrete spout including fixing in position with top and bottom khuras (S/I No.27, Ch/4, P/27)	Each	10.00	2,023.24	20,232.40
36	Providing & fixing barbed wire fencing with 12 gauge -4 points @ 6" apart barbed wire I/c straightening & fixing in angle iron vertical posts. (S.I.No. 9, CH/18, P-78)	P.Rft	800.00	27.85	22,280.00
37	Providing & fixing angle iron vertical plsts for barbed wire fencing of size 2" x 2" 1/4" embedded in RCC / Massonary pillars I/c Making cuts / holders @ 12" I/c fixing in pillars by chiseling and filling the with cement sand mortar, saprining & finishing the surface. (S.I.No. 8, CH/18, P-78)	P.Rft	48.00	764.10	36,676.80
38	Preparing surface and painting guard bars, gates of iron bars, gratings, railings (including standards braces, etc). And similar open work Three coats (S.I.No. 5(d), CH/11, P-63)	P.Sft	36.00	24.00	864.00
39	Extra labour rate for making grooves of 1" x 1/4" or 3/4" x 1/2" plastered surface with true edges both vertically and horizontally with uniform depth and with groove base smoothly finished etc. complete as per instructon of Engineer Incharge. (S.I.No.34, P-54)	P.Rft	350.00	31.19	10,916.50
40	Extra labour rate for making cement plaster pattas/band around straight or carved openings and around the edges of roof slabs, the width not less than 6" with fine finishing as directed by Engineer Incharge.(S.I.No.35, P-54)	P.Rft	100.00	57.43	5,743.00
	Total of Part-I				45,152,700.68
	Part-II				
1	GI expend actual 1/2" to 3/4" mesh 16 gauge fixed to chowkats without deodar patti. (S/I No.65, Ch/10, P/61)	P.Sft	1136.31	202.55	230,159.59
2	laying floors of approved coloured glazed tiles 1/4" thick laid in white cement and pigment on a bed of 3/4" thick cement mortar 1:2. (S/I No.25, Ch/8, P/46)	P.Sft	275.02	325.40	89,492.42
3	Glazed tile dado 1/4" thick laid in pigment over 1:2 cement sand mortar 3/4" thick including finishing. (S/I No.24, Ch/8, P/45)	P.Sft	1,056.91	389.36	411,518.48
4	Providing and fixing in position door and windows and ventilator for firs class deodar wood frames 1 1/2" thick and teak wood ply Shulters of forst class deodar wood skelton (Solid ) Stiled and ply wood stiled and rails core of Partal wood and teak ply wood (3 Ply) on both sides including hold fasts hinges al-drops Iron Tower Bolts handles Cleats with Cord etc. Complete. (CH: 10 Item: 51 PG: 60)				
	3053.66 - 1233.27=1820.39				
	deduct= item no 25 (b) Pg No 58				
	Ground Floor		430.60		
	Total	P.Sft	430.60	1,820.39	783,859.93
5	Supplying & fixing in position Aluminium channels framing for slidding windows & ventilators of alcop made with 5mm thick tinted glass glazing (Belgium) & Aluminium fly screen i/c handles stoppers & locking arrangement etc complete (b) Deluxe model (Bronze) (S/I No.84, Ch/18, P/83)				
	Ground Floor		579.50		
	Total	P.Sft	579.50	2,386.73	1,383,110.04

  
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Khairpur Mirs

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Contractor

ESTABLISHMENT OF CENTRE FOR INCUBATION & ENTERPRISE AT THE BBSU OF TECHNOLOGY &  
SKILLS DEVELOPMENT, KHAIRPUR

Bill of Quantities

S#	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
6	Supplying & fixing in position Aluminium channels framing for hinged doors or made with 5mm thick tinted glass glazing (belgium) and Alpha (Japan) locks i/c handles, stopper etc (Deluxe model Bronze). (S/I No.83, Ch/18, P/83)	P.Sft	160.00	1,656.14	264,982.40
7	Providing and laying HALA or pattern tiles glazed on floor or wall facing in required colour and pattern of STILE specification jointed in white cement and pigment over a base of 1:2 grey cement mortar 3/4" thick including washing and filling of joints with slurry of white cement and pigment in desired shape with finishing, cleaning and cost of wax polish etc. complete including cutting tiles to proper profile. (S/I No.55, Ch/8, P/48)	P.Sft	399.17	408.89	163,216.62
8	Mosaic chequer tiles of 11" x 8" x 1- 1/4" of approved shade laid flat in 1:2 grey cement mortar over a bed of 3/4" thick grey cement mortar. 1:2. (S/I No.52, Ch/8, P/48)	P.Sft	142.32	309.10	43,991.11
9	Laying Verona marble flooring Size 24"x12"x1"/12"x12"x1" fine dressed on the surface without winding set in lime mortar 1:2 including rubbing and polishing of the joints. (S/I No.28-iii(b), Ch/8, P/46)	P.Sft	446.09	381.88	170,352.09
10	Providing & fixing cement paving blocks flooring having size of 197 x 97 x 60 (mm) of city /quddra / cobble shape with natural colours , 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. (S/I No.67, Ch/8, P/50)	P.Sft	5080.00	197.48	1,003,198.40
Total of Part-II					4,543,881.07
Total of (Part-I + II)					49,696,581.76
<b>B</b>	<b>NON SCHEDULE ITEMS</b>				
	Providing & fixing false ceiling of gypsum coated with suitable material in panels of required design and size including frame work of Aluminum T-section hanged with nail galvanized wire to ceiling etc complete and T&P etc. complete in all respects as per site requirement and instructions of EI.	P.Sft	940.00		
Total Amount of Non Scheduled Items					

  
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 Contractor

ESTABLISHMENT OF CENTER FOR INCUBATION & ENTERPRISE AT  
THE BBSU OF TECHNOLOGY & SKILL DEVELOPMENT, KHAIRPUR

Bill of Quantities (BoQs)  
(ELECTRIFICATION WORKS)

S.NO	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
	Part-A Scheduled Items				
	Part-I				
1	Providing & laying (Main or Sub Main) PVC insulated with size 3-3/029 copper conductor in ¾" dia PVC conduit recessed in the wall or column as required. (SI No. 22 PG No.230)	Per Rft.	710	519.35	368,738.50
2	Providing & laying (MAIN or SUB MAIN) PVC insulated with size 3-7/029 copper conductor in ¾" Dia PVC conduit recessed in the wall or column as required (SI No.24 PG No.230)	Per Rft.	1150	684.64	787,336.00
3	Providing & laying (MAIN or SUB MAIN) PVC insulated with size 3-7/044 (6mm2) copper conductor in 1" Dia PVC conduit recessed in the wall or column as required. (SI No.26 PG No.230)	Per Rft.	600	1,370.97	822,582.00
4	Providing & laying (MAIN or SUB MAIN) PVC insulated with size 4-7/029 copper conductor in 1" Dia PVC conduit recessed in the wall or column as required (SI No. 38 PG No.231)	Per Rft	15	927.64	13,914.60
5	Providing & laying (MAIN or SUB MAIN) PVC insulated with size 4-7/044(6mm2) copper conductor in 1½" Dia PVC conduit recessed in the wall or column as required. (SI No.40 PG No.231)	Per Rft	110	1,829.39	201,232.90
6	Providing & laying (MAIN or SUB MAIN) PVC insulated with size 4-7/052(10mm2) copper conductor in 1½" Dia PVC conduit recessed in the wall or column as required. (SI No.41 PG No.231)	Per Rft	110	2,851.67	313,683.70
7	Providing & laying (MAIN or SUB MAIN) PVC Insulated & PVC sheeted with 4 core copper conductor 600/1000 volts size 50mm2 (SI No.83 PG No.234)	Per Rft	200	4,876.85	975,370.00
8	Wiring for light or fan point with 3/029 PVC insulated wire in 20mm (¾") PVC conduit recessed in the wall or column as required. (SI No.102 PG No.236)	Per Point	86	6,573.50	565,321.00
	Total of Part-I				4,048,178.70
	Part-II				
9	Providing & fixing three pin 10/15amp plug & socket flush type. (SI No.190 PG No.244)	Per No.	1	677.36	677.36
11	Providing & fixing earthing set (1'x1'x1/4") copper plet i/c excavation of rock or earth 12' depth or if water comes out i/c salt/choracale mixed i/c with G.I pipe with nuts & bolts testing cc topping etc complete. (SI No.252 PG No.249)	Per No.	3	30,191.00	90,573.00
12	Providing & fixing circuit breaker 15,20,30, 40,50,60,75 & 100amp TP (XS-100NS) on prepared board as required. (SI No.183 PG No.244)	Per No.	6	28,736.16	172,416.96
13	Providing & fixing circuit breaker 6, 10 , 15, 20,30,40,50&63 SP (TB-5S)on prepared board as required.(SI No.178 PG No.243)	Per No.	42	2,504.12	105,173.04
14	Providing & fixing Current Transformer rating 100/5amp (round) RLC-30 as required & as per instruction of EI (SI No. 225, PG No. 247)	Per No.	6	6,295.56	37,773.36
15	Providing & fixing ammeters size 96/96mm Direct 15A, 30A, 50A, 60A & 100A as required & as per instruction of EI (SI No. 239, PG No. 248)	Per No.	6	4,186.50	25,119.00
16	P/F Volt Meter size 96/96mm 500 volt as required and as per instruction of E.I. (SI No. 240, PG No. 248)	Per No.	6	4,186.50	25,119.00
17	Providing & fixing A.C Electric Wall Bracket fan 18" (good quality) (S.I.No.196, P-244)	Per No.	1	11,606.88	11,606.88
	Total of Part-II				468,458.60
				Total of Scheduled Items	4,516,637.30

  
**Director ( Works & Services)**  
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Khairpur Mirs

Contractor

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ESTABLISHMENT OF CENTER FOR INCUBATION & ENTERPRISE AT  
THE BBSU OF TECHNOLOGY & SKILL DEVELOPMENT, KHAIRPUR

Bill of Quantities (BoQs)  
(ELECTRIFICATION WORKS)

S.No	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
	Part-B Non Scheduled Items				
1	Wiring of light point to light point with 3x3/.029 PVC PVC insulated wire in 20mm 3/4" PVC conduit recessed in the wall or ceiling or column as required and T&P etc. complete in all respects as per site requirement and instructions of EI.	Per Point	42		
2	Providing & fixing of 1 Gang Double Pole (DP) Switch with Indicator lamp, 20 Ampere, suitable for 220V AC supply, complete with modular switch, flush type plate, mounting back box, required wiring connections and all necessary accessories and T&P etc. complete in all respects as per site requirement and instructions of EI.	Per No.	9		
3	Supply & Installation of Floor Box size 12" x 12" x 2" with powder coated galvanized steel sheet 1/16" with hinged cover, complete with knockouts for conduit entry, internal mounting plate for power/data outlets, earthing provision, and all fixing accessories. The floor box shall be suitable for installation in concrete/screed floor and T&P etc. complete in all respects as per site requirement and instructions of EI.	Per No.	2		
4	Supply & installation of flush type gang switche of 5-10 A rating including 16 SWG sheet steel back box recessed in wall (with earth terminal and 2 coats of antirust paint), including face plate and T&P etc. complete in all respects as per site requirement and instructions of EI.				
	i) One gang - 1 Way Switch	Per No.	10		
	ii) Two gang - 1 Way Switch	Per No.	1		
	iii) Three gang -1 Way Switch	Per No.	1		
	iv) Four gang - 1 Way Switch	Per No.	8		
	v) Six gang - 1 Way Switch	Per No.	26		
5	Providing & fixing double universal switch i/c MS back box with two coats of antirust paints and T&P etc. complete in all respects as per site requirement and instructions of EI.	Per No.	35		
7	Providing & fixing PVC face plate with having single i/o (input/output) ports i/c MS back box with two coats of antirust paints and T&P etc. complete in all respects as per site requirement and instructions of EI.	Per No.	40		
8	Supplying & installation of antirusting powder coated 1.5mm MS back box for three pin power plug as required and T&P etc. complete in all respects as per site requirement and instructions of EI.	Per No.	1		
9	Supply & Installation of electric fixtures (phillips/fast or equivalent) complete with required lamps, starters, holders, electronic ballast, chok etc including hangers, supports & all mounting / fixing accessories, and T&P etc. complete in all respects as per site requirement and instructions of EI.				
	a) 12 watt LED surface Downlight	Per No.	4		
	b) 18 watt LED surface Downlight	Per No.	63		
	c) LED Panel 2X2 ft. 40w	Per No.	21		
	d) LED 40 watt 4ft Batten Light	Per No.	1		
	e) LED 18 watt Wall light	Per No.	1		
	f) LED Flood Light 50w	Per No.	10		
10	Providing & fixing exhaust fan 12" dia with copper winding i/c required fixing material and T&P etc. complete in all respects as per site requirement and instructions of EI.	Per No.	6		
11	Providing & fixing 2'x2' false ceiling fan with copper winding having blade size of ~ 18" with air flow grille, remote control i/c required fixing material and T&P etc. complete in all respects as per site requirement and instructions of EI.	Per No.	10		

ESTABLISHMENT OF CENTER FOR INCUBATION & ENTERPRISE AT  
THE BBSU OF TECHNOLOGY & SKILL DEVELOPMENT, KHAIRPUR

Bill of Quantities (BoQs)  
(ELECTRIFICATION WORKS)

S.NO	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
12	Supply, Installation, Testing & Commissioning of Distribution Box after installation of electric fixtures as per specifications and drawings fabricated of 16 SWG steel sheet, recessed / surface mounted as per site requirement, painting after applying redoxide, with powder coated finish, complete with hinged door & a separate clamped/pins doors, lock, gasket, removable gland plate, copper made neutral & earth bar of size ~12"x2"x1/4", DIN rail, internal wiring, busbar supports, cable termination lugs, ferrules, identification labels, and all necessary mounting accessories, RYB indicating lamps. and T&P etc. complete in all respects as per site requirement and instructions of EL.	Per Sft	24		
13	Providing & Fixing AC and DC dual circuit ceiling fan (Khurshid made or equivalent) i/c making holes if required, required material, and ceiling steel hook of not less than 3/8" dia having PVC box and T&P etc. complete in all respects as per site requirement and instructions of EL.	Per No.	13		
14	Providing, laying & fixing copper made earthing wire 1/8" dia in pre-laid pipe i/c lugs, shrouds and T&P etc. complete in all respects as per site requirement and instructions of EL.	Per Rft	30		
Total of Non-Scheduled Items					

  
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ESTABLISHMENT OF CENTER FOR INCUBATION & ENTERPRISE AT  
THE BBSU OF TECHNOLOGY & SKILL DEVELOPMENT, KHAIRPUR

Bill of Quantities (BoQs)

S.NO	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
	Part-C Energization (NSI)				
1	P/F, testing and commissioning of 200KVA pole mounted transformer i/c all required fixing accessories i.e. nuts, bolts, insulated bushes and filled with required oil etc. complete in all respects as per site requirement and as per WAPDA & SEPCO specifications and T&P etc. complete in all respects as per site requirement and instructions of EI.	P.No	1		
2	P/F of 45' HT structure pole of galvanized steel i/c all fixing material i.e. grounding rod, excavation / refilling of earth grouting with concrete foundation 1:2:4 etc complete in all respects as per site requirement and as per WAPDA & SEPCO specifications and T&P etc. complete in all respects as per site requirement and instructions of EI.	P.No	1		
3	P/F of 35' HT structure pole of galvanized steel i/c all fixing material i.e. grounding rod, excavation / refilling of earth grouting with concrete foundation 1:2:4 etc complete in all respects as per site requirement and as per WAPDA & SEPCO specifications and T&P etc. complete in all respects as per site requirement and instructions of EI.	P.No	1		
4	P/F of ACSR dog conductor for H.T supply i/c insulators, nuts, bolts, P-G clamps etc. complete in all respects as per site requirement and as per WAPDA & SEPCO specifications and T&P etc. complete in all respects as per site requirement and instructions of EI.	P.Mtr	200		
5	P/F of D-fitting including P-G clamps, required insulators, fuse link and cable from H.T line to fuse link and fuse link to transformer bushes i/c nuts, bolts etc complete in all respects as per WAPDA & SEPCO and T&P etc. complete in all respects as per site requirement and instructions of EI.	P.No	1		
6	Supplying & installation of fixtures i/c making holes as required and allied material as per WAPDA & SEPCO specifications & standards and T&P etc. complete in all respects as per site requirement and instructions of EI.				
	a) Stay wire	P.No	2		
	b) Steel cross arms	P.No	6		
	c) Base plates/cross arms for transformer	P.No	2		
	d) Dead end clamps	P.No	6		
	e) Pin insulator 11KVA	P.No	3		
	f) Disc insulator 11 KV	P.No	6		
	g) Eye notes	P.No	6		
				<b>Total Cost</b>	

  
 Director (Works & Services)  
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 University of Technology and Skill Development  
 Khairpur Mirs

Contractor

Name of Work: Establishment of Centre for incubation & Enterprise at the BBSU of Technology & Skills Development, Khairpur					
Bill of Quantities (BoOs)					
Water Supply & Sanitary Fittings					
S.NO	DESCRIPTION	UNIT	QUANTI	RATE	AMOU
<b>Part-A Scheduled Items</b>					
1	Providing and fixing squatting type white glazed earthen ware W.C. pan with front flush inlet & complete with including the cost of flushing cistern with internal fitting and flush pipe with bend and making requisite number of holes in walls, plinth & floor for pipe connection & making good in cement concrete 1:2:4. (Foreign Quality)(23 inch) earthen ware trap and plastic thumble. CHAP-01 pg 184 S.I.No.2A(ii).	P.No	3	13,655.06	40,965.18
2	Providing and fixing European type white glazed earthen ware wash down W.C. pan complete with & including the cost of white / black plastic seat ( Best quality ) and lid with C.P. brass hinges best quality and buffers 3 gallons white glazed earthen ware low level flushing cistern with siphon fitting 1-1/2 " dia white porcelain enameled flush bend dia and making requisite number of holes in walls , plinth & floor for pipe connection & making good in cement concrete 1:2:4 (Foreign quality) . ( ICL or equivalent ). CHAP NO 1 pg 186 S.I.NO.5	P.No	3	44,244.72	132,734.16
3	Providing and fixing 24"x18" lavatory basin in white glazed earthen ware complete with & including the cost of W.I. or C.I. cantilever bracket 6 inches built into wall, painted white in two coats after a primary coat of red lead paint, a pair of 1/2" dia chrome plated pillar taps, 1-1/2" rubber plug & chrome plated brass chain 1-1/4" dia malleable iron or C.P. brass traps malleable iron or brass unions and making requisite number of holes in walls, plinth & floor for pipe connection & making good in cement concrete 1:2:4 (Foreign or Equivalent). CHAP NO 1 pg 187 S.I.NO.8	P.No	3	24,094.98	72,284.94
4	Add extra for providing & fixing of earth ware pedestal white or coloured Glazed (Foreign or equivalent). CHAP NO 1 pg 187 S.I.NO.9	P.No	3	3,675.07	11,025.21
5	Providing and fixing steel sinks stainless local bt make complete with cast iron or wrought iron LINA ALVH brackets 6 inches built into wall, 1-1/2" rubber plug and chrome plated brass chain 1-1/2" C.P. brass waste wvith 1 1/2" P.V.C. waste pipe & making requisite number of holes in walls, plinth & floor for pipe connection & making good in cement concrete 1:2:4. (a) Steel Sink stainless size 40"x20" local make (standard pattern). Chap-1 pg 188 S.I.No. 19(a)	P.No	1	12,555.27	12,555.27
6	Providing and fixing in position nylon connection complete with 1/2" dia brass stop cock with pair of brass nuts and lining jointed to nylon connection. CHAP NO 1 pg 189 S.I.NO.23	Each	10	637.65	6,376.50
7	Providing and fixing towel rail 30"x3/4" round or with brackets screws nuts & cleats etc.complete (Suparear quality). CHAP NO 2 pg 190 S.I.No.11b	Each	3	3,285.07	9,855.21
8	Providing and fixing C.P. brass toilet paper brackets complete (similar) to twyford design number 1108 (Suparear Quality).CHAP NO 2 pg 190 S.I.No	Each	5	1,170.00	5,850.00
9	Providing & fixing 24"x18" bavelled edge mirror of Belgium glass completed with 1/8" thick hard and C.P. screws fixed to wooden cleats (Standard pattern). CHAP NO 2 pg 190 S.I.No.3a	Each	3	2,106.00	6,318.00
10	Supplying & fixing soap tray of superior quality and design with fine finishing with C.P. screws etc. complete. CHAP NO 2 pg 190 S.I.No.5	Each	3	585.00	1,755.00
11	Providing G.I. pipes specials an clamps etc. including fixing cutting and fittings complete with and including the cost of breaking through walls and roof making good etc. painting 2 coats after cleaning the pipe etc. with white zinc paint with pigment to match the colour of the building and testing with water to a pressure bead of 200 feet and handling. CHAP NO 4 pg 193 S.I.No.1				
i	1/2" dia G.I Pipe I/C all fitting Etc.	P.Rft	50	275.55	13,777.50
ii	3/4" dia G.I Pipe I/C all fitting Etc.	P.Rft	50	334.05	16,702.50
iii	1" dia G.I Pipe I/C all fitting Etc.	P.Rft	50	503.70	25,185.00
iv	1-1/4" dia G.I Pipe I/C all fitting Etc.	P.Rft	50	639.42	31,971.00
12	Providing UPVC. Pipes specials and clamps etc. including fixing cutting and fittings complete with and including the cost of breaking through walls and roof making good etc. with pigment to match the colour of the building and testing with water to a pressure bead of 200 feet and handling. CHAP NO 4 pg 193 S.I.No.2				
i	1/2" dia UPVC Pipe (CPVC SCH-40)	P.Rft	30	159.30	4,779.00
ii	3/4" dia UPVC Pipe (CPVC SCH-40)	P.Rft	30	199.83	5,994.90
iii	1" dia UPVC Pipe (CPVC SCH-40)	P.Rft	530	272.35	144,345.50
iv	2" dia UPVC Pipe (CPVC SCH-40)	P.Rft	30	836.36	25,090.80
v	4" dia UPVC Pipe (SDR SERIES)	P.Rft	30	465.53	13,965.90

Name of Work: Establishment of Centre for incubation & Enterprise at the BBSU of Technology & Skills Development, Khairpur					
Bill of Quantities (BoQs)					
Water Supply & Sanitary Fittings					
S.NO	DESCRIPTION	UNIT	QUANTI	RATE	AMOU
13	P/F female thread adopter CHAP NO 4 pg 193 S.I.No 9				
a)	1/2" (CPVC SCH-40) Sanitary Tape/Sofaida I/C all Labour.	Each	10	629.46	6,294.60
b)	3/4" (CPVC SCH-40) Sanitary Tape/Sofaida I/C all Labour.	Each	4	657.54	2,630.16
c)	1" (CPVC SCH-40) Sanitary Tape/Sofaida I/C all Labour.	Each	2	678.60	1,357.20
14	P/F Tee 4" (CPVC SCH-40) Sanitary Tape/Sofaida I/C all Labour. CHAP NO 4 pg 193 S.I.No 10(d)	Each	10	1,106.35	11,063.50
15	Concealed C.P. fitting of superior quality for tiles bathroom. S/fixing concealed stop cock of superior best quality with C.P. head 1/2" dia. Chap-6 pg 198 S.I.No. 11(B)	Each	13	1,848.60	24,031.80
16	Supplying & Fixing in Position C.P bib (b) 1/2" dia C,p Bib Cock (standard pattern) Chap-6 pg 197 S.I.No. 2(b)	Each	3	1,134.90	3,404.70
17	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				
(i)	50 mm (2" dia.)	Rft	20	194.71	3,894.20
(ii)	80mm (3" dia.)	Rft	360	405.35	145,926.00
(iii)	100 mm (4" dia.)	Rft	50	660.78	33,039.00
(iv)	150mm (6" dia.)	Rft	250	1,391.07	347,767.50
18	MANHOLE				
	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.). Chapter -II Pg 134 S.I.NO O-(a)				
a)	4" to 12" dia 2'x2'x3'-6"	Each	7	55,584.18	389,089.26
19	Providing and Fixing Handle Value Chapter -6 Pg 197 S.I.NO 5				
	c) 1" dia	Each	2	1,907.10	3,814.20
	d) 1-1/4" dia	Each	2	2,082.60	4,165.20
20	Supplying & fixing long Bib -cock of superior quality with C.Phead 1/2" dia Handle Value Chapter -6 Pg 198 S.I.NO 13(a)	Each	3	2,316.60	6,949.80
21	Supplying & fixing swan type pillar cock of superior quality with Single C.P. head 1/2" dia Handle Value Chapter -6 Pg 199 S.I.NO 16(a)	Each	4	1,029.60	4,118.40
22	Supplying & fixing C.P muslim shower with double bib cock and ring pipe etc. complete Chapter -6 Pg 199 S.I.NO 19(A)	Each	3	5,475.60	16,426.80
23	Supply & fixing bath room accessories set (7 pieces) i/c towel rod, Brush holder, soap tray, shelf of approved design including cost of screw, nuts, etc. complete. (Master Brand) Chapter -6 Pg 199 S.I.NO 23	Each	1	14,320.80	14,320.80
24	Supplying & fixing Fiber glass tank of approved quality an design and wall thichness as specified including cost of nuts, bolts and fixing in plat form of cement concrete 1:3:6 and making connectin for inlet, outlet and over flow pipes etc. complete (D) 1000 gallons tank with wall thickness 5mm Chapter-8 Pg 201 S.I.NO 1(D)	P.No.	2	157,807.46	315,614.92
25	Boring for tube well in all water bearing soils from ground level upto 100 ft. or 30.5 meter depth i/c sinking and with drawing of casing pipe. b) 100mm (4" dia) Chapter-II Pg 129 S.I.NO 1(b)	P.Rft	60	1,621.28	97,276.80
Total of Scheduled Items					2,012,716.41

  
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 Khairpur Mirs

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Name of Work: Establishment of Centre for incubation & Enterprise at the BBSU of Technology & Skills Development, Khairpur					
Bill of Quantities (BoOs)					
Water Supply & Sanitary Fittings					
S.NO	DESCRIPTION	UNIT	QUANTI	RATE	AMOU
	Part-B Non Scheduled Items				
1	P/F 1-1/4" dia PVC blind water pipe i/c fitting/fixtures/supports and T&P required as per site requirement etc complete in all respects and as per instructions of EI.	P.Rft	45		
2	P/F 1-1/4" dia PVC water pipe i/c fitting/fixtures/supports, making required holes at 3" center to center, raping nylon double cloth, closing with wooden gutka and T&P required as per site requirement etc complete in all respects and as per instructions of EI.	P.Rft	15		
3	P/F 1 HP electric motor coper wired with jet pump (deep well injector) having suction and delivery arrangements i/c all required valves, check valves, fittings, sockets, elbows, electric connection with fitting,making holes in masonry/ PCC/ RCC, commissioning of water, making 2'x2'x2' PCC (1:2:4) foundation having covered with 3'x3'x3' steel grill with locking arrangement and with G.I sheet covered (i/c one coat of redoxide and two coats of oil paint) and T&P required as per site requirement etc complete in all respects and as per instructions of EI.	P.No	1		
4	Providing & fixing of POLYPROPYLENE RANDOM COPOLYMER (PPRC) pipe (made of Dadex /Popular/ Beta / BBJ or equivalent) with specified pressure rating PN (PRESSURE NOMINAL)and conforming to DIN 8077-8078 code i/c cost of solvent, specials, making jharries complete in all respect as approved and directed by Engineer Incharge. (Internal Diameters mentioned).				
	PN-20 PIPE				
a)	3/4" dia (25mm)	P.Rft	100		
b)	1" dia (32mm)	P.Rft	200		
c)	1 1/2" dia (50mm)	P.Rft	30		
5	Providing and fixing of U.PVC floor Trap with multiple inlets and 3" dia outlet with S.S grating the approved design as per specifications & engineers approval.	Each	9		
6	Supplying and fixing uPVC Vent Cowel 3 inch dia complete in all respects and T&P required as per site requirement etc complete in all respects and as per instructions of EI.	Each	3		
7	Supply and fix uPVC Vent Cowel 4 inch dia complete in all respects and T&P required as per site requirement etc complete in all respects and as per instructions of EI.	Each	1		
Total of Non Scheduled Items					

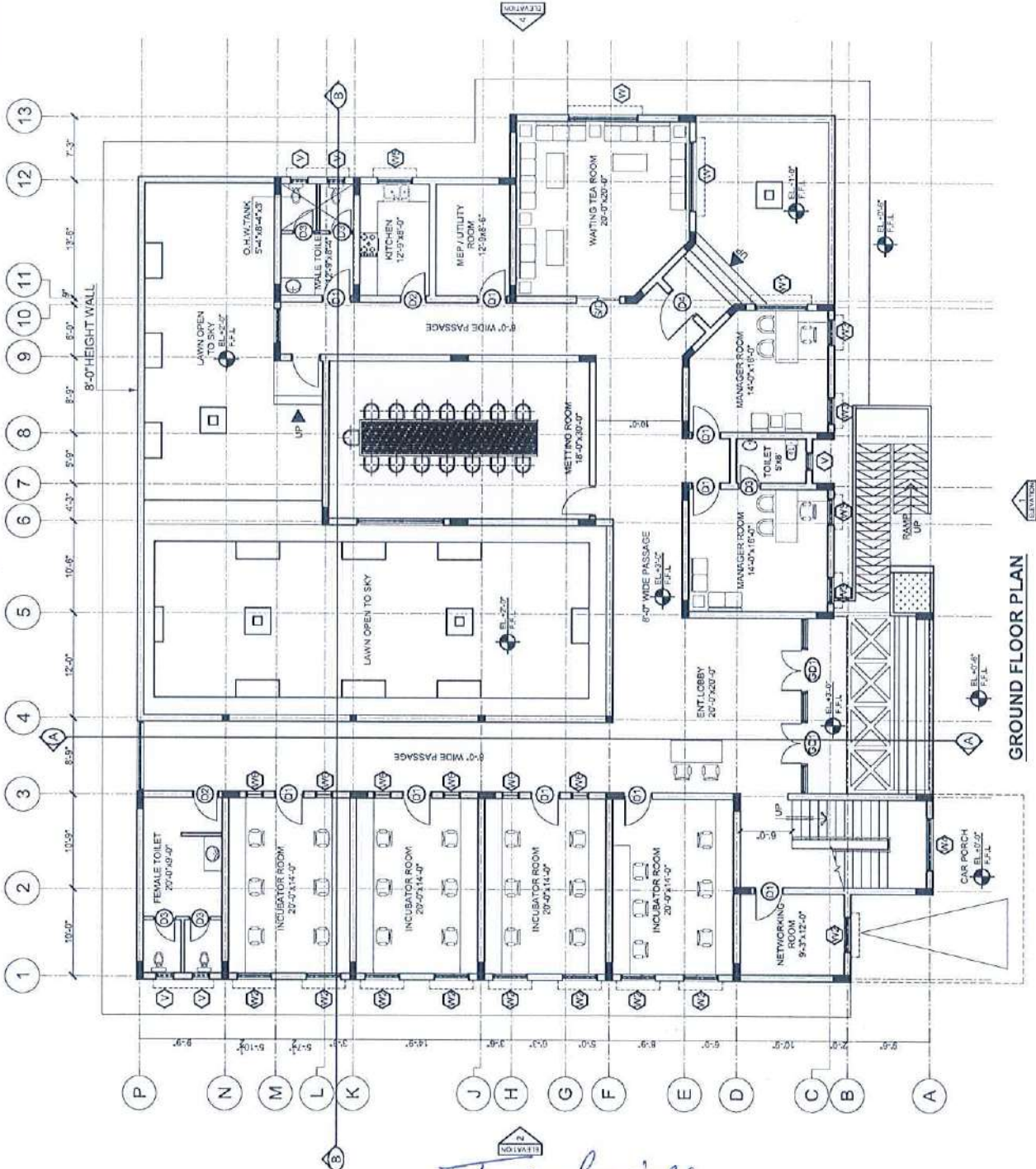
  
 Director ( Works & Services)  
 The Benazir Bhutto Shaheed  
 University of Technology and skill Development  
 Khairpur Mirs

Contractor

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# Volume-IV

## Tender Drawings



GROUND FLOOR PLAN

*Contracts*

*Tender drawings*

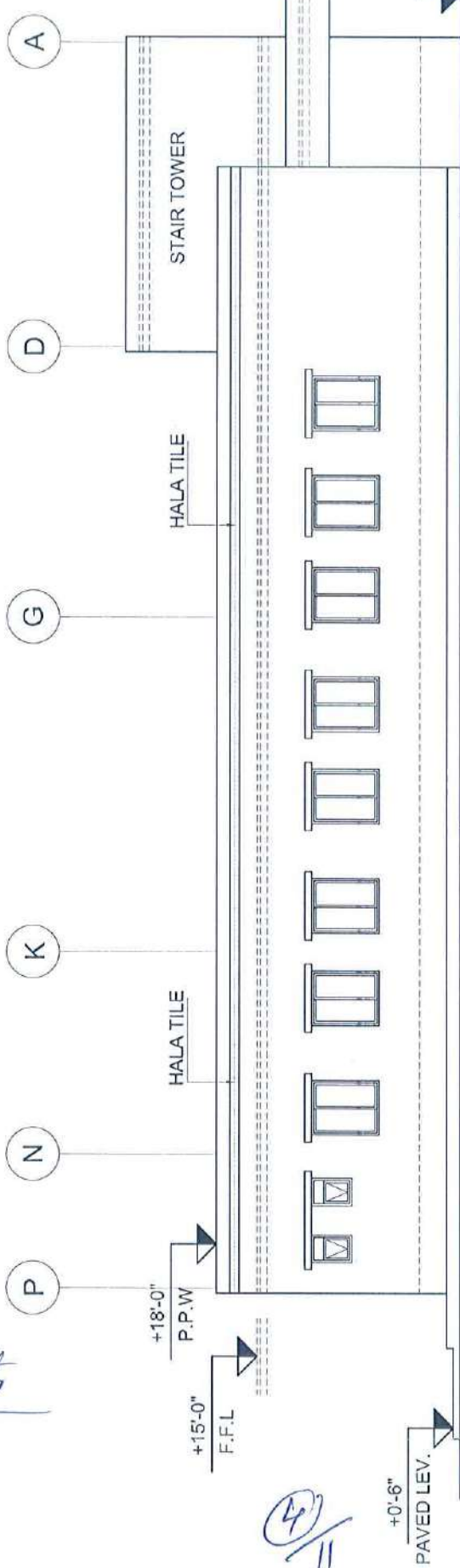
*2/11*

**Director (Works & Services)**  
**The Benazir Bhutto Shaheed**  
**University of Technology and Skill Development**  
**Khairpur Mirs**

CONSULTANT	<b>atif nazar (pvt.) ltd.</b> PROJECT MANAGERS, PLANNING ARCHITECTS & CONSULTING ENGINEERS D-11/A, BLOCK-NORTH, GALI-WAN-LABIAL, MARICHA, F-7/A, KARORI-7, KHARPUR		CLIENT <b>THE BENAZIR BHUTTO SHAHEED,</b> <b>UNIVERSITY OF TECHNOLOGY &amp; SKILL</b> <b>DEVELOPMENT KHARPUR MIRS.</b> <b>(BBSUTSD)</b>	PROJECT <b>INCUBATION CENTRE</b> <b>FUTURE EXPANSION</b>	RETURN NO. DATE DESCRIPTION REV. BY	TITLE <b>INCUBATOR BLOCK</b> <b>GROUND FLOOR PLAN</b>	DESIGN BY NASIR	DRAWN BY AR. HUMTAZ JILJANI	CHECKED/DOR/COORDINATED <b>JOK</b>	NTS DRAWING NO. LOK/IL/AR/201 JOB NO. P-1510 DATE FEB. 2020 REVISION SHEET SIZE A2



*Contractor*



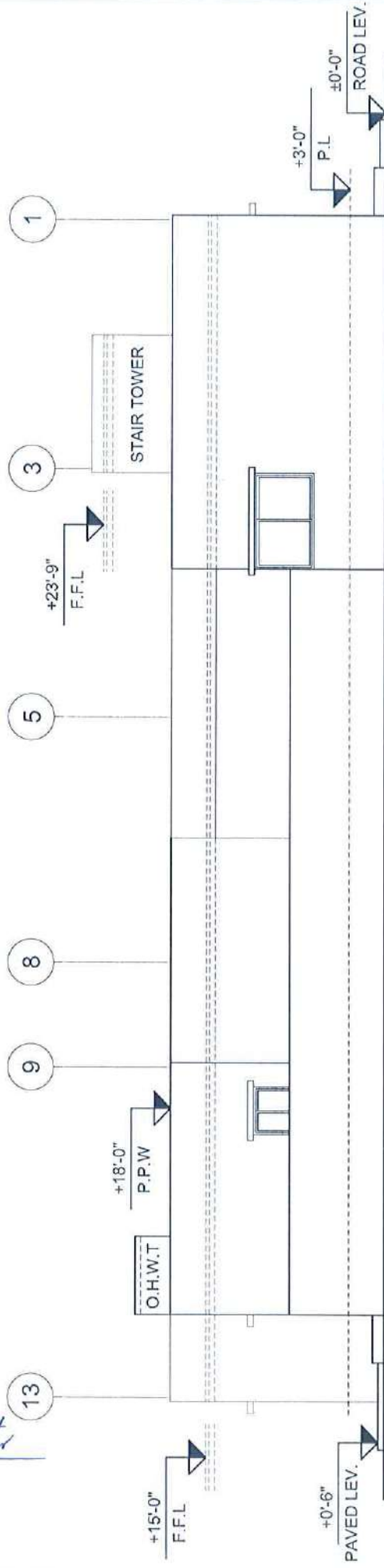
**ELEVATION -02**

*Tender Drawings*

Director (Works & Services)  
The Benazir Bhutto Shaheed  
University of Technology and Skill Development  
Khairpur Mirs.

CONSULTANT	THE BENAZIR BHUTTO SHAHEED, UNIVERSITY OF TECHNOLOGY & SKILL DEVELOPMENT KHAIROPUR MIRSA, (BBSUTSD)		PROJECT		INCUBATION CENTRE FUTURE EXPANSION		TITLE		DESIGN BY		CHECKED/COORDINATED		NTS	
	atif nazir (pvt.) ltd. <small>PROJ. MGR. / ARCHITECTS / ENGINEERS D-114, BLOCK-10/17, GULSHAN-E-GHANI, KARACHI, P.M. DISTRICT, SINDH</small>		NO. DATE DESCRIPTION REV. BY		NO. DATE DESCRIPTION REV. BY		INCUBATION BLOCK ELEVATION -02 TENDER DRAWING		NASIR		AR. MUHAMMAD JILLANI		SCALE DRAWING NO. LOK/NA/AR-002 JOB NO. P-1510 JOB DATE FEB. 2025 REVISION SHEET SIZE A2	

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**ELEVATION -03**

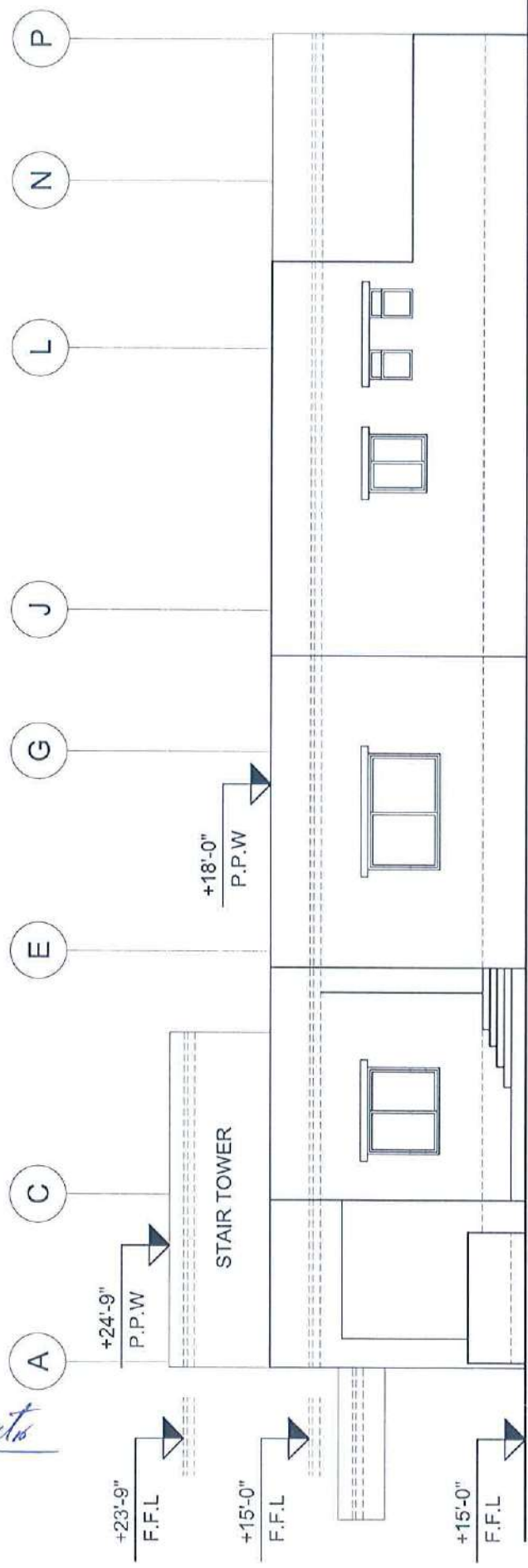
*Tender Drawings*

Director (Works & Services)  
**The Benazir Bhutto Shaheed**  
 University of Technology and Skill Development  
 Khairpur Mirs

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CONSULTANT	CLIENT	PROJECT	TITLE	DESIGN BY	CHECKED/COORDINATED	NTS
				NASIR	AR, MUMTAZ JILLANI	LOCK IN AR-303
atf nazar (pvt.) ltd. PLOT NO. 10/17, GULSHAN-e-GUL, KHARPUR MIRS	THE BENAZIR BHUTTO SHAHEED, UNIVERSITY OF TECHNOLOGY & SKILL DEVELOPMENT KHARPUR MIRS, (BBSUTSD)	INCUBATION CENTRE FUTURE EXPANSION	INCUBATION BLOCK ELEVATION -03 TENDER DRAWING	JUK	JOB NO. PA-1510	DATE
						FEB. 2025
				REVISION	REVISION	REVISION
				NO.	DATE	DESCRIPTION
				REV. BY	REV. BY	REV. BY
				SHEET SIZE	A2	

*Contracts*



**ELEVATION -04**

*Tender Drawings*

Director ( Works & Services )  
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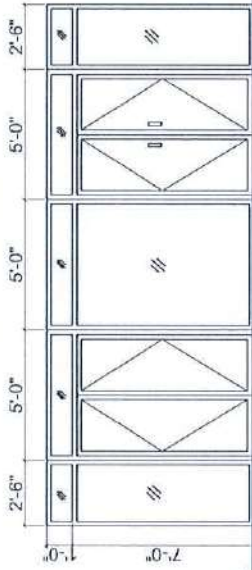
6/11

CONSULTANT <b>atif nazar (pvt.) ltd.</b> D-11A, BLOCK-NORTH, GULSHAN-APARTMENT, P.M.A. MARKS-II, JAMSHEDPUR	CLIENT <b>THE BENAZIR BHUTTO SHAHEED, UNIVERSITY OF TECHNOLOGY &amp; SKILL DEVELOPMENT KHAIRPUR MIRS, (BBSUTSD)</b>	PROJECT <b>INCUBATION CENTRE FUTURE EXPANSION</b>	REVISION NO. DATE DESCRIPTION REV. BY	TITLE <b>INCUBATION BLOCK ELEVATION-03 TENDER DRAWING</b>	DESIGN BY	CHECKED/OCCUPATIONED	SCALE DRAWING NO. DATE NO. DATE JOK	NTS BY DATE BY DATE
					NASIR	AP, MUHAMMAD JILANI	REVISION	REVISION



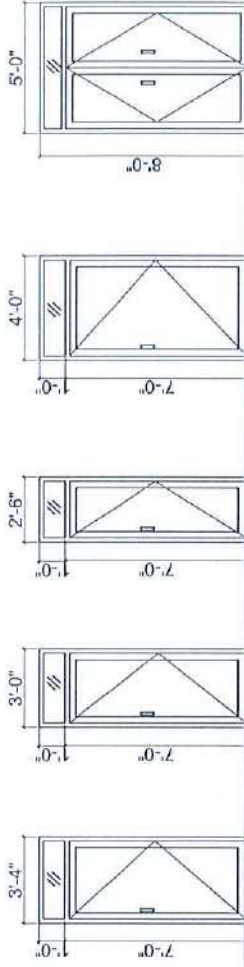


ALUMINIUM FRAME WITH GLASS



F.F.L

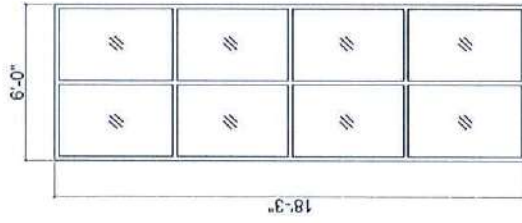
WOODEN FLUSH DOOR 1-1/2" THICK WITH GI FRAME 8'-0"



*Tender Drawings*

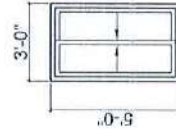
**Director ( Works & Services )  
The Benazir Bhutto Shaheed  
University of Technology and skill Development  
Khairpur Mirs**

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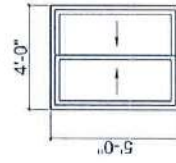
STAIR CASE

W4



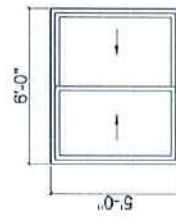
KITCHEN

W5

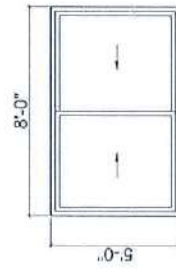


BATH

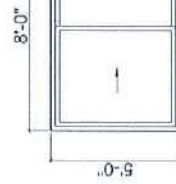
W6



W3



W2



W1

F.F.L

ALUMINIUM WINDOWS WITH M/S GRILL

CONSULTANT <b>atif nazar (pvt.) ltd.</b> PROJECT MANAGERS PLANNERS ARCHITECTS ENGINEERS D-114, BLOCK 10/11, GULSHAN-E-JAMALI, KARACHI - P.M. DISTRICT - SINDH	CLIENT <b>THE BENAZIR BHUTTO SHAHEED, UNIVERSITY OF TECHNOLOGY &amp; SKILL DEVELOPMENT KHAIROPUR MIRS, (BBSUTSD)</b>	PROJECT <b>INCUBATION CENTRE FUTURE EXPANSION</b>	TITLE INCUBATOR BLOCK DOORS&WINDOWS SCHEDULE	DESIGN BY NASIR	CHECKED/COORDINATED AR. MUHAMMAD JILLANI	NTS SCALE DRAWING NO. LOK/NAR/201 JOB NO. P-1510 JOB DATE FEB.2026 REVISION SHEET SIZE A2
			NO. DATE DESCRIPTION REV BY	NO. DATE DESCRIPTION REV BY	NO. DATE DESCRIPTION REV BY	NO. DATE DESCRIPTION REV BY

**FLOOR:**

- F.1: PORCELAIN TILE FLOORING
- F.2: CERAMIC TILE UPTO 7'-0" HEIGHT
- F.3: GRANITE ON ALL TREADS, RISERS AND LANDING
- F.4: CHEQUERED TILES ON RAMP
- F.5: AVG. 75mm THICK C.C 1:2:4 ROOF SCREED LAID IN PANELS  
STAIR CASE SS RAILING

**SKIRTING:/DADO**

- S1. 4" PORCELAIN TILES
- S2. CERAMIC TILE DADO UP TO 7'-0" HEIGHT

**WALL:**

- W1. MATT FINISH ENAMEL PAINT
- W2. WEATHER RESISTANT PAINT

**CEILING:**

- C1. 3 COATS OF DISTEMPER PAINT
- C2. GYPSUM TILE

*Technical Drawing*



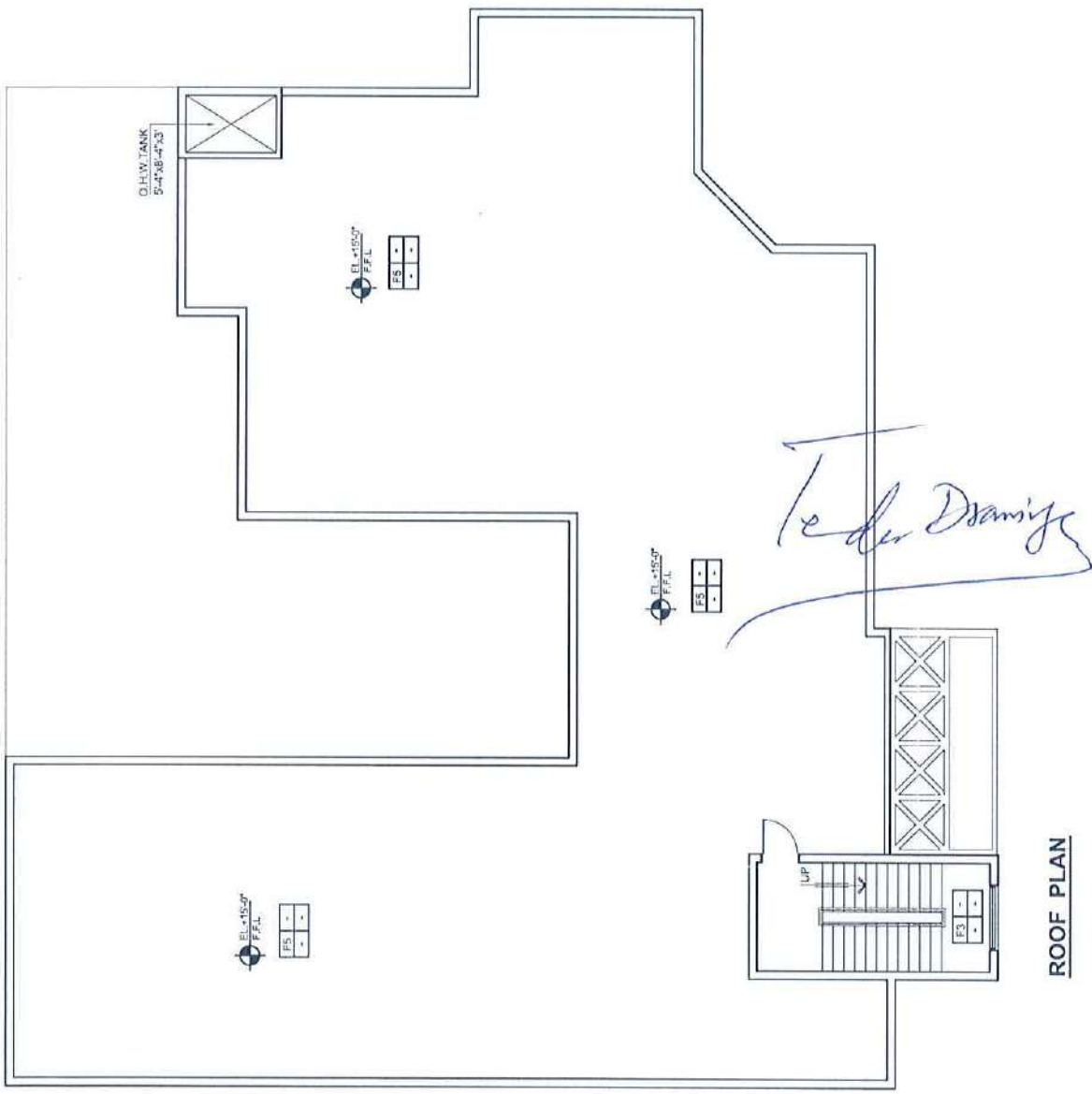
**GROUND FLOOR PLAN**

<b>CLIENT</b> THE BENAZIR BHUTTO SHAHEED, UNIVERSITY OF TECHNOLOGY & SKILL DEVELOPMENT KHAIROPUR MIRS. (BBSUTSD)	<b>PROJECT</b> INCUBATION CENTRE FUTURE EXPANSION	<b>REVISION</b> NO. DATE DESCRIPTION REV. BY	<b>TITLE</b> INCUBATION BLOCK GROUND FLOOR (FINISHES PLAN)	DESIGN BY	CHECKED/COORDINATED	SCALE DRAWING NO.	NTS LOOK IN AR 501
				NASIR	AR, MUMTAZ JILLANI	JOB NO. P.1510 DATE FEB.2025 REVISION	SHEET NO. JOK SHEET SIZE A2

**atif nazar (pvt.) ltd.**  
 PLANNERS, ARCHITECTS & CONSULTING ENGINEERS  
 D-114, BLOCK NO-17, GOLFING-GOAL, WAZIRABAD, PAF, ISLAMABAD - 44000

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 The Benazir Bhutto Shaheed  
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*[Signature]*  
**Director ( Works & Services )**  
**The Benazir Bhutto Shaheed**  
**University of Technology and Skill Development**  
 Khairpur Mirs

CONSULTANT <b>atif nazar (pvt.) ltd.</b> <small>PROJECT MANAGERS, PLANNERS, ARCHITECTS &amp; CONSULTING ENGINEERS</small> <small>D-11A, BLOCK-NOTI, GULSHAN-E-IBRAHIM, PH-1, HARBERT, CHAKRA</small>	CLIENT <b>THE BENAZIR BHUTTO SHAHEED,</b> <b>UNIVERSITY OF TECHNOLOGY &amp; SKILL</b> <b>DEVELOPMENT, KHAIRPUR MIRS.</b> <b>(BBSUTSD)</b>	PROJECT <b>INCUBATION CENTRE</b> <b>FUTURE EXPANSION</b>	REVISION NO. DATE DESCRIPTION REV. BY		TITLE INCUBATION BLOCK ROOF PLAN (FINISHES PLAN)		DESIGN BY NASIR	DRAWN BY AR. RAJANTAZ JILLANI	CHECKED/CORROBORATED <b>JOK</b>	SCALE DRAWING NO. P-1510 JOB NO. P-1510 DATE FEB 2026 REVISION SHEET SIZE A2
			NO. DATE DESCRIPTION REV. BY	NO. DATE DESCRIPTION REV. BY	NO. DATE DESCRIPTION REV. BY	NO. DATE DESCRIPTION REV. BY				