

# SUKKUR IBA UNIVERSITY

## Project

Construction of Hostel at IBA Public School Sukkur



Volume-I & II  
Conditions of Contract  
Bill of Quantities

CONSULTANT:



**NBK CONSULTANTS**  
Consulting Engineers, Architect &  
Planners

**Sukkur IBA University**  
Merit – Quality - Excellence



**Tender documents for Construction of  
Hostel Block at IBA Public School  
Tender # PROC/380**

**Sukkur IBA University**

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## TABLE OF CONTENTS

Description	Page No.
<b>INVITATION FOR BIDS</b>	<b>5</b>
Advertisement	6
<b>INSTRUCTIONS TO BIDDERS</b>	<b>7</b>
<b>A. General</b>	<b>8</b>
IB.1 Scope of Bid	8
IB.2 Source of Funds	8
IB.3 Eligible Bidders	8
IB.4 One Bid Per Bidder	8
IB.5 Cost of Bidding	8
IB.6 Site Visit	9
<b>B. Bidding Documents</b>	<b>9</b>
IB.7 Contents of Bidding Documents	9
IB.8 Clarification of Bidding Documents	9
IB.9 Amendment of Bidding Documents	10
<b>C. Preparation of Bids</b>	<b>10</b>
IB.10. Language of Bid	10
IB.11 Documents Accompanying the Bid	10
IB.12 Bid Prices	12
IB.13 Currencies of Bid and Payment	12
IB.14 Bid Validity	13
IB.15 Bid Security	13
IB.16 Alternate Proposals by Bidder	14
IB.17 Pre-Bid Meeting	14
IB.18 Format and Signing of Bid	15
<b>D. Submission of Bids</b>	<b>15</b>
IB.19 Sealing and Marking of Bids	15
IB.20 Deadline for Submission of Bids	16
IB.21 Late Bids	16
IB.22 Modification, Substitution and Withdrawal of Bids	17
<b>E. Bid Opening and Evaluation</b>	<b>17</b>
IB.23 Bid Opening	17



IB.24	Process to be Confidential	18
IB.25	Clarification of Bids	18
IB.26	Examination of Bids and Determination of Responsiveness	18
IB.27	Correction of Errors	19
IB.28	Evaluation and Comparison of Bids	19
<b>F.</b>	<b>Award of Contract</b>	<b>20</b>
IB.29	Award	20
IB.30	Employer's Right to Accept any Bid and to Reject any or all Bids	20
IB.31	Notification of Award	21
IB.32	Performance Security	21
IB.33	Signing of Contract Agreement	21
IB.34	General Performance of the Bidders	22
IB.35	Integrity Pact	22
IB.36	Instructions Not Part of Contract	22
	<b>BIDDING DATA</b>	<b>23</b>
	<b>FORM OF BID AND APPENDICES TO BID</b>	<b>32</b>
	<b>FORM OF BID</b>	<b>33</b>
Appendix-A to Bid	: Special Stipulations	35
Appendix-B to Bid	: Foreign Currency Requirements	36
Appendix-C to Bid	: Price Adjustment (Under Clause 70)	37
Appendix-D to Bid	: Bill of Quantities	38
Appendix-E to Bid	: Proposed Construction Schedule	39
Appendix-F to Bid	: Method of Performing the Work	40
Appendix-G to Bid	: List of Major Equipment – Related Items	41
Appendix-H to Bid	: Construction Camp and Housing Facilities	42
Appendix-I to Bid	: List of Subcontractors	43
Appendix-J to Bid	: Estimated Progress Payments	44
Appendix-K to Bid	: Organization Chart of the Supervisory Staff and Labour	45
Appendix-L to Bid	: Integrity Pact	46
	<b>FORMS</b>	<b>47</b>
	PERFORMANCE SECURITY	48
	CONTRACT AGREEMENT	50
	MOBILIZATION ADVANCE GUARANTEE	52





<b>PART-I: GENERAL CONDITIONS OF CONTRACT</b>	<b>54</b>
<b>PART-II: PARTICULAR CONDITIONS OF CONTRACT</b>	<b>129</b>
<b>BILL OF QUANTITIES</b>	
<b>SPECIFICATIONS</b>	
<b>DRAWINGS</b>	<b>150</b>



These Tender/Bid Documents are issued to M/s

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

\_\_\_\_\_ for bidding purpose for the  
**CONSTRUCTION OF HOSTEL AT IBA PUBLIC SCHOOL  
SUKKUR** as per Instructions to bidders, Conditions of Contract,  
Technical Specifications, Bill of Quantities, Drawings and Special  
Stipulations.

Dated:-



**INVITATION  
FOR  
BIDS**

(5)





**Sukkur IBA University**  
www.iba-suk.edu.pk

## NOTICE INVITING TENDER

### Tender # PROC/380

Sukkur IBA University invites sealed tenders on Composite Schedule of Rates (CSR) / Item Rate basis or on both from interested contractors/firms.

S. No.	Name of Work	Estimated Cost Rs. in Million	Bid Security	PEC Codes	Time for Completion
01	Construction works of Hostel Block at IBA Public School Sukkur	60.50	C-5	CE-09 CE-10 EE-04 EE-06 EE-11 ME-07	15 Months

**1. Eligibility:** Valid Registration with Pakistan Engineering Council including C5, FBR, SRB.

**2. Qualification:**

- List of similar assignments undertaken over the past 03 years.
- Details of equipment & machinery owned/ leased/hired by firm/contractor.
- Financial Statement (summary) and income tax return for the last 03 years.
- List of litigation (if any) their nature and status / outcomes.
- Evidence shows that the min average annual turnover of the company is more than Rs. 61.0 million.
- The bidders should submit Bid Security 2% of Estimated Amount (Refundable) in shape of Demand Draft or Pay Order in the favor of Sukkur IBA University should be attached with the Bid/Tender, otherwise such Tender will not be entertained.
- Company profile (including details of the work done, work in hand, details of staff engaged)
- Affidavit that firm is not blacklisted.
- Financial proposals of only technically qualified bidders will be opened.

**3. Method of Procurement: Single Stage Two Envelope**

**4. Bidding/Tender Documents:**

- Issuance: Documents will be issued from date of publication **27-April-2024 to 14-May -2024**, on payment of tender fee Rs. 4000/- Non-refundable.
- Submission: Last date will be **15-May 2024**, at 2:30 P.M.
- Technical Bids: Will be opened on **15-May, 2024** at 3:30 PM
- Place(s) of issuance, inquiries, and opening will be:-  
**Address:** Admin Block, Sukkur IBA University, Nisar Ahmed Siddiqui Road Sukkur. Telephone No: 071-5644025

**5. Terms & Conditions.**

- Under following conditions bid will be rejected: -
  - Conditional, electronic, and telegraphic bids/tenders.
  - Bids not accompanied by bid security of required amount and form.
  - Bids received after a specified date and time.
  - Blacklisted firms.
- Bid validity Period: 90 days.

The Procuring Agency reserves the right to reject all or any bids subject to the relevant provisions of Sindh Public Procurement Rules 2010.

Please send your queries: [pd@iba-suk.edu.pk](mailto:pd@iba-suk.edu.pk)  
[rafeeque.ahmed@iba-suk.edu.pk](mailto:rafeeque.ahmed@iba-suk.edu.pk)

**PROJECT DIRECTOR**  
**SUKKUR IBA UNIVERSITY**  
Nisar Ahmed Siddiqui Road, Sukkur.  
Ph: 071-5644025-26 Fax: 071-5804419



**INSTRUCTIONS  
TO  
BIDDERS**



## INSTRUCTIONS TO BIDDERS

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

### A. GENERAL

#### IB.1 Scope of Bid

- 1.1 The Employer as defined in the Bidding Data hereinafter called "the Employer" wishes to receive bids for 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 ADP Scheme No .647 2022-2023, Funded Government of Sindh.

#### IB.3 Eligible Bidders

- 3.1 This Invitation for Bids is open to all bidders meeting the following mandatory requirements:
  - Contractors / Firms registered with Income Tax (who are Active on Taxpayers List & non-defaulter of Federal Board of Revenue & Sindh Board of Revenue).
  - Contractors/Firms have No litigation history.
  - Contractor/Firms No blacklisted.
  - Valid/active registration certificate of Pakistan Engineering Council (PEC) in the category C-5 or above and at least specialization in PEC codes CE-09, CE-10, EE-04, EE-06, EE-11, ME-07 is mandatory.

#### 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 Employer 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 for themselves on their own responsibility all information that may be necessary for preparing the bid and entering into a contract for construction of the Works. All cost in this respect shall be at the bidder's own expense.
- 6.2 The bidders and any of their personnel or agents will be granted permission by the Employer to enter upon his premises and lands for the purpose of such inspection, but only upon the express condition that the bidders, their personnel and agents, will release and indemnify the Employer, his personnel and agents from and against all liability in respect thereof and will be responsible for death or personal injury, loss of or damage to property and any other loss, damage, costs and expenses incurred as a result of such inspection.

**B. BIDDING DOCUMENTS****IB.7 Contents of Bidding Documents**

- 7.1 The Bidding Documents, in addition to invitation for bids, are those stated below and should be read in conjunction with any Addenda issued in accordance with Clause IB.9.
1. Instructions to Bidders.
  2. Bidding Data.
  3. General Conditions of Contract, Part-I (GCC).
  4. Particular Conditions of Contract, Part-II (PCC).
  5. Form of Bid & Appendices to Bid.
  6. Bill of Quantities (Appendix-D to Bid).
  7. Form of Bid Security.
  8. Form of Contract Agreement.
  9. Forms of Performance Security and Mobilization Advance Guarantee/Bond.
  10. Specifications
  11. Drawings.
- 7.2 The bidders are expected to carefully examine the contents of all the above documents. Failure to comply with the requirements of bid submission will be at the Bidder's own risk. Pursuant to Clause IB.26, bids which are not substantially responsive to the requirements of the Bidding Documents will be rejected.

**IB.8 Clarification of Bidding Documents**

- 8.1 Any prospective bidder requiring any clarification (s) in respect of the Bidding Documents may notify the Employer in writing at the Employer's address indicated in the Invitation for Bids. The Employer will respond to any request for clarification, which he receives earlier than 07 days prior to the deadline for submission of bids.





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

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

- 9.1 At any time prior to the deadline for submission of bids, the Employer may, for any reason, whether at his own initiative or in response to a clarification requested by a prospective bidder, modify the Bidding Documents by issuing addendum.
- 9.2 Any addendum thus issued shall be part of the Bidding Documents pursuant to Sub-Clause 7.1 hereof and shall be communicated in writing to all purchasers of the Bidding Documents. Prospective bidders shall acknowledge receipt of each addendum in writing to the Employer.
- 9.3 To afford prospective bidders reasonable time in which to take an addendum into account in preparing their bids, the Employer may extend the deadline for submission of bids in accordance with Clause IB.20

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

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

- 10.1 The bid and all correspondence and documents related to the bid exchanged by a bidder and the Employer shall be in the bid language stipulated in the Bidding Data and Particular Conditions of Contract. Supporting documents and printed literature furnished by the bidders may be in any other language provided the same are accompanied by 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:
  - (a) Submit a written power of attorney authorizing the signatory of the bid to act for and on behalf of the bidder.
  - (b) Update the information indicated and listed in the Bidding Data and to meet the minimum criteria set out in this bidding documents, which as a minimum, would include the following:
    - (i) Evidence of access to financial resources along with average annual construction turnover.





- (ii) Financial predictions for the current year and the two following years including the effect of known commitments,
  - (iv) Current litigation information; and
  - (v) Availability of critical equipment.
- 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 program etc.

11.2 Bids submitted by a joint venture of two (2) or more firms shall comply with the following requirements:

- (a) the bid and in case of a successful bid, the Form of Contract Agreement shall be signed so as to be legally binding on all partners.
- (b) one of the joint venture partners shall be nominated as being in charge; and this authorization shall be evidenced by submitting a power of attorney signed by legally authorized signatories of all the joint venture partners.
- (c) the partner-in-charge shall always be duly authorized to deal with the Employer regarding all matters related with and/or incidental to the execution of Works as per the terms and Conditions of Contract and in this regard to incur any and all liabilities, receive instructions, give binding undertakings and receive payments on behalf of the joint venture.
- (d) all partners of the joint venture shall at all times and under all circumstances be liable jointly and severally for the execution of the Contract in accordance with the Contract terms and a statement to this effect shall be included in the authorization mentioned under Sub-Para (b) above as well as in the Form of Bid and in the Form of Contract Agreement (in case of a successful bid); and
- (e) a copy of the agreement entered into by the joint venture partners shall be submitted with the bid stating the conditions under which it will function, its period of duration, the persons authorized to represent and obligate it and which persons will be directly responsible for due performance of the Contract and can give valid receipts on behalf of the joint venture, the proportionate participation of the several firms forming the joint venture, and any other information necessary to permit a full appraisal of its functioning. No amendments / modifications whatsoever in the joint venture agreement shall be agreed to between the joint venture partner without prior written consent of the Employer.



- 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 in Sub-Clause 1.2 hereof.

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#### **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 Sub-Clause 1.1 hereof, based on the unit rates and / or prices submitted by the bidder.
- 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 Employer when executed and shall be deemed covered by rates and prices for other items in the Bill of Quantities.
- 12.3 All duties, taxes and other levies payable by the Contractor under the Contract, or for any other cause, as on the date 07 days prior to the deadline for submission of bids shall be included in the rates and prices and the total Bid Price submitted by a bidder.

Additional / reduced duties, taxes and levies due to subsequent additions or changes in legislation shall be reimbursed / deducted as per Sub-Clause 70.2 of the General Conditions of Contract Part-I.

- 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 the Conditions of Contract. The bidders shall furnish the prescribed information for the price adjustment formulae in Appendix-C to Bid and shall submit with their bids such other supporting information as required under the said Clause.

#### **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.
- 13.2 N/A.





**IB.14 Bid Validity**

- 14.1 Bids shall remain valid for the period stipulated in the Bidding Data after the Date of Bid Opening specified in Clause IB.23.
- 14.2 In exceptional circumstances, prior to expiry of the original bid validity period, the Employer may request that the bidders extend the period of validity for a specified additional period, which shall in no case be more than the original bid validity period. The request and the responses thereto shall be made in writing. A bidder may refuse the request without forfeiting his Bid Security. A bidder agreeing to the request will not be required or permitted to modify his bid but will be required to extend the validity of his Bid Security for the period of the extension, and in compliance with Clause IB.15 in all respects.

**IB.15 Bid Security**

- 15.1 Each bidder shall furnish, as part of his 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, at the option of the bidder, in the form of Deposit at Call or a Pay Order and Demand Draft.
- 15.3 Any bid not accompanied by an acceptable Bid Security shall be rejected by the Employer as non-responsive.
- 15.4 The bid securities of unsuccessful bidders will be returned as promptly as possible, but not later than 28 days after the expiration of the period of Bid Validity.
- 15.5 The Bid Security of the successful bidder will be returned when the bidder has furnished the required Performance Security and signed the Contract Agreement.
- 15.6 The Bid Security may be forfeited:
  - (a) if the bidder withdraws his bid except as provided in Sub-Clause 22.1.
  - (b) if the bidder does not accept the correction of his Bid Price pursuant to Sub-Clause 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.

#### **IB.16 Alternate Proposals by Bidder**

- 16.1 Should any bidder consider that he can offer any advantages to the Employer by a modification to the designs, specifications or other conditions, he may, in addition to his bid to be submitted in strict compliance with the Bidding Documents, submit any Alternate Proposal(s) containing (a) relevant design calculations; (b) technical specifications; (c) proposed construction methodology; and (d) any other relevant details / conditions, provided always that the total sum entered on the Form of Bid shall be that which represents complete compliance with the Bidding Documents. The technical details and financial implication involved are to be submitted in a sealed envelope as to be followed in main bid proposals.
- 16.2 Alternate Proposal(s), if any, of the lowest evaluated responsive bidder only may be considered by the Employer as the basis for the award of Contract to such bidder.

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

- 17.1 The Employer may, on his own motion or at the request of any prospective bidder(s), hold a pre-bid meeting to clarify issues and to answer any questions on matters related to the Bidding Documents. The date, time and venue of pre-bid meeting, if convened, is as stipulated in the Bidding Data. All prospective bidders or their authorized representatives shall be invited to attend such a pre-bid meeting.
- 17.2 The bidders are requested to submit questions, if any, in writing so as to reach the Employer not later than seven (7) days before the proposed pre-bid meeting.
- 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 purchasers of the Bidding Documents. Any modification of the Bidding Documents listed in Sub-Clause 7.1 hereof which may become necessary as a result of the pre-bid meeting shall be made by the Employer exclusively through the issue of an Addendum pursuant to Clause IB.9 and not through the minutes of the pre-bid meeting.
- 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 completely and without alterations one (1) original and number of copies, specified in the Bidding Data, of the documents comprising the bid as described in Clause IB.7 and clearly mark them "ORIGINAL" and "COPY" as appropriate. In the event of discrepancy between them, 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 or persons duly authorized to sign on behalf of the bidder pursuant to Sub- Clause 11.1(a) hereof. All pages of the bid shall be initialed and stamped by the person or persons signing the bid.
- 18.6 The bid shall contain no alterations, omissions, or additions, except to comply with instructions issued by the Employer, or as are necessary to correct errors made by the bidder, in which case such corrections shall be initialed by the person or persons signing the bid.
- 18.7 Bidders shall indicate in the space provided in the Form of Bid their full and proper addresses at which notices may be legally served on them and to which all correspondence in connection with their bids and the Contract is to be sent.
- 18.8 Bidders should retain a copy of the Bidding Documents as their file copy.

**D. SUBMISSION OF BIDS****IB.19 Sealing and Marking of Bids**

- 19.1 Each bidder shall submit his bid as under:
  - (a) ORIGINAL and each copy of the Bid shall be separately sealed and put in separate envelopes and marked as such.
  - (b) The envelopes containing the ORIGINAL and copies will be put in one sealed envelope and addressed / identified as given in Sub- Clause 19.2 hereof.



- 19.2 The inner and outer envelopes shall:
- (a) Be addressed to the Employer at the address provided in the Bidding Data.
  - (b) Bear the 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 19.2 hereof, the inner envelope shall indicate the name and address of the bidder to enable the bid to be returned unopened in case it is declared "late" pursuant to Clause IB.21

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

Note: Bidders are advised to read, understand and fill the unit rate, amount & unit of BOQ items carefully, Procuring Agency/Executing Agency no case shall be responsible for any claim after the award of contract.

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

- 20.1
- (a) Bids must be received by the Employer at the address specified no later than the time and date stipulated in the Bidding Data.
  - (b) Bids with charges payable will not be accepted, nor will arrangements be undertaken to collect the bids from any delivery point other than that specified above. Bidders shall bear all expenses incurred in the preparation and delivery of bids. No claims will be entertained for refund of such expenses.
  - (c) Where delivery of a bid is by mail and the bidder wishes to receive an acknowledgment of receipt of such bid, he shall make a request for such acknowledgment in a separate letter attached to but not included in the sealed bid package.
  - (d) Upon request, acknowledgment of receipt of bids will be provided to those making delivery in person or by messenger.
- 20.2 The Employer may, at his discretion, extend the deadline for submission of bids by issuing an amendment in accordance with Clause IB.9, in which case all rights and obligations of the Employer and the bidders previously subject to the original deadline will thereafter be subject to the deadline as extended.





**IB.21 Late Bids**

- 21.1 (a) Any bid received by the Employer after the deadline for submission of bids prescribed in Clause IB.20 will be returned unopened to such bidder.
- (b) Delays in the mail, delays of person in transit, or delivery of a bid to the wrong office shall not be accepted as an excuse for failure to deliver a bid at the proper place and time. It shall be the bidder's responsibility to determine the manner in which timely delivery of his bid will be accomplished either in person, by messenger or by mail.

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

- 22.1 Any bidder may modify, substitute or withdraw his bid after bid submission provided that the modification, substitution or written notice of withdrawal is received by the Employer prior to the deadline for submission of bids.
- 22.2 The modification, substitution, or notice for withdrawal of any bid shall be prepared, sealed, marked and delivered in accordance with the provisions of Clause IB.19 with the outer and inner envelopes additionally marked "MODIFICATION", "SUBSTITUTION" or "WITHDRAWAL" as appropriate.
- 22.3 No bid may be modified by a bidder after the deadline for submission of bids except in accordance with Sub-Clauses 22.1 and 27.2.
- 22.4 Withdrawal of a bid during the interval between the deadline for submission of bids and the expiration of the period of bid validity specified in the 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 The Employer will open the bids, including withdrawals, substitution and modifications made pursuant to Clause IB.22, in the presence of bidders' representatives who choose to attend, at the time, date and location stipulated in the Bidding Data. The bidders' representatives who are present shall sign a register evidencing their attendance.
- 23.2 Envelopes marked "MODIFICATION", "SUBSTITUTION" or "WITHDRAWAL" shall be opened and read out first. Bids for which an acceptable notice of withdrawal has been submitted pursuant to Clause IB.22 shall not be opened.
- 23.3 The bidder's name, total Bid Price and price of any Alternate Proposal(s), any discounts, bid modifications, substitution and withdrawals, the presence or absence of Bid Security, and such other details as the Employer may consider appropriate, will be announced by the Employer at the opening of bids.



- 23.4 Employer 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 a contract shall not be disclosed to bidders or any other person not officially concerned with such process before the announcement of bid evaluation report, which shall be done at least ten (10) days prior to issue of Letter of Acceptance. The announcement to all Bidders will include table(s) comprising read out prices, discounted prices, price adjustments made, final evaluated prices and recommendations against all the bids evaluated. Any effort by a bidder to influence the Employer's processing of bids or award decisions may result in the rejection of such bidder's bid. Whereas any bidder feeling aggrieved may lodge a written complaint not later than fifteen (15) days after the announcement of the bid evaluation report; however mere fact of lodging a complaint shall not warrant suspension of the procurement process.

#### **IB.25 Clarification of Bids**

- 25.1 To assist in the examination, evaluation and comparison of bids, the Employer may, at his discretion, ask any bidder for clarification of his bid, including breakdowns of unit rates. 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 of arithmetic errors discovered by the Employer 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 Employer will determine whether each bid is substantially responsive to the requirements of the Bidding Documents.
- 26.2 A substantially responsive bid is one, which (i) meets the eligibility criteria; (ii) has been properly signed; (iii) is accompanied by the required Bid Security; and (iv) 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 Employer'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.





- 26.3 If a bid is not substantially responsive, it will be rejected by the Employer, and may not subsequently be made responsive by correction or withdrawal of the non-conforming deviation or reservation.

#### **IB.27 Correction of Errors**

- 27.1 Bids determined to be substantially responsive will be checked by the Employer for any arithmetic errors. Errors will be corrected by the Employer as follows:
- (a) Where there is a discrepancy between the amounts in figures and in words, the amount in words will govern; 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 Employer there is an obviously gross misplacement of the decimal point in the unit rate, in which case the line-item total as quoted will govern and the unit rate will be corrected.
- 27.2 The amount stated in the Form of Bid will be adjusted by the Employer in accordance with the above procedure for the correction of errors and with the concurrence of the bidder, shall be considered as binding upon the bidder. If the bidder does not accept the corrected Bid Price, his Bid will be rejected, and the Bid Security shall be forfeited in accordance with Sub- Clause 15.6(b) hereof.

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

- 28.1 The Employer 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 Employer will determine for each Bid the evaluated Bid Price by adjusting the Bid Price as follows:
- (a) Making any correction for errors pursuant to Clause IB.27.
  - (b) excluding Provisional Sums and the provision, 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 into account in Bid evaluation.



- 28.4 If the Bid of the successful bidder is seriously unbalanced in relation to the Employer's estimate of the cost of work to be performed under the Contract, the Employer may require the bidder to produce detailed price analyses for any or all items of the Bill of Quantities to demonstrate the internal consistency of those prices with the construction methods and schedule proposed. After evaluation of the price analyses, the Employer may require 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 Employer against financial loss in the event of default of the successful bidder under the Contract.

## F. AWARD OF CONTRACT

### IB.29 Award

- 29.1 Subject to Clauses IB.30 and IB.34, the Employer will 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 Price, provided that such bidder has been determined to be eligible in accordance with the provisions of Clause IB.3 and qualify pursuant to Sub-Clause IB 29.2.
- 29.2 The Employer, at any stage of the bid evaluation, having credible reasons for or *prima facie* evidence of any defect in supplier's or contractor's capacities, may require the suppliers or contractors to provide information concerning their professional, technical, financial, legal or managerial competence whether already pre-qualified or not:

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

### IB.30 Employer's Right to accept any Bid and to reject any or all Bids

- 30.1 Notwithstanding Clause IB.29, the Employer reserves the right to accept or reject any Bid, and to annul the bidding process and reject all bids, at any time prior to 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 upon request be communicated to any bidder who submitted a bid, without justification of grounds. Rejection of all bids shall be notified to all bidders promptly.





**IB.31 Notification of Award**

- 31.1 Prior to expiration of the period of bid validity prescribed by the Employer, the Employer will notify the successful bidder in writing ("Letter of Acceptance") that his Bid has been accepted. This letter shall name the sum which the Employer will pay the Contractor in consideration of the execution and completion of the Works by the Contractor as prescribed by the Contract (hereinafter and in the Conditions of Contract called the "Contract Price").
- 31.2 No Negotiation with the bidder having evaluated as lowest responsive or any other bidder shall be permitted, however, Employer may have clarification meetings to get 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 Employer and the bidder till signing of the formal Contract Agreement.
- 31.3 Upon furnishing by the successful bidder of a Performance Security, the Employer will promptly notify the other bidders that their Bids have been unsuccessful and return their bid securities.

**IB.32 Performance Security**

- 32.1 The successful bidder shall furnish to the Employer a 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.

**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 Employer 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 Employer and the successful bidder shall be executed within 14 days of the receipt of the Contract Agreement by the successful bidder from the Employer.



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

The Employer reserves the right to obtain information regarding performance of the bidders on their previously awarded contracts/works. The Employer may in case of consistent poor performance of any Bidder as reported by the employers of the previously awarded contracts, inter alia, reject his bid and/or refer the case to the Pakistan Engineering Council (PEC). Upon such reference, PEC in accordance with its rules, procedures and relevant laws of the land take such action as may be deemed appropriate under the circumstances of the case including blacklisting of such Bidder and debarring him from participation in future bidding for similar works.

**IB.35 Integrity Pact**

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

**IB.36 Instructions not 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.



# BIDDING DATA





**BIDDING DATA**

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

**1.1 Name and address of the Employer:**

The Sukkur IBA University, Sukkur

Address: Nisar Ahmed Siddiqui Road, Sukkur

**1.3 Name of the Project:**

Construction of Hostel Block at IBA Public School Sukkur".

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

School Education and literacy Department Funded Government of Sindh.

**2.2 Amount and type of financing:**

Rs. 60.452 (M) ADP.NO 647, 2022-2023.

**3.1 Eligible Bidders**

*Delete the text of clause 3.1(b) and replace with the following*

This Invitation for Bids is open to all bidders meeting the following requirements:

- Contractors / Firms registered with Income Tax (who are Active on Taxpayers List & non-defaulter of Federal Board of Revenue & Sindh Board of Revenue).
- Contractors/Firms have No litigation history.
- Contractor/Firms No blacklisted.
- Valid/active registration certificate of Pakistan Engineering Council (PEC) in the category C-5 or above and at least specialization in PEC codes CE-09, CE-10, EE-04, EE-06, EE-11, ME-07 is mandatory.
- Having Valid/active Electric License.

**8.1 Time limits for clarification:**

7 days before deadline of submission of bids

**10.1 Bid language:**

English.

**11.1 Documents accompanying the Bid**

Delete the text of clause 11.1 (b) & (c) and replace with the following:

The bid is being invited as per 'Single Stage - Two Envelope' procedure. If the bidder fails to fulfill any of following mandatory requirements, his bid will be considered as nonresponsive and will be rejected.

1. The bid shall comprise a single package containing one envelope. Each envelope shall comprise of two parts, the financial proposal, and the company profile (Technical Proposal).
2. The envelope parts shall be marked as "FINANCIAL PROPOSAL" and "TECHNICAL PROPOSAL" in bold and legible letters to avoid confusion.
3. The 'Technical Proposal' must contain the following as per the requirements of this document and criteria mentioned in clause 28.1(iv) of bidding data:
  - a. Name of firm/contractor with year of establishment along with Postal Address and telephone number.
  - b. No. of project of similar nature and general works in hand and completed. (Details should be given as mentioned in clause 28.1(iv) of bidding data)
  - c. Registration/Clearance from FBR and SRB
  - d. Detail of Court cases if any/arbitration cases etc.
  - e. Enlistment with concerned Government Departments.
  - f. Detail of financial soundness.
  - g. Undertaking on judicial paper that the firm was never blacklisted by any Government, Semi Govt. Organization.
  - h. Copy of Valid Registration with Pakistan Engineering Council. Any additional information with documents in addition to the above that the firm might like to furnish in support of their application.
  - i. Appendix-E to Bid                      Proposed Construction Schedule
  - j. Appendix-F to Bid                      Method of Performing the Work
  - k. Appendix-H to Bid                      Construction camp and housing facilities
  - l. Appendix-I to Bid                      List of Subcontractors
  - m. Appendix-K to Bid                      Organization Chart of the Supervisory Staff and Labour
  - n. Appendix-L to Bid                      Integrity Pact
4. The "Financial proposal" must contain following documents:
  - a. Priced BOQ
  - Bid Security @ 2% of estimated amount in the form of Bank Draft/Call Deposit/Pay Order from any scheduled bank of Pakistan in favour of Sukkur IBA University, Sukkur

## 11.2 Joint Venture (JV)

Following text is added:

11.2.1 Joint Venture must comply with the following requirements: -

- a) Following are minimum technical requirements: -
  - i) The lead partner shall meet not less than 50 percent of all technical evaluation criteria given in clause 28.1(iv)
  - ii) Each of the partners shall meet not less than 25 percent of all the technical evaluation criteria given in clause 28.1(iv)





- iii) The joint venture must collectively satisfy the criteria of clause 28.1(iv) for which purpose the relevant figures for each of the partners shall be added together to arrive at the JV's total capacity.
  - b) Any change in technical bid of a JV after evaluation, shall be subject to the written approval of the Employer prior to the deadline for submission of bids. Such approval may be denied if: -
    - i) Partner(s) withdraw from a JV and remaining partners do not meet the technical requirements.
    - ii) The technical proposal of new partners to a JV are not accepted individually or as another JV; or
    - iii) In the opinion of the Employer, a substantial reduction in competition would result.
  - c) Bid shall be signed by all members in the JV so as to legally bind all partners, jointly and severally, and any bid shall be submitted with a copy of the JV agreement providing the joint and several liabilities with respect to the contract.
- 11.2.2 The acceptance of technical proposal of a JV does not necessarily make eligible any of its partners individually or as a partner in any other JV or association. In case of dissolution of a JV, technical proposal of each one of the constituent firms may be accepted if they meet all the technical requirements and any partner of J.V has requested/shall request for the same and then the acceptance of his technical bid shall subject to the written approval of the Employer.

### 13.1 Currencies of Bid and Payment

Bidders to quote entirely in Pak. Rupees

### 14.1 Period of Bid Validity:

90 days.

### 15.1 Bid Security:

#### &15.2

Bid Security @ 2% of estimated amount in the form of Bank Draft/Call Deposit/Pay Order from any scheduled bank of Pakistan in favour of The Sukkur IBA University, Sukkur

### 16.0 Alternate Proposals by Bidder

*Delete the text of clause 16.1 & 16.2 and replace with the following*

No Alternate bid is allowed

### 17.1 Venue, time, and date of the pre-Bid meeting:

*Delete the text of clause 17.1 and replace with the following*

No Pre-Bid Meeting will be held.



**18.4 Number of copies of the Bid to be completed and returned:**

One original and one copy.

**19.2(a) Employer's address for the purpose of Bid submission:**

The Sukkur IBA University, Sukkur  
Address: Nisar Ahmed Siddique Road, Sukkur.

**19.2(b) Name and Number of the Contract:**

Construction of Hostel at IBA Public School Sukkur”

**20.1(a) Deadline for submission of bids:**

Bids will be received till 10:00 am of 16-05-2024 in sealed envelope.

**23.1 Venue, time, and date of Bid opening:**

Bids will be open at 2:30 am of 26-05-2024 at the address mentioned in advertisement.

**28.1 Evaluation and Comparison of Bids:**

*Add following text to clause 28.1*

- i. The envelope part shall be marked “**TECHNICAL PROPOSAL**” shall be opened at a time, date & venue on Bid opening date 16-05-2024 and the envelop “**FINANCIAL PROPOSAL**” Opening date will be announced and communicated to the bidders in advance, within the bid validity period.
- ii.
- iii. The procuring agency shall evaluate the company profile in a manner prescribed in tender document.
- iv. The procuring agency shall open in the presence of intending tenderers the financial proposal, at the announced time, date & venue after the technical Evaluation.
- v. The financial proposal of bids found technically non-responsive (not qualified) shall be returned un-opened to the respective bidders; and the lowest evaluated bidder shall be awarded the work.
- vi. Verification and up-to-date information: Procuring agency can verify the previous experience and financial statements made by the bidders in their bids.
- vii. **Technical Evaluation Criteria**  
Technical proposal of contractors will be evaluated as per following criteria:

Sr. No.	Category	Weightage/Marks
1.	Experience Record	35
2.	Personnel Capabilities	15
3.	Equipment Capabilities	20
4.	Financial Soundness	20
5.	Technical Capabilities	05





Sr. No.	Category	Weightage/Marks
6.	HSE Statement	05
	<b>Total:</b>	<b>100</b>

*Note: Technical soundness shall be decided on the basis of Pass/Fail basis. The applicant must secure at least 50% score in each category and overall, 75% score.*

#### Relevant Experience and PEC Requirement

Sr. No.	Type of Work	PEC Requirement
1.	Building Works	(PEC) in the category C-5 or above and at least specialization in PEC codes CE-09, CE-10, EE-04, EE-06, EE-11, ME-07.

#### a. General Experience

Credit Marks for experience shall be awarded on the basis of following criteria:

Sr. No.	Description	Maximum Points
i)	3 projects of similar nature and complexity completed over last 10 years (5 points for each project of 25 million or above of building works, Projects below 25 million will be awarded zero marks). (Supporting documents including work order and completion certificate duly signed by respective clients are mandatory)	15
ii)	2 project of similar nature and complexity in hand (5 points for 1 project of 25 million or above of building works, Project below 25 million will be awarded zero marks). (Supporting documents including work order duly signed by respective clients are mandatory)	10
iii)	General experience of 3 projects completed over last 10-years (1 point for each project of 25 million or above of any type of civil work, Projects below 25 million will be awarded zero marks). (Supporting documents including work order and completion certificate duly signed by respective clients are mandatory)	5
iv)	Status of enlistment with Govt. Organization & other agencies (2.5 marks for each).	5
	<b>Sub-total:</b>	<b>35</b>

#### b. Personnel Capabilities

Credit Marks shall be awarded under this category using the following Criteria:

Sr. No.	Description	Maximum Points
---------	-------------	----------------



Sr. No.	Description	Maximum Points
i)	Graduate Engineer (CV, PEC Reg. & Signed Affidavit is mandatory)	
	a) Number of Engineers (3-Marks for each Civil Engineer with building work experience)	6
	b) Experience of Civil Engineer: - experience in number of years (1.5 marks for 5-year experience in building work. Marks for less experience will be given proportionately).	3
ii)	DAE Associate Engineer (Civil) (CV, Educational Docs. & Signed Affidavit is mandatory).	
	a) Number of Engineers (2-Marks for each with building work experience.	4
	b) Experience of DAE Engineer: - experience in number of years (1 marks for 10-year experience in building work. Marks for less experience will be given proportionately).	2
	<b>Sub-total:</b>	<b>15</b>

**c. Equipment Capabilities**

Credit Marks shall be granted on the basis of the following criteria for various kinds of equipment, Proof of possession / lease affidavit is mandatory:

Sr. No.	Equipment Type and Characteristics	Maximum Marks
1.	Shuttering + Scaffolding (1000 Sft)	5
2.	Mixer Machine (2 bag) (5 nos.) Wheel Barrows (10 nos.)	5
3.	Concrete Vibrator + Plate Compactor (3+3 nos.)	4
4.	Tractor with blade + Water Tankers (2+2 nos.)	6
	<b>Sub-total:</b>	<b>20</b>

**d. Financial Soundness /Status:**

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

For Financial Status assessment, the Applicants may be required to submit Audited Financial Statements for the last five years or any other document which verifies their Financial Status. Where necessary, the Procuring Agency will make enquiries with the firm's/contractor's bankers.

Working Capital in hand for this project/work (Attach proof of Bank Statement/Credit Facilities)

Sr. No.	Description	Maximum Marks
i)	Audited Report of last 5-years showing Average Annual Turnover of 25 million will be awarded full marks but for	10





Sr. No.	Description	Maximum Marks
	less than 25 million no marks will be awarded.	
ii)	Available Bank Credit line. Full marks for 5 million limit but for less than 5 million no marks will be awarded. (Mandatory)	5
iii)	Registration with FBR & SRB (Mandatory)	1
iv)	Litigation History in which Decision has been given against the firm. (In case the firm is involved in any litigation, no marks will be given and 2 points will be given in case affidavit of no litigation is attached).	2
v)	Blacklisting from any agency. (In case the firm is blacklisted, no Marks will be given and 2 points will be given in case affidavit by the company that it has not been black listed is attached).	2
<b>Sub-total:</b>		<b>20</b>

**e. Technical Capabilities**

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

Sr. No.	Description	Maximum Marks
i)	Appendix-E to Bid: Proposed Construction Schedule	1.5
ii)	Appendix-F to Bid: Method of Performing the Work	1.5
iii)	Appendix-H to Bid: Construction camp and housing facilities	1
iv)	Appendix-I to Bid: List of Subcontractors	1
<b>Total Marks:</b>		<b>05</b>

**f. HSE Policy & Certification**

**05**

**29.1 Award of the Contract:**

*Delete the text of clause 29.1 & 29.2 and replace with the following:*

Subject to Clause IB.30 and IB.34, the Employer will award the Contract to the bidder whose bid has been determined to be substantially responsive to the Bidding Document, has met the technical requirement criteria as mentioned in clause 28.1(iv) and has offered the lowest evaluated Bid Price, provided that such bidder has been determined to be eligible in accordance with the provisions of Clause IB.3.

**32.1 Standard form and amount of Performance Security acceptable to the Employer:**

Up to 10% of the contract amount against bank guarantee from any scheduled bank of Pakistan.

**37.0 Price Adjustment:**

No price adjustment will be applicable on said project.





**FORM OF BID  
AND  
APPENDICES TO BID**



## FORM OF BID

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

To:

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

Gentleman,

1. Having examined the Bidding Documents including Instructions to Bidders, Bidding Data, Conditions of Contract, Specifications, 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 receiving 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)

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

Witness:

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

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

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

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





**SPECIAL STIPULATIONS****Clause****Conditions of Contract**

1.	Engineer's Authority to issue Variation in emergency.	2.1	15% of the Contract Price stated in the Letter of Acceptance.
2.	Amount of Performance Security	10.1	Up to 10% of Contract Price stated in the Letter of Acceptance in shape of bank guarantee from any scheduled bank of Pakistan as per approved format.
3.	Time for Furnishing Program	14.1	Within 14 days from the date of receipt of Letter of Acceptance.
4.	Time for Commencement	41.1	Within 7 days from the date of receipt of Engineer's Notice to Commence which shall be issued within fourteen (14) days after signing of Contract Agreement.
5.	Time for Completion	43.1, 48.1	15 months.
6.	Amount of Liquidated Damages	47.1	Rs. 10,000/- 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	49.1	365 days from the effective date of Taking Over Certificate.
8.	Percentage of Retention Money	60.2	5% of the amount of Interim Payment Certificate will be deducted upto the maximum limit specified
9.	Limit of Retention Money	60.2	10% of Contract Price stated in the Letter of Acceptance.
10.	Minimum amount of Interim Payment Certificates (Running Bills)	60.2	Rs. 05 million.
11.	Time of Payment from delivery of Engineer's Interim Payment Certificate to the Employer.	60.10	30 days. (Subjected to availability of funds).
12.	Mobilization Advance	60.12	Up to 10% of Contract Price stated in the Letter of Acceptance against bank guarantee from any scheduled bank of Pakistan as per approved format.
13.	Mobilization Advance Recovery	60.12	This advance shall be recovered in five equal installments starting from the second IPC.
14.	Secured Advance	60.11	Contractor can obtain the secured advance at non-perishable material subject to verification & with the approval of Employer.
15.	Secured Advance Recovery	60.11	This advance shall be recovered within (90) days even if unutilized.



**FOREIGN CURRENCY REQUIREMENTS**

1. The Bidder may indicate here in 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	_____
_____	_____
_____	_____



**PRICE ADJUSTMENT UNDER CLAUSE 70  
OF CONDITIONS OF CONTRACT**

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 Employer)

Cost Element	Description	Weightages	Applicable index
1	2	3	4
(i)	Fixed Portion	0.350	
(ii)	Local Labour		Government of Pakistan (GP) 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)	Steel		
	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 28 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. Employer to determine the weightage of Fixed Portion considering only those cost elements having cost impact of seven (7) percent or more on his specific project.





**BILL OF QUANTITIES**

**A. Preamble**

1. The Bill of Quantities shall be read in conjunction with the Conditions of Contract, Specifications and Drawings.
2. The quantities given in the Bill of Quantities are estimated and provisional and are given to provide a common basis for bidding. The basis of payment will be the actual quantities of work executed and measured by the Contractor and verified by the Engineer and valued at the rates and prices entered in the priced Bill of Quantities, where applicable, and otherwise at such rates and prices as the 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 Contractor's plant, labour, supervision, materials, execution, insurance, profit, taxes and duties, together with all general risks, liabilities and obligations set out or implied in the Contract. Furthermore, all duties, taxes and other levies payable by the Contractor under the Contract, or for any other cause, as on the date 28 days prior to deadline for submission of Bids, shall be included in the rates and prices and the total Bid Price submitted by the Bidder.
4. A rate or price shall be entered against each item in the priced Bill of Quantities, whether quantities are stated or not. The cost of items against which the Contractor will have failed to enter a rate or price shall be deemed to be covered by other rates and prices entered in the Bill of Quantities.
5. The whole cost of complying with the provisions of the Contract shall be included in the items provided in the priced Bill of Quantities, and where no items are provided, the cost shall be deemed to be distributed among the rates and prices entered for the related items of the Works.
6. General directions and description of work and materials are not necessarily repeated nor summarised in the Bill of Quantities. References to the relevant sections of the Bidding Documents shall be made before entering prices against each item in the 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.

**B. Work Items**

1. The Bill of Quantities are attached at the end of this document.



**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 Appendix-E 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 program for completion of the whole of the Works and parts of the Works may meet Employer's completion targets in days noted below and counted from the 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>
a) Whole Works	_____ days
b) Part-A	_____ days
c) Part-B	_____ days
d) _____	_____ days
e) _____	_____ 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 list of equipment's as per the requirements of clause 28.1(vi) of bidding data along with details make, model etc. The bidder will also provide a signed affidavit (mandatory) that the mentioned equipment is in possession of the bidder.



### CONSTRUCTION CAMP AND HOUSING FACILITIES

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

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

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) Contractor's Office, Workshop and Work Areas (areas required and proposed layout, type of construction of buildings, etc.).
  - b) Warehouses and Storage Areas (area required, type of construction and layout).
  - c) Housing and Staff Facilities (Plans for housing for proposed staff, layout, type of construction, etc.).
4. Construction Equipment Assembly and Preparation (detailed plans for carrying out this activity).
5. Other Items Proposed (Security services, etc.).



**LIST OF SUBCONTRACTORS**

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

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

<b>Part of Works (Give Details)</b>	<b>Subcontractor (With Complete Address)</b>
<b>1</b>	<b>2</b>





**ESTIMATED PROGRESS PAYMENTS**

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

<b>Quarter/ Year/ Period</b>	<b>Amounts (1,000 Rs.)</b>
<b>1</b>	<b>2</b>
1st 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	
<b>Bid Price</b>	



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



**(INTEGRITY PACT)****DECLARATION OF FEES, COMMISSION AND BROKERAGE ETC.  
PAYABLE BY THE SUPPLIERS OF GOODS, SERVICES & WORKS IN  
CONTRACTS WORTH RS. 10.00 MILLION OR MORE**

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

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

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

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

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

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

Name of Buyer: .....

Signature: .....

[Seal]

Name of Seller/Supplier: .....

Signature: .....

[Seal]





**FORMS**

**PERFORMANCE SECURITY  
CONTRACT AGREEMENT  
MOBILIZATION ADVANCE GUARANTEE/BOND**



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

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

[Letter by the Guarantor to the Employer]

Name of Guarantor (Bank) with address: \_\_\_\_\_  
 (Scheduled Bank in Pakistan)

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

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

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

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

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

NOW THEREFORE, if the Principal (Contractor) shall well and truly perform and fulfill all the undertakings, covenants, terms and conditions of the said Documents during the original terms of the said Documents and any extensions thereof that may be granted by the Employer, with or without notice to the Guarantor, which notice is, hereby, waived and shall also well and truly perform and fulfill all the undertakings, covenants terms and conditions of the Contract and of any and all modifications of said Documents that may hereafter be made, notice of which modifications to the Guarantor being hereby waived, then, this obligation to be void; otherwise to remain in full force and virtue till all requirements of 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 defences under the Contract, do hereby irrevocably and independently guarantee to pay to the Employer without delay upon the Employer's first written demand without cavil or arguments and without requiring the Employer to prove or to show grounds or reasons for such demand any sum or sums up to the amount stated above, against the Employer's written declaration that the Principal has refused or failed to perform the obligations under the Contract which payment will be effected by the Guarantor to Employer's designated Bank & Account Number.

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

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

Witness:

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

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

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

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

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

Signature \_\_\_\_\_

Name \_\_\_\_\_

Title \_\_\_\_\_

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





## FORM OF CONTRACT AGREEMENT

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

WHEREAS the Employer is desirous that certain Works, viz \_\_\_\_\_ should be executed by the Contractor and has accepted a Bid by the Contractor for the execution and completion of such Works and the remedying of any defects therein.

NOW this Agreement witnessed as follows:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to.
2. The following documents after incorporating addenda, if any, except those parts relating to Instructions to Bidders shall be deemed to form and be read and construed as part of this Agreement, 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 Particular 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 M).
  - (i) The Drawings.
  - (j) The Specifications.
3. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the Works and remedy defects therein in conformity and in all respects with the provisions of the Contract.
4. The Employer hereby covenants to pay the Contractor, in consideration of the execution and completion of the Works as per provisions of the Contract, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.



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

Signature of the Contactor

Signature of Employer

\_\_\_\_\_  
(Seal)

\_\_\_\_\_  
(Seal)

Signed, Sealed and Delivered in the presence of:

Witness:

Witness:

\_\_\_\_\_

\_\_\_\_\_

(Name, Title and Address)

(Name, Title and Address)



## MOBILIZATION ADVANCE GUARANTEE

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

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

\_\_\_\_\_ (Particulars of Contract)

with \_\_\_\_\_ (hereinafter called the "Contractor").

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

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

AND WHEREAS, \_\_\_\_\_

(Scheduled Bank in Pakistan)

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

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

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

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

(Date)

The Guarantor's liability under this Guarantee shall not in any case exceed the sum of 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 Contractor is fully adjusted against payments from Interim Payment Certificates of the Contractor provided that the Guarantor agrees that the aforesaid period of validity shall be deemed to be extended if on the above-mentioned date, the advance payment is not fully adjusted.





GUARANTOR

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

WITNESS

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

Corporate Secretary (Seal)

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

(Name Title & Address)

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



Part I - General Conditions of Contract



## CONTENTS

### PART I: GENERAL CONDITIONS

<b>Definitions and Interpretation</b>	<b>61</b>
1.1 Definitions	61
1.2 Headings and Marginal Notes	63
1.3 Interpretation	63
1.4 Singular and Plural	64
1.5 Notices, Consents, Approvals, Certificates and Determinations	64
<b>Engineer and Engineer's Representative</b>	<b>64</b>
2.1 Engineer's Duties and Authority	64
2.2 Engineer's Representative	64
2.3 Engineer's Authority to Delegate	64
2.4 Appointment of Assistants	65
2.5 Instructions in Writing	65
2.6 Engineer to Act Impartially	65
<b>Assignment and Subcontracting</b>	<b>66</b>
3.1 Assignment of Contract	66
4.1 Subcontracting	66
4.2 Assignment of Subcontractors' Obligations	66
<b>Contract Documents</b>	<b>67</b>
5.1 Language/s and Law	67
5.2 Priority of Contract Documents	67
6.1 Custody and Supply of Drawings and Documents	67
6.2 One Copy of Drawings to be Kept on Site	68
6.3 Disruption of Progress	68
6.4 Delays and Cost of Delay of Drawings	68
6.5 Failure by Contractor to Submit Drawings	68
7.1 Supplementary Drawings and Instructions	69
7.2 Permanent Works Designed by Contractor	69
7.3 Responsibility Unaffected by Approval	69
<b>General Obligations</b>	<b>69</b>
8.1 Contractor's General Responsibilities	69
8.2 Site Operations and Methods of Construction	69
9.1 Contract Agreement	70
10.1 Performance Security	70
10.2 Period of Validity of Performance Security	70





10.3	Claims under Performance Security	70
11.1	Inspection of Site	70
12.1	Sufficiency of Tender	71
12.2	Not Foreseeable Physical Obstructions or Conditions	71
13.1	Work to be in Accordance with Contract	72
14.1	Program to be Submitted	72
14.2	Revised Program	72
14.3	Cash Flow Estimate to be Submitted	72
14.4	Contractor not Relieved of Duties or Responsibilities	73
15.1	Contractor's Superintendence	73
16.1	Contractor's Employees	73
16.2	Engineer at Liberty to Object	73
17.1	Setting-out	74
18.1	Boreholes and Exploratory Excavation	74
19.1	Safety, Security and Protection of the Environment	74
19.2	Employer's Responsibilities	75
20.1	Care of Works	75
20.2	Responsibility to Rectify Loss or Damage	75
20.3	Loss or Damage Due to Employer's Risks	76
20.4	Employer's Risks	76
21.1	Insurance of Works and Contractor's Equipment	77
21.2	Scope of Cover	77
21.3	Responsibility for Amounts not Recovered	77
21.4	Exclusions	78
22.1	Damage to Persons and Property	78
22.2	Exceptions	78
22.3	Indemnity by Employer	79
23.1	Third Party Insurance (including Employer's Property)	79
23.2	Minimum Amount of Insurance	79
23.3	Cross Liabilities	79
24.1	Accident or Injury to Workmen	79
24.2	Insurance Against Accident to Workmen	79
25.1	Evidence and Terms of Insurances	80
25.2	Adequacy of Insurances	80
25.3	Remedy on Contractor's Failure to Insure	80
25.4	Compliance with Policy Conditions	80
26.1	Compliance with Statutes, Regulations	80
27.1	Fossils	81
28.1	Patent Rights	81
28.2	Royalties	81
29.1	Interference With Traffic and Adjoining Properties	82
30.1	Avoidance of Damage to Roads	82
30.2	Transport of Contractor's Equipment or Temporary Works	82
30.3	Transport of Materials or Plant	82
30.4	Waterborne Traffic	83
31.1	Opportunities for Other Contractors	83
31.2	Facilities for Other Contractors	83
32.1	Contractor to Keep Site Clear	84



33.1	Clearance of Site on Completion	84
	<b>Labour</b>	<b>84</b>
34.1	Engagement of Staff and Labour	84
35.1	Returns of Labour and Contractor's Equipment	84
	<b>Materials, Plant and Workmanship</b>	<b>85</b>
36.1	Quality of Materials, Plant and Workmanship	85
36.2	Cost of Samples	85
36.3	Cost of Tests	85
36.4	Cost of Tests not Provided for	85
36.5	Engineer's Determination where Tests not Provided for	86
37.1	Inspection of Operations	86
37.2	Inspection and Testing	86
37.3	Dates for Inspection and Testing	86
37.4	Rejection	87
37.5	Independent Inspection	87
38.1	Examination of Work before Covering up	87
38.2	Uncovering and Making Openings	87
39.1	Removal of Improper Work, Materials or Plant	88
39.2	Default of Contractor in Compliance	88
	<b>Suspension</b>	<b>88</b>
40.1	Suspension of Work	88
40.2	Engineer's Determination following Suspension	89
40.3	Suspension lasting more than 84 Days	89
	<b>Commencement and Delays</b>	<b>89</b>
41.1	Commencement of Works	89
42.1	Possession of Site and Access Thereto	90
42.2	Failure to Give Possession	90
42.3	Rights of Way and Facilities	90
43.1	Time for Completion	91
44.1	Extension of Time for Completion	91
44.2	Contractor to Provide Notification and Detailed Particulars	91
44.3	Interim Determination of Extension	91
45.1	Restriction on Working Hours	92
46.1	Rate of Progress	92
47.1	Liquidated Damages for Delay	92
47.2	Reduction of Liquidated Damages	93
48.1	Taking-Over Certificate	93
48.2	Taking-Over of Sections or Parts	94
48.3	Substantial Completion of Parts	94



48.4	Surfaces Requiring Reinstatement	94
	<b>Defects Liability</b>	<b>94</b>
49.1	Defects Liability Period	94
49.2	Completion of Outstanding Work and Remedying Defects	95
49.3	Cost of Remedying Defects	95
49.4	Contractor's Failure to Carry Out Instructions	95
50.1	Contractor to Search	96
	<b>Alterations, Additions and Omissions</b>	<b>96</b>
51.1	Variations	96
51.2	Instructions for Variations	96
52.1	Valuation of Variations	97
52.2	Power of Engineer to Fix Rates	97
52.3	Variations Exceeding 15 percent	98
52.4	Daywork	98
	<b>Procedure for Claims</b>	<b>99</b>
53.1	Notice of Claims	99
53.2	Contemporary Records	99
53.3	Substantiation of Claims	99
53.4	Failure to Comply	100
53.5	Payment of Claims	100
	<b>Contractor's Equipment, Temporary Works and Materials</b>	<b>100</b>
54.1	Contractor's Equipment, Temporary Works and Materials; Exclusive Use for the Works.	100
54.2	Employer not Liable for Damage	100
54.3	Customs Clearance	100
54.4	Re-export of Contractor's Equipment	101
54.5	Conditions of Hire of Contractor's Equipment	101
54.6	Costs for the Purpose of Clause 63	101
54.7	Incorporation of Clause in Subcontracts	101
54.8	Approval of Materials not Implied	101
	<b>Measurement</b>	<b>102</b>
55.1	Quantities	102
56.1	Works to be Measured	102
57.1	Method of Measurement	102





57.2	Breakdown of Lump Sum Items	102
	<b>Provisional Sums</b>	<b>103</b>
58.1	Definition of "Provisional Sum"	103
58.2	Use of Provisional Sums	103
58.3	Production of Vouchers	103
	<b>Nominated Subcontractors</b>	<b>103</b>
59.1	Definition of "Nominated Subcontractors"	103
59.2	Nominated Subcontractors; Objection to Nomination	104
59.3	Design Requirements to be Expressly Stated	104
59.4	Payments to Nominated Subcontractors	104
59.5	Certification of Payments to Nominated Subcontractors	105
	<b>Certificates and Payment</b>	<b>105</b>
60.1	Monthly Statements	105
60.2	Monthly Payments	106
60.3	Payment of Retention Money	106
60.4	Correction of Certificates	107
60.5	Statement at Completion	107
60.6	Final Statement	108
60.7	Discharge	108
60.8	Final Payment Certificate	108
60.9	Cessation of Employer's Liability	109
60.10	Time for Payment	109
61.1	Approval only by Defects Liability Certificate	109
62.1	Defects Liability Certificate	109
62.2	Unfulfilled Obligations	110
	<b>Remedies</b>	<b>110</b>
63.1	Default of Contractor	110
63.2	Valuation at Date of Termination	111
63.3	Payment after Termination	111
63.4	Assignment of Benefit of Agreement	111
64.1	Urgent Remedial Work	112
	<b>Special Risks</b>	<b>112</b>
65.1	No Liability for Special Risks	112
65.2	Special Risks	112
65.3	Damage to Works by Special Risks	112
65.4	Projectile, Missile	113
65.5	Increased Costs arising from Special Risks	113
65.6	Outbreak of War	113
65.7	Removal of Contractor's Equipment on Termination	114



65.8	Payment if Contract Terminated	114
	<b>Release from Performance</b>	<b>115</b>
66.1	Payment in Event of Release from Performance	115
	<b>Settlement of Disputes</b>	<b>115</b>
67.1	Engineer's Decision	115
67.2	Amicable Settlement	116
67.3	Arbitration	116
67.4	Failure to Comply with Engineer's Decision	117
	<b>Notices</b>	<b>117</b>
68.1	Notice to Contractor	117
68.2	Notice to Employer and Engineer	117
68.3	Change of Address	117
	<b>Default of Employer</b>	<b>117</b>
69.1	Default of Employer	117
69.2	Removal of Contractor's Equipment	118
69.3	Payment on Termination	118
69.4	Contractor's Entitlement to Suspend Work	118
69.5	Resumption of Work	119
	<b>Changes in Cost and Legislation</b>	<b>119</b>
70.1	Increase or Decrease of Cost	119
70.2	Subsequent Legislation	119
	<b>Currency and Rates of Exchange</b>	<b>119</b>
71.1	Currency Restrictions	119
72.1	Rates of Exchange	120
72.2	Currency Proportions	120
72.3	Currencies of Payment for Provisional Sums	120
	<b>REFERENCE TO PART II</b>	
	<b>INDEX</b>	<b>121</b>
	<b>TENDER (NOT USED)</b>	
	<b>AGREEMENT (NOT USED)</b>	



**PART I - GENERAL CONDITIONS****Definitions and Interpretation****I.1 Definitions**

In the Contract (as hereinafter defined) the following words and expressions shall have the meanings hereby assigned to them, except where the context otherwise requires:

- (a) (i) "Employer" means the person named as such in Part II of these Conditions and the legal successors in title to such person, but not (except with the consent of the Contractor) any assignee of such person.
- (ii) "Contractor" means the person whose tender has been accepted by the Employer and the legal successors in title to such person, but not (except with the consent of the Employer) any assignee of such person.
- (iii) "Subcontractor" means any person named in the Contract as a Subcontractor for a part of the Works or any person to whom a part of the Works has been subcontracted with the consent of the Engineer and the legal successors in title to such person, but not any assignee of any such person.
- (iv) "Engineer" means the person appointed by the Employer to act as Engineer for the purposes of the Contract and named as such in Part II of these Conditions.
- (v) "Engineer's Representative" means a person appointed from time to time by the Engineer under Sub-Clause 2.2.
- (b) (i) "Contract" means these Conditions (Parts I and II), the Specification, the Drawings, the Bill of Quantities, the Tender, the Letter of Acceptance, the Contract Agreement (if completed) and such further documents as may be expressly incorporated in the Letter of Acceptance or Contract Agreement (if completed).
- (ii) "Specification" means the specification of the Works included in the Contract and any modification thereof or addition thereto made under Clause 51 or submitted by the Contractor and approved by the Engineer.
- (iii) "Drawings" means all drawings, calculations and technical information of a like nature provided by the Engineer to the Contractor under the Contract and all drawings, calculations, samples, patterns, models, operation and maintenance manuals and





- other technical information of a like nature submitted by the Contractor and approved by the Engineer.
- (iv) "Bill of Quantities" means the priced and completed bill of quantities forming part of the Tender.
  - (v) "Tender" means the Contractor's priced offer to the Employer for the execution and completion of the Works and the remedying of any defects therein in accordance with the provisions of the Contract, as accepted by the Letter of Acceptance.
  - (vi) "Letter of Acceptance" means the formal acceptance by the Employer of the Tender.
  - (vii) "Contract Agreement" means the contract agreement (if any) referred to in Sub-Clause 9.1.
  - (viii) "Appendix to Tender" means the appendix comprised in the form of Tender annexed to these Conditions.
- (c) (i) "Commencement Date" means the date upon which the Contractor receives the notice to commence issued by the Engineer pursuant to Clause 41.
  - (ii) "Time for Completion" means the time for completing the execution of and passing the Tests on Completion of the Works or any Section or part thereof as stated in the Contract (or as extended under Clause 44) calculated from the Commencement Date.
- (d) (i) "Tests on Completion" means the tests specified in the Contract or otherwise agreed by the Engineer and the Contractor which are to be made by the Contractor before the Works of any Section or part thereof are taken over by the Employer.
  - (ii) "Taking-Over Certificate" means a certificate issued pursuant to Clause 48.
- (e) (i) "Contract Price" means the sum stated in the Letter of Acceptance as payable to the Contractor for the execution and completion of the Works and the remedying of any defects therein in accordance with the provisions of the Contract.
  - (ii) "Retention Money" means the aggregate of all monies retained by the Employer pursuant to Sub-Clause 60.2(a).
  - (iii) "Interim Payment Certificate" means any certificate of payment issued by the Engineer other than the Final Payment Certificate.



- (iv) "Final Payment Certificate" means the certificate of payment issued by the Engineer pursuant to Sub-Clause 60.8.
- (f) (i) "Works" means the Permanent Works and the Temporary Works or either of them as appropriate.
- (ii) "Permanent Works" means the permanent works to be executed (including Plant) in accordance with the Contract
- (iii) "Temporary Works" means all temporary works of every kind (other than Contractor's Equipment) required in or about the execution and completion of the Works and the remedying of any defects therein.
- (iv) "Plant" means machinery, apparatus and the like intended to form or forming part of the Permanent Works.
- (v) "Contractor's Equipment" means all appliances and things of whatsoever nature (other than Temporary Works) required for the execution and completion of the Works and the remedying of any defects therein, but does not include Plant, materials or other things intended to form or forming part of the Permanent Works.
- (vi) "Section" means a part of the Works specifically identified in the Contract as a Section.
- (vii) "Site" means the places provided by the Employer where the Works are to be executed and any other places as may be specifically designated in the Contract as forming part of the Site.
- (g) (i) "cost" means all expenditure properly incurred or to be incurred, whether, on or off the Site, including overhead and other charges properly allocable thereto but does not include any allowance for profit.
- (ii) "day" means calendar day.
- (iii) "foreign currency" means a currency of a country other than that in which the Works are to be located.
- (iv) "writing" means any hand-written, type-written, or printed communication, including telex, cable and facsimile transmission.

**1.2 Headings and Marginal Notes**

The headings and marginal notes in these Conditions shall not be deemed part thereof or be taken into consideration in the interpretation or construction thereof or of the Contract.

**1.3 Interpretation**

Words importing persons or parties shall include firms and organizations and any organization having legal capacity.





#### 1.4 Singular and Plural

Words importing the singular only also include the plural and vice versa where the context requires.

#### 1.5 Notices, Consents, Approvals, Certificates and Determinations

Wherever in the Contract provision is made for the giving or issue of any notice, consent, approval, certificate or determination by any person, unless otherwise specified such notice, consent, approval, certificate or determination shall be in writing and the words "notify", "certify" or "determine" shall be construed accordingly. Any such consent, approval, certificate or determination shall not unreasonably be withheld or delayed.

### Engineer and Engineer's Representative

#### 2.1 Engineer's Duties and Authority

- (a) The Engineer shall carry out the duties specified in the Contract.
- (b) The Engineer may exercise the authority specified in or necessarily to be implied from the Contract, provided, however, that if the Engineer is required, under the terms of his appointment by the Employer, to obtain the specific approval of the Employer before exercising any such authority, particulars of such requirements shall be set out in Part II of these Conditions. Provided further that any requisite approval shall be deemed to have been given by the Employer for any such authority exercised by the Engineer.
- (c) Except as expressly stated in the Contract, the Engineer shall have no authority to relieve the Contractor of any of his obligations under the Contract.

#### 2.2 Engineer's Representative

The Engineer's Representative shall be appointed by and be responsible to the Engineer and shall carry out such duties and exercise such authority as may be delegated to him by the Engineer under Sub-Clause 2.3.

#### 2.3 Engineer's Authority to Delegate

The Engineer may from time-to-time delegate to the Engineer's Representative any of the duties and authorities vested in the Engineer and he may at any time revoke such delegation. Any such delegation or revocation shall be in writing and shall not take effect until a copy thereof has been delivered to the Employer and the Contractor.





Any communication given by the Engineer's Representative to the Contractor in accordance with such delegation shall have the same effect as though it had been given by the Engineer. Provided that:

- (a) any failure of the Engineer's Representative to disapprove any work, materials or Plant shall not prejudice the authority of the Engineer to disapprove such work, materials or Plant and to give instructions for the rectification thereof; and
- (b) if the Contractor questions any communication of the Engineer's Representative, he may refer the matter to the Engineer who shall confirm, reverse or vary the contents of such communication.

#### 2.4 **Appointment of Assistants**

The Engineer or the Engineer's Representative may appoint any number of persons to assist the Engineer's Representative in the carrying out of his duties under Sub-Clause 2.2. He shall notify to the Contractor the names, duties and scope of authority of such persons. Such assistants shall have no authority to issue any instructions to the Contractor save in so far as such instructions may be necessary to enable them to carry out their duties and to secure their acceptance of materials, Plant or workmanship as being in accordance with the Contract, and any instructions given by any of them for those purposes shall be deemed to have been given by the Engineer's Representative.

#### 2.5 **Instructions in Writing**

Instructions given by the Engineer shall be in writing, provided that if for any reason the Engineer considers it necessary to give any such instruction orally, the Contractor shall comply with such instruction. Confirmation in writing of such oral instruction given by the Engineer, whether before or after the carrying out of the instruction, shall be deemed to be an instruction within the meaning of this Sub-Clause. Provided further that if the Contractor, within 7 days, confirms in writing to the Engineer any oral instruction of the Engineer and such confirmation is not contradicted in writing within 7 days by the Engineer, it shall be deemed to be an instructions of the Engineer.

The provisions of this Sub-Clause shall equally apply to instructions given by the Engineer's Representative and any assistants of the Engineer or the Engineer's Representative appointed pursuant to Sub-Clause 2.4.

#### 2.6 **Engineer to Act Impartially**

Wherever, under the Contract, the Engineer is required to exercise his discretion by:

- (a) giving his decision, opinion or consent,
- (b) expressing his satisfaction or approval,
- (c) determining value, or



- (d) otherwise taking action which may affect the rights and obligations of the Employer or the Contractor

he shall exercise such discretion impartially within the terms of the Contract and having regard to all the circumstances. Any such decision, opinion, consent expression of satisfaction, or approval, determination of value or action may be opened up, reviewed or revised as provided in Clause 67.

### **Assignment and Subcontracting**

#### **3.1 Assignment of Contract**

The Contractor shall not, without the prior consent of the Employer (which consent, notwithstanding the provisions of Sub-Clause 1.5, shall be at the sole discretion of the Employer), assign the Contract or any part thereof, or any benefit or interest therein or thereunder, otherwise than by:

- (a) a charge in favour of the Contractor's bankers of any monies due or to become due under the Contract, or
- (b) assignment to the Contractor's insurers (in cases where the insurers have discharged the Contractor's loss or liability) of the Contractor's right to obtain relief against any other party liable.

#### **4.1 Subcontracting**

The Contractor shall not subcontract the whole of the Works. Except where otherwise provided by the Contract, the Contractor shall not subcontract any part of the Works without the prior consent of the Engineer. Any such consent shall not relieve the Contractor from any liability or obligation under the Contract and he shall be responsible for the acts, defaults and neglects of any Subcontractor, his agents, servants or workmen as fully as if they were the acts, defaults or neglects of the Contractor, his agents' servants or workmen.

Provided that the Contractor shall not be required to obtain such consent for:

- (a) the provision of labour,
- (b) the purchase of materials which are in accordance with the standards specified in the Contract,
- (c) the subcontracting of any part of the Works for which the Subcontractor is named in the Contract.

#### **4.2 Assignment of Subcontractors' Obligations**

In the event of a Subcontractor having undertaken towards the Contractor in respect of the work executed, or the goods, materials, Plant or services supplied by such Subcontractor, any continuing obligation extending for a period





exceeding that of the Defects Liability Period under the Contract, the Contractor shall at any time, after the expiration of such Period, assign to the Employer, at the Employer's request and cost, the benefit of such obligation for the unexpired duration thereof.

## **Contract Documents**

### **5.1 Language/s and Law**

There is stated in Part II of these Conditions:

- (a) the language or languages in which the Contract documents shall be drawn up, and
- (b) the country or state the law of which shall apply to the Contract and according to which the Contract shall be construed.

If the said documents are written in more than one language, the language according to which the Contract shall be construed and interpreted is also stated in Part II of these Conditions, being therein designated the "Ruling Language".

### **5.2 Priority of Contract Documents**

The several documents forming the Contract are to be taken as mutually explanatory of one another, but in case of ambiguities or discrepancies the same shall be explained and adjusted by the Engineer who shall thereupon issue to the Contractor instructions thereon and in such event, unless otherwise provided in the Contract, the priority of the documents forming the Contract shall be as follows:

- (1) The Contract Agreement (if completed).
- (2) The Letter of Acceptance.
- (3) The Tender.
- (4) Part II of these Conditions.
- (5) Part I of these Conditions; and
- (6) Any other document forming part of the Contract.

### **6.1 Custody and Supply of Drawings and Documents**

The Drawings shall remain in the sole custody of the Engineer, but two copies thereof shall be provided to the Contractor free of charge. The Contractor shall make at his own cost any further copies required by him. Unless it is strictly necessary for the purposes of the Contract, the Drawings, Specification and other documents provided by the Employer or the Engineer shall not, without the consent of the Engineer, be used or communicated to a third party by the Contractor. Upon issue of the Defects Liability Certificate, the Contractor shall





return to the Engineer all Drawings, Specification and other documents provided under the Contract.

The Contractor shall supply to the Engineer four copies of all Drawings, specification and other documents submitted by the Contractor and approved by the Engineer in accordance with Clause 7, together with a reproducible copy of any material which cannot be reproduced to an equal standard by photocopying. In addition, the Contractor shall supply such further copies of such Drawings, Specification and other documents as the Engineer may request in writing for the use of the Employer, who shall pay the cost thereof.

#### 6.2 **One Copy of Drawings to be Kept on Site**

One copy of the Drawings, provided to or supplied by the Contractor as aforesaid, shall be kept by the Contractor on the Site and the same shall at all reasonable times be available for inspection and use by the Engineer and by any other person authorised by the Engineer in writing.

#### 6.3 **Disruption of Progress**

The Contractor shall give notice to the Engineer, with a copy to the Employer, whenever planning or execution of the Works is likely to be delayed or disrupted unless any further drawing or instruction is issued by the Engineer within a reasonable time. The notice shall include details of the drawing or instruction required and of why and by when it is required and of any delay or disruption likely to be suffered if it is late.

#### 6.4 **Delay and Cost of Delay of Drawings**

If, by reason of any failure or inability of the Engineer to issue, within a time reasonable in all the circumstances, any drawing or instruction for which notice has been given by the Contractor in accordance with Sub-Clause 6.3, the Contractor suffers delay and/or incurs costs then the Engineer shall, after due consultation with the Employer and the Contractor, determine:

- (a) any extension of time to which the Contractor is entitled under Clause 44, and
- (b) the amount of such costs, which shall be added to the Contract Price, and shall notify the Contractor accordingly, with a copy to the Employer.

#### 6.5 **Failure by Contractor to Submit Drawings**

If the failure or inability of the Engineer to issue any drawings or instructions is caused in whole or in part by the failure of the Contractor to submit Drawings, Specification or other documents which he is required to submit under the Contract, the Engineer shall take such failure by the Contractor into account when making his determination pursuant to Sub-Clause 6.4.



### 7.1 **Supplementary Drawings and Instructions**

The Engineer shall have authority to issue to the Contractor, from time to time, such supplementary Drawings and instructions as shall be necessary for the purpose of the proper and adequate execution and completion of the Works and the remedying of any defects therein. The Contractor shall carry out and be bound by the same.

### 7.2 **Permanent Works Designed by Contractor**

Where the Contract expressly provides that part of the Permanent Works shall be designed by the Contractor, he shall submit to the Engineer, for approval:

- (a) such drawings, specifications, calculations and other information as shall be necessary to satisfy the Engineer as to the suitability and adequacy of that design, and
- (b) operation and maintenance manuals together with drawings of the Permanent Works as completed, in sufficient detail to enable the Employer to operate, maintain, dismantle, reassemble and adjust the Permanent Works incorporating that design. The Works shall not be considered to be completed for the purposes of taking over in accordance with Clause 48 until such operation and maintenance manuals together with drawings on completion have been submitted to and approved by the Engineer.

### 7.3 **Responsibility Unaffected by Approval**

Approval by the Engineer, in accordance with Sub-Clause 7.2, shall not relieve the Contractor of any of his responsibilities under the Contract.

## **General Obligations**

### 8.1 **Contractor's General Responsibilities**

The Contractor shall, with due care and diligence, design (to the extent provided for by the Contract), execute and complete the Works and remedy any defects therein in accordance with the provisions of the Contract. The Contractor shall provide all superintendence, labor, material, Plant, Contractor's Equipment and all other things, whether of a temporary or permanent nature, required in and for such design, execution, completion and remedying of any defects, so far as the necessity for providing the same is specified in or is reasonably to be inferred from the Contract.

### 8.2 **Site Operations and Methods of Construction**

The Contractor shall take full responsibility for the adequacy, stability and safety of all Site operations and methods of construction. Provided that the





Contractor shall not be responsible (except as stated hereunder or as may be otherwise agreed) for the design or specification of Permanent Works, or for the design or specification of any Temporary Works not prepared by the Contractor. Where the Contract expressly provides that part of the Permanent Works shall be designed by the Contractor, he shall be fully responsible for that part of such Works, notwithstanding any approval by the Engineer.

#### 9.1 **Contract Agreement**

The Contractor shall, if called upon so to do, enter into and execute the Contract Agreement, to be prepared and completed at the cost of the Employer, in the form annexed to these Conditions with such modification as may be necessary.

#### 10.1 **Performance Security**

If the Contract requires the Contractor to obtain security for his proper performance of the Contract, he shall obtain and provide to the Employer, such security within 28 days after the receipt of the Letter of Acceptance, in the sum stated in the Appendix to Tender. When providing such security to the Employer, the Contractor 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 Employer and the Contractor. The institution providing such security shall be subject to the approval of the Employer. The cost of complying with the requirements of this Clause shall be borne by the Contractor, unless the Contract otherwise provides.

#### 10.2 **Period of Validity of Performance Security**

The performance security shall be valid until the Contractor has executed and completed the Works and remedied any defects therein in accordance with the Contract. No claim shall be made against such security after the issue of the Defects Liability Certificate in accordance with Sub-Clause 62.1 and such security shall be returned to the Contractor within 14 days of the issue of the said Defects Liability Certificate.

#### 10.3 **Claims under Performance Security**

Prior to making a claim under the performance security the Employer shall, in every case, notify the Contractor stating the nature of the default in respect of which the claim is to be made.

#### 11.1 **Inspection of Site**

The Employer shall have made available to the Contractor, before the submission by the Contractor of the Tender, such data on hydrological and sub-surface conditions as have been obtained by or on behalf of the Employer from investigations undertaken relevant to the Works but the Contractor shall be responsible for his own interpretation thereof.





The Contractor shall be deemed to have inspected and examined the Site and its surroundings and information available in connection therewith and to have satisfied himself (so far as is practicable, having regard to considerations of cost and time) before submitting his Tender, as to:

- (a) the form and nature thereof, including the sub-surface conditions,
- (b) the hydrological and climatic conditions,
- (c) the extent and nature of work and materials necessary for the execution and completion of the Works and the remedying of any defects therein, and
- (d) the means of access to the Site and the accommodation he may require, and, in general, shall be deemed to have obtained all necessary information, subject as above mentioned, as to risks, contingencies and all other circumstances which may influence or affect his Tender.

The Contractor shall be deemed to have based his Tender on the data made available by the Employer and on his own inspection and examination, all as aforementioned.

#### 12.1 **Sufficiency of Tender**

The Contractor shall be deemed to have satisfied himself as to the correctness and sufficiency of the Tender and of the rates and prices stated in the Bill of Quantities, all of which shall, except insofar as it is otherwise provided in the Contract, cover all his obligations under the Contract (including those in respect of the supply of goods, materials, Plant or services or of contingencies for which there is a Provisional Sum) and all matters and things necessary for the proper execution and completion of the Works and the remedying of any defects therein.

#### 12.2 **Not Foreseeable Physical Obstructions or Conditions**

If, however, during the execution of the Works the Contractor encounters physical obstructions or physical conditions, other than climatic conditions on the Site, which obstructions or conditions were, in his opinion, not foreseeable by an experienced contractor, the Contractor shall forthwith give notice thereof to the Engineer, with a copy to the Employer. On receipt of such notice, the Engineer shall if in his opinion such obstructions or conditions could not have been reasonably foreseen by an experienced contractor, after due consultation with the Employer and the Contractor, determine:

- (a) any extension of time to which the Contractor is entitled under Clause 44, and



- (b) the amount of any costs which may have been incurred by the Contractor by reason of such obstructions or conditions having been encountered, which shall be added to the Contract Price,

and shall notify the Contractor accordingly, with a copy to the Employer. Such determination shall take account of any instruction which the Engineer may issue to the Contractor in connection therewith, and any proper and reasonable measures acceptable to the Engineer which the Contractor may take in the absence of specific instructions from the Engineer.

**13.1 Work to be in Accordance with Contract**

Unless it is legally or physically impossible, the Contractor shall execute and complete the Works and remedy any defects therein in strict accordance with the Contract to the satisfaction of the Engineer. The Contractor shall comply with and adhere strictly to the Engineer's instructions on any matter, whether mentioned in the Contract or not, touching or concerning the Works. The Contractor shall take instructions only from the Engineer (or his delegate).

**14.1 Program to be Submitted**

The Contractor shall, within the time stated in Part II of these Conditions after the date of the Letter of Acceptance, submit to the Engineer for his consent a Program, in such form and detail as the Engineer shall reasonably prescribe, for the execution of the Works. The Contractor shall, whenever required by the Engineer, also provide in writing for his information a general description of the arrangements and methods which the Contractor proposes to adopt for the execution of the Works.

**14.2 Revised Program**

If at any time it should appear to the Engineer that the actual progress of the Works does not conform to the Program to which consent has been given under Sub-Clause 14.1, the Contractor shall produce, at the request of the Engineer, a revised Program showing the modifications to such Program necessary to ensure completion of the Works within the Time for Completion.

**14.3 Cash Flow Estimate to be Submitted**

The Contractor shall, within the time stated in Part II of these Conditions after the date of the Letter of Acceptance, provide to the Engineer for his information a detailed cash flow estimate, in quarterly periods, of all payments to which the Contractor will be entitled under the Contract and the Contractor shall subsequently supply revised cash flow estimates at quarterly intervals, if required to do so by the Engineer.





**14.4 Contractor not Relieved of Duties or Responsibilities**

The submission to and consent by the Engineer of such Programs or the provision of such general descriptions or cash flow estimates shall not relieve the Contractor of any of his duties or responsibilities under the Contract.

**15.1 Contractor's Superintendence**

The Contractor shall provide all necessary superintendence during the execution of the Works and as long thereafter as the Engineer may consider necessary for the proper fulfilling of the Contractor's obligations under the Contract. The Contractor, or a competent and authorised representative approved of by the Engineer, which approval may at any time be withdrawn, shall give his whole time to the superintendence of the Works. Such authorised representative shall receive, on behalf of the Contractor, instructions from the Engineer.

If approval of the representative is withdrawn by the Engineer, the Contractor shall, as soon as is practicable, having regard to the requirement of replacing him as hereinafter mentioned, after receiving notice of such withdrawal, remove the representative from the Works and shall not thereafter employ him again on the Works in any capacity and shall replace him by another representative approved by the Engineer.

**16.1 Contractor's Employees**

The Contractor shall provide on the Site in connection with the execution and completion of the Works and the remedying of any defects therein:

- (a) only such technical assistants as are skilled and experienced in their respective callings and such foremen and leading hands as are competent to give proper superintendence of the Works, and
- (b) such skilled, semi-skilled and unskilled labour as is necessary for the proper and timely fulfilling of the Contractor's obligations under the Contract.

**16.2 Engineer at Liberty to Object**

The Engineer shall be at liberty to object to and require the Contractor to remove forthwith from the Works any person provided by the Contractor who, in the opinion of the Engineer, misconducts himself, or is incompetent or negligent in the proper performance of his duties, or whose presence on Site is otherwise considered by the Engineer to be undesirable, and such person shall not be again allowed upon the Works without the consent of the Engineer. Any person so removed from the Works shall be replaced as soon as possible.

**17.1 Setting-out**





The Contractor shall be responsible for:

- (a) the accurate setting-out of the Works in relation to original points, lines and levels of reference given by the Engineer in writing,
- (b) the correctness, subject as above mentioned of the position, levels dimensions and alignment of all parts of the Works, and
- (c) the provision of all necessary instruments, appliances and labour in connection with the foregoing responsibilities.

If, at any time during the execution of the Works, any error appears in the position, levels, dimensions or alignment of any part of the Works, the Contractor, on being required so to do by the Engineer, shall, at his own cost, rectify such error to the satisfaction of the Engineer, unless such error is based on incorrect data supplied in writing by the Engineer, in which case the Engineer shall determine an addition to the Contract Price in accordance with Clause 52 and shall notify the Contractor accordingly, with a copy to the Employer.

The checking of any setting-out or of any line or level by the Engineer shall not in any way relieve the Contractor of his responsibility for the accuracy thereof and the Contractor shall carefully protect and preserve all benchmarks, sight-rails, pegs and other things used in setting-out the Works.

#### 18.1 **Boreholes and Exploratory Excavation**

If, at any time during the execution of the Works, the Engineer requires the Contractor to make boreholes or to carry out exploratory excavation, such requirement shall be the subject of an instruction in accordance with Clause 51, unless an item or a Provisional Sum in respect of such work is included in the Bill of Quantities.

#### 19.1 **Safety, Security and Protection of the Environment**

The Contractor shall, throughout the execution and completion of the Works and the remedying of any defects therein:

- (a) have full regard for the safety of all persons entitled to be upon the Site and keep the Site (so far as the same is under his control) and the Works (so far as the same are not completed or occupied by the Employer) in an orderly state appropriate to the avoidance of danger to such persons,
- (b) provide and maintain at his own cost all lights, guards, fencing, warning signs and watching, when and where necessary or required by the Engineer or by any duly constituted authority, for the protection of the Works or for the safety and convenience of the public or others, and



- (c) take all reasonable steps to protect the environment on and off the Site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other causes arising as a consequence of his methods of operation.

#### 19.2 **Employer's Responsibilities**

If under Clause 31 the Employer shall carry out work on the Site with his own workmen he shall, in respect of such work:

- (a) have full regard to the safety of all persons entitled to be upon the Site, and
- (b) keep the Site in an orderly state appropriate to the avoidance of danger to such persons.

If under Clause 31 the Employer shall employ other contractors on the Site, he shall require them to have the same regard for safety and avoidance of danger.

#### 20.1 **Care of Works**

The Contractor shall take full responsibility for the care of the Works and materials and Plant for incorporation therein from the Commencement Date until the date of issue of the Taking-Over Certificate for the whole of the Works, when the responsibility for the said care shall pass to the Employer. Provided that:

- (a) if the Engineer issues a Taking-Over Certificate for any Section or part of the Permanent Works the Contractor shall cease to be liable for the care of that Section or part from the date of issue of the Taking-Over Certificate, when the responsibility for the care of that Section or part shall pass to the Employer, and
- (b) the Contractor shall take full responsibility for the care of any outstanding Works and materials and Plant for incorporation therein which he undertakes to finish during the Defects Liability Period until such outstanding Works have been completed pursuant to Clause 49.

#### 20.2 **Responsibility to Rectify Loss or Damage**

If any loss or damage happens to the Works, or any part thereof, or materials or Plant for incorporation therein, during the period for which the Contractor is responsible for the care thereof, from any cause whatsoever, other than the risks defined in Sub-Clause 20.4, the Contractor shall, at his own cost, rectify such loss or damage so that the Permanent Works conform in every respect with the provisions of the Contract to the satisfaction of the Engineer. The Contractor shall also be liable for any loss or damage to the Works occasioned by him in the course of any operations carried out by him for the purpose of complying





with his obligations under Clauses 49 and 50.

### 20.3 **Loss or Damage Due to Employer's Risks**

In the event of any such loss or damage happening from any of the risks defined in Sub-Clause 20.4, or in combination with other risks, the Contractor shall, if and to the extent required by the Engineer, rectify the loss or damage and the Engineer shall determine an addition to the Contract Price in accordance with Clause 52 and shall notify the Contractor accordingly, with a copy to the Employer. In the case of a combination of risks causing loss or damage any such determination shall take into account the proportional responsibility of the Contractor and the Employer.

### 20.4 **Employer's Risks**

The Employer's risks are:

- (a) war, hostilities (whether war be declared or not), invasion, act of foreign enemies,
- (b) rebellion, revolution, insurrection, or military or usurped power, or civil war,
- (c) ionising radiations, or contamination by radioactivity from any nuclear fuel, or from any nuclear waste from the combustion of nuclear fuel, radio-active toxic explosive, or other hazardous properties of any explosive nuclear assembly or nuclear component thereof,
- (d) pressure waves caused by aircraft or other aerial devices travelling at sonic or supersonic speeds,
- (e) riot, commotion or disorder, unless solely restricted to employees of the Contractor or of his Subcontractor and arising from the conduct of the Works,
- (f) loss or damage due to the use or occupation by the Employer of any Section or part of the Permanent Works, except as may be provided for in the Contract,
- (g) loss or damage to the extent that it is due to the design of the Works, other than any part of the design provided by the Contractor or for which the Contractor is responsible, and
- (h) any operation of the forces of nature against which an experienced contractor could not reasonably have been expected to take precautions.

### 21.1 **Insurance of Works and Contractor's Equipment**





The Contractor shall, without limiting his or the Employer's obligations and responsibilities under Clause 20, insure:

- (a) the Works, together with materials and Plant for incorporation therein, to the full replacement cost (the term "cost" in this context shall include profit),
- (b) an additional sum of 15 per cent of such replacement cost, or as may be specified in Part II of these Conditions, to cover any additional costs of and incidental to the rectification of loss or damage including professional fees and the cost of demolishing and removing any part of the Works and of removing debris of whatsoever nature, and
- (c) the Contractor's Equipment and other things brought onto the Site by the Contractor, for a sum sufficient to provide for their replacement at the Site.

#### 21.2 **Scope of Cover**

The insurance in paragraphs (a) and (b) of Sub-Clause 21.1 shall be in the joint names of the Contractor and the Employer and shall cover:

- (a) the Employer and the Contractor against all loss or damage from whatsoever cause arising, other than as provided in Sub-Clause 21.4, from the start of work at the Site until the date of issue of the relevant Taking-Over Certificate in respect of the Works or any Section or part thereof as the case may be, and
- (b) the Contractor for his liability:
  - (i) during the Defects Liability Period for loss or damage arising from a cause occurring prior to the commencement of the Defects Liability Periods, and
  - (ii) for loss or damage occasioned by the Contractor in the course of any operations carried out by him for the purpose of complying with his obligations under Clauses 49 and 50.

#### 21.3 **Responsibility for Amounts Not Recovered**

Any amounts not insured or not recovered from the insurers shall be borne by the Employer or the Contractor in accordance with their responsibilities under Clause 20.

#### 21.4 **Exclusions**



There shall be no obligation for the insurances in Sub-Clause 21.1 to include loss or damage caused by:

- (a) war, hostilities (where war be declared or not), invasion, act of foreign enemies,
- (b) rebellion, revolution, insurrection, or military or usurped power, or civil war,
- (c) ionising, radiations, or contamination by radioactivity from any nuclear fuel, or from any nuclear waste from the combustion of nuclear fuel, radioactive toxic explosive or other hazardous properties of any explosive nuclear assembly or nuclear component thereof, or
- (d) pressure waves caused by aircraft or other aerial devices travelling at sonic or supersonic speeds.

#### 22.1 **Damage to Persons and Property**

The Contractor shall, except if and so far as the Contract provides otherwise, indemnify the Employer against all losses and claims in respect of:

- (a) death of or injury to any person, or
- (b) loss of or damage to any property (other than the Works),

which may arise out of or in consequence of the execution and completion of the Works and the remedying of any defects therein, and against all claims, proceedings, damages, costs, charges and expenses whatsoever in respect thereof or in relation thereto, subject to the exceptions defined in Sub-Clause 22.2.

#### 22.2 **Exceptions**

The "exceptions" referred to in Sub-Clause 22.1 are:

- (a) the permanent use or occupation of land by the Works, or any part thereof,
- (b) the right of the Employer to execute the Works, or any part thereof, on, over, under, is or through any land,
- (c) damage to property which is the unavoidable result of the execution and completion of the Works, or the remedying of any defects therein, in accordance with the Contract, and
- (d) death of or injury to persons or loss of or damage to property resulting from any act or neglect of the Employer, his agents servants or other contractors, not being employed by the Contractor, or in respect of any claims,





proceedings, damages, costs, charges and expenses in respect thereof or in relation thereto or, where the injury or damage was contributed to by the Contractor, his servants or agents, such part of the said injury or damage as may be just and equitable having regard to the extent of the responsibility of the Employer, his servants or agents or other contractors for the injury or damage.

**22.3 Indemnity by Employer**

The Employer shall indemnify the Contractor against all claims, proceedings, damages, costs, charges and expenses in respect of the matters referred to in the exceptions defined in Sub-Clause 22.2

**23.1 Third Party Insurance (including Employer's Property)**

The Contractor shall, without limiting his or the Employer's obligation and responsibilities under Clause 22, insure, in the joint names of the Contractor and the Employer, against liabilities for death of or injury to any person (other than as provided in Clause 24) or loss of or damage to any property (other than the Works) arising out of the performance of the Contract, other than the exceptions defined in paragraphs (a), (b) and (c) of Sub-Clause 22.2.

**23.2 Minimum Amount of Insurance**

Such insurance shall be for at least the amount stated in the Appendix to Tender.

**23.3 Cross Liabilities**

The insurance policy shall include a cross liability clause such that the insurance shall apply to the Contractor and to the Employer as separate insureds.

**24.1 Accident or Injury to Workmen**

The Employer shall not be liable for or in respect of any damages or compensation payable to any workman or other person in the employment of the Contractor or any Subcontractor, other than death or injury resulting from any act or default of the Employer, his agents or servants. The Contractor shall indemnify and keep indemnified the Employer against all such damages and compensation, other than those for which the Employer is liable as aforesaid, and against all claims, proceedings, damages, costs, charges, and expenses whatsoever in respect thereof or in relation thereto.

**24.2 Insurance Against Accident to Workmen**

The Contractor shall insure against such liability and shall continue such insurance during the whole of the time that any persons are employed by him on the Works. Provided that, in respect of any persons employed by any Subcontractor, the Contractor's obligations to insure shall extend to the Sub-





Clause shall be satisfied if the Subcontractor shall have insured against the liability in respect of such persons in such manner that the Employer is indemnified under the policy, but the Contractor shall require such Subcontractor to produce to the Employer, when required, such policy of insurance and the receipt for the payment of the current premium.

#### 25.1 **Evidence and Terms of Insurances**

The Contractor shall provide evidence to the Employer prior to the start of work at the Site that the insurances required under the Contract have been effected and shall, within 84 days of the Commencement Date, provide the insurance policies to the Employer. When providing such evidence and such policies to the Employer, the Contractor shall notify the Engineer of so doing. Such insurance policies shall be consistent with the general terms agreed prior to the issue of the Letter of Acceptance. The Contractor shall effect all insurances for which he is responsible with insurers and in terms approved by the Employer.

#### 25.2 **Adequacy of Insurances**

The Contractor shall notify the insurers of changes in the nature, extent or Program for the execution of the Works and ensure the adequacy of the insurances at all times in accordance with the terms of the Contract and shall, when required, produce to the Employer the insurance policies in force and the receipts for payment of the current premiums.

#### 25.3 **Remedy on Contractor's Failure to Insure**

If the Contractor fails to effect and keep in force any of the insurances required under the Contract, or fails to provide the policies to the Employer within the period required by Sub-Clause 25.1, then and in any such case the Employer may effect and keep in force any such insurances and pay any premium as may be necessary for that purpose and from time to time deduct the amount so paid from any monies due or to become due to the Contractor, or recover the same as a debt due from the Contractor.

#### 25.4 **Compliance with Policy Conditions**

In the event that the Contractor or the Employer fails to comply with conditions imposed by the insurance policies effected pursuant to the Contract, each shall indemnify the other against all losses and claims arising from such failure.

#### 26.1 **Compliance with Statutes, Regulations**

The Contractor shall conform in all respects, including by the giving of all notices and the paying of all fees, with the provisions of:

- (a) any National or State Statute, Ordinance, or other Law, or any regulation, or



byelaw of any local or other duly constituted authority in relation to the execution and completion of the Works and the remedying of any defects therein, and

- (b) the rules and regulations of all public bodies and companies whose property or rights are affected or may be affected in any way by the Works,

and the Contractor shall keep the Employer indemnified against all penalties and liability of every kind for breach of any such provisions. Provided always that the Employer shall be responsible for obtaining any planning, zoning or other similar permission required for the Works to proceed and shall indemnify the Contractor in accordance with Sub-Clause 22.3.

#### 27.1 **Fossils**

All fossils, coins, articles of value or antiquity and structures and other remains or things of geological or archaeological interest discovered on the Site shall, as between the Employer and the Contractor, be deemed to be the absolute property of the Employer. The Contractor shall take reasonable precautions to prevent his workmen or any other persons from removing or damaging any such article or thing and shall, immediately upon discovery thereof and before removal, acquaint the Engineer of such discovery and carry out the Engineer's instructions for dealing with the same. If, by reason of such instructions, the Contractor suffers delay and/or incurs costs then the Engineer shall, after due consultation with the Employer and the Contractor, determine:

- (a) any extension of time to which the Contractor is entitled under Clause 44, and
- (b) the amount of such costs, which shall be added to the Contract Price, and shall notify the Contractor accordingly, with a copy to the Employer.

#### 28.1 **Patent Rights**

The Contractor shall save harmless and indemnify the Employer from and against all claims and proceedings for or on account of infringement of any patent rights, design trademark or name or other protected rights in respect of any Contractor's Equipment, materials or Plant used for or in connection with or for incorporation in the Works and from and against all damages, costs, charges and expenses whatsoever in respect thereof or in relation thereto, except where such infringement results from compliance with the design or Specification provided by the Engineer.

#### 28.2 **Royalties**

Except where otherwise stated, the Contractor shall pay all tonnage and other royalties, rent and other payments or compensation, if any, for getting stone, sand, gravel, clay or other materials required for the Works.





### 29.1 **Interference with Traffic and Adjoining Properties**

All operations necessary for the execution and completion of the Works and the remedying of any defects therein shall, so far as compliance with the requirements of the Contract permits, be carried on so as not to interfere unnecessarily or improperly with:

- (a) the convenience of the public, or
- (b) the access to, use and occupation of public or private roads and footpaths to or of properties whether in the possession of the Employer or of any other person.

The Contractor shall save harmless and indemnify the Employer in respect of all claims, proceedings, damages, costs, charges and expenses whatsoever arising out of, or in relation to, any such matters insofar as the Contractor is responsible, therefore.

### 30.1 **Avoidance of Damage to Roads**

The Contractor shall use every reasonable means to prevent any of the roads or bridges communicating with or on the routes to the Site from being damaged or injured by any traffic of the Contractor or any of his Subcontractors and, in particular, shall select routes, choose and use vehicles and restrict and distribute loads so that any such extraordinary traffic as will inevitably arise from the moving of materials, Plant, Contractor's Equipment or Temporary Works from and to the Site shall be limited, as far as reasonably possible, and so that no unnecessary damage or injury may be occasioned to such roads and bridges.

### 30.2 **Transport of Contractor's Equipment or Temporary Works**

Save insofar as the Contract otherwise provides, the Contractor shall be responsible for and shall pay the cost of strengthening any bridges or altering or improving any road communicating with or on the routes to the Site to facilitate the movement of Contractor's Equipment or Temporary Works and the Contractor shall indemnify and keep indemnified the Employer against all claims for damage to any such road or bridge caused by such movement, including such claims as may be made directly against the Employer, and shall negotiate and pay all claims arising solely out of such damage.

### 30.3 **Transport of Materials or Plant**

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





indemnify the road authority against damage the Employer shall not be liable for any costs, charges or expenses in respect thereof or in relation thereto. In other cases, the Employer shall negotiate the settlement of and pay all sums due in respect of such claim and shall indemnify the Contractor in respect thereof and in respect of all claims, proceedings damages, costs, charges and expenses in relation thereto. Provided that if and so far as any such claim or part thereof is, in the opinion of the Engineer, due to any failure on the part of the Contractor to observe and perform his obligations under Sub-Clause 30.1, then the amount determined by the Engineer, after due consultation with the Employer and the Contractor, to be due to such failure shall be recoverable from the Contractor by the Employer and may be deducted by the Employer from any monies due or to become due to the Contractor and the Engineer shall notify the Contractor accordingly, with a copy to the Employer. Provided also that the Employer shall notify the Contractor whenever a settlement is to be negotiated and, where any amount may be due from the Contractor, the Employer shall consult with the Contractor before such settlement is agreed.

#### 30.4 **Waterborne Traffic**

Where the nature of the Works is such as to require the use by the Contractor of waterborne transport the foregoing provisions of this Clause shall be construed as though "road" included a lock, dock, sea wall or other structure related to a waterway and "vehicle" included craft and shall have effect accordingly.

#### 31.1 **Opportunities for Other Contractors**

The Contractor shall, in accordance with the requirements of the Engineer, afford all reasonable opportunities for carrying out their work to:

- (a) any other contractors employed by the Employer and their workmen,
- (b) the workmen of the Employer, and
- (c) the workmen of any duly constituted authorities who may be employed in the execution on or near the Site of any work not included in the Contract or of any contract which the Employer may enter into in connection with or ancillary to the Works.

#### 31.2 **Facilities for Other Contractors**

If, however, pursuant to Sub-Clause 31.1 the Contractor shall, on the written request of the Engineer:

- (a) make available to any other contractor, or to the Employer or any such authority, any roads or ways for the maintenance of which the Contractor is responsible,
- (b) permit the use, by any such, of Temporary Works or Contractor's



Equipment on the Site, or

(c) provide any other service of whatsoever nature for any such,

the Engineer shall determine an addition to the Contract Price in accordance with Clause 52 and shall notify the Contractor accordingly, with a copy to the Employer.

### 32.1 **Contractor to Keep Site Clear**

During the execution of the Works the Contractor shall keep the Site reasonably free from all unnecessary obstruction and shall store or dispose of any Contractor's Equipment and surplus materials and clear away and remove from the Site any wreckage, rubbish or Temporary Works no longer required.

### 33.1 **Clearance of Site on Completion**

Upon the issue of any Taking-Over Certificate the Contractor shall clear away and remove from that part of the Site to which such Taking-Over Certificate relates all Contractor's Equipment, surplus materials, rubbish and Temporary Works of every kind, and leave such part of the Site and Works clean and in a workmanlike condition to the satisfaction of the Engineer. Provided that the Contractor shall be entitled to retain on Site, until the end of the Defects Liability Period, such materials, Contractor's Equipment and Temporary Works as are required by him for the purpose of fulfilling his obligations during the Defects Liability Period.

## **Labour**

### 34.1 **Engagement of Staffs and Labour**

The Contractor shall, unless otherwise provided in the Contract, make his own arrangements for the engagement of all staff and labour, local or other, and for their payment, housing, feeding and transport.

### 35.1 **Returns of Labour and Contractor's Equipment**

The Contractor shall, if required by the Engineer, deliver to the Engineer a return in detail, in such form and at such intervals as the Engineer may prescribe, showing the staff and the numbers of the several classes of labour from time to time employed by the Contractor on the Site and such information respecting Contractor's Equipment as the Engineer may require.





## **Materials, Plant and Workmanship**

### **36.1 Quality of Materials, Plant and Workmanship**

All materials, Plant and workmanship shall be:

(a) of the respective kinds described in the Contract and in accordance with the Engineer's instructions, and

(b) subjected from time to time to such tests as the Engineer may require at the place of manufacture, fabrication or preparation, or on the Site or at such other place or places as may be specified in the Contract, or at all or any of such places.

The Contractor shall provide such assistance, labour, electricity, fuels, stores, apparatus and instruments as are normally required for examining, measuring and testing any materials or Plant and shall supply samples of materials, before incorporation in the Works, for testing as may be selected and required by the Engineer.

### **36.2 Cost of Samples**

All samples shall be supplied by the Contractor at his own cost if the supply thereof is clearly intended by or provided for in the Contract.

### **36.3 Cost of Tests**

The cost of making any test shall be borne by the Contractor if such test is:

(a) clearly intended by or provided for in the Contract, or

(b) particularised in the Contract (in cases only for a test under load or of a test to ascertain whether the design of any finished or partially finished work is appropriate for the purposes which it was intended to fulfil) in sufficient detail to enable the Contractor to price or allow for the same in his Tender.

### **36.4 Cost of Tests not provided for**

If any test required by the Engineer which is:

(a) not intended by or provided for,

(b) (in the cases above mentioned) not so particularised, or

(c) (through so intended or provided for) required by the Engineer to be carried out at any place other than the Site or the place of manufacture, fabrication or preparation of the materials or Plant tested,





shows the materials, Plant or workmanship not to be in accordance with the provisions of the Contract to the satisfaction of the Engineer, then the cost of such test shall be borne by the Contractor, but in any other case Sub-Clause 36.5 shall apply.

### 36.5 **Engineer's Determination where Tests Not Provided for**

Where, pursuant to Sub-Clause 36.4, this Sub-Clause applies the Engineer shall, after due consultation with the Employer and the Contractor, determine:

- (a) any extension of time of which the Contractor is entitled under Clause 44, and
- (b) the amount of such costs, which shall be added to the Contract Price,

and shall notify the Contractor accordingly, with a copy to the Employer.

### 37.1 **Inspection of Operations**

The Engineer, and any person authorized by him, shall at all reasonable times have access to the Site and to all workshops and places where materials or Plant are being manufactured, fabricated or prepared for the Works and the Contractor shall afford every facility for and every assistance in obtaining the right to such access.

### 37.2 **Inspection and Testing**

The Engineer shall be entitled, during manufacture, fabrication or preparation to inspect and test the materials and Plant to be supplied under the Contract. If materials or Plant are being manufactured, fabricated or prepared in workshops or places other than those of the Contractor, the Contractor shall obtain permission for the Engineer to carry out such inspection and testing in those workshops or places. Such inspection or testing shall not release the Contractor from any obligation under the Contract.

### 37.3 **Dates for Inspection and Testing**

The Contractor shall agree with the Engineer on the time and place for the inspection or testing of any materials or Plant as provided in the Contract. The Engineer shall give the Contractor not less than 24 hour's notice of his intention to carry out the inspection or to attend the tests. If the Engineer, or his duly authorized representative, does not attend on the date agreed, the Contractor may, unless otherwise instructed by the Engineer, proceed with the tests, which shall be deemed to have been made in the presence of the Engineer. The Contractor shall forthwith forward to the Engineer duly certified copies of the test's readings. If the Engineer has not attended the tests, he shall accept the said readings as accurate.



**37.4 Rejection**

If, at the time and place agreed in accordance with Sub-Clause 37.3, the materials or Plant are not ready for inspection or testing or if, as a result of the inspection or testing referred to in this Clause, the Engineer determines that the materials or Plant are defective or otherwise not in accordance with the Contract, he may reject the materials or Plant and shall notify the Contractor thereof immediately. The notice shall state the Engineer's objections with reasons. The Contractor shall then promptly make good the defect or ensure that rejected materials or Plant comply with the Contract. If the Engineer so requests, the tests of rejected materials or Plant shall be made or repeated under the same terms and conditions. All costs incurred by the Employer by the repetition of the test shall after due consultation with the Employer and the Contractor, be determined by the Engineer and shall be recoverable from the Contractor by the Employer and may be deducted from any monies due or to become due to the Contractor and the Engineer shall notify the Contractor accordingly, with a copy to the Employer.

**37.5 Independent Inspection**

The Engineer may delegate inspection and testing of materials or Plant to an independent inspector. Any such delegation shall be affected in accordance with Sub-Clause 2.4 and for this purpose such independent inspector shall be considered as an assistant of the Engineer. Notice of such appointment (not being less than 14 days) shall be given by the Engineer to the Contractor.

**38.1 Examination of Work before Covering up**

No part of the works shall be covered up or put out of view without the approval of the Engineer and the Contractor shall afford full opportunity for the Engineer to examine and measure any such part of the Works which is about to be covered up or put out of view and to examine foundations before any part of the Works is placed thereon. The Contractor shall give notice to the Engineer whenever any such part of the Works or foundations is or are ready or about to be ready for examination and the Engineer shall, without unreasonable delay, unless he considers it unnecessary and advises the Contractor, accordingly, attend for the purpose of examining and measuring such part of the Works or of examining such foundations.

**38.2 Uncovering and Making Openings**

The Contractor shall uncover any part of the Works or make openings in or through the same as the Engineer may from time to time instruct and shall reinstate and make good such part. If any such part has been covered up or put out of view after compliance with the requirement of Sub-Clause 38.1 and is found to be executed in accordance with the Contract, the Engineer shall, after due consultation with the Employer and the Contractor, determine the amount the Contractor's costs in respect of such of uncovering, making openings in or





through, reinstating and making good the same, which shall be added to the Contract Price, and shall notify the Contractor accordingly, with a copy to the Employer. In any other case all costs shall be borne by the Contractor.

### 39.1 **Removal of Improper Work, Materials or Plant**

The Engineer shall have authority to issue instructions from time to time, for:

(a) the removal from the Site, within such time or times as may be specified in the instruction, of any materials or Plant which, in the opinion of the Engineer, are not in accordance with the Contract,

(b) the substitution of proper and suitable materials or Plant, and

(c) the removal and proper re-execution, notwithstanding any previous test thereof or interim payment therefor, of any work which, in respect of

(i) materials, Plant or workmanship, or

(ii) design by the Contractor or for which he is responsible,

is not, in the opinion of the Engineer, in accordance with the Contract.

### 39.2 **Default of Contractor in Compliance**

In case of default on the part of Contractor in carrying out such instruction within the time specified therein or, if none, within a reasonable time, the Employer shall be entitled to employ and pay other persons to carry out the same and all costs consequent thereon or incidental thereto shall, after due consultation with the Employer and the Contractor, be determined by the Engineer and shall be recoverable from the Contractor by the Employer, and may be deducted by the Employer from any monies due or to become due to the Contractor and the Engineer shall notify the Contractor accordingly, with a copy to the Employer.

## **Suspension**

### 40.1 **Suspension of Work**

The Contractor shall, on the instructions of the Engineer, suspend the progress of the Works or any part thereof for such time and in such manner as the Engineer may consider necessary and shall, during such suspension, properly protect and secure the Works or such part thereof so far as is necessary in the opinion of the Engineer. Unless such suspension is:

(a) otherwise provided for in the Contract,

(b) necessary by reason of some default of or breach of contract by the Contractor or for which he is responsible,





(c) necessary by reason of climatic conditions of the Site, or

(d) necessary for the proper execution of the Works or for the safety of the Works or any part thereof (save to the extent that such necessity arises from any act or default by the Engineer or the Employer or from any of the risks defined in Sub-Clause 20.4).

Sub-Clause 40.2 shall apply.

#### **40.2 Engineer's Determination following Suspension**

Where, pursuant to Sub-Clause 40.1, this Sub-Clause applies the Engineer shall, after due consultation with the Employer and the Contractor, determine:

(a) any extension of time to which the Contractor is entitled under Clause 44, and

(b) the amount, which shall be added to the Contract Price, in respect of the cost incurred by the Contractor by reason of such suspension,

and shall notify the Contractor accordingly, with a copy to the Employer.

#### **40.3 Suspension lasting more than 84 Days**

If the progress of the Works or any part thereof is suspended on the written instructions of the Engineer and if permission to resume work is not given by the Engineer within a period for 84 days from the date of suspension then, unless such suspension is within paragraph (a), (b), (c) or (d) of Sub-Clause 40.1, the Contractor may give notice to the Engineer requiring permission, within 28 days from the receipt thereof, to proceed with the Works or that part thereof in regard to which progress is suspended. If, within the said time, such permission is not granted, the Contractor may, but is not bound to, elect to treat the suspension, where it affects part only of the Works, as an omission of such part under Clause 51 by giving a further notice to the Engineer to that effect, or, where it affects the whole of the Works, treat the suspension as an event of default by the Employer and terminates his employment under the Contract in accordance with the provisions of Sub-Clause 69.1, whereupon the provisions of Sub-Clause 69.2 and 69.3 shall apply.

### **Commencement and Delays**

#### **41.1 Commencement of Works**

The Contractor shall commence the Works as soon as is reasonably possible after the receipt by him of notice to this effect from the Engineer, which notice shall be issued within the time stated in the Appendix to Tender after the date of the Letter of Acceptance. Thereafter, the Contractor shall proceed with the Works with due expedition and without delay.



**42.1 Possession of Site and Access Thereto**

Save insofar as the Contract may prescribe:

(a) the extent of portions of the Site of which the Contractor is to be given possession from time to time,

(b) the order in which such portions shall be made available to the Contractor,

and, subject to any requirement in the Contract as to the order in which the Works shall be executed, the Employer will, with the Engineer's notice to commence the Works, give to the Contractor possession of

(c) so much of the Site, and

(d) such access as, in accordance with the Contract, is to be provided by the Employer as may be required to enable the Contractor to commence and proceed with the execution of the Works in accordance with the Program referred to in Clause 14, if any, and otherwise in accordance with such reasonable proposals as the Contractor shall, by notice to the Engineer with a copy to the Employer, make. The Employer will, from time to time as the Works proceed, give to the Contractor possession of such further portions of the Site as may be required to enable the Contractor to proceed with the execution of the Works with due dispatch in accordance with such Program or proposals, as the case may be.

**42.2 Failure to Give Possession**

If the Contractor suffers delay and/or incurs costs from failure on the part of the Employer to give possession in accordance with the terms of Sub-Clause 42.1, the Engineer shall, after due consultation with the Employer and the Contractor, determine:

(a) any extension of time to which the Contractor is entitled under Clause 44, and

(b) the amount of such costs, which shall be added to the Contract Price,

and shall notify the Contractor accordingly, with a copy to the Employer.

**42.3 Rights of Way and Facilities**

The Contractor shall bear all costs and charges for special or temporary way leaves required by him in connection with access to the Site. The Contractor shall also provide at his own cost any additional facilities outside the Site required by him for the purposes of the Works.





#### 43.1 **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 Appendix to Tender, shall be completed, in accordance with the provisions of Clause 48, within the time stated in the Appendix to Tender for the whole of the Works or the Section (as the case may be), calculated from the Commencement Date, or such extended time as may be allowed under Clause 44.

#### 44.1 **Extension of Time for Completion**

In the event of:

- (a) the amount or nature of extra or additional work,
- (b) any cause of delay referred to in these Conditions,
- (c) exceptionally adverse climatic conditions,
- (d) any delay, impediment or prevention by the Employer, or
- (e) other special circumstances which may occur, other than through a default of or breach of contract by the Contractor or for which he is responsible,

being such as fairly to entitle the Contractor to an extension of the Time for Completion of the Works, or any Section or part thereof, the Engineer shall, after due consultation with the Employer and the Contractor, determine the amount of such extension and shall notify the Contractor accordingly, with a copy to the Employer.

#### 44.2 **Contractor to Provide Notification and Detailed Particulars**

Provided that the Engineer is not bound to make any determination unless the Contractor has

- (a) within 28 days after such event has first arisen notified the Engineer with a copy to the Employer, and
- (b) within 28 days or such other reasonable time as may be agreed by the Engineer, after such notification submitted to the Engineer detailed particulars of any extension of time to which he may consider himself entitled in order that such submission may be investigated at the time.

#### 44.3 **Interim Determination of Extension**

Provided also that where an event has a continuing effect such that it is not





practicable for the Contractor to submit detailed particulars within the period of 28 days referred to in Sub-Clause 44.2(b), he shall nevertheless be entitled to an extension of time provided that he has submitted to the Engineer interim particulars at intervals of not more than 28 days and final particulars within 28 days of the end of the effects resulting from the event. On receipt of such interim particulars, the Engineer shall, without undue delay, make an interim determination of extension of time and, on receipt of the final particulars, the Engineer shall review all the circumstances and shall determine an overall extension of time in regard to the event. In both such cases the Engineer shall make his determination after due consultation with the Employer and the Contractor and shall notify the Contractor of the determination, with a copy to the Employer. No final review shall result in a decrease of any extension of time already determined by the Engineer.

#### 45.1 **Restriction on Working Hours**

Subject to any provision to the contrary contained in the Contract, none of the Works shall, save as hereinafter provided, be carried on during the night or on locally recognised days of rest without the consent of the Engineer, except when work is unavoidable or absolutely necessary for the saving of life or property or for the safety of the Works, in which case the Contractor shall immediately advise the Engineer. Provided that the provisions of this Clause shall not be applicable in the case of any work which it is customary to carry out by multiple shifts.

#### 46.1 **Rate of Progress**

If for any reason, which does not entitle the Contractor to an extension of time, the rate of progress of the Works or any Section is at any time, in the opinion of the Engineer, too slow to comply with the Time for Completion, the Engineer shall so notify the Contractor who shall thereupon take such steps as are necessary, subject to the consent of the Engineer, to expedite progress so as to comply with the Time for Completion. The Contractor shall not be entitled to any additional payment for taking such steps. If, as a result of any notice given by the Engineer under this Clause, the Contractor considers that it is necessary to do any work at night or on locally recognized days of rest, he shall be entitled to seek the consent of the Engineer so to do. Provided that if any steps, taken by the Contractor in meeting his obligations under this Clause, involve the Employer in additional supervision costs, such cost shall, after due consultation with the Employer and the Contractor, be determined by the Engineer and shall be recoverable from the Contractor by the Employer, and may be deducted by the Employer from any monies due or to become due to the Contractor and the Engineer shall notify the Contractor accordingly, with a copy to the Employer.

#### 47.1 **Liquidated Damages for Delay**

If the Contractor fails to comply with the Time for Completion in accordance with Clause 48, for the whole of the Works or, if applicable, any Section within



the relevant time prescribed by Clause 43, then the Contractor shall pay to the Employer the relevant sum stated in the Appendix to Tender as liquidated damages for such default and not as a penalty (which sum shall be the only monies due from the Contractor 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 a Taking-Over Certificate of the whole of the Works or the relevant Section, subject to the applicable limit stated in the Appendix to Tender. The Employer 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 Contractor. The payment or deduction of such damages shall not relieve the Contractor from his obligation to complete the Works, or from any other of his obligations and liabilities under the Contract.

#### 47.2 **Reduction of Liquidated Damages**

If, before the Time for Completion of the whole of the Works or, if applicable, any Section, a Taking-Over Certificate has been issued for any part of the Works or of a Section, the liquidated damages for delay in completion of the remainder of the Works or of that Section shall, for any period of delay after the date stated in such Taking-Over Certificate, and in the absence of Alternative provisions in the Contract, be reduced in the proportion which the value of the part so certified bears to the value of the whole of the Works or Section, as applicable. The provisions of this Sub-Clause shall only apply to the rate of liquidated damages and shall not affect the limit thereof.

#### 48.1 **Taking-Over Certificate**

When the whole of the Works has been substantially completed and have satisfactorily passed any Tests on Completion prescribed by the Contract, the Contractor may give a notice to that effect to the Engineer with a copy to the Employer, 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 Contractor 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 Contractor, with a copy to the Employer, 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 Contractor specifying all the work which, in the Engineer's opinion, is required to be done by the Contractor before the issue of such Certificate. The Engineer shall also notify the Contractor of any defects in the Works affecting substantial completion that may appear after such instructions and before completion of the Works specified therein. The Contractor 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.





**48.2 Taking Over of Sections or Parts**

Similarly, in accordance with the procedure set out in Sub-Clause 48.1, the Contractor may request, and 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 Employer, or
- (c) any part of the Permanent Works which the Employer 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 Contractor as a temporary measure).

**48.3 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 Contractor, 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 Contractor 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.

**48.4 Surfaces Requiring Reinstatement**

Provided that a Taking-Over Certificate given 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.

**Defects Liability****49.1 Defects Liability Period**

In these Conditions the expression "Defects Liability Period" shall mean the defects liability period named in the Appendix 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 event 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.

#### 49.2 **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 Employer in the condition required by the Contract, fair wear and tear excepted, to the satisfaction of the Engineer, the Contractor 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 or within 14 days after its expiration, as a result of an inspection made by or on behalf of the Engineer prior to its expiration, instruct the Contractor to execute.

#### 49.3 **Cost of Remedying Defects**

All work referred to in Sub-Clause 49.2(b) shall be executed by the Contractor 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 Contractor 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 Contractor to comply with any obligation, expressed or implied, on the Contractor'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 Contractor accordingly, with a copy to the Employer.

#### 49.4 **Contractor's Failure to Carry Out Instructions**

In case of default on the part of the Contractor in carrying out such instruction within a reasonable time, the Employer 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 Contractor 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 Employer and the Contractor, be determined by the Engineer and shall be recoverable from the Contractor by the Employer, and may be deducted by the Employer from any monies due or to become due to the Contractor and the Engineer shall notify the Contractor accordingly, with a copy to the Employer.



### 50.1 Contractor to Search

If any defect, shrinkage or other fault in the Works appears at any time prior to the end of the Defects Liability Period, the Engineer may instruct the Contractor, with a copy to the Employer, to search under the directions of the Engineer for the cause thereof. Unless such defect, shrinkage or other fault is one for which the Contractor is liable under the Contract, the Engineer shall, after due consultation with the Employer and the Contractor, determine the amount in respect of the costs of such search incurred by the Contractor, which shall be added to the Contract Price and shall notify the Contractor accordingly, with a copy to the Employer. If such defect, shrinkage or other fault is one for which the Contractor is liable, the cost of the work carried out in searching as aforesaid shall be borne by the Contractor and he shall in such case remedy such defect, shrinkage or other fault at his own cost in accordance with the provisions of Clause 49.

## Alterations, Additions and Omissions

### 51.1 Variations

The Engineer shall make any variation of the form, quality or quantity of the Works or any part thereof that may, in his opinion, be necessary and for that purpose, or if for any other reason it shall, in his opinion, be appropriate, he shall have the authority to instruct the Contractor to do and the Contractor shall do any of the following:

- (a) increase or decrease the quantity of any work included in the Contract,
- (b) omit any such work (but not if the omitted work is to be carried out by the Employer or by another contractor),
- (c) change the character or quality or kind of any such work,
- (d) change the levels, lines, position and dimensions of any part of the Works,
- (e) execute additional work of any kind necessary for the completion of the Works, or
- (f) change any specified sequence or timing of construction of any part of the Works.

No such variation shall in any way vitiate or invalidate the Contract, but the effect, if any, of all such variations shall be valued in accordance with Clause 52. Provided that where the issue of an instruction to vary the Works is necessitated by some default of or breach of contract by the Contractor or for which he is responsible, any additional cost attributable to such default shall be borne by the Contractor.

### 51.2 Instructions for Variations

The Contractor shall not make any such variation without an instruction of the Engineer. Provided that no instruction shall be required for increase or decrease in the quantity of any work where such increase or decrease is not the result of





an instruction given under this Clause but is the result of the quantities exceeding or being less than those stated in the Bill of Quantities.

#### 52.1 Valuation of Variations

All variations referred to in Clause 51 and any additions to the Contract Price which are required to be determined in accordance with Clause 52 (for the purposes of this Clause referred to as "varied work"), shall be valued at the rates and prices set out in the Contract if, in the opinion of the Engineer, the same shall be applicable. If the Contract does not contain any rates or prices applicable to the varied work, the rates and prices in the Contract shall be used as the basis for valuation so far as may be reasonable, failing which, after due consultation by the Engineer with the Employer and the Contractor, suitable rates or prices shall be agreed upon between the Engineer and the Contractor. In the event of disagreement, the Engineer shall fix such rates or prices as are, in his opinion, appropriate and shall notify the Contractor accordingly, with a copy to the Employer. Until such time as rates or prices are agreed or fixed, the Engineer shall determine provisional rates or prices to enable on-account payments to be included in certificates issued in accordance with Clause 60.

#### 52.2 Power of Engineer to Fix Rates

Provided that if the nature or amount of any varied work relative to the nature or amount of the whole of the Works or to any part thereof, is such that, in the opinion of the Engineer, the rate or price contained in the Contract for any item of the Works is, by reason of such varied work, rendered inappropriate or inapplicable, then, after due consultation by the Engineer with the Employer and the Contractor, a suitable rate or price shall be agreed upon between the Engineer and the Contractor. In the event of disagreement, the Engineer shall fix such other rate or price as is, in his opinion, appropriate and shall notify the Contractor accordingly, with a copy to the Employer. Until such time as rates or prices are agreed or fixed, the Engineer shall determine provisional rates or prices to enable on-account payments to be included in certificates issued in accordance with Clause 60.

Provided also that no varied work instructed to be done by the Engineer pursuant to Clause 51 shall be valued under Sub-Clause 52.1 or under this Sub-Clause unless, within 14 days of the date of such instruction and, other than in the case of omitted work, before the commencement of the varied work, notice shall have been given either:

- (a) by the Contractor to the Engineer of his intention to claim extra payment or a varied rate or price, or
- (b) by the Engineer to the Contractor of his intention to vary a rate or price.





**52.3 Variations Exceeding 15 per cent**

If, on the issue of the Taking-Over Certificate for the whole of the Works, it is found that as a result of:

- (a) all varied work valued under Sub-Clauses 52.1 and 52.2, and
- (b) all adjustments upon measurement of the estimated quantities set out in the Bill of Quantities, excluding Provisional Sums, dayworks and adjustment of price made under Clause 70.

but not from any other cause, there have been additions to or deductions from the Contract Price which taken together are in excess of 15 per cent of the "Effective Contract Price" (which for the purposes of this Sub-Clause shall mean the Contract Price, excluding Provisional Sums and allowance for dayworks, if any) then and in such event (subject to any action already taken under any other Sub-Clause of this Clause), after due consultation by the Engineer with the Employer and the Contractor, there shall be added to or deducted from the Contract Price such further sums as may be agreed between the Contractor and the Engineer or, failing agreement, determined by the Engineer having regard to the Contractor's Site and general overhead costs of the Contract. The Engineer shall notify the Contractor of any determination made under this Sub-Clause, with a copy to the Employer. Such sum shall be based only on the amount by which such additions or deductions shall be in excess of 15 per cent of the Effective Contract Price.

**52.4 Daywork**

The Engineer may, if in his opinion it is necessary or desirable, issue an instruction that any varied work shall be executed on a daywork basis. The Contractor shall then be paid for such varied work under the terms set out in the daywork schedule included in the Contract and at the rates and prices affixed thereto by him in the Tender.

The Contractor shall furnish to the Engineer such receipts or other vouchers as may be necessary to provide the amounts paid and, before ordering material, shall submit to the Engineer quotations for the same for his approval.

In respect of such of the Works executed on a daywork basis, the Contractor shall during the continuance of such work, deliver each day to the Engineer an exact list in duplicate of the names, occupation and time of all workmen employed on such work and a statement, also in duplicate, showing the description and quantity of all materials and Contractor's Equipment used thereon or therefore other than Contractor's Equipment which is included in the percentage addition in accordance with such daywork schedule. One copy of each list and statement will, if correct, or when agreed, be signed by the Engineer and returned to the Contractor.

At the end of each month the Contractor shall deliver to the Engineer a priced



statement of the labour, materials and Contractor's Equipment, except as aforesaid, used and the Contractor shall not be entitled to any payment unless such lists and statements have been fully and punctually rendered. Provided always that if the Engineer considers that for any reason the sending of such lists or statements by the Contractor, in accordance with the foregoing provision, was impracticable he shall nevertheless be entitled to authorize payment for such work, either as daywork, on being satisfied as to the time employed and the labour, materials and Contractor's Equipment used on such work, or at such value therefore as shall, in his opinion, be fair and reasonable.

### **Procedure for Claims**

#### **53.1 Notice of Claims**

Notwithstanding any other provision of the Contract, if the Contractor intends to claim any additional payment pursuant to any Clause of these Conditions or otherwise, he shall give notice of his intention to the Engineer with a copy to the Employer, within 28 days after the event giving rise to the claim has first arisen.

#### **53.2 Contemporary Records**

Upon the happening of the event referred to in Sub-Clause 53.1, the Contractor shall keep such contemporary records as may reasonably be necessary to support any claim he may subsequently wish to make. Without necessarily admitting the Employer's liability, the Engineer shall, on receipt of a notice under Sub-Clause 53.1, inspect such contemporary records and may instruct the Contractor to keep any further contemporary records as are reasonable and may be material to the claim of which notice has been given. The Contractor shall permit the Engineer to inspect all records kept pursuant to this Sub-Clause and shall supply him with copies thereof as and when the Engineer so instructs.

#### **53.3 Substantiation of Claims**

Within 28 days, or such other reasonable time as may be agreed by the Engineer, of giving notice under Sub-Clause 53.1, the Contractor shall send to the Engineer an account giving detailed particulars of the amount claimed and the grounds upon which the claim is based. Where the event giving rise to the claim has a continuing effect, such account shall be considered to be an interim account and the Contractor shall, at such intervals as the Engineer may reasonably require, send further interim accounts giving the accumulated amount of the claim and any further grounds upon which it is based. In cases where interim accounts are sent to the Engineer, the Contractor shall send a final account within 28 days of the end of the effects resulting from the event. The Contractor shall, if required by the Engineer so to do, copy to the Employer all accounts sent to the Engineer pursuant to this Sub-Clause.





**53.4 Failure to Comply**

If the Contractor fails to comply with any of the provisions of this Clause in respect of any claim which he seeks to make, his entitlement to payment in respect thereof shall not exceed such amount as the Engineer or any arbitrator or arbitrators appointed pursuant to Sub-Clause 67.3 assessing the claim considers to be verified by contemporary records (whether or not such records were brought to the Engineer's notice as required under Sub-Clause 53.2 and 53.3).

**53.5 Payment of Claims**

The Contractor shall be entitled to have included in any interim payment certified by the Engineer pursuant to Clause 60 such amount in respect of any claim as the Engineer, after due consultation with the Employer and the Contractor, may consider due to the Contractor provided that the Contractor has supplied sufficient particulars to enable the Engineer to determine the amount due. If such particulars are insufficient to substantiate the whole of the claim, the Contractor shall be entitled to payment in respect of such part of the claim as such particulars may substantiate to the satisfaction of the Engineer. The Engineer shall notify the Contractor of any determination made under this Sub-Clause, with a copy to the Employer.

**Contractor's Equipment, Temporary Works and Materials****54.1 Contractor's Equipment, Temporary Works and Materials; Exclusive Use for the Works**

All Contractor's Equipment, Temporary Works and materials provided by the Contractor shall, when brought on to the Site, be deemed to be exclusively intended for the execution of the Works and the Contractor shall not remove the same or any part thereof, except for the purpose of moving it from one part of the Site to another, without the consent of the Engineer. Provided that consent shall not be required for vehicles engaged in transporting any staff, labour, Contractor's Equipment, Temporary Works, Plant or materials to or from the Site.

**54.2 Employer not Liable for Damage**

The Employer shall not at any time be liable, save as mentioned in Clauses 20 and 65, for the loss of or damage to any of the said Contractor's Equipment, Temporary Works or materials.

**54.3 Customs Clearance**

The Employer will use his best endeavors in assisting the Contractor, where required, in obtaining clearance through the Customs of Contractor's Equipment, materials and other things required for the Works.





**54.4 Re-export of Contractor's Equipment**

In respect of any Contractor's Equipment which the Contractor has imported for the purposes of the Works, the Employer will use his best endeavors to assist the Contractor, where required, in procuring any necessary Government consent to the re-export of such Contractor's Equipment by the Contractor upon the removal thereof pursuant to the terms of Contract.

**54.5 Conditions of Hire of Contractor's Equipment**

With a view to securing, in the event of termination under Clause 63, the continued availability, for the purpose of executing the Works, of any hired Contractor's Equipment, the Contractor shall not bring on to the Site any hired Contractor's Equipment unless there is an agreement for hire thereof (which agreement shall be deemed not to include an agreement for hire purchase) which contains a provision that the owner thereof will, on request in writing made by the Employer within 7 days after the date on which any termination has become effective, and on the Employer undertaking to pay all hire charges in respect thereof from such date, hire such Contractor's Equipment to the Employer on the same terms in all respect as the same was hired to the Contractor save that the Employer shall be entitled to permit the use thereof by any other contractor employed by him for the purpose of execution and completing the Works and remedying any defects therein, under the terms of the said Clause 63.

**54.6 Costs for the Purpose of Clause 63**

In the event of the Employer entering into any agreement for the hire of Contractor's Equipment pursuant to Sub-Clause 54.5, all sums properly paid by the Employer under the provision of any such agreement and all costs incurred by him (including stamp duties) in entering into such agreement shall be deemed, for the purpose of Clause 63, to be part of the cost of executing and completing the Works and the remedying of any defects therein.

**54.7 Incorporation of Clause in Subcontracts**

The Contractor shall, where entering into any subcontract for the execution of any part of the Works, incorporate in such subcontract (by reference or otherwise) the provisions of this Clause in relation to Contractor's Equipment, Temporary Works or materials brought on to the Site by the Subcontractor.

**54.8 Approval of Materials not implied**

The operation of this Clause shall not be deemed to imply any approval by the Engineer of the materials or other matters referred to therein nor shall it prevent the rejection of any such materials at any time by the Engineer.



## Measurement

### 55.1 Quantities

The quantities set out in the Bill of Quantities are the estimated quantities for the Works, and they are not to be taken as the actual and correct quantities of the Works to be executed by the Contractor in fulfillment of his obligations under the Contract.

### 56.1 Works to be Measured

The Engineer shall, except as otherwise stated, ascertain and determine by measurement the value of the Works in accordance with the Contract and the Contractor shall be paid that value in accordance with Clause 60. The Engineer shall, when he requires any part of the Works to be measured, give reasonable notice to the Contractor's authorized agent, who shall:

- (a) forthwith attend or send a qualified representative to assist the Engineer in making such measurement, and
- (b) supply all particulars required by the Engineer.

Should the Contractor not attend, or neglect or omit to send such representative, then the measurement made by the Engineer or approved by him shall be taken to be the correct measurement of such part of the Works. For the purpose of measuring such Permanent Works as are to be measured by records and drawings, the Engineer shall prepare records and drawings as the work proceeds and the Contractor, as and when called upon to do so in writing, shall, within 14 days, attend to examine and agree such records and drawings with the Engineer and shall sign the same when so agreed. If the Contractor does not attend to examine and agree such records and drawings, they shall be taken to be correct. If, after examination of such records and drawings, the Contractor does not agree the same or does not sign the same as agreed, they shall nevertheless be taken to be correct, unless the Contractor, within 14 days of such examination, lodges with the Engineer notice of the respects in which such records and drawings are claimed by him to be incorrect. On receipt of such notice, the Engineer shall review the records and drawings and either confirm or vary them.

### 57.1 Method of Measurement

The Works shall be measured net, notwithstanding any general or local custom, except where otherwise provided for in the Contract.

### 57.2 Breakdown of Lump Sum Items

For the purposes of statements submitted in accordance with Sub-Clause 60.1, the Contractor shall submit to the Engineer, within 28 days after the receipt of





the Letter of Acceptance, a breakdown for each of the lump sum items contained in the Tender. Such breakdowns shall be subject to the approval of the Engineer.

### **Provisional Sums**

#### **58.1 Definition of "Provisional Sum"**

"Provisional Sum" means a sum included in the Contract and so designated in the Bill of Quantities for the execution of any part of the Works or for the supply of goods, materials, Plant or services, or for contingencies, which sum may be used, in whole or in part, or not at all, on the instructions of the Engineer. The Contractor shall be entitled to only such amounts in respect of the work, supply or contingencies to which such Provisional Sums relate as the Engineer shall determine in accordance with this Clause. The Engineer shall notify the Contractor of any determination made under this Sub-Clause, with a copy to the Employer.

#### **58.2 Use of Provisional Sums**

In respect of every Provisional Sum the Engineer shall have authority to issue instructions for the execution of work or for the supply of goods, material, Plant or services by:

- (a) the Contractor, in which case the Contractor shall be entitled to an amount equal to the value thereof determined in accordance with Clause 52, and
- (b) a nominated Subcontractor, as hereinafter defined, in which case the sum to be paid to the Contractor therefore shall be determined and paid in accordance with Sub-Clause 59.4.

#### **58.3 Production of Vouchers**

The Contractor shall produce to the Engineer all quotations, invoices, vouchers and accounts or receipts in connection with expenditure in respect of Provisional Sums, except where work is valued in accordance with rates or prices set out in the Tender.

### **Nominated Subcontractors**

#### **59.1 Definition of "Nominated Subcontractors"**

All specialists, merchants, tradesmen and others executing any work or supplying any goods, materials, Plant or services for which Provisional Sums are included in the Contract, who may have been or be nominated or selected or approved by the Employer or the Engineer, and all persons to whom by virtue of the provisions of the Contract the Contractor is required to





subcontract shall, in the execution of such work or the supply of such goods, materials, Plant or services, be deemed to be subcontractors to the Contractor and are referred to in this Contract as "nominated Subcontractors".

#### 59.2 **Nominated Subcontractors, Objection to Nomination**

The Contractor shall not be required by the Employer or the Engineer, or be deemed to be under any obligation, to employ any nominated Subcontractor against whom the Contractor may raise reasonable objection, or who declines to enter into subcontract with the Contractor containing provisions:

(a) that in respect of the work, goods, materials, Plant or services the subject of the subcontract, the nominated Subcontractor will undertake towards the Contractor such obligations and liabilities as will enable the Contractor to discharge his own obligations and liabilities towards the Employer under the terms of the Contract and will save harmless and indemnify the Contractor from and against the same and from all claims, proceedings, damages, costs, charges and expenses whatsoever arising out of or in connection therewith, or arising out of or in connection with any failure to perform such obligations or to fulfill such liabilities, and

(b) that the nominated Subcontractor will save harmless and indemnify the Contractor from and against any negligence by the nominated Subcontractor, his agents, workmen and servants and from and against any misuse by him or them of any Temporary Works provided by the Contractor for the purposes of the Contract and from all claims as aforesaid.

#### 59.3 **Design Requirements to be Expressly Stated**

If in connection with any Provisional Sum the services to be provided include any matter of design or specification of any part of the Permanent Works or of any Plant to be incorporated therein, such requirement shall be expressly stated in the Contract and shall be included in any nominated Subcontract. The nominated Subcontract shall specify that the nominated Subcontractor providing such services will save harmless and indemnify the Contractor from and against the same and from all claims, proceedings, damages, costs, charges and expenses whatsoever arising out of or in connection with any failure to perform such obligations or to fulfill such liabilities.

#### 59.4 **Payments to Nominated Subcontractors**

For all work executed or goods, materials, Plant or services supplied by any nominated Subcontractor, the Contractor shall be entitled to:

- (a) the actual price paid or due to be paid by the Contractor, on the instructions of the Engineer, and in accordance with the subcontract.
- (b) in respect of labour supplied by the Contractor, the sum, if any,



entered in the Bill of Quantities or, if instructed by the Engineer pursuant to paragraph (a) of Sub-Clause 58.2, as may be determined in accordance with Clause 52; and

(c) in respect of all other charges and profit, a sum being a percentage rate of the actual price paid or due to be paid, calculated, where provision has been made in the Bill of Quantities for a rate to be set against the relevant Provisional Sum, at the rate inserted by the Contractor against that item or, where no such provision has been made, at the rate inserted by the Contractor in the Appendix to Tender and repeated where provision for such is made in a special item provided in the Bill of Quantities for such purpose.

#### 59.5 **Certification of Payments to Nominated Subcontractors**

Before issuing, under Clause 60 any certificate, which includes any payment in respect of work done or goods, materials, Plant or services supplied by any nominated Subcontractor, the Engineer shall be entitled to demand from the Contractor reasonable proof that all payments, less retentions, included in previous certificates in respect of the work or goods, materials, Plant or services of such nominated Subcontractor have been paid or discharged by the Contractor. If the Contractor fails to supply such proof, then, unless the Contractor:

(a) satisfies the Engineer in writing that he has reasonable cause for withholding or refusing to make such payment, and

(b) produces to the Engineer reasonable proof that he has so informed such nominated Subcontractor in writing,

the Employer shall be entitled to pay to such nominated Subcontractor direct, upon the certificate of the Engineer, all payments, less retention, provided for in the nominated Subcontract, which the Contractor has failed to make to such nominated Subcontractor and to deduct by way of set-off the amount so paid by the Employer from any sums due or to become due from the Employer to the Contractor.

Provided that, where the Engineer has certified and the Employer has paid direct as aforesaid, the Engineer shall in issuing any further certificate in favour of the Contractor, deduct from the amount thereof the amount so paid, direct as aforesaid, but shall not withhold or delay the issue of the certificate itself when due to be issued under the terms of the Contract.

### **Certificates and Payment**

#### 60.1 **Monthly Statements**

The Contractor shall submit to the Engineer after the end of each month six copies, each signed by the Contractor's representative approved by the Engineer in accordance with the Sub-Clause 15.1, of a statement, in such form





as the Engineer may from time to time prescribe, showing the amounts to which, the Contractor considers himself to be entitled up to the end of the month in respect of:

- (a) the value of the Permanent Works executed,
- (b) any other items in the Bill of Quantities including those for Contractor's Equipment, Temporary Works, dayworks and the like,
- (c) the percentage of the invoice value of listed materials, all as stated in the Appendix to Tender, and Plant delivered by the Contractor on the Site for incorporation in the Permanent Works but not incorporated in such Works,
- (d) adjustments under Clause 70, and
- (e) any other sum to which the Contractor may be entitled under the Contract or otherwise.

#### 60.2 Monthly Payments

The Engineer shall, within 28 days of receiving such statement, certify to the Employer the amount of payment to the Contractor 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 Appendix to Tender, to the amount to which the Contractor is entitled under paragraph (a), (b), (c) and (e) of Sub-Clause 60.1 until the amount so retained reaches the Limit of Retention Money stated in the Appendix to Tender, and
- (b) secondly, to the deduction, other than pursuant to Clause 47, of any sums which may have become due and payable by the Contractor to the Employer.

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 Appendix 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 Contractor and approved by the Employer.

#### 60.3 Payment of Retention Money

- (a) Upon the issue of the Taking-Over Certificate with respect to the whole of the Works, one half of the Retention Money, or upon the issue of a Taking-





Over Certificate with respect to a Section or part of the Permanent

Works only such proportion thereof as the Engineer determines having regard to the relative value of such Section or part of the Permanent Works, shall be certified by the Engineer for payment to the Contractor.

(b) Upon the expiration of the Defects Liability Period for the Works the other half of the Retention Money shall be certified by the Engineer for payment to the Contractor. Provided that, in the event of different Defects Liability Periods having become applicable to different Sections or part of the Permanent Works pursuant to Clause 48, the expression "expiration of the Defects Liability Period" shall, for the purposes of this Sub-Clause, be deemed to mean the expiration of the latest of such periods. Provided also that if at such time, there shall remain to be executed by the Contractor any work instructed, pursuant to Clause 49 and 50, in respect of the Works, the Engineer shall be entitled to withhold certification until completion of such work of so much of the balance of the Retention Money as shall, in the opinion of the Engineer, represent the cost of the work remaining to be executed.

#### 60.4 **Correction of Certificates**

The Engineer may by any Interim Payment Certificate make any correction or modification in any previous certificate which shall have been issued by him and shall have authority, if any work is not being carried out to his satisfaction, to omit or reduce the value of such work in any Interim Payment Certificate.

#### 60.5 **Statement at Completion**

Not later than 84 days after the issue of the Taking-Over Certificate in respect of the whole of the Works, the Contractor shall submit to the Engineer a Statement at Completion with supporting documents showing in detail, in the form approved by the Engineer:

- (a) The final value of all work done in accordance with the Contract up to the date stated in such Taking-Over Certificate,
- (b) Any further sums which the Contractor considers to be due, and
- (c) An estimate of amounts which the Contractor considers will become due to him under the Contract.

The estimated amounts shall be shown separately in such Statement at Completion. The Engineer shall verify payment in accordance with Sub-Clause 60.2.



**60.6 Final Statement**

Not later than 56 days after the issue of the Defects Liability Certificate pursuant to Sub-Clause 62.1, the Contractor shall submit to the Engineer for consideration a draft final statement with supporting documents showing in detail, in the form approved by the Engineer:

- (a) the value of all work done in accordance with the Contract, and
- (b) any further sums which the Contractor considers to be due to him under the Contract.

If the Engineer disagrees with or cannot verify any part of the draft final statement, the Contractor shall submit such further information as the Engineer may reasonably require and shall make such changes in the draft as may be agreed between them. The Contractor shall then prepare and submit to the Engineer the final statement as agreed (for the purposes of these Conditions referred to as the "Final Statement").

If, following discussions between the Engineer and the Contractor and any changes to the draft final statement which may be agreed between them, it becomes evident that a dispute exists, the Engineer shall deliver to the Employer an Interim Payment Certificate for those parts of the draft final statement, if any, which are not in dispute. The dispute may then be settled in accordance with Clause 67.

**60.7 Discharge**

Upon submission of the Final Statement, the Contractor shall give to the Employer, with a copy to the Engineer, a written discharge confirming that the total of the Final Statement represents full and final settlement of all monies due to the Contractor arising out of or in respect of the Contract. Provided that such discharge shall become effective only after payment due under the Final Payment Certificate issued pursuant to Sub-Clause 60.8 has been made and the performance security referred to in Sub-Clause 10.1, if any, has been returned to the Contractor.

**60.8 Final Payment Certificate**

Within 28 days after receipt of the Final Statement, and the written discharge, the Engineer shall issue to the Employer (with a copy to the Contractor) a Final Payment Certificate stating:

- (a) the amount which, in the opinion of the Engineer, is finally due under the Contract or otherwise, and

(b) after giving credit to the Employer for all amounts previously paid by the Employer and for all sums to which the Employer is entitled other than under Clause 47, the balance, if any, due from the Employer to the Contractor or from the Contractor to the Employer as the case may be.





**60.9 Cessation of Employer's Liability**

The Employer shall not be liable to the Contractor for any matter or thing arising out of or in connection with the Contract or execution of the Works, unless the Contractor shall have included a claim in respect thereof in his Final Statement and (except in respect of matters or things arising after the issue of the Taking-Over Certificate in respect of the whole of the Works) in the Statement at Completion referred to in Sub-Clause 60.5.

**60.10 Time for Payment**

The amount due to the Contractor under any Interim Payment Certificate issued by the Engineer pursuant to this Clause, or to any other term of the Contract, shall, subject to Clause 47, be paid by the Employer to the Contractor within 28 days after such Interim Payment Certificate has been delivered to the Employer, or, in the case of the Final Payment Certificate referred to in Sub-Clause 60.8, within 56 days, after such Final Payment Certificate has been delivered to the Employer. In the event of the failure of the Employer to make payment within the times stated, the Employer shall pay to the Contractor interest at the rate stated in the Appendix to Tender upon all sums unpaid from the date by which the same should have been paid. The provisions of this Sub-Clause are without prejudice to the Contractor's entitlement under Clause 69 or otherwise.

**61.1 Approval only by Defects Liability Certificate**

Only the Defects Liability Certificate, referred to in Clause 62, shall be deemed to constitute approval of the Works.

**62.1 Defects Liability Certificate**

The Contract shall not be considered as completed until a Defects Liability Certificate shall have been signed by the Engineer and delivered to the Employer, with a copy to the Contractor, stating the date on which the Contractor shall have completed his obligations to execute and complete the Works and remedy any defects therein to the Engineer's satisfaction. The Defects Liability Certificate shall be given by the Engineer within 28 days after the expiration of the Defects Liability Period, or, if different defects liability periods shall become applicable to different Sections or parts of the Permanent Works, the expiration of the latest such period, or as soon thereafter as any works instructed, pursuant to Clause 49 and 50, have been completed to the satisfaction of the Engineer. Provided that the issue of the Defects Liability Certificate shall not be a condition precedent to payment to the Contractor of the second portion of the Retention Money in accordance with the conditions set out in Sub-Clause 60.3.





## 62.2 Unfulfilled Obligations

Notwithstanding the issue of the Defects Liability Certificate the Contractor and the Employer shall remain liable for the fulfillment of any obligation incurred under the provisions of the Contract prior to the issue of the Defects Liability Certificate which remains unperformed at the time of such Defects Liability Certificate is issued and, for the purposes of determining the nature and extent of any such obligation, the Contract shall be deemed to remain in force between the parties to the Contract.

## Remedies

### 63.1 Default of Contractor

If the Contractor is deemed by law unable to pay his debts as they fall due, or enters into voluntary or involuntary bankruptcy, liquidation or dissolution (other than a voluntary liquidation for the purposes of amalgamation or reconstruction), or becomes insolvent, or makes an arrangement with, or assignment in favour of, his creditors, or agrees to carry out the Contract under a committee of inspection of his creditors, or if a receiver, administrator, trustee or liquidator is appointed over any substantial part of his assets, or if, under any law or regulation relating to reorganization, arrangement or readjustment of debts, proceedings are commenced against the Contractor or resolutions passed in connection with dissolution or liquidation or if any steps are taken to enforce any security interest over a substantial part of the assets of the Contractor, or if any act is done or event occurs with respect to the Contractor or his assets which, under any applicable law has a substantially similar effect to any of the foregoing acts or events, or if the Contractor has contravened Sub-Clause 3.1, or has an execution levied on his goods, or Contract, if the Engineer certifies to the Employer, with a copy to the Contractor, that, in his opinion, the Contractor:

- (a) has repudiated the Contract, or
- (b) without reasonable excuse has failed
  - (i) to commence the Works in accordance with Sub-Clause 41.1,
  - (ii) to proceed with the Works, or any Section thereof, within 28 days after receiving notice pursuant to Sub-Clause 46.1,
- (c) has failed to comply with a notice issued pursuant to Sub-Clause 37.4 or an instruction issued pursuant to Sub-Clause 39.1 within 28 days after having received it
- (d) despite previous warning from the Engineer, in writing, is otherwise persistently or flagrantly neglecting to comply with any of his obligations under the Contract, or



(e) has contravened Sub-Clause 4.1, then the Employer may, after giving 14 days' notice to the Contractor, enter upon the Site and the Works and terminate the employment of the Contractor without thereby releasing the Contractor from any of his obligations or liabilities under the Contract, or affecting the rights and authorities conferred on the Employer or the Engineer by the Contract, and may himself complete the Works or may employ any other contractor to complete the Works. The Employer or such other contractor may use for such completion so much of the Contractor's Equipment, Temporary Works and materials as he or they may think proper.

### 63.2 Valuation at Date of Termination

The Engineer shall, as soon as may be practicable after any such entry and termination by the Employer, fix and determine ex parte, or by or after reference to the parties or after such investigation or enquiries as he may think fit to make or institute, and shall certify:

- (a) what amount (if any) had, at the time of such entry and termination, been reasonably earned by or would reasonably accrue to the Contractor in respect of work then actually done by him under the Contract, and
- (b) the value of any of the said unused or partially used materials, any Contractor's Equipment and any Temporary Works.

### 63.3 Payment after Termination

If the Employer terminates the Contractor's employment under this Clause, he shall not be liable to pay to the Contractor any further amount (including damages) in respect of the Contract until the expiration of the Defects Liability Period and thereafter until the costs of execution, completion and remedying of any defects, damages for delay in completion (if any) and all other expenses incurred by the Employer have been ascertained and the amount thereof certified by the Engineer. The Contractor shall then be entitled to receive only such sum (if any) as the Engineer may certify would have been payable to him upon due completion by him after deducting the said amount. If such amount exceeds the sum which would have been payable to the Contractor on due completion by him, then the Contractor shall, upon demand, pay to the Employer the amount of such excess and it shall be deemed a debt due by the Contractor to the Employer and shall be recoverable accordingly.

### 63.4 Assignment of Benefit of Agreement

Unless prohibited by law, the Contractor shall, if so, instructed by the Engineer within 14 days of such entry and termination referred to in Sub-Clause 63.1, assign to the Employer the benefit of any agreement for the supply of any goods or materials or services and/or for the execution of any work for the purposes of the Contract, which the Contractor may have entered





into.

**64.1 Urgent Remedial Work**

If, by reason of any accident, or failure, or other event occurring to, in, or in connection with the Works, or any part thereof, either during the execution of the Works, or during the Defects Liability Period, any remedial or other work is, in the opinion of the Engineer, urgently necessary for the safety of the Works and the Contractor is unable or unwilling at once to do such work, the Employer shall be entitled to employ and pay other persons to carry out such work as the Engineer may consider necessary. If the work or repair so done by the Employer is work which, in the opinion of the Engineer, the Contractor was liable to do at his own cost under the Contract, then all costs consequent thereon or incidental thereto shall, after due consultation with the Employer and the Contractor, be determined by the Engineer and shall be recoverable from the Contractor by the Employer, and may be deducted by the Employer from any monies due or to become due to the Contractor and the Engineer shall notify the Contractor accordingly, with a copy to the Employer. Provided that the Engineer shall, as soon after the occurrence of any such emergency as may be reasonably practicable, notify the Contractor thereof.

**Special Risks**

**65.1 No Liability for Special Risks**

The Contractor shall be under no liability whatsoever in consequence of any of the special risks referred to in Sub-Clause 65.2, whether by way of indemnity or otherwise, for or in respect of:

- (a) destruction of or damage to the Works, save to work condemned under the provisions of Clause 39 prior to the occurrence of any of the said special risks,
- (b) destruction of or damage to property, whether of the Employer or third parties, or
- (c) injury or loss of life.

**65.2 Special Risks**

The Special Risks are:

- (a) the risks defined under paragraphs (a), (c), (d) and (e) of Sub-Clause 20.4, and
- (b) the risks defined under paragraph (b) of Sub-Clause 20.4 insofar as these relate to the country in which the Works are to be executed.

**65.3 Damage to Works by Special Risks**

If the Works or any materials or Plant on or near or in transit to the Site, or any





of the Contractor's Equipment, sustain destruction or damage by reason of any of the said special risks, the Contractor shall be entitled to payment in accordance with the Contract for any Permanent Works duly executed and for any materials or Plant so destroyed or damaged and, so far as may be required by the Engineer or as may be necessary for the completion of the Works, to payment for:

- (a) rectifying any such destruction or damage to the Works, and
- (b) replacing or rectifying such materials or Contractor's Equipment,

and the Engineer shall determine an addition to the Contract Price in accordance with Clause 52 (which shall in the case of the cost of replacement of Contractor's Equipment include the fair market value thereof as determined by the Engineer) and shall notify the Contractor accordingly, with a copy to the Employer.

#### 65.4 **Projectile, Missile**

Destruction, damage, injury or loss of life caused by the explosion or impact, whenever and wherever occurring, of any mine, bomb, shell, grenade, or other projectile, missile, munition, or explosive of war, shall be deemed to be a consequence of the said special risks.

#### 65.5 **Increased Costs arising from Special Risks**

Save to the extent that the Contractor is entitled to payment under any other provision of the Contract, the Employer shall repay to the Contractor any costs of the execution of the Work (other than such as may be attributable to the cost of reconstructing work condemned under the provisions of Clause 39 prior to the occurrence of any special risk) which are howsoever attributable to or consequent on or the result of or in any way whatsoever connected with the said special risks, subject however to the provisions in this Clause hereinafter contained in regard to outbreak of war, but the Contractor shall, as soon as any such cost comes to his knowledge, forthwith notify the Engineer thereof. The Engineer shall, after due consultation with the Employer and the Contractor, determine the amount of the Contractor's costs in respect thereof which shall be added to the Contract Price and shall notify the Contractor accordingly, with a copy to the Employer.

#### 65.6 **Outbreak of War**

If, during the currency of the Contract, there is an outbreak of war, whether war is declared or not, in any part of the world which, whether financially or otherwise, materially affects the execution of the Works, the Contractor shall, unless and until the Contract is terminated under the provisions of this Clause, continue to use his best endeavor to complete the execution of the Works. Provided that the Employer shall be entitled, at any time after such outbreak of war, to terminate the Contract by giving notice to the Contractor and, upon



such notice being given, the Contract shall, except as to the rights of the parties under this clause and Clause 67, terminate, but without prejudice to the rights of either party in respect of any antecedent breach thereof.

#### 65.7 **Removal of Contractor's Equipment on Termination**

If the Contract is terminated under the provisions of Sub-Clause 65.6, the Contractor shall, with all reasonable dispatch, remove from the Site all Contractor's Equipment and shall give similar facilities to his Subcontractors to do so.

#### 65.8 **Payment if Contract Terminated**

If the Contract is terminated as aforesaid, the Contractor shall be paid by the Employer, insofar as such amounts or items have not already been covered by payments on account made to the Contractor, for all work executed prior to the date of termination at the rates and prices provided in the Contract and in addition:

- (a) the amounts payable in respect of any preliminary items referred to in the Bill of Quantities, so far as the work or service comprised therein has been carried out or performed, and a proper portion of any such items which have been partially carried out or performed.
- (b) the cost of materials, Plant or goods reasonably ordered for the Works which have been delivered to the Contractor or of which the Contractor is legally liable to accept delivery, such materials, Plant or goods becoming the property of the Employer upon such payments being made by him.
- (c) a sum being the amount of any expenditure reasonably incurred by the Contractor in the expectation of completing the whole of the Works insofar as such expenditure has not been covered by any other payments referred to in this Sub-Clause.
- (d) any additional sum payable under the provisions of Sub-Clauses 65.3 and 65.5.
- (e) such proportion of the cost as may be reasonable, taking into account payments made or to be made for work executed, of removal of Contractor's Equipment under Sub-Clause 65.7 and, if required by the Contractor, return thereof to the Contractor's main plant yard in his country of registration or to other destination, at no greater cost; and
- (f) the reasonable cost of repatriation of all the Contractor's staff and workmen employed on or in connection with the Works at the time of such termination.

Provided that against any payment due from the Employer under this Sub-





Clause, the Employer shall be entitled to be credited with any outstanding balances due from the Contractor for advances in respect of Contractor's Equipment, materials and Plant and any other sums which, at the date of termination, were recoverable by the Employer from the Contractor under the terms of Contract. Any sums payable under this Sub-Clause shall, after due consultation with the Employer and the Contractor, be determined by the Engineer who shall notify the Contractor accordingly, with a copy to the Employer.

## **Release from Performance**

### **66.1 Payment in Event of Release from Performance**

If any circumstance outside the control of both parties arises after the issue of the Letter of Acceptance which renders it impossible or unlawful for either party to fulfill his or their contractual obligations, or under the law governing the Contract the parties are released from further performance, then the parties shall be discharged from the Contract, except as to their rights under this Clause and Clause 67 and without prejudice to the rights of either party in respect of any antecedent breach of the Contract, and the sum payable by the Employer to the Contractor in respect of the work executed shall be the same as that which would have been payable under Clause 65 if the Contract had been terminated under the provisions of Clause 65.

## **Settlement of Disputes**

### **67.1 Engineer's Decision**

If a dispute of any kind whatsoever arises between the Employer and the Contractor in connection with, or arising out of, the Contract or the execution of the Works, whether during the execution of the Works or after their completion and whether before or after repudiation or other termination of the Contract, including any dispute as to any opinion, instruction, determination, certificate or valuation of the Engineer, the matter in dispute shall, in the first place, be referred in writing to the Engineer, with a copy to the other party. Such reference shall state that it is made pursuant to this Clause. No later than the eighty-fourth day after the day on which he received such reference the Engineer shall give notice of his decision to the Employer and the Contractor. Such decision shall state that it is made pursuant to this Clause.

Unless the Contract has already been repudiated or terminated, the Contractor shall, in every case, continue to proceed with the Works with all due diligence and the Contractor and the Employer shall give effect forthwith to every such decision of the Engineer unless and until the same shall be revised, as hereinafter provided, in an amicable settlement or an arbitral award.

If either the Employer or the Contractor be dissatisfied with any decision of





the Engineer, or if the Engineer fails to give notice of his decision on or before the eighty-fourth day on which he received the reference, then either the Employer or the Contractor may, on or before the seventieth day after the day on which he received notice of such decision, or on or before the seventieth day after the day on which the said period of 84 days expired, as the case may be, give notice to the other party, with a copy for information to the Engineer, of his intention to commence arbitration, as hereinafter provided, as to the matter in dispute. Such notice shall establish the entitlement of the party giving the same to commence arbitration, as hereinafter provided, as to such dispute and, subject to Sub-Clause 67.4, no arbitration in respect thereof may be commenced unless such notice is given.

If the Engineer has given notice of his decision as to a matter in dispute to the Employer and the Contractor and no notice of intention to commence arbitration as to such dispute has been given by either the Employer or the Contractor on or before the seventieth day after the day on which the parties received notice as to such decision from the Engineer, the said decision shall become final and binding upon the Employer and the Contractor.

#### 67.2 **Amicable Settlement**

Where notice of intention to commence arbitration as to a dispute has been given in accordance with Sub-Clause 67.1, the parties shall attempt to settle such dispute amicably before the commencement of arbitration. Provided that, unless the parties otherwise agree, arbitration may be commenced on or after the fifty-sixth day after the day on which notice of intention to commence arbitration of such dispute was given, even if no attempt at amicable settlement thereof has been made.

#### 67.3 **Arbitration**

Any dispute in respect of which:

- (a) the decision, if any, of the Engineer has not become final and binding pursuant to Sub-Clause 67.1, and
- (b) amicable settlement has not been reached within the period stated in Sub-Clause 67.2,

shall be finally settled, unless otherwise specified in the Contract, under the Rules of Conciliation and Arbitration of the International Chamber of Commerce by one or more arbitrators appointed under such Rules. The said arbitrator/s shall have full power to open up, review and revise any decision, opinion, instruction, determination, certificate or valuation of the Engineer related to the dispute.

Neither party shall be limited in the proceedings before such arbitrator/s to the evidence or arguments put before the Engineer for the purpose of obtaining his said decision pursuant to Sub-Clause 67.1. No such decision shall disqualify



the Engineer from being called as a witness and giving evidence before the arbitrator/s on any matter whatsoever relevant to the dispute.

Arbitration may be commenced prior to or after completion of the Works, provided that the obligations of the Employer, the Engineer and the Contractor shall not be altered by reason of the arbitration being conducted during the progress of the Works.

#### 67.4 **Failure to Comply with Engineer's Decision**

Where neither the Employer nor the Contractor has given notice of intention to commence arbitration of a dispute within the period stated in Sub-Clause 67.1 and the related decision has become final and binding, either party may, if the other party fails to comply with such decision, and without prejudice to any other rights it may have, refer the failure to arbitration in accordance with Sub-Clause 67.3. The provisions of Sub-Clause 67.1 and 67.2 shall not apply to any such reference.

### **Notices**

#### 68.1 **Notice to Contractor**

All certificates, notices or instructions to be given to the Contractor by the Employer or the Engineer under the terms of the Contract shall be sent by post, cable, telex or facsimile transmission to or left at the Contractor's principal place of business or such other address as the Contractor shall nominate for that purpose.

#### 68.2 **Notice to Employer and Engineer**

Any notice to be given to the Employer or to the Engineer under the terms of the Contract shall be sent by post, cable, telex or facsimile transmission to or left at the respective addresses nominated for that purpose in Part II of these Conditions.

#### 68.3 **Change of Address**

Either party may change a nominated address to another address in the country where the Works are being executed by prior notice to the other party, with a copy to the Engineer, and the Engineer may do so by prior notice to both parties.

### **Default of Employer**

#### 69.1 **Default of Employer**

In the event of the Employer:





(a) failing to pay to the Contractor the amount due under any certificate of the Engineer within 28 days after the expiry of the time stated in Sub-Clause 60.10 within which payment is to be made, subject to any deduction that the Employer is entitled to make under the Contract,

(b) interfering with or obstructing or refusing any required approval to the issue of any such certificate,

(c) becoming bankrupt or, being a company, going into liquidation, other than for the purpose of a scheme of reconstruction or amalgamation, or

(d) giving notice to the Contractor that for economic reasons it is impossible for him to continue to meet his contractual obligations,

the Contractor shall be entitled to terminate his employment under the Contract by giving notice to the Employer, with a copy to the Engineer. Such termination shall take effect 14 days after the giving of the notice.

#### 69.2 **Removal of Contractor's Equipment**

Upon the expiry of the 14 days' notice referred to in Sub-Clause 69.1, the Contractor shall, notwithstanding the provisions of Sub-Clause 54.1, with all reasonable dispatch, remove from the Site all Contractor's Equipment brought by him thereon.

#### 69.3 **Payment on Termination**

In the event of such termination the Employer shall be under the same obligations to the Contractor in regard to payment as if the Contract had been terminated under the provisions of Clause 65, but in addition to the payments specified in Sub-Clause 65.8, the Employer shall pay to the Contractor the amount of any loss or damage to the Contractor arising out of or in connection with or by consequence of such termination.

#### 69.4 **Contractor's Entitlement to Suspend Work**

Without prejudice to the Contractor's entitlement to interest under Sub-Clause 60.10 and to terminate under Sub-Clause 69.1, the Contractor may, if the Employer fails to pay the Contractor the amount due under any certificate of the Engineer within 28 days after the expiry of the time stated in Sub-Clause 60.10 within which payment is to be made, subject to any deduction that the Employer is entitled to make under the Contract, after giving 28 days' prior notice to the Employer, with a copy to the Engineer, suspend work or reduce the rate of work.

If the Contractor suspends work or reduces the rate of work in accordance with the provisions of this Sub-Clause and thereby suffers delay or incurs costs the Engineer shall, after due consultation with the Employer and the Contractor, determine:





- (a) any extension of time to which the Contractor is entitled under Clause 44, and  
 (b) the amount of such costs, which shall be added to the Contract Price,  
 and shall notify the Contractor accordingly, with a copy to the Employer.

**69.5 Resumption of Work**

Where the Contractor suspends work or reduces the rate of work, having given notice in accordance with Sub-Clause 69.4, and the Employer subsequently pays the amount due, including interest pursuant to Sub-Clause 60.10, the Contractor's entitlement under Sub-Clause 69.1 shall, if notice of termination has not been given, lapse and the Contractor shall resume normal working as soon as is reasonably possible.

**Changes in Cost and Legislation**

**70.1 Increase or Decrease of Cost**

There shall be added to or deducted from the Contract Price such sums in respect of rise or fall in the cost of labour and/or materials or any other matters affecting the cost of the execution of the Works as may be determined in accordance with part II of these Conditions.

**70.2 Subsequent Legislation**

If, after the date 28 days prior to the latest date for submission of tenders for the Contract there occur in the country in which the Works are being or are to be executed changes to any National or State Statute, Ordinance, Decree or other Law or any regulation or bye-law of any local or other duly constituted authority, or the introduction of any such State Statute, Ordinance, Decree, Law, regulation or bye-law which causes additional or reduced cost to the Contractor, other than under Sub-Clause 70.1, in the execution of the Contract, such additional or reduced cost shall, after due consultation with the Employer and the Contractor, be determined by the Engineer and shall be added to or deducted from the Contract Price and the Engineer shall notify the Contractor accordingly, with a copy to the Employer.

**Currency and Rates of Exchange**

**71.1 Currency Restrictions**

If, after the date 28 days prior to the latest date for submission of tenders for the Contract, the Government or authorized agency of the Government of the country in which the Works are being or are to be executed imposes currency restrictions and/or transfer of currency restrictions in relation to the currency or currencies in which the Contract Price is to be paid, the Employer shall



reimburse any loss or damage to the Contractor arising therefrom, without prejudice to the right of the Contractor to exercise any other rights or remedies to which he is entitled in such event.

**72.1 Rates of Exchange**

Where the Contract provides for payment in whole or in part to be made to the Contractor in foreign currency or currencies, such payment shall not be subject to variations in the rate or rates of exchange between such specified foreign currency or currencies and the currency of the country in which the Works are to be executed.

**72.2 Currency Proportions**

Where the Employer has required the Tender to be expressed in a single currency but with payment to be made in more than one currency and the Contractor has stated the proportions or amounts of other currency or currencies in which he requires payment to be made, the rate or rates of exchange applicable for calculating the payment of such proportions or amounts shall, unless otherwise stated in Part II of these Conditions, be those prevailing, as determined by the Central Bank of the country in which the Works are to be executed, on the date 28 days prior to the latest date for the submission of tenders for the Contract, as has been notified to the Contractor by the Employer prior to the submission of tenders or as provided for in the Tender.

**72.3 Currencies of Payment for Provisional Sums**

Where the Contract provides for payment in more than one currency, the proportions or amounts to be paid in foreign currencies in respect of Provisional Sums shall be determined in accordance with the principles set forth in Sub-Clauses 72.1 and 72.2 as and when these sums are utilised in whole or in part in accordance with the provisions of Clauses 58 and 59.

**REFERENCE TO PART II**



## INDEX

### PART I GENERAL CONDITIONS

INDEX	Clause
Access to Site	42.1
Access to Works, Engineer	37.1
Access, Contractor to Satisfy Himself	11.1
Accident or Injury to Workmen - Insurance Against	24.2
Accident or Injury to Workmen - Liability for	24.1
Address, Change of	68.3
Adequacy of Insurance	25.2
Adjustment of Contract Price if Variations Exceed 15 percent of Tender Sum	52.3
Agreement	9.1
Alterations, Additions and Omissions	51&52
Ambiguities in Contract Documents	5.2
Amicable Settlement of Disputes	67.2
Appointment of Assistants to Engineer	2.4
Approval by the Engineer	7.3
Approval of Materials not Implied	54.8
Approval Only by Defects Liability Certificate	61.1
Arbitration	67.3
Assignment of Contract	3.1
Avoidance of Damage to Roads	30.1
Bills of Quantities – Estimated Only	55.1
Boreholes and Exploratory Excavation	18.1
Breakdown of Lump Sum items	57.2
Care of works	20.1
Cash Flow Estimate to be Submitted	14.3
Certificate, Final	60.8
Certificate and Payment, Monthly Statements	60.1
Certificates, Correction of	60.4
Certificate, Taking-Over	48.1
Certification of Completion of Works	48.1
Certification of Completion of Sections or Parts	48.2
Cessation of Employer's Liability	60.9
Change of Address, Notice of	68.3
Claims, Contemporary Records	53.2
Claims, Notice of	53.1
Claims, Payment of	53.5
Claims, Substantiation of	53.3
Claims Under Performance Security	10.3
Clearance of Site on Completion	33.1
Commencement of Works	41.1
Completion of Works, Time for	43.1
Completion of Works, Time for, Extension of	44.1
Completion, Statement at	60.5





**INDEX****Clause**

Compliance with Insurance Policy Conditions	25.4
Compliance with Statues and Regulations	26.1
Contemporary Records for Claims	53.2
Contract Agreement	9.1
Contract Not Relieved of Duties or Responsibilities	14.4
Contractor's Employees	16.1
Contractor's Employees, Engineer at Liberty to Object	16.2
Contractor's Entitlement to Suspend Work for Employer's Default	69.4
Contractor's Equipment, Conditions of Hire	54.5
Contractor's Equipment, Employer not Liable for Damage	54.2
Contractor's Equipment, Insurance of	21.1
Contractor's Equipment, Reference in Subcontracts	54.7
Contractor's Equipment, Temporary Works and Material; Exclusive Use for the Works	54.1
Contractor's Equipment, Transport of	30.2
Contractor's Failure to Carry Out Instructions	49.4
Contractor's Failure to Insure, Remedy	25.3
Contractor's General Responsibilities	8.1
Contractor's Superintendence	15.1
Contractor to Keep Site Clear	32.1
Contractor to Search	50.1
Correction of Certificates	60.4
Cost of Remedying Defects	49.3
Cost of Samples	36.2
Cost of Tests	35.3
Cost of Tests not Provided for	36.4
Covering up Work, Examination Before	38.1
Cross Liabilities	23.3
Currencies of Payment for Provisional Sums	72.3
Currencies, Rates of Exchange	72.1
Currency Restrictions	71.1
Custody and Supply of Drawings and Documents	6.1
Customs Clearance	54.3
Damage to Persons and Property	22.1
Damage to Roads, Avoidance of	30.1
Damage to Works, Special Risks	65.3
Damages, Liquidated	47.1
Dates for Inspection and Testing	37.3
Daywork	52.4
Decrease or Increase of Costs	70.1
Default of Contractor in Compliance with Instructions on Improper Work	39.2
Default of Contractor, Remedies for	63.1
Default of Employer	69.1
Defective Materials and Work	39.1
Defects, Contractor to Search for, if Required	50.1



**INDEX****Clause**

Defects, Cost of Remedying	49.3
Defects Liability Certificate	62.1
Defects Liability Period	49.1
Defects, Remedying of	49.2
Definitions	1.1
Delay, Liquidated Damages for	47.1
Delays and Cost of Delay of Drawings	6.4
Design by Nominated Subcontractors	59.3
Discharge	60.7
Discrepancies in Documents	5.2
Dismissal of Contractor's Employees	16.2
Disorderly Conduct, etc.	34.1
Dispute, Engineer's Decision	67.1
Disruption of Progress	6.3
Documents Mutually Explanatory	5.2
Drawings	6&7
Drawings and Documents - Custody and Supply of	6.1
Drawings and Instructions – Supplementary	7.1
Drawing, Copy to be Kept on Site	6.2
Drawings, Delays and Cost of Delay of Drawings	6.4
Drawings, Failure by Contractor to submit	6.5
Employer not liable for Damage to Contractor's Equipment etc.	54.2
Employer's Liability, Cession of	60.9
Employer's Responsibilities	19.2
Employer's Risks	20.4
Engagement of Staff and Labour	34.1
Engineer's Authority to Delegate	2.3
Engineer's Determination Where Tests not Provided for	36.5
Engineer's Duties and Authority	2.1
Engineer to Act Impartially	2.6
Environment – Protection of	19.1
Errors in Setting Out	17.1
Evidence and Terms of Insurance	25.1
Examination of Work before Covering Up	38.1
Exceptions	22.2
Exchange, Rates of	72.1
Exclusions	21.4
Extension of Time, due to Engineer's Failure to give Possession of Site	42.2
Extension of Time for Completion	44.1
Extension of Time for Completion, Contractor's Claims	44.2
Extension of Time for Completion, Engineer's Determination	44.3
Extraordinary Traffic	30.
Facilities for Other Contractors	31.2
Facilities - Rights of Way and	42.3
Failure by Contractor to Submit Drawings	6.5



## INDEX

	Clause
Failure to Comply with Claims Procedure	53.4
Failure to Comply with Engineer's Decision	67.4
Failure to give Possession of Site	42.2
Faulty Work, Removal of	39.1
Fees and Notices	26.1
Fencing, Watching, Lighting, etc.	19.1
Final Payment Certificate	60.8
Final Statement	60.6
Foreign Currencies, Payment in	72.
Fossils	27.1
Foundations, Examination of	38.1
General Responsibilities of Contractor	8.1
Giving of Notices – Payment of Fees	26.1
Headings and Marginal Notes	1.2
Improper Work and Materials, Removal of	39.1
Increase or Decrease of Costs	70.1
Indemnity by Contractor	22.1 & 24.1
Indemnity by Employer	22.3
Independent Inspection	37.5
Injury to Persons – Damage to Property	22.1
Injury to Workmen	24.1
Inspection and Testing	37.2
Inspection of Testing, Dates for	37.3
Inspection of Foundations, etc.	38.1
Inspection of Operations	37.1
Inspection of Site by Contractor	11.1
Instructions for Variations	51.2
Instructions in Writing	2.5
Instructions, Supplementary	7.1
Insurance, Adequacy of	25.2
Insurance, Evidence and Terms of	25.1
Insurance, Minimum Amount of	23.2
Insurance of Works and Contractor's Equipment	21.1
Insurance, Remedy on Failure to Insurance	25.3
Insurance, responsibility for Amounts not Recovered	21.3
Insurance, Scope of Cover	21.2
Insurance, Third Party	23.1
Insurance, Workmen	24.2
Interference with Traffic and Adjoining Properties	29.1
Interim Determination of Extension	44.3
Interpretations	1.3
Labour, Engagements of	34.1
Language/s and Law	5.1
Law to which Contract Subject	5.1





## INDEX

## Clause

Legislation, Subsequent	70.2
Lighting, Fencing, Watching, etc.	19.1
Liquidated Damages for Delay	47.1
Liquidated Damages, Reduction of	47.2
Loss or Damage due to Employer's Risks	20.3
Loss or Damage – Responsibility to Rectify	20.2
Lump-Sum Items – Breakdown of	57.2
Materials and Plant, Transport of	30.3
Materials - Approval of, etc, not Implied	54.8
Materials, Improper – Removal of	39.1
Materials, Quality of	36.1
Materials, Supply of	8.1
Measurement by Engineer	56.1
Measurement, Method of	57.1
Measurement, Quantities Estimated Only	55.1
Methods of Construction	8.2
Minimum Amount of Insurance	23.2
Monthly Payments	60.2
Nominated Subcontractors, Certification of Payments to	59.5
Nominated Subcontractors, Definition	59.1
Nominated Subcontractors, Design by	59.3
Nominated Subcontractors, Objection to Nomination	59.2
Nominated Subcontractors, Payment of	59.4
Not Foreseeable Physical Obstructions or Conditions	12.2
Notice of Claims	53.1
Notices and Fees, Payment of	26.1
Notices, Consents and Approvals	1.5
Notice to Contractor	68.1
Notice to Employer and Engineer	68.2
Objections to Contractor's Employees	16.2
Obstructions or Conditions - Not Foreseeable Physical	12.2
Omissions, Alterations and Additions	59.0
Openings, Uncovering and Making	38.2
Operations, Inspection of	37.1
Order of Work, Contractor to Furnish Program	14.1
Other Contractors, Opportunities for	31.1
Patent Rights	28.1
Payment if Contract Terminated for Contractor's Default	63.3
Payment if Contract Terminated for Employer's Default	69.3
Payment of Claims	53.5
Payment, Time for	60.10
Performance Security	10.1
Performance Security – Claims Under	10.3
Performance Security – Period of Validity	10.2
Period of Defects Liability	49.1



**INDEX****Clause**

Permanent Works Designed by Contractor	7.2
Physical Obstruction or Conditions – Not Foreseeable	12.2
Physical Obstruction or Conditions – Engineer's Determination	12.3
Plant and Materials, Transport of	30.3
Plant, Conditions of Hire	54.5
Plant, Customs Clearance	54.3
Plant, Employer not Liable for Damage to	54.2
Plant, etc. – Exclusive Use for the Works	54.1
Plant, Quality of	36.1
Plant, Re-export of	54.4
Plant, Removal of	39.1
Policy of Insurance – Compliance with Conditions	25.4
Possession of Site	42.1
Possession of Site, Failure to Give	42.2
Power of Engineer to Fix rates	52.2
Priority of Contract Documents	5.2
Program to be Submitted	14.1
Progress – Disruption of	6.3
Progress-Rate of	46.1
Protection of Environment	19.1
Provision to Indemnify Contractor	22.3
Provision to Indemnify Employer	22.2
Provisional Sums, Currencies of Payment	72.3
Provisional Sums, Definition	58.1
Provisional Sums, Production of Vouchers	58.3
Provisional Sums, Use of	58.2
Quality of Materials and Workmanship	36.1
Quantities	55.1
Rate of Progress	46.1
Rates of Exchange	72.1
Rates, Power of Engineer to Fix	52.2
Rectification of Loss or Damage	20.2
Reduction of Liquidated Damages	47.2
Re-export of Plant	54.4
Regulations, Status etc. Compliance with	26.1
Rejection	37.4
Release from Performance	66.1
Remedies for Default of Contractor	63.1
Remedying of Defects,	49.2
Remedying of Defects, Cost of	49.3
Remedy on Contractor's Failure	25.3
Removal of Contractor's Employees	16.2
Removal of Contractor's Equipment	69.2
Removal of Improper Work, Materials or Plant	39.1



<b>INDEX</b>	<b>Clause</b>
Removal of Plant, etc.	65.7
Responsibility to Rectify Loss or Damage	20.2
Responsibility Un-affected by Approval	7.3
Restriction on Working Hours	45.1
Resumption of Work	69.5
Retention Money, Payment of	50.3
Returns of Labour and Contractor's Equipment	35.1
Revised Program	14.2
Rights of Way and Facilities	42.3
Risks, Employer's	20.4
Risks, Special	65.0
Roads, etc, - Damage by Extraordinary Traffic	30.1
Roads, Interference with Access to	29.1
Royalties	28.2
Safety, Security and Protection of the Environment	19.1
Samples, Cost of	36.2
Security, Safety and Protection of the Environment	19.1
Setting Out	17.1
Singular and Plural	1.4
Site, Clearance on Completion	33.1
Site, Contractor to Keep Clear	32.1
Site Inspection by Contractor	11.1
Site Operations and Methods of Construction	8.2
Site, Possession of	42.1
Special Risks	65.0
Staff, Engagement of	34.1
Statement at Completion	60.5
Statement, Final	60.6
Statutes, Regulations, etc. – Compliance with	26.1
Subcontracting	4.1
Subcontractors, Nominated	59.0
Subcontractors, Responsibility of the Contractor for Acts and Default of	4.1
Subsequent Legislation	70.2
Substantial Completion of Sections or Parts	48.3
Sufficiency of Tender	12.1
Supply of Plant, Materials and Labour	8.1
Surfaces Requiring Reinstatement	48.4
Supervision, Engineer's Determination	40.2
Suspension lasting more than 84 days	40.3
Suspension of Work	40.1
Taking Over Certificate	48.1
Taking Over of Sections or Parts	48.2
Tender Documents	11.1
Tender, Sufficiency of	12.1
Termination of Contract by Employer	63.1





<b>INDEX</b>	<b>Clause</b>
Termination of Contract by Employer, Assignment of Benefit	63.4
Terms of Insurance	25.1
Tests, Cost of	36.3
Test not Provide for – Cost of	36.4
Third Part Insurance	23.1
Time for Completion	43.1
Time for Completion, Extension of	44.1
Time for Payment	60.10
Traffic, Extraordinary	30.1
Traffic Interference with	29.1
Traffic Waterborne	30.4
Transport of Contractor's Equipment and Temporary Works	30.2
Transport of Materials and Plant	30.3
Uncovering Work and Making Openings	38.2
Unfulfilled Obligations	62.2
Urgent Remedial Work	64.1
Valuation at Date of Termination by the Employer	63.2
Variations	51.1
Variations, Daywork Basis	52.4
Variations, Exceeding 15 percent	52.3
Variations, Instructions for	51.2
Variations, Power of the Engineer to Fix Rates	52.2
Variations, Valuation of	51.3
Vouchers Production of	58.3
War, Outbreak of	20.4
Watching and Lighting, etc.	19.1
Waterborne Traffic	30.4
Work, Examination of Before Covering Up	38.1
Work, Improper, Removal of	39.1
Working Hours, Restriction of	45.1
Workmanship, Quality of	36.1
Workmen, Accident or Injury to	24.1
Works, Care of	20.1
Works, Completion of (Defects Liability Certificate)	62.1
Works Commencement of	41.1
Works Insurance of	21.1
Works Remedying of Defects	49.2
Works, Time for Completion of	43.1
Works to be Measured	56.1
Works, Suspension of	40.1
Work to be in Accordance with the Contract	13.1



**Part II - Particular Conditions of Contract**



## TABLE OF CONTENTS

## PART II - PARTICULAR CONDITIONS OF CONTRACT

Clause	Title	Page
1.1	Definitions	132
2.1	Engineer's Duties and Authority	132
2.2	Engineer's Representative	134
2.7	Engineer Not Liable	134
2.8	Replacement of the Engineer	134
5.1	Language(s) and Law	134
5.2	Priority of Contract Documents	134
6.6	Shop Drawings	135
6.7	As-Built Drawings	135
10.1	Performance Security	135
10.4	Performance Security Binding on Variations and Changes	136
14.1	Program to be Submitted	136
14.3	Cash Flow Estimate to be Submitted	136
14.5	Detailed Program and Monthly Progress Report	136
15.2	Language Ability of Contractor's Representative	137
15.3	Contractor's Representative	137
16.3	Language Ability of Superintending Staff of Contractor	137
16.4	Employment of Local Personnel	137
19.4	Lighting Works at Night	137
20.4	Employer's Risks	137
21.4	Exclusions	139
25.5	Insurance Company	139
31.3	Co-operation with Other Contractors	139
34.2	Rates of Wages and Conditions of Labour	139
34.3	Employment of Persons in the Service of Others	139
34.4	Housing for Labour	139
34.5	Health and Safety	140
34.6	Epidemics	140
34.7	Supply of Water	140
34.8	Alcoholic Liquor or Drugs	140
34.9	Arms and Ammunition	140
34.10	Festivals and Religious Customs	140
34.11	Disorderly Conduct	141
34.12	Compliance by Subcontractors	141
35.2	Records of Safety and Health	141
35.3	Reporting of Accidents	141
36.6	Use of Pakistani Materials and Services	141
41.1	Commencement of Works	141
47.3	Bonus for Early Completion of Works	142
48.2	Taking Over of Sections or Parts	142
51.2	Instructions for Variations	142





## TABLE OF CONTENTS

## PART II - PARTICULAR CONDITIONS OF CONTRACT

Clause	Title	Page
52.1	Valuation of Variations	142
53.4	Failure to Comply	142
54.3	Customs Clearance	142
54.5	Conditions of Hire of Contractor's Equipment	142
59.4	Payments to Nominated Sub-contractors	142
59.5	Certification of Payments & Nominated Subcontractors	143
60.1	Monthly Statements	143
60.10	Time for Payment	143
60.11	Secured Advance on Materials	143
60.12	Financial Assistance to Contractor	144
60.13	Mode of Payment	145
63.1	Default of Contractor	145
65.2	Special Risks	145
67.3	Arbitration	145
68.1	Notice to Contractor	145
68.2	Notice to Employer and Engineer	146
70.1	Increase or Decrease of Cost	146
71.0	Currencies and Rate of Exchange	146
73.1	Payment of Income Tax	146
74.1	Integrity Pact	146
75.1	Termination of Contract for Employer's Convenience	147
76.1	Liability of Contractor	147
77.1	Joint and Several Liability	147
78.1	Details to be Confidential	147



## PART II - PARTICULAR CONDITIONS OF CONTRACT

## 1.1 Definitions

(a) (i) The Employer is **Sukkur IBA University, Sukkur**

(a) (iv) The \_\_\_\_\_ Engineer is

\_\_\_\_\_, or any other competent person appointed by the Employer, and notified to the Contractor, to act in replacement of the Engineer. Provided always that except in cases of professional misconduct, the outgoing Engineer is to formulate his certifications/recommendations in relation to all outstanding matters, disputes and claims relating to the execution of the Works during his tenure.

The following paragraph is added:

(a)(vi) "Bidder or Tenderer" means any person or persons, company, corporation, firm or joint venture submitting a Bid or Tender.

(b)(v) The following is added at the end of the paragraph:

The word "Tender" is synonymous with "Bid" and the word "Tender Documents" with "Bidding Documents".

The following paragraph is added:

(b)(ix) "Program" means the Program to be submitted by the Contractor in accordance with Sub-Clause 14.1 and any approved revisions thereto.

(e)(i) The text is deleted and substituted with the following:

"Contract Price" means the sum stated in the Letter of Acceptance as payable to the Contractor for the execution and completion of the Works subject to such additions thereto or deductions therefrom as may be made and remedying of any defects therein in accordance with the provisions of the Contract.

## 2.1 Engineer's Duties and Authority

With reference to Sub-Clause 2.1(b), the following provisions shall also apply.

The Engineer shall obtain the specific approval of the Employer before carrying out his duties in accordance with the following Clauses:

- (i) Consenting to the sub-letting of any part of the Works under Sub-Clause 4.1 "Subcontracting".
- (ii) Certifying additional cost determined under Sub-Clause 12.2 "Not Foreseeable



## Physical Obstructions or Conditions".

- (iii) Any action under Clause 10 "Performance Security" and Clauses 21,23,24 & 25 "Insurance" of sorts.
- (iv) Any action under Clause 40 "Suspension".
- (v) Any action under Clause 44 "Extension of Time for Completion".
- (vi) Any action under Clause 47 "Liquidated Damages for Delay" or Payment of Bonus for Early Completion of Works (PCC Sub-Clause 47.3).
- (vii) Issuance of "Taking Over Certificate" under Clause 48.
- (viii) Issuing a Variation Order under Clause 51, except:
  - a) in an emergency\* situation, as stated here below, or
  - b) if such variation would increase the Contract Price by less than the amount stated in the Appendix-A to Bid.
- (ix) Fixing rates or prices under Clause 52.
- (x) Extra payment as a result of Contractor's claims under Clause 53.
- (xi) Release of Retention Money to the Contractor under Sub-Clause 60.3 "Payment of Retention Money".
- (xii) Issuance of "Final Payment Certificate" under Sub-Clause 60.8.
- (xiii) Issuance of "Defect Liability Certificate" under Sub-Clause 62.1.
- (xiv) Any change in the ratios of Contract currency proportions and payments thereof under Clause 72 "Currency and Rate of Exchange".

(Note: Employer may further vary according to need of the project)

\* (If in the opinion of the Engineer an emergency occurs affecting the safety of life or of the Works or of adjoining property, the Engineer may, without relieving the Contractor of any of his duties and responsibilities under the Contract, instruct the Contractor to execute all such work or to do all such things as may, in the opinion of the Engineer, be necessary to abate or reduce the risk. The Contractor shall forthwith comply with any such instruction of the Engineer. The Engineer shall determine an addition to the Contract Price, in respect of such instruction, in accordance with Clause 52 and shall notify the Contractor accordingly, with a copy to the Employer.)





**2.2 Engineer's Representative**

The following paragraph is added:

The Employer shall ensure that the Engineer's Representative is a professional engineer as defined in the Pakistan Engineering Council Act 1975 (V of 1976)

The following Sub-Clauses 2.7 and 2.8 are added:

**2.7 Engineer Not Liable**

Approval, reviews and inspection by the Engineer of any part of the Works does not relieve the Contractor from his sole responsibility and liability for the supply of materials, plant and equipment for construction of the Works and their parts in accordance with the Contract and neither the Engineer's authority to act nor any decision made by him in good faith as provided for under the Contract whether to exercise or not to exercise such authority shall give rise to any duty or responsibility of the Engineer to the Contractor, any Subcontractor, any of their representatives or employees or any other person performing any portion of the Works.

**2.8 Replacement of the Engineer**

"If the Employer intends to replace the Engineer, the Employer shall, not less than 14 days before the intended date of replacement, give notice to the Contractor, of the name, address and relevant experience of the intended replacement Engineer. The Employer shall not replace the Engineer with a person against whom the Contractor raises reasonable objection by notice to the Employer, with supporting particulars."

**5.1 Language(s) and Law**

- (a) The Contract Documents shall be drawn up in the English language.
- (b) The Contract shall be subject to the Laws of Islamic Republic of Pakistan.

**5.2 Priority of Contract Documents**

The documents listed at (1) to (6) of the Sub-Clause are deleted and substituted with the following:

- (a) The Contract Agreement.
- (b) The Letter of Acceptance.
- (c) The Completed Form of Bid.
- (d) Special Stipulations (Appendix-A to Bid).
- (e) The Particular Conditions of Contract – Part II.
- (f) The General Conditions – Part I.
- (g) Special Provisions
- (h) Appendices to Bid (B to L).
- (i) The Priced Bill of Quantities



- (j) The Specifications, Technical Provisions
- (k) The Drawings

In case of discrepancies between drawings, those of larger scale shall govern unless they are superseded by a drawing of later date regardless of scale. All Drawings and Specifications shall be interpreted in conformity with the Contract and these Conditions. Addendum, if any, shall be deemed to have been incorporated at the appropriate places in the documents forming the Contract.

The following Sub-Clauses 6.6 and 6.7 are added:

#### **6.6 Shop Drawings**

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

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

#### **6.7 As-Built Drawings**

At the completion of the Works under the Contract, the Contractor shall furnish to the Engineer 6 copies and one reproducible of all drawings amended to conform with the Works as built. The price of such Drawings shall be deemed to be included in the Contract Price.

#### **10.1 Performance Security**

The text is deleted and substituted with the following:

The Contractor shall provide Performance Security to the Employer in the prescribed form. The said Security shall be furnished or caused to be furnished by the Contractor within 14 days after the receipt of the Letter of Acceptance. The Performance Security shall be of an amount equal up to 10% of the Contract Price stated in the Letter of Acceptance. Such Security shall be in the form of bank guarantee from any Scheduled Bank in Pakistan

The cost of complying with requirements of this Sub-Clause shall be borne by the Contractor.

The following Sub-Clause 10.4 is added:





**10.4 Performance Security Binding on Variations and Changes**

The Performance Security shall be binding irrespective of changes in the quantities or variations in the Works or extensions in Time for Completion of the Works which are granted or agreed upon under the provisions of the Contract.

**14.1 Program to be submitted**

The Program shall be submitted within 14 days from the date of receipt of Letter of Acceptance, which shall be in the form of:

- i) a Bar Chart identifying the critical activities.
- ii) a CPM identifying the critical path/activities.  
*(Employer to select appropriate one)*

**14.3 Cash Flow Estimate to be Submitted**

The detailed Cash Flow Estimate shall be submitted within 21 days from the date of receipt of Letter of Acceptance

The following Sub-Clause 14.5 is added:

**14.5 Detailed Program and Monthly Progress Report**

- a) For purposes of Sub-Clause 14.1, the Contractor shall submit to the Engineer Detailed Program for the following:
  - (1) Execution of Works.
  - (2) Labour Employment.
  - (3) Local Material Procurement.
  - (4) Material Imports, if any; and
  - (5) Other details as required by the Engineer.
- (b) During the period of the Contract, the Contractor shall submit to the Engineer not later than the 8<sup>th</sup> day of the following month, 10 copies each of Monthly Progress Reports covering:
  - (1) A Construction Schedule indicating the monthly progress in percentage.
  - (2) Description of all work carried out since the last report.
  - (3) Description of the work planned for the next 56 days sufficiently detailed to enable the Engineer to determine his Program of inspection and testing.
  - (4) Monthly summary of daily job record.
  - (5) Photographs to illustrate progress; and
  - (6) Information about problems and difficulties encountered, if any, and proposals to overcome the same.
- (c) During the period of the Contract, the Contractor shall keep a daily record of the work





progress, which shall be made available to the Engineer as and when requested. The daily record shall include particulars of weather conditions, number of men working, deliveries of materials, quantity, location and assignment of Contractor's equipment.

The following Sub-Clauses 15.2 and 15.3 are added:

**15.2 Language Ability of Contractor's Representative**

The Contractor's authorized representative shall be fluent in the English language. Alternately an interpreter with ability of English language shall be provided by the Contractor on full time basis.

**15.3 Contractor's Representative**

The Contractor's authorised representative and his other professional engineers working at Site shall register themselves with the Pakistan Engineering Council.

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

The following Sub-Clauses 16.3 and 16.4 are added:

**16.3 Language Ability of Superintending Staff of Contractor**

A reasonable proportion of the Contractor's superintending staff shall have a working knowledge of the English language. If the Contractor's superintending staff are not fluent in English language, the Contractor shall make competent interpreters available during all working hours in a number deemed sufficient by the Engineer.

**16.4 Employment of Local Personnel**

The Contractor is encouraged, to the extent practicable and reasonable, to employ staff and labour from sources within Pakistan.

The following Sub-Clauses 19.3 is added:

**19.3 Lighting Work at Night**

In the event of work being carried out at night, the Contractor shall at his own cost, provide and maintain such good and sufficient light as will enable the work to proceed satisfactorily and without danger. The approaches to the Site and the Works where the night-work is being carried out shall be sufficiently lighted. All arrangement adopted for such lighting shall be to the satisfaction of the Engineer's Representative.

**20.4 Employer's Risks**

The Employer's risks are:



Delete the text and substitute with the following:

- (a) insofar as they directly affect the execution of the Works in Pakistan:
- (i) war and hostilities (whether war be declared or not), invasion, act of foreign enemies,
  - (ii) rebellion, revolution, insurrection, or military or usurped power, or civil war,
  - (iii) ionizing radiations, or contamination by radioactivity from any nuclear fuel, or from any nuclear waste from the combustion of nuclear fuel, radioactive toxic explosive or other hazardous properties of any explosive nuclear assembly or nuclear component thereof,
  - (iv) pressure waves caused by aircraft or other aerial devices travelling at sonic or supersonic speeds,
  - (v) riot, commotion or disorder, unless solely restricted to the employees of the Contractor or of his Subcontractors and arising from the conduct of the Works.
- (b) loss or damage due to the use or occupation by the Employer of any Section or part of the Permanent Works, except as may be provided for in the Contract.
- (c) loss or damage to the extent that it is due to the design of the Works, other than any part of the design provided by the Contractor or for which the Contractor is responsible; and
- (d) any operation of the forces of nature (insofar as it occurs on the Site) which an experienced contractor:
- (i) could not have reasonably foreseen, or
  - (ii) could reasonably have foreseen, but against which he could not reasonably have taken at least one of the following measures:
    - (a) prevent loss or damage to physical property from occurring by taking appropriate measures, or
    - (b) insure against.

#### 21.4 Exclusions

The text is deleted and substituted with the following:

There shall be no obligation for the insurances in Sub-Clause 21.1 to include loss or damage caused by the risks listed under Sub-Clause 20.4 paras (a) (i) to (iv).

The following Sub-Clause 25.5 is added:

#### 25.5 Insurance Company

The Contractor shall be obliged to place all insurances relating to the Contract (including, but not limited to, the insurances referred to in Clauses 21, 23 and 24) with either National Insurance Company of Pakistan or any other insurance company operating in Pakistan and acceptable to the Employer.





Costs of such insurances shall be borne by the Contractor.

The following Sub-Clause 31.3 is added:

### **31.3 Co-operation with other Contractors**

During the execution of the Works, the Contractor shall co-operate fully with other contractors working for the Employer at and in the vicinity of the Site and also shall provide adequate precautionary facilities not to make himself a nuisance to local residents and other contractors.

The following Sub-Clauses 34.2 to 34.12 are added:

### **34.2 Rates of Wages and Conditions of Labour**

The Contractor shall pay rates of wages and observe conditions of labour not less favourable than those established for the trade or industry where the work is carried out. In the absence of any rates of wages or conditions of labour so established, the Contractor shall pay rates of wages and observe conditions of labour which are not less favourable than the general level of wages and conditions observed by other employers whose general circumstances in the trade or in industry in which the Contractor is engaged are similar.

### **34.3 Employment of Persons in the Service of Others**

The Contractor shall not recruit his staff and labour from amongst the persons in the services of the Employer or the Engineer; except with the prior written consent of the Employer or the Engineer, as the case may be.

### **34.4 Housing for Labour**

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

### **34.5 Health and Safety**

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





**34.6 Epidemics**

In the event of any outbreak of illness of an epidemic nature, the Contractor shall comply with and carry out such regulations, orders and requirements as may be made by the Government, or the local medical or sanitary authorities, for purpose of dealing with and overcoming the same.

**34.7 Supply of Water**

The Contractor shall, so far as is reasonably practicable, having regard to local conditions, provide on the Site, to the satisfaction of the Engineer or his representative, adequate supply of drinking and other water for the use of his staff and labour.

**34.8 Alcoholic Liquor or Drugs**

The Contractor shall not, otherwise than in accordance with the Statutes, Ordinances and Government Regulations or Orders for the time being in force, import, sell, give, barter or otherwise dispose of any alcoholic liquor or drugs, or permit or suffer any such importation, sale, gift, barter or disposal by his Subcontractors, agents, staff or labour.

**34.9 Arms and Ammunition**

The Contractor shall not give, or otherwise dispose of to any person or persons, any arms or ammunition of any kind or permit or suffer the same as aforesaid.

**34.10 Festivals and Religious Customs**

The Contractor shall in all dealings with his staff and labour have due regard to all recognised festivals, days of rest and religious and other customs,

**34.11 Disorderly Conduct**

The Contractor shall at all times take all reasonable precautions to prevent any unlawful, riotous or disorderly conduct by or amongst staff and labour and for the preservation of peace and protection of persons and property in the neighbourhood of the Works against the same.

**34.12 Compliance by Subcontractors**

The Contractor shall be responsible for compliance by his Subcontractors of the provisions of this Clause.

The following Sub-Clauses 35.2 and 35.3 are added:



**35.2 Records of Safety and Health**

The Contractor shall maintain such records and make such reports concerning safety, health and welfare of persons and damage to property as the Engineer may from time to time prescribe.

**35.3 Reporting of Accidents**

The Contractor shall report to the Engineer details of any accident as soon as possible after its occurrence. In the case of any fatality or serious accident, the Contractor shall, in addition, notify the Engineer immediately by the quickest available means.

The following Sub-Clause 36.6 is added:

**36.6 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.

**41.1 Commencement of Works**

The text is deleted and substituted with the following:

The Contractor shall commence the Works on Site within the period named in Appendix-A 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.

The following Sub-Clause 47.3 is added:

**47.3 Bonus for Early Completion of Works**

No bonus for early completion of work

**48.2 Taking Over of Sections or Parts**

For the purposes of para (a) of this Sub-Clause, separate Times for Completion shall be provided in the Appendix-A to Bid "Special Stipulations".

**51.2 Instructions for Variations**

At the end of the first sentence, after the word "Engineer", the words "in writing" are added.

**52.1 Valuation of Variations**



In the tenth line, after the words "Engineer shall" the following is added:  
within a period not exceeding one-eighth of the completion time subject to a minimum of 56 days from the date of disagreement whichever is later.

#### **53.4 Failure to Comply**

This Sub-Clause is deleted in its entirety.

#### **54.3 Customs Clearance**

The following text is added:

However, all the expenses and activities related to custom clearance is responsibility of the Contractor

#### **54.5 Conditions of Hire of Contractor's Equipment**

The following paragraph is added:

The Contractor shall, upon request by the Engineer at any time in relation to any item of hired Contractor's Equipment, forthwith notify the Engineer in writing the name and address of the Owner of the equipment and shall certify that the agreement for the hire thereof contains a provision in accordance with the requirements set forth above.

The following Sub-Clauses 59.4 & 59.5 are added:

#### **59.4 Payments to Nominated Subcontractors**

The Contractor shall pay to the nominated Subcontractor the amounts which the Engineer certifies to be due in accordance with the subcontract. These amounts plus other charges shall be included in the Contract Price in accordance with Clause 58 [Provisional Sums], except as stated in Sub-Clause 59.5 [Certification of Payments].

#### **59.5 Certification of Payments & Nominated Subcontractors**

Before issuing a Payment, Certificate which includes an amount payable to a nominated Subcontractor, the Engineer may request the Contractor to supply reasonable evidence that the nominated Subcontractor has received all amounts due in accordance with previous Payment Certificates, less applicable deductions for retention or otherwise. Unless the Contractor:

- a) submits reasonable evidence to the Engineer, or
- b)
  - i) satisfies the Engineer in writing that the Contractor is reasonably entitled to withhold or refuse to pay these amounts, and
  - ii) submits to the Engineer reasonable evidence that the nominated Subcontractor has been notified of the Contractor's entitlement,





then the Employer may (at his sole discretion) pay direct to the nominated Subcontractor, part or all of such amounts previously certified (less applicable deductions) as are due to the nominated Subcontractor and for which the Contractor has failed to submit the evidence described in sub-paragraphs (a) or (b) above. The Contractor shall then repay, to the Employer, the amount which the nominated Subcontractor was directly paid by the Employer.

#### 60.1 Monthly Statements

In the first line after the word "shall", the following is added:

"On the basis of the joint measurement of work done under Clause 56.1,"

In Para (c) the words "the Appendix to Tender" are deleted and substituted with the words "Sub-Clause 60.11 (a)(6) hereof".  
(In case Clause 60.11 is applicable)

#### 60.10 Time for Payment

The text is deleted and substituted with the following:

The amount due to the Contractor under any Interim Payment Certificate issued by the Engineer pursuant to this Clause, or to any other terms of the Contract, shall, subject to Clause 47, be paid by the Employer to the Contractor within 30 days after such Interim Payment Certificate has been jointly verified by Consultant/Employer and Contractor, or, in the case of the Final Certificate referred to in Sub Clause 60.8, within 60 days after such Final Payment Certificate has been jointly verified by Consultant/Employer and Contractor.

The following Sub-Clause 60.11, 60.12 & 60.13 is added:

#### 60.11 Secured Advance on Materials

- a) The Contractor shall be entitled to receive from the Employer Secured Advance against an indemnity bond acceptable to the Employer of such sum as the Engineer may consider proper in respect of non-perishable materials brought at the Site but not yet incorporated in the Permanent Works provided that:
- (1) The materials are in accordance with the Specifications for the Permanent Works.
  - (2) Such materials have been delivered to the Site and are properly stored and protected against loss or damage or deterioration to the satisfaction of the Engineer but at the risk and cost of the Contractor.
  - (3) The Contractor's records of the requirements, orders, receipts and use of materials are kept in a form approved by the Engineer, and such records shall be available for inspection by the Engineer.



- (4) The Contractor shall submit with his monthly statement the estimated value of the materials on Site together with such documents as may be required by the Engineer for the purpose of valuation of materials and providing evidence of ownership and payment therefor.
  - (5) Ownership of such materials shall be deemed to vest in the Employer and these materials shall not be removed from the Site or otherwise disposed of without written permission of the Employer; and
  - (6) The sum payable for such materials on Site shall not exceed 75 % of the (i) landed cost of imported materials, or (ii) ex-factory / ex-warehouse price of locally manufactured or produced materials, or (iii) market price of other materials.
- (b) The recovery of Secured Advance paid to the Contractor under the above provisions shall be affected from the monthly payments on actual consumption basis or within 90 days.

#### 60.12 Financial Assistance to Contractor

##### Mobilization Advance

- (a) An interest-free Mobilization Advance up to 10 % of the Contract Price stated in the Letter of Acceptance shall be paid by the Employer to the Contractor in two equal parts upon submission by the Contractor of a Mobilization Advance Guarantee/Bond for the full amount of the Advance in the specified form from a Scheduled Bank in Pakistan:
  - (1) First part within 14 days after signing of the Contract Agreement or date of receipt of Engineer's Notice to Commence, whichever is earlier; and
  - (2) Second part within 42 days from the date of payment of the first part, subject to the satisfaction of the Engineer as to the state of mobilization of the Contractor.
- (b) This Advance shall be recovered in four equal instalments from first four IPCs.

#### 60.13 Mode of Payment

The payments shall be released by the Employer to the Contractor, at Employer's choice, either in the form of Cheque/(s) drawn in the favour of the Contractor or in the form of Irrevocable Inland Letter of Credit (LC) opened in the favour of Contractor. If letter of credit is opened in favour of contractor, the cost (commission and bank charges) of L/C shall be the responsibility of the Contractor





**63.1 Default of Contractor**

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

Provided further that in addition to the action taken by the Employer against the Contractor under this Clause, the Employer may also refer the case of default of the Contractor to Pakistan Engineering Council for punitive action under the Construction and Operation of Engineering Works Byelaws 1987, as amended from time to time.

**65.2 Special Risks**

The text is deleted and substituted with the following:

The Special Risks are the risks defined under Sub-Clause 20.4 sub paragraphs (a) (i) to (a) (v).

**67.3 Arbitration**

In the sixth to eight lines, the words "shall be finally settled ..... appointed under such Rules" are deleted and substituted with the following:

shall be finally settled under the provisions of the Arbitration Act, 1940 as amended or any statutory modification or re-enactment thereof for the time being in force.

The following paragraph is added:

The place of arbitration shall be Sukkur, Pakistan.

**68.1 Notice to Contractor**

The following paragraph is added:

For the purposes of this Sub-Clause, the Contractor shall, immediately after receipt of Letter of Acceptance, intimate in writing to the Employer and the Engineer by registered post, the address of his principal place of business or any change in such address during the period of the Contract.

**68.2 Notice to Employer and Engineer**

For the purposes of this Sub-Clause, the respective addresses are:

a) The Employer:

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b) The Engineer:

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**70.1 Increase or Decrease of Cost**

Sub-Clause 70.1 is deleted in its entirety, and substituted with the following:  
Price adjustment is not applicable to this project.

**71.0 Currency and Rates of Exchange**

Sub-Clauses 71.1, 72.1, 72.2 and 72.3 are deleted entirely and substituted with the following:  
Contract is based on Pakistani Rupees (PKR) and payments will be made only in Pakistani Rupees (PKR)

The following Sub-Clauses 73.1, 74.1, 75.1, 76.1, 77.1 and 78.1 are added:

**73.1 Payment of Income Tax**

The Contractor, Subcontractors and their employees shall be responsible for payment of all their income tax, super tax and other taxes on income arising out of the Contract and the rates and prices stated in the Contract shall be deemed to cover all such taxes as per prevailing laws.

**74.1 Integrity Pact**

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 Employer shall be entitled to:

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

The termination under Sub-Para (b) of this Sub-Clause shall proceed in the manner prescribed under Sub-Clauses 63.1 to 63.4 and the payment under Sub-Clause 63.3 shall be made after having deducted the amounts due to the Employer under Sub-Para (a) and (c) of this Sub-Clause.

**75.1 Termination of Contract for Employer's Convenience**

The Employer shall be entitled to terminate the Contract at any time for the



Employer's convenience after giving 56 days' prior notice to the Contractor, with a copy to the Engineer. In the event of such termination, the Contractor:

- (a) shall proceed as provided in Sub-Clause 65.7 hereof; and
- (b) shall be paid by the Employer as provided in Sub-Clause 65.8 hereof.

**76.1 Liability of Contractor**

The Contractor or his Subcontractors or assigns shall follow strictly, all relevant labour laws including the Workmen's Compensation Act and the Employer shall be fully indemnified for all claims, damages etc. arising out of any dispute between the Contractor, his Subcontractors or assigns and the labour employed by them.

**77.1 Joint and Several Liability**

If the Contractor is a joint venture of two or more persons, all such persons shall be jointly and severally bound to the Employer for the fulfilment of the terms of the Contract and shall designate one of such persons to act as leader with authority to bind the joint venture. The composition or the constitution of the joint venture shall not be altered without the prior consent of the Employer.

**78.1 Details to be Confidential**

The Contractor shall treat the details of the Contract as private and confidential, save in so far as may be necessary for the purposes thereof, and shall not publish or disclose the same or any particulars thereof in any trade or technical paper or elsewhere without the prior consent in writing of the Employer or the Engineer. If any dispute arises as to the necessity of any publication or disclosure for the purpose of the Contract, the same shall be referred to the decision of the Engineer whose award shall be final.



## PART II –PARTICULAR CONDITIONS OF CONTRACT

Index	Clause
Alcoholic Liquor or Drugs	34.8
Arbitration	67.3
Arms and Ammunition	34.9
As-Built Drawings	6.7
Bonus for Early Completion of Works	47.3
Cash Flow Estimate to be Submitted	14.3
Commencement of Works	41.1
Compliance by Sub-Contractors	34.12
Conditions of Hire of Contractor's Equipment	54.5
Contractor's Representative	15.3
Co-operation with Other Contractors	31.3
Customs Clearance	54.3
Customs Duty and Taxes	73.2
Default of Contractor	63.1
Definitions	1.1
Detailed Program and Monthly Progress Report	14.5
Details to be Confidential	78.1
Disorderly Conduct	34.11
Employer's Risks	20.4
Employment of Local Personnel	16.4
Employment of Persons in the Service of Others	34.3
Engineer Not Liable	2.7
Engineer's Duties and Authority	2.1
Engineer's Representative	2.2
Epidemics	34.6
Exclusions	21.4
Failure to Comply	53.4
Festivals and Religious Customs	34.10
Financial Assistance to Contractor	60.11
Health and Safety	34.5
Housing for Labour	34.4
Increase or Decrease of Cost	70.1
Instructions for Variations	51.2
Insurance of Works and Contractor's Equipment	21.1
Insurance Company	25.5
Integrity Pact	74.1
Joint and Several Liability	77.1
Language Ability of Contractor's Representative	15.2
Language Ability of Superintending Staff of Contractor	16.3
Language(s) and Law	5.1
Liability of Contractor	76.1





<b>Index</b>	<b>Clause</b>
Lighting Work at Night	19.4
Monthly Statements	60.1
Notice to Contractor	68.1
Notice to Employer and Engineer	68.2
Payment of Income Tax	73.1
Payments of Nominated Subcontractors	59.4
Performance Security	10.1
Performance Security Binding on Variation and Changes	10.4
Priority of Contract Documents	5.2
Program to be Submitted	14.1
Rates of Wages and Conditions of Labour	34.2
Records of Safety and Health	35.2
Replacement of the Engineer	2.8
Reporting of Accidents	35.3
Safety Precautions	19.3
Secured Advance on Materials	60.11
Shop Drawings	6.6
Special Risks	65.2
Supply of Water	34.7
Taking Over of Sections or Parts	48.2
Termination of Contract for Employer's Convenience	75.1
Time for Payment	60.10
Use of Pakistani Materials and Services	36.6
Valuation of Variations	52.1



# **BILL OF QUANTITIES (BOQ)**



**CONSTRUCTION OF HOSTEL AT IBA PUBLIC SCHOOL SUKKUR**

**Bill Of Quantities (Civil Works)**

Rates Based on Composite Schedule of Rate (GENERAL-2012) Sindh

Sr. No.	Item No.	Description of Item	Unit	Qty	Rate	Amount
1	C-1/18(b)	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 in Ordinary Soil.	%0Cft	29503.00	3176.25	93,708.90
2	C-1/15	Extra for wet earth work.	%0Cft	29503.00	1058.75	31,236.30
3	C-18/92	Providing Anti -termite treatment by spraying /sprinkling /spreading Neptachlar 0.5% Emulsion as an overall pre -construction treatment in slab type construction under the slab and along attached perches or entrances etc. complete as per directions of Engineer Incharge.	P.Sft	8676.00	9.74	84,504.24
4	C-4/5(i)	Cement concrete plain including placing compacting, finishing and curing, complete (including screening and washing at stone aggregate without for all shuttering.(Mix 1:4:8)	%Cft	3304.88	11288.75	373,079.08
5	C-4/6 a-i	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 (I) Ratio (1 : 2: 4 ) 90 Lbs.cement 2 Cft. Sand 4 Cft. Shingle 1/8" to 1/4" gauge. (Foundation)	P.Cft	7038.75	337.00	2,372,058.75
6	C-4/6 a-i	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 (I) Ratio (1 : 2: 4 ) 90 Lbs.cement 2 Cft. Sand 4 Cft. Shingle 1/8" to 1/4" gauge. (Ground Floor)	P.Cft	8222.17	337.00	2,770,870.28
12	C-4/6 a-ii	Reinforced cement concrete in roof slab, beams, columns lintels, girders and other structural members laid in situ or precast laid in position, or prestressed members cast in situ, complete in all respects:- Type B (nominal mix 1: 1.5: 3) UPL	P.Cft	697.50	349.00	243,427.50
13	C-4/6 a-ii	Reinforced cement concrete in roof slab, beams, columns lintels, girders and other structural members laid in situ or precast laid in position, or prestressed members cast in situ, complete in all respects:- Type B (nominal mix 1: 1.5: 3) G.F	P.Cft	2092.50	349.00	730,282.50
17	C-5/4-l(e)	Pacca brick work in foundation and plinth in cement sand mortar 1:6.	%Cft	3345.50	11948.36	399,732.38
18	C-1/21	Filling, watering and ramming earth in floors with surplus earth from foundation lead upto one chain and lift upto 5 feet.	%0Cft	9834.33	1512.50	14,874.43
19	C-1/22	Filling, watering and ramming earth under floor with new earth (Excavated from	%0Cft	70658.58	3630.00	256,490.64





		outside) lead upto one chain and lift upto 5 feet.				
20	C-5/5-l(d)	Pacca brick work in Ground Floor cement, sand mortar Ratio 1:5	%Cft	9568.13	12902.08	1,234,487.14
21	C-5/5-l(c)	Pacca brick work in Ground Floor cement, sand mortar Ratio 1:4	%Cft	288.00	13227.41	38,094.94
27	C-9/12(b)	Cement plaster 1:5 upto 12' height- b) 1/2" (13 mm) thick. (Internal) Ground Floor	%Sft	26709.25	2241.80	598,767.97
31	C-9/12(c)	Cement plaster 1:5 upto 12' height- b) 1/4" (20 mm) thick. (Internal) Ground Floor	%Sft	26709.25	2678.50	715,407.26
35	C-9/11(c)	Cement plaster 1:4 Ground Floor upto 12' height- c) 1/4" (20 mm) thick. (External)	%Sft	5998.00	3015.76	180,885.28
39	C-9/10(a)	Cement plaster 1:3 upto 12' height (a) 3/8" thick (Slab Soffit) G.F	%Sft	9684.00	2225.12	215,480.62
43	C-9/24(c)	Distempering- New surface- three coats	%Sft	63102.50	1079.65	681,286.14
44	C-9/(38.A+38.B)	Preparing the surface and painting with weather coat l/c rubbing the surface with rubbing brick / sand Paper, filling the voids with chalk/ plaster of Paris and then painting with weather coat of approved make - three coats	%Sft	5998.00	2567.95	154,025.64
45	C-5/29	Supplying and filling sand under floor and plugging in walls.	%Cft	3222.12	1141.25	36,772.44
46	C-4/2	Dry rammed brick or stone ballast 1 1/2" to 2" gauge.	%Cft	3222.12	3327.50	107,216.04
47	C-8/16-a	Providing and laying 1" thick topping cement concrete (1:2:4 ) including Surface finishing and dividing into panels:(a) 1" thick Ground Floor.	%Sft	9968.50	1915.13	190,909.73
48	C-8/25	Laying floor of aproved colour Glazed tiles 1/4" thick laid in white cement and pigment on a bed of 3/4" thick cement mortar 1:2	%Sft	8134.50	27747.06	2,257,084.60
49	C-8/38	Glazed tiles/dado/Skirting 1/4" thick laid in pigment over 1:2 ratio cement sand mortar 3/4" thick including finishing.	%Sft	4413.75	28299.30	1,249,060.35
59	C-8/75	Providing & fixing glass strips 4 mm for flooring upto 1" depth l/c fixing in flooring with cement in specified pattern & design.	P.Sft	4928.70	11.16	55,004.29
60	C-4/5(f)	Cement concrete plain including placing compacting, finishing and curing, complete (including screening and washing at stone aggregate without for all shuttering (Mix 1:2:4)	%Cft	2421.00	14429.25	349,332.14
61	C-8/16-c	Providing and laying 2" thick topping cement concrete (1:2:4 ) including Surface finishing and dividing into panels.	%Sft	80.00	3275.50	2,620.40
62	C-7/5	Single layer of tiles 9" x4 1/2" x 2" laid over 4" earth 1" mud plaster without Bhoosa grouted with cement sand 1:3 on top of R.C.C slab provide with 34 Lbs. Bitumen coating sand blinded.	%Sft	9684.00	5310.35	514,254.29
63	C-7/18	Khuras on roof 2'x2'x6" (600 x 600 x 150 mm)	Each		358.68	8,608.32



64	C-17/24	Making & fixing steel grated door with 1/16" thick sheeting including angle iron frame 2" x 2" 3/8" and 3/4" square bars 4" centre to centre with locking arrangement.	P.Sft	24.48	726.72	17,790.11
65	C-10/59	First class Sheesham wood wrought framed and fixed in place including chowkhats hold fasts, tower bolts, chocks, cleats, handles card with hooks and cost of nails and screws, etc. panelled or panelled and glazed or fully glazed 1-1/2" thick.	P.Sft	633.50	662.24	419,529.04
66	C-10/19-(A)-ii	Providing and fixing sliding bolt to doors. Iron sliding bolt 12" long. (a) Panelled or panelled and glazed or fully glazed 2" thick.	Each	26.00	222.23	5,777.98
67	C-10/21	Providing and fixing, approved quality mortice lock.	Each	26.00	1786.13	46,439.38
68	C-11/5-(c)	Preparing surface and painting of doors and windows any type, (including edges) Three Coats.	%Sft	1152.00	2116.41	24,381.04
69	C-18/83(a)	Supplying & fixing in position Aluminium channels framing for hinged doors or Alcop made with 5 mm thick tinted glass glazing (Belgium) and Alpha (Japan) locks l/c handles, stoppers etc. (a) Deluxe model (White)	P.Sft	24.50	1450.76	35,543.62
70	C-18/84(a)	Supplying & fixing in position Aluminium channels framing for sliding windows & ventilators of Alcop made with 5 mm thick tinted glass glazing (Belgium) & Aluminium fly screen l/c handles stoppers & locking arrangement etc. complete. (a) Deluxe model (White).	P.Sft	1088.00	1592.69	1,732,846.72
71	C-17/26	Supplying & fixing in position iron/steel grill of 3/4" x 1/4" size flat iron of approved design including painting 3 coats etc. complete (weight not to be less than 3.7 Lbs./Sq. Foot of finished grill).	P.Sft	1208.00	180.50	218,044.00
72	C-18/69(a)	Damp Proof course with cement sand Ratio (1: 2) mixed with dampo b) 1-1/2" thick	%Sft	1108.50	1934.82	21,447.48
73	C-7/13	Two coats of bitumen laid hot using 34 Lbs for % Sft. Ober roof and blinded with sand at one Cft. Per % Sft.	%Sft	9607.00	1887.40	181,322.52
74	C-7/38	Providing and laying single per layer of polythene sheet 0.13 mm thick for water proffing as per specification and instructions of Engineer incharge.	P.Sft	28975.00	10.70	310,032.50
75	C-4/7(ii)	Extra cost due to use of Hi Bond Pre-packaged Polymer Modified mortar (DHPMM) as an admixture in concrete mix for increasing durability, to be used in concreting, flooring, block/ brick/ stone masonry or plastering as % by weight of cement.	P.Kg	6769.00	459.80	3,112,386.20
78	C-18/88	Providing & fixing Aluminium sheet 6" to 9" with V-Notch for expansion joints l/c fixing with nails / screws.	P.Rft	30.00	207.51	6,225.30





79	SOR (PHE works) Part-B (II) R(B)-1	Providing "expansion joint" in concrete work of 9" wide corrugated PVC (with bulb) i.c soldering and providing wooden key of partal wood i/c cutting of planks to the exact shape of structure and cost of the material and labour etc complete.	P.Rft	15.00	463.00	6,945.00
<b>O.H.W.T</b>						
1	C-4/6 a-l +6 (d)	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 (I) Ratio (1 : 2: 4 ) 90 Lbs.cement 2 Cft. Sand 4 Cft. Shingle 1/8" to 1/4" gauge. (Third Floor)	P.Cft	546.25	373.30	203,915.13
<b>Total of SOR Items</b>					<b>Rs.</b>	<b>22,302,188.64</b>
-----% Above /Below						
<b>Cost of Civil work (Scheduled Items)</b>						





**CONSTRUCTION OF HOSTEL AT IBA PUBLIC SCHOOL SUKKUR**

**Bill Of Quantities (Civil Works)**

**Non-Scheduled Items**

Sr. No.	Item No.	Description of Item	Unit	Qty	Rate	Amount
1	NSI	Fabrication of mild steel reinforcement for cement concrete, including cutting, bending, laying in position, making joints and fastenings, including cost of binding wire and labour charges for binding of steel reinforcement (also includes the removal of rust from bars, wastage, overlaps and steel chairs, etc.). Deformed bars (Grade-60)	P.Kg	52839.50		
2	NSI	Providing and laying pure sand including placing, mixing, spreading and compaction of material to required, to achieve 95% maximum modified AASHTO dry density, including carriage of all material to site of work complete in all respect as approved by the Engineer incharge.	P.Cft	29040.38		
3	NSI	Providing and applying wall putty (Kansai or equivalent) two coats on plastered surface to prepare the surface even and smooth complete in all respect as approved and directed by the Engineer Incharge.	P.Sft	126205.00		
6	NSI	Providing and fixing 3/4" thick Boticina Marble full width area above 2 Sft laid in white cement matching pigment 3/4" thick cement sand mortar (1:2) i/c filling joints in white cement & matching pigment, including Polished and making gola on exposed edges complete in all respect as approved by the Engineer/ Incharge. (Stairs, Podium, Vanity)	P.Sft	1335.11		
8	NSI	Providing and fixing UPVC Doors 38mm thickness i/c deluex matching color UPVC frame matt or glossy finish having color (white-Gray-Marble Gray-Oak Wood- Dard Oak Wood, Coffee Wood Honey Pine Wood-Mahagony-Marry Gold-Chocolate Brown-Honey Dew) i/c all accessories i/c mortice locks complete in all respect as approval by the Engineer Incharge.	P.Sft	320.25		
9	NSI	Providing and fixing SS railing 2'-6" height, 2" dia SS pole 16 SWG at 4 ft c/c, 2" dia SS 16 SWG pipe on top, 3 no. 3/4" dia SS 16 SWG horizontal pipe from pole to pole, buffing and polishing complete in all respect including the cost of base plate, base plate cap, rawl bolt etc. as per approval of Engineer/ Incharge.	P.Rft	30.00		
13	NSI	Providing and fixing thermopore (foamed polythene) sheet in horizontal and vertical expansion joints. (a) 1" (25 mm) thick thermopore sheet.	P.Cft	37.85		
14	NSI	Providing and fixing ornamental cement jali 4" thick (1 : 2 : 4) with steel wire.	P.Sft	98.00		



15	NSI	Providing and fixing metal (chicken mesh) mesh of 16 guage fixed with nails for concrete and bricks joint complete in all respect and as approved and directed by the Engineer Incharge.	P Sft	2596.50		
<b>O.H.W.T</b>						
1	NSI	Fabrication of mild steel reinforcement for cement concrete, including cutting, bending, laying in position, making joints and fastenings, including cost of binding wire and labour charges for binding of steel reinforcement (also includes the removal of rust from bars, wastage, overlaps and steel chairs, etc.). Deformed bars (Grade-60)	P Kg	1750.38		
2	NSI	Providing embedding 10" (250 mm) wide 1/4" (6 mm) thick rubber water stopper in expansion joints of R.C.C. roof slab, tanks complete in all respects.	P Rft	57.00		
<b>Total of Non SOR Items</b>						



CONSTRUCTION OF HOSTEL AT IBA PUBLIC SCHOOL SUKKUR						
Bill Of Quantities						
ELECTRICAL WORKS						
Rates Based on Composite Schedule of Rate (GENERAL-2012) Sindh						
Sr. No.	Item No.	Description	Unit	Qty	Unit Rate (Rs.)	Total Amount (Rs.)
1		<b>DISTRIBUTION BOARDS</b>				
		(General Description) Supply at site, fabrication, installation, testing and commissioning of Distribution Board (DB) made of sheet steel 16 SWG, degreased and derusted, with 2 coats of antirust paint, 2 coats of powder coated paint of approved colour, protection classification IP-44, totally enclosed indoor floor mounting cubicle type in free standing design, with hinged door, handle including cost of all auxiliaries, internal wiring, designation lables on MCCBS, grounding bar suitable for system Voltage 440 V, 50 Hz, 3 Phase and neutral bus bars of 99.9% electrolytic copper, including cost of cable terminal blocks wiring from breakers, brass cable glands, all accessories complete in all respects metion in BOQ or not required for performing completely. All incoming and outgoing breakers shall be accessible only by opening the front door having further M.S. sheet cover gaskets shall also be provided where necessary. Panel should be compeltely made in certified factory ie PEL, Green T & D, Mazcorp engineering or equivalent as per instructions by engineer incharge				
		(General Description) All MCCBs shall be suitable to operate without any derating at 40°C ambient temperature and shall be of one make only. The sides of MDB shall also have louvers at bottom and top on sides of panel for hot air exhaust, wire mesh etc. The back of the panel shall be lockable door instead of bolted and shall conform to single line diagram. item should be of ABB, Schneider or equivalent as per instructions by engineer incharge				
	i)	<b>Main Distribution Board</b>				
		<b>INCOMMING</b>				
	a	ELECT SH-X(208) Providing and fixing circuit breaker 400amp TP setting 250-400amp (XS-400CJ) on prepared board as required	Per No.	1	39401	39,401
	c	ELECT SH-XVI(285) Providing and fixing voltmeter size 96/96mm 500 volt as required and as instruction of EI.	Per No.	1	999	999
		<b>OUTGOING</b>				
	f	ELECT SH-X(207) Providing and fixing circuit breaker 15,20,30,40,50, 75 & 100 amps TP(XS-100NS) on prepared board as required.	Per No.	6	9261	55,566
	ii)	<b>DB-GF</b>				





		<b>(General Description)</b> Wiring of light circuit from Distribution Board to switch, with Three nos. single core 2.5 Sqmm PVC insulated 450/750 volts grade stranded copper conductor cables in concealed PVC conduits (conduits partly shared) including PVC conduit, and conduit accessories etc. Cable should be of Newage, Fast cable, Universal cables or equivalent and conduit should be of Dadex, Turkplast Easyfit or equivalent as per instructions by engineer incharge				
		<b>INCOMING</b>				
a	ELECT SH-X(207)	Providing and fixing circuit breaker 15,20,30,40,50, 75 & 100 amps TP(XS-100NS) on prepared board as required.	Per No.	4	9261	37,044
c	ELECT SH-XVI(285)	Providing and fixing voltmeter size 96/96mm 500 volt as required and as instruction of EI.	Per No.	4	999	3,996
		<b>OUTGOING</b>				
d	ELECT SH-X(203)	Providing and fixing circuit breaker 6,10,15,20,30,40,50 & 63 amps SP(TB-5S) on prepared board as required.	Per No.	30	916	27,480
<b>2</b>		<b>WIRING IN CONCEALED CONDUITS</b>				
i)		<b>Distribution board to Switch</b>				
		<b>(General Description)</b> Wiring of light circuit from Distribution Board to switch, with Three nos. single core 2.5 Sqmm PVC insulated 450/750 volts grade stranded copper conductor cables in concealed PVC conduits (conduits partly shared) including PVC conduit, and conduit accessories etc. Cable should be of Newage, Fast cable, Universal cables or equivalent and conduit should be of Dadex, Turkplast, Easyfit or equivalent as per instructions by engineer incharge				
a	ELECT SH-I(24)	Providing and laying (main or Sub Main Pvc insulated with 3-7.29 copper conductor in 3/4" dia PVC conduit recessed in the wall or column as required.	Rmtr	1250	294.00	367,500
ii)		<b>Switch to light point</b>				
		<b>(General Description)</b> Wiring from switch to light or fan point with 3 nos. single core 1.5 Sqmm PVC insulated 450/750 Volts grade stranded copper conductor cables in concealed PVC conduit including PVC conduit, Conduit accessories etc. (conduit partly shared).				
a	ELECT SH-II(124)	Wiring of Light and fan point with 3.29 Pvc insulated wire in 20mm (3/4") dia PVC conduit recessed in the wall or column as required.	Per/Point	250	1,130.00	282,500
		Point to point wiring				
b	ELECT SH-I(22)	Providing and laying (main or Sub Main Pvc insulated with 3-3.29 copper conductor in 3/4" dia PVC conduit recessed in the wall or column as required.	Rmtr	1500	220.00	330,000
iii)		<b>Switch to Switch</b>				



		<b>(General Description)</b> Wiring from switch to switch with 3 nos. single core 2.5 Sqmm PVC insulated 450/750 Volts grade stranded copper conductor cables in concealed PVC conduit including PVC conduit, Conduit accessories etc.(conduit partly shared).				
a	ELECT SH-I(24)	Providing and laying (main or Sub Main Pvc insulated with 3-7.29 copper conductor in 3/4" dia PVC conduit recessed in the wall or column as required.	Rmtr	230	294.00	67,620
iv)		<b>Distribution board to General Purpose ( 5A/13A) socket</b>				
		<b>(General Description)</b> Wiring of circuit from Distribution Board to 5A/13A ,230Volts with 3 nos. single core 2.5 Sqmm PVC insulated 450/750 Volts graded , 2&3 pin switched socket, stranded copper conductor cables in concealed PVC conduit, including conduit accessories, etc.(conduit partly shared)				
a	ELECT SH-I(24)	Providing and laying (main or Sub Main Pvc insulated with 3-7.29 copper conductor in 3/4" dia PVC conduit recessed in the wall or column as required.	Rmtr	1250	294.00	367,500
v)		<b>Socket to Socket</b>				
		<b>(General Description)</b> Wiring from 5 Amps, 2&3 pin socket to socket with 3 nos. single core 2.5 Sqmm PVC insulated 450/750 Volts grade solid or stanerd copper conductor cables in concealed PVC conduit including PVC conduit,Conduit accessories, etc complete. (conduit partly shared)				
a	ELECT SH-I(24)	Providing and laying (main or Sub Main Pvc insulated with 3-7.29 copper conductor in 3/4" dia PVC conduit recessed in the wall or column as required.	Rmtr	50	294.00	14,700
vi)		<b>Distribution board to 20Amps socket</b>				
		<b>(General Description)</b> Wiring of circuit from distribution board to 20A, 230Volts, DP switch with 3 or 5 nos. single core 6 Sqmm PVC insulated 450/750 Volts grade stranded copper conductor cables in concealed PVC conduit including PVC conduit, Conduit accessories, etc (conduit partly shared for A/Cs)				
a	ELECT SH-I(26)	Providing and laying (main or Sub Main Pvc insulated with 3-7.44 copper conductor in 1" dia PVC conduit recessed in the wall or column as required.	Rmtr	50	468.00	23,400
b	ELECT SH-I(40)	Providing and laying (main or Sub Main Pvc insulated with 4-7.44 copper conductor in 1-1/2" dia PVC conduit recessed in the wall or column as required.	Rmtr	50	613.00	30,650
<b>Total of SOR Items</b>					<b>Rs.</b>	<b>1,648,356</b>
-----% Above /Below					<b>Rs</b>	
<b>Cost of Electrical work (Scheduled Items)</b>					<b>Rs.</b>	





**CONSTRUCTION OF HOSTEL AT IBA PUBLIC SCHOOL SUKKUR**

**Bill of Quantities**

**ELECTRICAL WORKS**

**Non-Scheduled Items**

Sr.	Item No.	Description	Unit	Qty	Rate	Total Amount (Rs.)
1		<b><u>DISTRIBUTION BOARDS</u></b>				
		(General Description)Supply at site, fabrication, installation, testing and commissioning of Distribution Board (DB) , made of sheet steel 16 SWG, degreased and derusted, with 2 coats of antirust paint, 2 coats of powder coated paint of approved colour, protection classification IP-44, totally enclosed indoor floor mounting cubicle type in free standing design, with hinged door, handle including cost of all auxiliaries, internal wiring, designation labels on MCCBS, grounding bar suitable for system Voltage 440V, 50 Hz, 3 Phase and neutral bus bars of 99.9% electrolytic copper, including cost of cable terminal blocks wiring from breakers, brass cable glands, all accessories complete in all respects metion in BOQ or not required for performing completely. All incoming and outgoing breakers shall be accessible only by opening the front door having further M.S. sheet cover gaskets shall also be provided where necessary. Panel should be compeltely made in certified factory. ie PEL, Green T & D, Mazcorp engineering or equivalent as per instructions by engineer incharge				





		(General Description) All MCCBs shall be suitable to operate without any derating at 40°C ambient temperature and shall be of one make only. The sides of MDB shall also have louvers at bottom and top on sides of panel for hot air exhaust, wire mesh etc. The back of the panel shall be lockable door instead of bolted and shall conform to single line diagram. item should be of ABB, Schneider or equivalent as per instructions by engineer incharge				
i)		<b>Main Distribution Board</b>				
		INCOMING				
		03 No Digital Ammeter scaled 0-500 Amps of appropriate sizes.				
		03 Nos. R-Y-B indication lamps.				
		05 Nos.copper bus bars 400 Ampere, three phase, Earth and Netural for distributions with appropriate size DB BOX				
		02 Nos Phase Rotation/failure, (adjustable under/over voltage threshold),50/60Hz, 0.1-10 Sec Delay, 380-500V				
ii)		DB-GF				
		INCOMING				
	NSI	03 No Digital Ammeter scaled 0-500 Amps of appropriate sizes.	NO	5		
		03 Nos. R-Y-B indication lamps.	NO	15		
	NSI	05 Nos.copper bus bars 80Ampere,three phase, Earth and Netural for distributions with appropriate size DB BOX	Job	1		
2		<b>LIGHT FIXTURES</b>				
		(General Description) Supply, installation, testing and commissioning of following light fittings, ceiling, recessed, wall mounted as per specified fixture. Complete with internal wiring, Grounding terminal, driver complete in all respects. Lights should be of Phillips, ledvance or equivalent		216		



i)	NSI	20 Watt LED Light Fixture surface/recessed mounted, IP-22 rated	No.	100		
ii)	NSI	15 Watt (White) LED Light Fixture surface/recessed mounted, IP-22 rated	No.	100		
iv)	NSI	10 Watt LED Light Fixture surface/recessed mounted, IP-22 rated	No.	16		
v)	NSI	Emergency Exit Light	No.	2		
3		<b>MISCELLANEOUS FITTINGS</b>				
		(General Description) Supply, installation, testing & commissioning of Ceiling/ Exhaust fan. The ceiling/exhaust fan shall comprise circular fan metallic/ plastic body, metallic fan blades, down rod (if necessary) of suitable dia & length, AC capacitor, internal wiring, terminals all installation & operational accessories as per tender specifications, as per site requirements and as per instructions by the Engineer. make GFC, Pak Fan, Royal Fan or approved equivalent.		54		
i)	NSI	12 " outer dia exhaust fan with plastic body, fan blades and louvers	No.	4		
ii)	NSI	Providing and Fixing of brass ceiling fan 56" (good quality)	No.	50		
4		<b>WIRING ACCESSORIES</b>				
		(General Description) Supply at site, installation, testing and commissioning of the following wiring accessories, complete in all respects. Made of TJ, Legrand or approved equivalent. Clipsal				
iv)	NSI	10 Amps, 250Volts one way, four gang light control switches including appropriate size concealed Plastic back box. Clipsal	No.	10		
iv)	NSI	10 Amps, 250Volts one way, five gang light control switches including appropriate size concealed Plastic back box. Clipsal	No.	10		
v)	NSI	10 Amps, 250Volts one way, six gang light control switches including appropriate size concealed Plastic	No.	50		



		back box. Clipsal				
vi)	NSI	15 Amps, 250Volts, universal 5 in 1 switched socket unit including appropriate size Plastic back box. Clipsal	No.	120		
viii)	NSI	Fan dimmer Clipsal	No.	50		
ix)	NSI	Appropriate size of plastic body fan box and ceiling fan rod 24" in length	Nos	81		
x)	NSI	MS BAR for hanging Ceiling fan	Nos	81		
5		<b>LT CABLES</b>				
		(General Description) Supply at site, installation, testing and commissioning of PVC insulated armored copper conductor cable 600 / 1000 Volt grade (or otherwise mentioned in cable description) in prelaid conduits / trenches to be installed as per routes shown on drawings including cost of all necessary materials, connections, identification tags, cables lugs properly crimped at both ends for the following sizes complete in all respects. Actual length of cables to be installed shall be practically measured at site by the Contractor, duly authenticated by the Engineer before placing the order with the manufacturer, however, approximate length of cables is shown herewith. Payments shall be made as per actual length installed. Cable should be of New age, Fast cable, Universal cables or equivalent and conduit should be of Dadex, Turkplast, Easyfit or equivalent as per instructions by engineer incharge				
i)	NSI	Providing and laying (main) XLPE insulated, XLPE sheathed with 4 core copper conductor 600/1000 volts size 50mm <sup>2</sup>	Rmt	33		
ii)	NSI	Providing and laying ( Sub Main) Pvc insulated, Pvc sheathed with 4 core copper conductor 600/1000 volts	Rmt	50		





		size 25mm <sup>2</sup>				
6		<b><u>GROUNDING SYSTEM</u></b>				
i)		<b><u>GROUNDING cable</u></b>				
a	NSI	Supply and erection of single core XLPE insulated, XLPE sheathed copper conductor, 660/1100 volts grade cable, in prelaid G.I. pipe/M.S. conduits/PVC pipe/G.I. wire/trenches, etc (rate for cable only):-50 mm sq	RM.	50		
ii)		<b><u>Plate type earthing</u></b>				
	NSI	Providing & fixing of copper rod type Earthing with resistance <2 ohm completed with all respect	No.	1		
iii)		<b><u>Grounding Connection Point</u></b>				
	NSI	Supply of Grounding connecting points consisting of copper plate 300mm long x50mm wide x 6mm thick to be installed, complete with fixing arrangement, brass nuts bolts, washers, lugs, 12.5mm dia. holes to facilitate connections of Incoming copper strips / copper conductors.	Nos.	1		
iv)		<b><u>Testing and commission</u></b>				
	NSI	Testing and commissioning of the earthing system in the presence of site engineer with electronic devices such as megger etc, making so report with after approximating 3 time testing and the grounding ohm must be less than or up to 2 ohms	Nos.	1		
7		<b><u>CIVIL WORKS</u></b>				
i)		<b><u>Trench ( for LT Cable )</u></b>				
	NSI	Labour for excavation and refilling of trench 12" wide, 24" deep 9" sand compaction below and above in preinstalled PVC pipes, ramming watering all necessary material, labour etc, complete in all respect. Actual length of the trench shall be as per site condition and paid accordingly however approximate length of trench is given.	R.M	20		
ii)		<b><u>Manhole For LT Cable Pulling ( If</u></b>				



		<b>Required)</b>				
	NSI	Construction of manholes to facilitate pulling of cables in trench or conduit as shown on drawing, manholes shall be of the size 24" x 24" x 30" deep with 9" thick wall with cement mortar, internal plaster 1:4, 100mm thick RCC cover for manhole, including cost of all accessories / materials, complete in all respects. (Tentative number of manholes have been provided, however payment shall be made as per actual and as per quantity requirement)	Nos.	1		
8		<b>Wi-Fi Cable</b>				
	NSI	Supply, installation, Testing and commissioning of CAT 6a UTP CABLE IN PVC PIPE Ø 1"; MEASUREMENT IN METERS complete in all respects. Including cost of conduit and its accessories: installing arrangement, making juries in wall and repairmen of wall. Made of D-Link or equivalent approved by engineer incharge	R.M	50		
9		<b>Fire Extinguishers</b>				
	NSI	Supply & installation of 1 x 6kg DCP CO2 Fire Extinguishers installed as per instructions of Client, complete with wall hanging and mounting arrangement complete in all respects. Complete in all respect as per instructions by site engineer	Nos.	3		
<b>Total of Non-SOR Items</b>						



**Construction of Hostel at IBA Public School Sukkur**

**Bill Of Quantities FOR 10 KWP ON-GRID SOLAR POWER SYSTEM**

Imported Material						
Sr No	Product	Capacity	Unit	Qty.	Rate	Amount
1	Supply, Installation, Testing, and commissioning of Solar PV Modules with related accessories, complete in all respects as engineer-approved. -Min 545Wp, Bifacial & see Through Technology Tier-1 -Min Module Efficiency: 21.3 %, Anodized aluminum frame, and support bars, Junction Box IP 67, Opertaing Temp: -40 .85 Degree, Vmp=41.8v, VOC = 49.65v, Imp = 13.04A, Isc = 13.92 - Certified IEC 61215, IEC 61730, UL 1703, VDE / MCS / CE / SII / CEC AU CSA / IEC 61701, 502, IEC 60068-2-68 -Manufacturer should be ISO 9001:2008 Certified (Quality Management System) -ISO 14001:2004 ( Environmental Management) -OHSAS 18001 18001:2007 (Health & safety Standard) -Warranty: 12 Years Product Warranty, 25 Years linear Output Warranty. -Brand: Longi or AAA Equivalent Payment will be made on per watt basis	10KWp	Nos	18		
<p align="center"><b>Material (there could be + - 10% variations, bidders are requested to come to the site for exact measurements)</b></p>						
2	Supply, Installation, Testing, and Commissioning of PV Mounting Structure with related Accessories complete in all respects as Engineer approved. Anodized Aluminium imported AL6005-T5, Suitable to withstand a wind speed of 150km/hr. Orientation - 2 Stack Landscape. Respective calculations (ASCE7-10) subject to		WATT	5450		





	wind speed will be provided with the bid. The product should be certified with standard AS/NZS 1170.11S 8955:2011 and other related standards. The manufacturer will be certified from 1509001:20000 Quality Management System, The Design life of the product should be a minimum of 25 years. Brand: Imported A Grade Quality. (Roof Mounted)					
3	Grid Tied Inverter, 10KW imported quality with Online Monitoring	10KW	Nos	1		
4	Supply, Installation, Testing, and commissioning of DC Cable, 2 Core 6mm <sup>2</sup> including PVC/HDPE Pipe complete in all respects with accessories as per engineer approval. 1 Core 6mm <sup>2</sup> , Red 1 Core 6mm <sup>2</sup> , Black Minimum voltage capacity 1500VDC, Highest permissible voltage conductor/conductor should be 1.8kV DC, Standard E N50618. Double insulated: Cross-link polyolefin. Tinned copper conductor: Certified from DIN VDE 0295 CL.5, Fine-wire, IEC 60228 CL.5. Cable should be Certified from TUV Approved (2PFG 1169) & UL. The cable should be Ozone resistant acc. to EN50396 and weather & and UV resistant acc. to HD605/A1. Service life: 25 Years minimum. Brand : halukabel Germany		Mtr.	200		
5	Supply, Installation, Testing & Commissioning of DC Breaker 40A 2P DC MCB, 1000V MCB Make: ABB/eqv (European)		Nos	1		
6	Supply, Installation, Testing, and commissioning of DC Combiner Box, minimum IP 54 with all related accessories. (Contractor shall co-ordinate the size & and type of DB in conformation with locations to be installed)		Nos	1		



7	Supply, Installation, Testing, and commissioning of AC Combiner Box, minimum IP 54 with all related accessories. (Contractor shall co-ordinate the size & and type of DB in conformation with locations to be installed)	Nos	1		
8	Supply, Installation, Testing & Commissioning of AC Breaker 63A, 3P MCCB , 600V 50KA Make : ABB/Schinder	Nos	1		
9	Supply, Installation, Testing & Commissioning of AC Surge Protective Devices (SPD) 4P 100 KA Class II Make : Dehn/Schneider/Citel	Nos	1		
10	Supply, Installation, Testing & Commissioning of Earthing Cable, 1 core, 10 sqmm, CU/PVC/FLEX(Green) Including PVC Pipe with related accessories as per engineer approved. Brand : Pakistan Cable or Equivalent	Mtr	10		
11	Supply, Installation, Testing & Commissioning of AC Power Cable 4C x 16mm sq, Cu 0.6/1kV CU/XLPE/PVC Pure Copper including related accessories	Mtr	10		
12	Supply, Installation, Testing & Commissioning of Powder Coated with anti-rust paint min 90 micron MS Sheet 16 SWG 150mm x 75mm Cable Tray with cover complete with all installation material such as bends, tees & cross over, clamos, hooks, bolts, etc complete in all respect	Mtr	20		
13	Civil Works : Footing & Foundation work for Mounting Structure as per IBA Standard or engineer approved	Job	1		
14	Supply, installation, testing, and commissioning of Earth Pit and Earth Electrodes (Rod Type) for Earthing System with 25mm dia 3 meters (10 feet) long driven copper rod, complete with clamps lugs, washers/bolts,	Job	1		



	connected with 70mmsq CU/PVC/PVC earth conductors to Earth connecting point including 50mm dia G.I pipe/UPVC pipe class 'D/E' up to Earth Chamber, the job includes cad-welding of copper conductor to earth electrode rod at one end and provision/ fixing of cable lugs at other end, including all accessories and RCC inspection chamber, heavy duty G.I. Cover having earth symbol, etc., as per the Specifications and Drawings and to the entire satisfaction and approval of the Engineer. Earthing result should be less than 5 Ohm for AC combiner, less than 1 Ohm for DC				
15	Supply, Installation, Testing, and commissioning of Other Accessories required to complete the project Such as Epoxy filling, Cable Ties, Nut Bolts, etc.		<b>Job</b>	<b>1</b>	
		<b>Grand Total</b>			





**CONSTRUCTION OF HOSTEL AT IBA PUBLIC SCHOOL SUKKUR**

**Bill of Quantities**

**PUBLIC HEALTH WORKS**

Rates Based on Composite Schedule of Rate (GENERAL-2012) Sindh

SR. NO.	ITEM NO.	DESCRIPTION	UNIT	QTY	RATE (RS)	AMOUNT (RS)
		<b>SANITARY FIXTURES AND FITTINGS</b>				
1	SOR(Water supply & Sewerage (Ch 1/5)	Providing and fixing European type white glazed earthen ware wash down W.C. pan complete with and i/c the cost of white/black plastic seat (Best quality) and lid with C.P.brass hinges and buffers, 3 gallons white glazed earthen ware low level fushing cistern with siphon fitting 1-1/2" dia white porcelain enamelled flush bend 3/4" dia and making requisite number of holes in walls, plinth and floor for pipe connections and making good in cement concrete 1:2:4. (ICL or Equivalent)	Each	6.00	11,477.40	68,864.40
2	SOR(Water supply & Sewerage (Ch 1/2-A ii)	Providing and Fixing squatting type white glazed earthen ware w.c pan with front fresh 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 and making good in cement concrete 1:2:4. (A) W.C pan 23" & low level earthen ware flush tank 3 gallons. (ii) with 4" dia white glazed earthen ware trap and plastic thumble. (Foreign Quality)	Each	2.00	5,772.80	11,545.60
3	SOR(Water supply & Sewerage (Ch 1/19-c)	Providing and fixing steel sinks stainless local make complete with cast iron or wrought iron brackets 6 inches built in wall, 1-1/2" c.p bubber plug chrome plated brass chain, 1-1/2" c.p brass waste, with 1-1/2" P.V.C. waste pipe & making requisite number of holes in wall, plinth & floor for pipe connection & making good in cement concrete 1:2:4. (c) Steel sink stainless sized 33" x 18" local make (Standard pattern) (Master or Equivalent)	Each	1.00	5,712.30	5,712.30
4	SOR(Water supply & Sewerage (Ch 6/19 (a)	Providing and fixing CP Muslim shower with double bib cock & ring pipe etc complete.	Each	8.00	3,432.00	27,456.00
5	SOR(Water supply & Sewerage (Ch 2/5)	Providing and fixing soap tray earthen ware with c.p screws etc complete.	Each	10.00	497.20	4,972.00



6	SOR(Water supply & Sewerage (Ch 2/1 (iii-b))	Providing and fixing chrome plated brass towel rail complete with brackets, fixing with 1" long c.p brass screws. (iii) Towel Rail 24" long (b) 3/4" dia round or square (Superior Quality)	Each	8.00	1,082.95	8,663.60
7	SOR(Water supply & Sewerage (Ch 2/2 (b))	Providing and fixing c.p brass toilet paper holder of standard size with chrome plated brass brackets complete (Similar to twyford's design No 1108) (b) Superior Quality	Each	2.00	1,071.40	2,142.80
8	SOR(Water supply & Sewerage (Ch 1/22))	Providing and fixing (1/2") dia. lead connection complete with a (1/2") dia brass stop cock, two brass nuts & lining jointed to lead pipe with plumber wiped solder joints (1/2" lead pipe to be of not less than 4lbs per lineal yard.	Each	8.00	689.70	5,517.60
9	SOR(Water supply & Sewerage (Ch 10/1 (i))	Providing and fixing 6" x 4" C.C gully trap with 4" outlet complete with 4" thick 1:2:4 C.C for bed & 1/2" thick cement plaster (1:3) to the carb. C.I grating 6" x 6" C.I cover and frame 12" x 12" (inside) etc complete. Earthen ware glazed Gully trap 6" x 6" x 4" with C.I cover & Frame.	Each	8.00	1,220.67	9,765.36
10	SOR (PHE works) Part-B (II) A-2	Providing and laying R.C.C. pipe & collors of class "B" and fixing in trench i/c cutting, fitting and jointing with maxphalt composition and cement mortar (1:1) i/e. testing with water to a head of 22.5 meter or 76 ft. (e) 300mm (12") i/d	P.Rft	200.00	543.75	108,750.00
11	SOR (PHE works) Part-B (III) A-1	Excavation for pipeline in trechches, and pits in soft soils i/c trimming and dressing sides to true alignment and shape levelling of beds of trenches to correct level and grade, cutting joint and holes and disposal of surplus earth within a one chain as directed by engineer incharge Providing fence guards, lights, flags and temperory crossings for non-vehicular traffic where ever required lift upto 5ft. (1.52 m) and lead upto one chain (30.5 m).	1000 Cft	1,800.00	3,600.00	6,480.00
12	Ch/1/13 (d)	Earth work compaction (Soft, ordinary or hard soil). (d) Ramming earth work (All types of soil).	1000 Cft	1,800.00	453.75	816.75
13	Ch/1/9 (a)	Rehandling of earth work. (a) Lead upto a single throw of Kassi, Phawrah or a = Shovel.	1000 Cft	1,800.00	756.25	1,361.25
14	SOR(Water supply & Sewerage (Ch 6/4 (iv))	Providing and fixing full way gun metal peet/gate valve with wheels, threaded or flabged ends with rubber washing. (iv) 1-1/4" (Light pattern)	Each	2.00	337.92	675.84
15	SOR(Water supply & Sewerage (Ch 6/4 (v))	Providing and fixing full way gun metal peet/gate valve with wheels, threaded or flabged ends with rubber washing. (v) 1-1/2" (Light pattern)	Each	1.00	695.42	695.42
16		<b>MANHOLE</b>				





	SOR (PHE works) P-1	Constructing manhole or inspection chamber for the required diameter of circular sewer and 3'-6" (1067 mm) depth with walls of BB in cement sand mortar 1:3 cement plastered 1:3, 1/2" thick. Inside of walls and 1" (25 mm) thick over benching and channel i/c fixing C.I manhole cover with frame of clear opening 1-1/2' x 1-1/2' (457 x 457mm) of 1.75 cwt. (88.9 Kg) embaded in plain C.C 1:2:4 and fixing 1"(25mm) dia MS steps 6" (150 mm) wide projecting 4" (102mm) from the face of wall at 12" (305mm) C/C duly painted etc. Complete as per Standard specification and drawing.	Job	3.00	14,748.00	44,244.00
17	SOR (Water supply & Sanitary works) Ch 1-13	Providing & fixing 22"x 16" lavatory basin in white glazed earthen ware complete with & i/c the cost of W.I or C.I cantilever brackets 6 inches built into walls, painted white in 2 coats after a primary coat of red lead paint, a pair of 1/2" rubber plug & chrome brass waste of approved pattern 1-1/4" dia malleable iron or CP brass trap, malleable iron or brass unions and making requisite number of holes in walls plinth and floor for pipe connection & making good in cement concrete 1:2:4 (Foreign or Equivalent)	Each	2.00	6,237.00	12,474.00
18	SOR (Water supply & Sanitary works) Ch 1-20	Providing and fixing 6" x 2" or 6" x 3" C.I floor trap of the approved self cleaning design with a C.I screwed down grating without a vent arm complete with & i/c making requisite number of holes in walls, plinth & floor for pipe connections & making good cement concrete 1:2:4.	Each	8.00	2,042.43	16,339.44
19	SOR (Water supply & Sanitary works) Ch 1-26 (b)	Providing and fixing 24"x 18" bevelled edge mirror of beilgium glass complete with 1/8" thick hard board and c.p screws fixed to wooden pleat. (Standard Pattern)	Sft	24.00	2,376.00	57,024.00
		<b>VALVES</b>				
20	SOR (Water supply & Sanitary works) Ch 6-5	Providing and fixing handle valves (China) 16bars or equivalent complete in all respects as approved by the engineer incharge.				
	ii	3/4 inch	Each	4.00	271.92	1,087.68
	i	1/2 inch	Each	4.00	200.42	801.68
21	SOR (Water supply & Sanitary works) Ch 6-6 (iv)	Providing, fixing and testing PPRC ball valve 32mm, (with unsoldered copper ball) made to B.B.S 1212.	Each	1.00	510.84	510.84
22	SOR (Water	Providing, fixing and testing PPRC ball	Each	1.00	573.70	





	supply & Sanitary works) Ch 6-6 (v)	valve 40mm , (with unsoldered copper ball) made to B.B.S 1212.				573.70
23	SOR (Water supply & Sanitary works) Ch 4-1	Providing G.I Pipes, specials, and clamps etc. including fixing cutting & fitting complete with and l/c the cost of breaking through walls and roof, making good etc. Painting two coats after cleaning the pipe etc. with white zink paint with pigment to match the color of the building and testing with water to a pressure head of 200 feet and handling.				
	v	1-1/2" dia G.I pipe	Rft	150.00	188.97	28,345.50
	vi	2" dia G.I pipe	Rft	100.00	233.00	23,300.00
		<b>1 no. Bore</b>				
24	SOR (PHE works) Part-B (II) (O-1 (a))	Boring for tubewell in all water bearing soils from ground level upto 100 ft. (30.5 m) depth, including sinking and with drawing of casing pipe:- 3" (80 mm)	Rft	100.00	160.00	16,000.00
25	SOR (PHE works) Part-B (II) (O-9 (a))	Providing and installing P.V.C. strainers 'B' class of approved design quality and make including necessary sockets and solvent, etc. complete: 3" (80 mm)	Rft	60.00	166.35	9,981.00
26	SOR (PHE works) Part-B (II) (O-8 (b))	Supplying & fixing M.S ball plug.	Each	1.00	2,607.00	2,607.00
<b>Total of SOR ITEMS</b>					<b>Rs.</b>	<b>476,707.76</b>
-----% Above/Below					<b>Rs.</b>	
<b>Cost of PHE work (Scheduled)</b>					<b>Rs</b>	



**CONSTRUCTION OF HOSTEL AT IBA PUBLIC SCHOOL SUKKUR**

**Bill of Quantities  
PUBLIC HEALTH WORKS**

**Non-Scheduled Items**

Sr. No	Item No		Unit	QTY	Rate	Amount
1	NSI	UPVC Multi Floor Trap (110x75mm) including strainer, making required number of connections, breaking concrete or masonry work & then making it good, etc. of approved make	Each	8.00		
2	NSI	Providing, Fixing Dadex Class D or equivalent UPVC clean out with cover making requisite number of holes in walls, plinth or floor for pipe connection and making good the same as necessary to the structure complete including, rubber gasket and clamp.	Each	2.00		
3	NSI	Providing and fitting "P" trap.ii) 10 cm (4") glazed.	Each	16.00		
4	NSI	Providing and fixing Wall Shower complete in all respects as approved by the Engineer incharge. (Master, Sonex, or Equivalent)	Each	8.00		
5		<b><u>WATER SUPPLY PIPES AND FITTINGS</u></b>				
		P/F Polypropylene Random copolymer (PPRC) PN-20 pipe with fusion / threaded joints including the cost of all specials/ accessories i.e elbow, bend, sockets etc. (Popular /Beta or equivalent) complete in all respect.				
	i	1 1/2" (40 mm) dia.	Rft	120.00		
	ii	1" (25 mm) dia.	Rft	110.00		
	iii	2" (50 mm) dia.	Rft	100.00		
	iv	3/4" (20 mm) dia.	Rft	150.00		
6		<b><u>SOIL, WASTE, VENTILATING PIPES &amp; FITTINGS</u></b>				
		Providing , fixing and testing UPVC Nikasi type "B" with solution of same quality make including the cost of all specials/ accessories i.e elbow, bend, sockets etc. (Popular/Beta or equivalent)				



		complete in all respect.			
	i	100 mm (4") dia.	Rft	200.00	
	ii	80 mm (3") dia.	Rft	150.00	
		<b>GAS GESYER</b>			
7	NSI	Providing and Fixing Sun Gas Geyser 50 gallon capacity comprising of internal tank of G.I sheet 14-SWG and External M.S sheet 22-SWG covering with proper foot rests dully enamel painted, 4" thick heigh density glass wool insulation with proper warranty with thermostat temperature gauge including fixing and making connection at site etc. complete in all respects as approved by the Engineer Incharge. (Ambassador/Firex/Exquire)	No	2.00	
8	NSI	Providing and Fixing Electric Geyser 15 gallon capacity comprising of internal tank of G.I sheet 14-SWG and External M.S sheet 22-SWG covering with proper foot rests dully enamel painted, 4" thick heigh density glass wool insulation with proper warranty with thermostat temperature gauge including fixing and making connection at site etc. complete in all respects as approved by the Engineer Incharge. (Ambassador/Firex/Exquire)	No	1.00	
9	NSI	Providing and fixing Gate valve 1 bars, RUV(ity) or equivalent complete in all respects as approved by the Engineer incharge.	Each	1.00	
10	NSI	Providing and fixing Gate valve 2 bars, RUV(ity) or equivalent complete in all respects as approved by the Engineer incharge.	Each	1.00	
11	NSI	Providing and fixing of 5.5 HP Centrifugal motor pump having 32mm suction and 100ft head (non-automatic) from approved manufacturer complete in all respect as per approval of Engineer Incharge.	Each	2.00	
		<b>1 no. Bore</b>			





12	NSI	Supplying and installing PVC blind pipe 'B' Class of approved design quality and make i/c necessary sockets etc. complete.				
	a	1½" i/d (30 mm) 1 x 70	Rft	120.00		
	b	1½" i/d (40 mm) 1 x 40	Rft	110.00		
	c	2" i/d (50 mm) 1 x 50	Rft	100.00		
<b>Total of Non SOR ITEMS</b>						



<b>CONSTRUCTION OF HOSTEL AT IBA PUBLIC SCHOOL SUKKUR</b>		
<b>SUMMARY OF COST</b>		
<b>Rates Based on Composite Schedule of Rate (GENERAL-2012) Sindh</b>		
<b>Sr. No.</b>	<b>DESCRIPTION</b>	<b>AMOUNT</b>
1.	CIVIL WORKS	
A	Cost of Schedule Items	
B	Cost of Non-Schedule Items	
	<b>TOTAL OF CIVIL WORKS - A</b>	
2	ELECTRIC WORKS	
A	Cost of Schedule Items	
B	Cost of Non-Schedule Items	
	<b>TOTAL OF ELECTRICAL WORKS-B</b>	
3	10KW SOLAR SYSTEM	
A	Cost of Non-Schedule Items	
	<b>TOTAL OF SOLAR SYSTEM-C</b>	
4	PUBLIC HEALTH WORKS	
A	Cost of Schedule Items	
B	Cost of Non-Schedule Items	
	<b>TOTAL OF PHE WORKS -D</b>	
	<b>TOTAL (A+B+C+D)</b>	
	<b>Grand Total without SST</b>	
	<b>Add 5% SST</b>	
	<b>Grand Total with SST</b>	

Note: All Cartage Charges, Material differences Amount, Other premiums and all Taxes must be included in Quoted Premium Percentage. No any charges will be paid separately.



# SUKKUR IBA UNIVERSITY

## Project

**Construction of Hostel at IBA Public School Sukkur**



## Volume-III Specifications

CONSULTANT:



**NBK CONSULTANTS**  
Consulting Engineers, Architect &  
Planners





SPECIFICATIONS  
(Civil / Architectural Works)

TABLE OF CONTENTS

• Part-1 - General .....	Pg. 1
• Part-2 – Reinforced Concrete Works (Div. 3).....	Pg. 1 to 47
• Part-3 – Masonry Works (Div. 4).....	Pg. 48 to 56
• Part-4 – Metal Works (Div. 5).....	Pg. 57 to 59
• Part-5– Water Proofing/Roofing (Div. 7).....	Pg. 60 to 64
• Part-6– Openings-Doors, Windows, Ventilators (Div. 8).....	Pg. 65 to 69
• Part-7– Finishes-Floors, Walls & Ceiling Coverings (Div. 9).....	Pg. 70 to 86
• Part-8– Earthwork (Div. 31).....	Pg. 87 to 95



# SPECIFICATIONS

## CIVIL/ARCHITECTURAL WORKS

### PART - 1

#### GENERAL

Work of the Contract can be summarized by references to the Contract, General Conditions, Supplementary Conditions, Specification Sections, Drawings, addenda and modifications to the contract documents issued subsequent to the initial printing of these documents and including but not necessarily limited to printed material referenced by any of these.

The detailed specifications given hereinafter are applicable for the items of works described in the schedule of quantities attached herein, and shall be guidance for proper execution of work to the required standards. It may also be noted that the specifications are of generalized nature and these shall be read in conjunction with the description of item in schedule of quantities and drawings. The work also includes all minor details of construction which are obviously and fairly intended and which may not have been referred to in these documents but are essential for the entire occupation in accordance with standard Engineering practice.

It is recognized that work of the Contract is also unavoidably affected or influenced by governing regulations, natural phenomena including weather conditions and other forces outside the contract documents.

The work of this Contract includes coordination of the entire work of the project, including preparation of general coordination drawings, diagrams and schedules, and control of site utilization, from beginning of construction activity through project close out and Defect Liability Period.

Where installations include manufactured products, comply with the manufacturer's applicable instructions and recommendations for installation, to the extent that these instructions and recommendations are more explicit or more stringent than requirements indicated in the contract documents.

During handling and installation of work at the project site, clean and protect work in progress and adjoining work on the basis of continuous maintenance. Apply protective covering on installed work where it is required to ensure freedom from damage or deterioration at time of substantial completion.

Clean and perform maintenance on installed work as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

The Work includes furnishing all labour, plant, equipment, appliances and materials, and performing all operations in connection with supply, fabrication and installation, complete in all respects, of the items applicable out of the following Sections:

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## PART - 2

### (DIVISION-3)

#### REINFORCED CONCRETE WORK

#### 3.1. SCOPE

The work covered by this section of Specifications consists of furnishing all plant, labor, equipment, appliances and materials, and in performing all operation in connection with the supply and installation of plain and reinforced concrete work, complete in strict accordance with this section of the Specifications and the applicable drawings, subject to the conditions of the CONTRACT.

#### 3.2. GENERAL

- a. Full co-operation shall be given to other trades to install embedded items.
- b. Suitable templates or instructions, or both will be provided for setting items not placed in the forms. Embedded items shall have been inspected, and tests for concrete and other material or for mechanical operations shall have been completed and approved, before concrete is placed.
- c. For special concrete finishes and for special methods of construction (e.g. slip forms), formwork shop drawings shall be designed and prepared by the CONTRACTOR at his own cost. Approval of shop drawings as well as that of actual samples of finished concrete shall be obtained before WORK is commenced.
- d. CONTRACTOR shall also prepare BAR BENDING SCHEDULE, and get the same approved by the ENGINEER, prior to commencement of work.
- e. Approximate equivalent conversion of F.P.S. and S.I. units are indicated in the text. Engineer's decision on any specific conversion shall be final and binding on all parties.

#### 3.3. RELATED SPECIFICATIONS

Latest editions of the following British, ASTM and ACI Standards are relevant to these Specifications where indicated:- (Equivalent Pakistan Standards are also applicable.)

##### a. British Standards:

B.S. 12-78	Portland Cement, Ordinary and Rapid Hardening (in lieu of C-150).
B.S. 410	Test Sieves.
B.S. 693	General Requirements for Oxyacetylene Welding of Mild Steel
B.S. 882-1201	Concrete aggregates from Natural Sources.





B.S. 1141	Cold Worked Steel Bars for the reinforcement of Concert. General Requirements for the Metal-Arc Welding of Mild Steel.
B.S. 1881	Methods of Testing Concrete.
B.S. 3148	Tests for Water for Making Concrete.
B.S. 4027	Sulfate-Resisting Portland Cement.
B.S. 4449	Carbon Steel Bars for the Reinforcement of Concrete.
B.S. 4461	Cold Worked Steel Bars for the Reinforcement of Concrete.

**b. Latest ASTM Standards:**

A 615-94	Deformed Billet-Steel Bars for Concrete Reinforcement.
C 33-93	Standard Specification for Concrete Aggregates.
C 39-93a	Compressive Strength of Cylindrical concrete Specimens.
C 42-90	Standard Methods of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
C 94-94	Standard Specification for Ready Mixed Concrete.
C 138-92	Standard test method for unit weight, Yield, and Air Content (Gravimetric) of Concrete.
C143-90a	Standard Method of Test for Slump of Hydraulic Cement.
C 150-94	Standard Specification for Portland Cement.
C 171-92	Standard Specification for Sheet Materials for Curing Concrete.
C 172-90	Standard Method of Sampling fresh Concrete.
C 173-94	Standard Method of Test for Air Content of freshly Mixed Concrete by the Volumetric Method.
C 208	Standard Specification for Insulating Board (Cellulosic Fiber) Structural and Decorative.
C 231-91b	Standard Method Test for Air Content of Freshly Mixed Concrete by the Pressure Method.



- C 260-94 Standard Specifications for Air Entraining Admixtures for Concrete
- C309-93 Standard Specification for Liquid Membrane-Forming Compounds for curing Concrete.
- C 494-92 Standard Specification for Chemical Admixtures for Concrete.
- E 329-90 Specification for minimum requirements for agencies engaged in the testing and or inspection of materials used in construction.

**c ACI Standards:**

ACI 318 Building Code Requirements for Reinforced Concrete

- d.** 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.

**3.4. MATERIALS**

**3.4.1 Aggregates (Except for light-weight concrete):**

- a. The sources of supply of all fine and coarse aggregates shall be subject to the approval of ENGINEER.
- b. All fine and coarse aggregates shall be clean and free from clay, loam, silt, and other deleterious matter. If required, ENGINEER reserves the right to have them washed by the CONTRACTOR at no additional expenses. 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.
- c. Fine aggregate shall be hard coarse sand, crushed stone or gravel screenings and shall conform to requirements of ASTM C-33.
- d. Coarse aggregate shall be gravel or broken stone or hard, durable material free from laminated structure and conforming to ASTM C-33 graded as follows for use in mass concrete such as in foundations:

TOTAL PASSING	PERCENT BY WEIGHT
2" B.S Sieve (50.00 mm)	100
1-1/2" Sieve (38.10 mm)	95 - 100
3/4" Sieve (19.00 mm)	35 - 70
3/8" Sieve ( 9.50 mm)	10 - 30
No. 4 Sieve ( 4.75 mm)	0 - 5



Coarse aggregate for all cast-in-place concrete other than mass concrete and thick fair faced cast-in-place concrete shall be graded with the following limits:-

TOTAL PASSING	PERCENT BY WEIGHT
1" Sieve (25.00 mm)	100
3/4" Sieve (19.00 mm)	90-100
3/8" Sieve ( 9.50 mm)	20- 55
No. 4 Sieve ( 4.75 mm)	0- 10

Coarse aggregate for thin fair faced cast-in-place concrete shall be graded as follows:-

TOTAL PASSING	PERCENT BY WEIGHT
1/2" Sieve (12.50 mm)	100
3/8" Sieve ( 9.50 mm)	85-100
No. 4 Sieve ( 4.75 mm)	10- 30

- e. The nominal maximum size of aggregate for precast fair faced concrete shall be smallest of the following:
- One-fifth of the narrowest dimensions between sides of forms.
  - One-third of the depth of slabs.
  - Three-fourth of the minimum clear distance between reinforcing bars or between bars and form.
  - 1/2" (12.0 mm).
- f. The nominal maximum size of the aggregate for normal weight precast concrete shall be smallest of the following:-
- One-fifth of narrowest dimension between forms.
  - One-third of depth of slab.
  - Three-fourth of clear distance between bars.
  - 1"
- g. The aggregate shall be stockpiled 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 aggregate shall be tested at least once for every 50 tons (or 750 C. ft) supplied to ensure that the grading is uniform and the same as that of the samples used in the preliminary tests.

#### 3.4.2 Cement:

- Cement shall conform to ASTM C - 150.
- Only one brand of each type of cement shall be used for concrete in any individual member of the structure.





- c. Cement shall be used in the sequence of receipt of shipment, unless otherwise directed. There shall be sufficient cement at SITE to ensure that each section of WORK is completed without interruption. If the cement is supplied by THE OWNER, the CONTRACTOR shall inform ENGINEER of his requirement much before its use in construction.
- d. Cement reclaimed from cleaning of bags or from leaky containers shall not be used.
- e. CONTRACTOR shall provide and erect, at his own cost, in a suitable place, dry, well ventilated, and water proof shed of sufficient capacity to store the cement.
- f. The cement shall be used as soon as possible after delivery, and cement which 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 CONTRACTOR's expense. Any cement in containers, damaged so as to allow the contents to spill or access of the atmosphere to the cement prior to opening at the time of concrete mixing shall be rejected and removed immediately from the SITE at CONTRACTOR's expense.
- g. The mixing together of different types of cement shall not be permitted.

#### 5.4.3 Water:

Clean and clear water which does not have sweet, saline or brackish taste to be used for mixing and curing of concrete. Where doubt exists, the strength of mortar sample made with questionable water is compared with mortar sample produced with acceptable water (like distilled water). The questionable water may be accepted if the sample yield concrete strength of at least 90% of the other sample made with acceptable water.

Water contaminants under no circumstance shall be greater than following limits:-

Oil	-----	0.00 ppm.
Chlorides	-----	1000 ppm.
Sulfates	-----	1000 ppm.
Turbidity	-----	2000 ppm.
Acids	-----	10,000 ppm.

Potassium and NaOH 0.5 to 1.0% by weight of cement.

Sea water shall not be used for any reinforced concrete works or where concrete is later required to be plastered, painted or otherwise decorated.



#### 3.4.4 Reinforcement:

- a. Reinforcement for concrete shall conform to the respective British, ASTM or other standards as specified in the Drawings and CONTRACT Documents or as may be specified by ENGINEER.
- b. Unless otherwise specified, all plain reinforcing bars shall comply with the requirements of B.S. 4449 for plain mild steel bars and shall have a minimum yield stress of 36 ksi, (248 N/mm sq).
- c. Unless otherwise specified, all deformed reinforcing bars shall comply with the requirements of B.S. 4461 for deformed cold worked steel bars and shall have minimum characteristic stress of 66 ksi, (460 N/mm sq) with minimum elongation of 12%.
- d. Reinforcement shall be obtained only from the manufacturer approved by the ENGINEER. If and when required CONTRACTOR shall provide all necessary facilities to ENGINEER for the selection of test pieces and shall cause these to be prepared and submitted where directed for tests at CONTRACTOR's cost.
- e. If the reinforcement is to be supplied by the OWNER, the CONTRACTOR shall inform ENGINEER of his requirements much before its use in construction.
- f. CONTRACTOR shall report immediately on receipt of any consignment, having any deviation in the standard weights of the reinforcing bars beyond those allowed in respective standards mentioned in clause (4.4.b) and (4.4.c) herein before.

### 3.5. CONCRETE MIX PROPORTIONS

#### 3.5.1 General:

- a. The proportions of ingredients shall be such as to produce a mixture which will work readily into the corners and angles of the forms and around reinforcement by the methods of placing and consolidation employed on the WORK, but without permitting the materials to segregate or excessive free water to collect on the surface. Specific approval of the ENGINEER is required to waive limitations on mixture proportions.
- b. The proportions of ingredients shall be selected in accordance with Section 5.6 to produce the proper placeability, durability, strength and other required properties.

#### 3.5.2 Strength:

The Specified compressive strength of the concrete cylinder, shall be 3000 psi, (21 N/mm sq) except where otherwise noted on Drawings. The equivalent cube strength shall be at least 25% higher than the specified cylinder strength. Strength requirements shall be based on the sampling and testing methods of ASTM C 39-72 (and BS 1881 for cubes).





### 3.5.3 Durability:

Maximum permissible water-cement ratios for concrete in severe exposures to be as follows, unless lower water-cement ratios are required to meet specified strength limits:

Type of Structure	Structure continuously wet or frequently freezing and thawing (1)	Structure exposed to sulfates
sea or		
i. Thin sections & sections with less than 1" cover over steel	0.45	0.40 (1)
ii. All other Structures	0.50	0.45 (2)

(1) Concrete should also be air-entrained.

(2) If S. R. Cement is used, permissible water-cement ratio may be increased by 0.05

### 3.5.4 Slump:

Unless otherwise permitted or specified, the concrete shall be proportioned and produced to have a slump of 4" (100 mm) or less. A tolerance of upto 1" (25 mm) above the indicated maximum shall be allowed for individual batches provided the average for all batches or the most recent 10 batches tested, whichever is fewer, does not exceed the maximum limit. Concrete of lower than usual slump may be used provided it is properly placed and consolidated. The slump shall be determined by the "Test for Slump for Portland Cement Concrete" (ASTM C-143).

### 3.5.5 Admixtures:

If required or permitted, admixtures used shall be in accordance with the manufacturer's instructions except as otherwise specified herein.

### 3.5.6 Methods of Obtaining Mix Design:

For concrete of normal weight, mix proportions to provide the desired characteristics shall be developed using the methods/procedure covered by the latest edition of Recommended Practice for Selecting Proportions for Normal Weight Concrete ACI 211.1.

Trial mixtures having proportions and consistencies suitable for the WORK shall be made based on ACI 211.1, using at least three different water-cement ratios which will produce a range of strengths encompassing those required for the WORK. Trial mixes shall be





designed to produce the specified slump. The temperature of concrete used in trial batches shall be reported.

For each water-cement ratio, compression test of cylinder/cube shall be made, cured, and tested in accordance with "ASTM C - 39 or BS 1881". From the results of these tests a curve shall be plotted showing the relationship between the water-cement ratio and compressive strength. From this curve, the water-cement ratio to be used in the concrete shall be selected to produce the required/specified design strength. The cement content and mix proportions to be used shall be such that this water-cement ratio is not exceeded when slump is the maximum permitted. Control in the field shall be based upon maintenance of proper cement content and slump.

Concrete should also be air-entrained. If S. R. Cement is used, permissible water-cement ratio may be increased by 0.05.

### 3.6. PLANT AND WORKMANSHIP

#### 3.6.1 Formwork:

- a. Forms shall be used, wherever necessary, to confine the concrete and shape it to the required dimensions. Forms shall have sufficient strength to with-stand the pressure resulting from placement and vibration of the concrete and shall have sufficient rigidity to maintain specified tolerances.

Structurally adequate, form work shall also conform to the requirements of the special architectural finishes of the in-situ Plain and Reinforced Concrete specified/or shown on the Drawings. Shop drawings of such form shall be subject to the approval of the ENGINEER prior to its use. ENGINEER shall refuse concreting of any part which in his opinion may not yield specified finishes.

- b. Earth cuts shall not be used as forms for vertical surface or reinforced concrete work unless required or permitted.
- c. Mud centering shall not be permitted without the prior approval of the ENGINEER.
- d. Formwork shall be made of either timber, steel, plywood, proprietary building boards and such special material, as may be shown on the drawings or approved by the ENGINEER which gives the required finish to the surface of concrete. Wooden frame work shall be free from loose knots and shall be well seasoned. For the external concrete finishes 1/16" (1.5 mm) thick mild steel sheet forms shall be used. CONTRACTOR shall furnish shop drawings of such formwork prepared on the basis of architectural concept for the approval of the ENGINEER.
- e. 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 concrete, and shall be sufficiently tight to prevent loss of cement slurry. The



design and engineering of the formwork, as well as its construction, shall be the responsibility of CONTRACTOR. Where necessary to maintain the specified tolerances, the formwork shall be cambered to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete and due to construction loads.

CONTRACTOR shall establish and maintain in an undisturbed conditions, and until final completion and acceptance of the WORK, sufficient control points and bench marks to be used for reference purpose to check tolerances.

- f. Requirements for facing materials are given in clause 8 "Finishing of formed Concrete". The maximum deflection of facing materials reflected in concrete surfaces exposed to view shall be  $1/240$  of the span between structural members.
- g. 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 prefabricated panels) and true to line, in order that the surfaces produced with required little dressing to arrive at true surfaces. Where any as-cast finish is required, no dressing shall be permitted in the finishing operation.
- h. Where as-cast surfaces, including natural plywood form finish, are specified, the panels of materials against which concrete is cast shall be arranged orderly with joints between panels planned in approved relations to opening, building corners, and other architectural features.
- i. 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 within the joints so that patches of tie holes will not fall within the panel areas.
- j. 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. Forms shall be thoroughly cleaned and properly coated before re-use.
- k. The formwork may be designed so that soffits of slabs and sides of beams, columns, and wall may be removed first leaving the forms to the soffits of beams and their supports in position.
- l. Positive means, wedges or jacks of accurate adjustment and proper removal of shores and struts shall be provided and all settlement shall be taken up during placing of concrete. Forms shall also be securely braced against lateral deflections.
- m. Where concreting of narrow 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 the concrete. Small temporary openings shall be provided at the bottom of the formwork to columns, walls and deep beams to permit the





cleaning out of debris and observations immediately before concrete is deposited.

- n. 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 twice the 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" (19 mm) when the formed face of the concrete is not to be permanently exposed to view, form tie may be cut off flush with the formed surfaces. Through bolts shall 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.
- o. 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 not more than 1" (25 mm). The forms shall be held against the hardened concrete to prevent offsets or loss of mortar at the construction joint and to maintain a true surface.
- p. Runways or planks for moving labor and equipment shall be provided with struts or legs and shall be supported directly on the formwork or structural member without resting on the reinforcing steel.
- q. All surfaces of the embedded items shall be cleaned and any accumulated mortar or grout from previous concreting and of all other foreign material is removed before concrete is placed in them.
- r. Board forms having joints opened by shrinkage of the wood shall be swelled until closed by wetting before concrete is placed. Plywood and other wood surface not subject to shrinkage shall be sealed against absorption of moisture from the concrete either by (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. Care shall be taken that such approved coating is kept out of contact with the reinforcement. Where as-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 surface shall be compatible with the type of paint to be used.
- s. In normal circumstances generally where temperatures are above 68°F (20°C) 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 directed by the ENGINEER





Slabs (Shores or props left under, removal and refixing of props not permitted) 10 days

Beams soffits (Shores or props left under, removal and refixing of props not permitted) 12 days

Removal of shores or props to slabs:

1. Spanning upto 14 ft (4 meters) 10 days

2. Spanning over 14 ft (4 meters) 21 days

Removal of shores or props of beams:

1. Spanning upto 20 ft (6 meters) 18 days

2. Spanning over 20 ft (6 meters) 25 days

For rapid hardening cement 1/2 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 24 hours.

- t. Proper allowance shall be made for the decrease in rate of hardening of concrete in cold weather and the minimum periods must be increased when the mean daily temperature is below 68°F, (20°C).
- u. 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.
- v. Top forms on sloping surfaces of concrete shall be removed as soon as the concrete has attained sufficient stiffness to prevent sagging. Any needed repairs or the treatment required on such sloping surfaces shall be performed at once and followed by the specified curing.
- w. All formwork shall be removed without such shock or vibration as would damage the reinforced concrete.
- x. 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 beams, slab, columns or any other structural member be subject to combined dead and construction loads in



excess of the load permitted by ENGINEER for the developed concrete strength at the time of reshoring. Reshores shall be placed simultaneously with stripping operations are 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 over stressing the concrete. Reshores shall remain in place at least until representative tests of the concrete being supported have reached the strength/time specified in 6.1.s.

- y. 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 have a capacity equal to at least one half of 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 storeys to distribute the weight of newly placed concrete, forms, and construction live loads in such a manner that the design superimposed load of the floors supporting shores or props are not exceeded.

No loads, other than those permitted by the ENGINEER 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.

- z. It is required to give forms for reinforced concrete an upward camber to ensure that the beams or slabs including cantilever slabs do not have a sag when they have taken up their deflection. Camber, unless indicated otherwise on drawings, should be about 1/240 for supported beams and slabs and 1/180 for cantilevers.

### 3.6.2 Reinforcement:

- a. All metal for reinforcement shall be free from loose mill scale, loose rust, mud, oil, grease, or other harmful matter immediately before the concrete is placed.
- b. Reinforcement is to be accurately placed as shown in the Drawings, and secured against displacement by using 18-20 gauge black annealed 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 formwork shall be galvanized or shall be made of plastic.
- c. Bars used for concrete reinforcement shall be fabricated in accordance with the dimensions shown in the Bending Schedule.





- d. The cutting tolerance for all bars shall be  $\pm 1"$  ( $\pm 25$  mm).
- e. Where an overall or an internal dimension of a bent bar is specified in the schedule, the bending tolerance, unless otherwise stated, shall be as in Table 1.

**TABLE 1-BENDING TOLERANCES**

DIMENSIONS OF BENT BARS				TOLERANCE			
Over Inches (mm)		Upto and Including Inches (mm)		Plus Inches (mm)		Minus Inches (mm)	
--	--	36	900	1/8	3	1/4	6.0
36	900	72	1800	1/4	6.0	1/2	12.0
72	1800	--	--	1/2	12.0	1	25.0

- f. Bars shall be placed to the following tolerances:
- i. Concrete cover to formed surface:  $\pm 1/4"$  (6.0 mm)
  - ii. Minimum spacing between bars:  $\pm 1/4"$  (6.0 mm)
  - iii. Top bars in slabs and beams:
    - Members 8" (200 mm) deep or less:  $\pm 1/4"$  (6.0 mm)
    - Members more than 8" (200 mm) but not over 24" (600 mm) deep:  $\pm 1/2"$  (12.0 mm)
    - Members more than 24" (600 mm) deep:  $\pm 1"$  (25 mm)
  - iv. Crosswise of member: spaced evenly within 1" (25 mm)
  - v. Lengthwise of members:  $\pm 2"$  (50 mm)
- g. 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, resulting arrangement of bars shall be subject to approval of the ENGINEER.
- h. Vertical bars in column shall be offset at least one bar diameter at lapped splices. To ensure proper placement, templates shall be furnished for all columns dowels.





i. 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 the ENGINEER, reinforcement shall not be bent after being partially embedded in hardened concrete. Bars which depend for their strength on cold working shall not be heated for any reason (except for welding). Reinforcement larger than 1-1/2" (38.0 mm) in dia may be bent by the use of heat at (not exceeding 1550 °F). Bars bent shall not be cooled by quenching.

j. No splice of reinforcement shall be made except as shown on the working Drawings.

k. Welding shall be permitted for bars only under suitable conditions and with suitable safeguards in accordance with B.S 693, 1856, or AWS D 12.1, provided the type of reinforcement bars have the required welding properties. Tack welding may be used to fix in position bars that cross each other, only with prior approval of the ENGINEER.

l. 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 exposed part to be built into later concrete.

m. No concreting is to be carried out until the reinforcement has been checked and approved by the ENGINEER.

### 3.6.3 Batching:

a. All cement, including cement supplied in bulk, shall be batched by weight. A bag of cement, unless marked otherwise, may be taken as 112 lbs (50 kg) or as directed by the ENGINEER.

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

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

d. Where volumetric batching of aggregate is permitted gauge boxes shall be provided for measuring the coarse and the fine aggregate. These shall be **deep and narrow** rather than **shallow and wide**. Tests for the bulking of sand shall be made at intervals and the necessary quantity of sand added.



- d. 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.

#### 3.6.4

##### Mixing:

- a. The concrete shall be mixed in an approved batch mixer conforming to the requirement of B.S 1305. It shall be fitted with the manufacturer's plate stating the rated 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.
- b. Mixing shall continue for the period recommended by the mixer manufacturer or until apparently the mix is uniform in color, whichever period is longer. If it is desired to use a mixing period less than 1-1/2 minute ENGINEER's approval shall be obtained in writing.
- c. 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.
- d. 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% of their original height.
- e. Concrete shall be mixed only in quantities for immediate use. Concrete which has set shall not be retempered, but shall be discarded.

#### 3.6.5

##### Transport:

- a. 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 or addition to ingredients. It shall be deposited as nearly as practicable in its final position so as to avoid rehandling or flowing. All skips vehicles, or containers used for transporting the concrete shall be thoroughly cleaned.
- b. During hot or cold weather, concrete shall be transported in deep containers to minimise the loss of water/heat.

#### 3.6.6

##### Placing:

- a. 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.

- b. No concrete is to be placed into the foundation trenches until the ground to receive the same has been examined and approved by ENGINEER for this purpose.
- c. The actual sequence of construction proposed by CONTRACTOR shall be subject to ENGINEER's approval before construction starts on any part of the structure, and this sequence shall not be varied without ENGINEER's prior approval.
- d. The concrete shall be placed after it has been mixed as soon as 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 are 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, 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. CONTRACTOR shall ensure that the delay between mixing and placing does not exceed 30 minutes under any circumstances. Any concrete which does not satisfy this requirement shall not be used.

- e. The concrete shall be deposited as nearly as possible in its final position to avoid rehandling. In no circumstances may concrete be made to flow along the forms by the use of vibrators. Concreting shall be carried out on as a continuous operation using methods which shall prevent separation or loss of ingredients.
- f. The free fall of concrete shall not be allowed to exceed eight feet and where it is necessary for the concrete to be lowered more than this amount, it is not to be dropped into its final position, but it is to be placed through pipe, the lower end of which shall be kept in, or close to the freshly deposited concrete. The dia. of the pipe shall be not less than 4 times the maximum size of aggregate.
- g. For mass concrete, concrete shall be placed in layers approximately 18" (450 mm) thick. Vibrator heads shall extend into the previously placed layer.
- h. The workmen carrying concrete to the SITE, and all other workmen moving about before the concrete is placed shall move only along runways or planks placed over the forms.
- i. Prior to the laying of concrete on load bearing masonry walls, bearing plates and at other points, as may be directed by ENGINEER, the surface will be brought to a true, hard smooth, level using a cement sand mortar in the ratio of 1 volume of





cement to 3 volumes of sand. Two layers of building paper weighing 1.3 oz/sq. ft (400 g/m ) will then be laid flat to separate the concrete from the surface on which it is to be laid.

### 3.6.7 Construction Joints:

- a. Concreting shall be carried out continuously upto construction joints, the position and arrangement of which shall be pre-determined with the approval of the ENGINEER.
- b. 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 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 to a distance equal to twice the width of the secondary beam. Joints in walls and columns shall be at the underside of floors slab or beams, and at the top of footings. 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.
- c. All reinforcing steel shall be continued across joints. Key and inclined dowels shall be provided as directed by ENGINEER. Longitudinal keys at least 1- 1/2" ( 40 mm. ) deep shall be provided in all joints in walls and between walls and slab or footings.
- d. When the work is 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.
- e. 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 below shall be dampened (but not saturated) immediately prior to placing of fresh concrete.
- f. 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 of similar proportions to the mortar in the concrete. The grout shall be as thick as possible on vertical surface and at least 1/2" (12.0 mm) thick on horizontal surface. The fresh concrete shall be placed before the grout has attained its initial set.
- g. Where the concrete has not fully hardened, all laitance shall be removed by scrubbing the wet surface with wire or bristle brush. Care being taken to avoid dislodging 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"



(150 mm) in thickness, and shall be well rammed against old work, particular attention being paid to corners and close spots.

- h. Stop ends for movement joints or construction joints shall be made by splitting them along the lines of 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 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. Wood strips inserted for architectural treatment shall be kerfed to permit swelling without pressure on the concrete.

### 3.6.8

#### Embedded Items:

- a. The material, design and location of waterstops in joints shall be as indicated in the Drawings. Each piece of premolded 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 end of pieces shall be made in the manner most appropriate to the material being used. Joints shall develop effective watertightness fully equal to that of the continuous water-stop material, and shall permanently develop not less than 50% of the mechanical strength of the parent section, and shall permanently retain their flexibility.

- b. 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 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 so as not to impair unduly the strength of the construction. Such sleeves, conduits in compression in 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" (50 mm) and are spaced at centers not less than thrice their diameter. Except when plans of conduits and pipes are approved by ENGINEER embedded pipes or conduits other than those merely passing through, shall not be larger in outside diameter than one-third the thickness of the slab, walls, or beam in which they are embedded nor shall be spaced closer than three diameters on center, nor so located as to impair unduly the strength of the construction. Sleeve pipes, or conduits with-in the limitations of this section may be embedded in concrete with the approval of ENGINEER, provided they are not considered to replace the displaced concrete.

- c. All sleeves, inserts, anchors, and embedded items required for adjoining work or for its support shall be placed prior to concreting.





All CONTRACTORS 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.

- d. Expansion joint material, waterstops 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.

### 3.6.9

#### Consolidation:

- a. All concrete shall be consolidated by vibration, so that the concrete is thoroughly worked around the reinforcement, around embedded items, and into corners of form, eliminating all air or stone pockets which may cause honeycombing, pitting, or planes of weakness. Internal vibrators shall have a minimum frequency of 800 vibrations per minute and sufficient amplitude to consolidate the concrete effectively.

Vibrators shall be inserted and withdrawn at points approximately 18" apart (450 mm). At each insertions, the duration shall be sufficient to cause consolidation, generally from 5 to 15 sec. A spare vibrator shall be kept on the SITE during all concreting 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.

- b. 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 affect an improvement in the quality of the concrete to the satisfaction of ENGINEER and in conformity with the provisions of Clause 5.
- c. Vibrators shall not be allowed to contact the formwork for exposed concrete surface.
- d. Mechanical vibrators shall be of a type suited in the opinion of ENGINEER to the particular conditions.
- e. Over-vibration or vibration of very wet mix is harmful and should be avoided.

### 3.6.10 Curing and Protection:

- a. Beginning immediately after placement, concrete shall be protected from premature drying, excessively hot or cold temperatures, and mechanical injury, and shall be maintained with minimal moisture loss at a relative constant temperature for the period necessary for hydration of the cement and hardening of the concrete. The materials and methods of curing shall be subject to approval of ENGINEER.





b. For concrete surfaces not in contact with forms, one of the following procedure shall be applied immediately after completion and finishing:

- Ponding or continuous sprinkling.
- Application of absorptive mats or fabric kept continuously wet.
- Application of water proof sheet materials approved by ENGINEER.
- Application of other moisture retaining covering as approved.
- Application of curing compound conforming to ASTM C 309. The compound shall be applied in accordance with the recommendations of the manufacturer immediately after any sheen which develops after finishing has disappeared from the concrete surface. It shall not be used on any surface against which additional concrete or other materials 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 area to receive bonded applications.

c. Moisture loss from surface placed against wooden forms or metal forms exposed to heating by the sun shall be minimized by keeping forms wet until they can be safely removed. After form removal, the concrete shall be cured until the end of the limit prescribed in Clause 6.10 d by one of the methods of Clause 6.10.b.

d. Curing in accordance with clause 6.10.a & 6.10.b shall be continued for at least 14 days in the case of all concrete except concrete with Rapid hardening Portland cement for which the period shall be at least 7 days.

Alternatively if tests are made of cylinders/cubes kept adjacent to the structure and cured by the same methods, moisture retention measures, unless stated otherwise on drawings, may be terminated when the average compressive strength has reached 70 percent of the minimum specified works strength. If one of the first four curing procedures of clause 6.10.b is used initially, it may be replaced by one of the other procedures of that Clause any time provided the concrete is not permitted to become surface dry during the transition.

e. When the mean daily outdoor temperature is less than 41 degree F (5 C) then temperature of the concrete shall be maintained between 50-68°F (10°C-20°C) for the required curing period of Clause 6.10.d. When necessary arrangements for heating, covering, insulation or housing the concrete work shall be made in advance of placement and shall be adequate to maintain the required temperature without injury to concentration of heat.



Combustion heaters shall not be used during the first 24 hours unless approved precautions are taken to prevent exposure of the concrete to exhaust gases which contain carbon dioxide.

- f. When necessary, provision for windbreak, shading for spraying, sprinkling, ponding or wet covering with a light colored material shall be made in advance of placement, and such protective measures shall be taken as quickly as concrete hardening and finishing operations will allow.
- g. 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 5° F (3° C) in any one hour or 50° F (28° C) in any 24 hour period.
- h. During the curing period, the concrete shall be protected from damaging mechanical disturbances, such as load stresses, heavy shock and excessive vibration. 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.

### 3.6.11

#### Works in Extreme Weather:

- a. Unless adequate protection is provided and approval is obtained concrete shall not be placed during rain. Rain water shall not be allowed to increase the mixing water nor to damage the surface finish.
- b. When the temperature of the surrounding air is expected to be below 40 degrees F (4.4 C) during placing or within 24 hours thereafter, the temperature of the plastic concrete, as placed shall be no lower than 55 degrees F (13 - C) for sections less than 12" (300 mm) in any dimension nor 50°F (10°C) for any other sections.

When necessary, concrete materials should be heated before mixing and carefully protected after placing; in general, heating of mixing water alone to about 140°F (60°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 gallons (25 liters) per bag of cement. If water or aggregate is heated above 100°F (38°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 100°F (38°C).

- c. 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 90°F (32.°C). For





massive concrete this temperature should not exceed 70°F (21°C). When the temperature of the concrete exceeds 90°F (32°C), precautionary measures approved by ENGINEER shall be put into effect. When the temperature of the steel is greater than 122°F (50°C) steel forms and reinforcement shall be sprayed with water just prior to placing the concrete. The ingredients shall be cooled before mixing, or flake ice or well-crushed ice of a size that will melt completely during mixing may be substituted for all or 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 305R-91 shall also be adopted.

### 3.7. TEST FOR CONCRETE QUALITY

#### 3.7.1 General:

CONTRACTOR shall provide samples of concrete for testing at ENGINEER'S direction. Proper facilities shall be provided for making and curing the test specimens in accordance with the specifications. A competent person shall be employed by CONTRACTOR 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 and at CONTRACTOR'S cost.

#### 3.7.2 Samples:

Conduct strength tests on at least one test sample per 50 cubic yards of concrete (38 cu meters) with a minimum of one sample per concrete pour. Each test sample shall consist of no less than three concrete test cylinders/cubes made from a single sample of concrete from a randomly selected batch of concrete, taken at point of discharge from mixer or truck, cured under standard conditions. One cylinder/cube from each sample shall be tested at age 3 days and two at age 28 days unless otherwise directed by the ENGINEER.

#### 3.7.3 Adequacy of Mix:

In case of Concrete mix, the appropriate strength requirement shall be considered to be satisfied if none of the strengths of the specimen is below the specified strength or if the average strength of the three specimens is not less than the specified strength and the difference between the greatest and least strengths is not more than 20% of that average.

When the results of tests show that the strength of any concrete is below the minimum specified, ENGINEER may give instructions for the whole or part of the work concerned to be removed and be replaced at the expense of CONTRACTOR. CONTRACTOR shall bear the cost of any other part of his, or any other CONTRACTOR'S work, which has to be removed and replaced as a result of the defective concrete. If any concrete is held to have failed, ENGINEER may order the proportions of that class of concrete to be changed in order to provide the specified strength.





### 3.8. FINISHING OF FORMED CONCRETE

#### 3.8.1 General:

- a. After removal of forms the surfaces of concrete shall be given one or more of the finishes specified below in locations designated by the Drawing or as specified in Clause 8.5.
- b. When finishing is required to match a small sample furnished to CONTRACTOR, the sample finish shall be reproduced on an area at least 100 square feet in an inconspicuous location designated by ENGINEER before proceeding with the finish in the specified location.

#### 3.8.2 As-Cast Finishes:

##### a. Rough Form Finish:

No selected form facing materials shall be specified for rough form finish surfaces. Tie holes and defects shall be patched, Unless if required to be retained if so directed by ENGINEER. Fins exceeding 1/4" (6 mm) in height shall be chipped off or rubbed off. Otherwise, surfaces shall be left with the texture imparted by the forms.

##### b. Smooth Form Finish:

The form facing material shall produce a smooth hard uniform texture on the concrete.

It may be plywood, tempered concrete-form grade hardboard, metal, plastic paper, or other approved material capable of producing the desired 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.

#### 3.8.3 Architectural Finishes:

##### a. Textured Finishes:

Textured form liners may be of formed plastic sheet, wood, sheet metal, or other material designated in Drawings. Liner panels shall be secured in forms by cementing or stapling, but not by methods which will permit impressions of nail heads, screw heads washers, or the like to be imparted to the surface of the concrete, unless shown otherwise on the Drawings. Edges of textured panels shall be sealed to each other or to dividing strips, if specified or shown, to prevent bleeding of grout. The sealant used shall be non-staining to the surface.



b. Applied Finishes:

When finishes of plaster or similar trowelled materials are to be applied, the surface of the concrete shall be prepared to ensure permanent adhesion of the finish. If the concrete is less than 24 hours old, it can be roughened with a heavy wire brush or scouring tool. If the concrete is older the surface may be roughened mechanically or by etching with dilute hydrochloric acid. After roughening, the surface shall be washed free of all dust, acid, chemical retarder, and other foreign material before the final finish is applied.

### 3.8.4 Rubbed Finishes:

The following finishes shall be produced on concrete with a smooth form finish. Where smooth rubbed finish is to be applied, the forms shall have been removed and necessary patching completed as soon after the placement of the concrete as possible without compromising any structural requirements.

a. Smooth Rubbed Finish:

Smooth rubbed finish shall be produced on newly hardened concrete not later than a day following form removal.

Surfaces shall be wetted and rubbed with carborundum brick or other abrasive until uniform color and texture are produced. No cement grout shall be used other than the cement paste drawn from the concrete itself by the rubbing process.

b. Grout Cleaned Finish:

No cleaning operations shall be undertaken until all contiguous surfaces to be cleaned are completed and accessible. Cleaning as the work progresses shall not be permitted.

Mix 1 part Portland Cement and 1-1/2 part fine sand with sufficient water to produce a grout having the consistency of thick paint. White Portland Cement shall be substituted for a part of the grey Portland Cement in order to produce a color matching the color of the surrounding concrete, as determined by a trial patch. Wet the surface of the concrete sufficiently to prevent absorption of water from the grout and apply the grout uniformly with a brush or a spray gun. Immediately after applying the grout, scrub surface vigorously with a cork float or stone and fill all air bubbles and holes. While the grout is still plastic, remove all excess grout by working the surface with a rubber float, sack or other means. After the surface whitens from drying (about thirty minutes at normal temperature) rub vigorously with clean burlap. The finish shall be kept damp for at least 36 hours after final rubbing.

c. Cork Floated Finish:

1. Remove forms at an early stage, within 2 to 3 days of placement where possible.
2. Remove ties, and all burrs and fins.





3. Mix 1 part Portland cement and 1 part fine sand with sufficient water to produce a stiff mortar.
4. Dampen surface.
5. Apply mortar with firm rubber float or with trowel, filling all surface voids.
6. Apply a small amount of water with a fog spray to prevent too rapid drying of compressed mortar.
7. Apply a small amount of water with a fog sprayer.
8. Produce the final texture with a cork float using a swirling motion.

### 3.8.5 Unspecified Finishes:

If the finish is not designated in the Drawings, the following finishes shall be used as applicable:

a. Rough Form Finish:

For all concrete surface not exposed to public view and / or are specified to have subsequent finishing.

b. Smooth Form Finish:

For all concrete surfaces exposed to public view and or are not required to have subsequent finishing.

### 3.8.6 Related Unformed Surfaces:

Tops of walls or buttresses, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces shall be struck smooth after concrete is placed and shall be floated to a texture reasonably consistent with that of the formed surfaces. Final treatment on form surfaces shall continue uniformly across the unformed surfaces.

## 3.9. REPAIR OF SURFACE DEFECTS:

### 3.9.1 General:

- a. Any concrete failing to meet the specified strength or not formed as shown on Drawings, concrete with surface beyond tolerances or with defective surfaces which cannot be properly repaired or patched in the opinion of ENGINEER shall be removed and replaced at CONTRACTORS's expenses. ENGINEER may reject any defective concrete and order it to be cut out in part or in whole and replaced at the CONTRACTOR's expense. Only in case of minor surface defects, ENGINEER may approve a surface treatment in accordance with the Clause. 9.2





- b. All ties and bolt holes and all repairable defective areas shall be patched immediately after the removal of forms.

### 3.9.2 Repair of Defective Areas:

- a. All honeycombed and other defective concrete shall be removed down to sound concrete. The area to be patched and area at least 6" (150 mm) wide surrounding it shall be dampened to prevent absorption of water from the patching mortar. A bonding grout shall be prepared using a mix of approximately 1 part cement to 1 part fine sand or an approved bonding agent shall then be well brushed/ applied into the surface.
- b. The patching mixture shall be made of the same material and of 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 grey Portland cement on exposed concrete in order to produce a color matching the color of the surrounding concrete, as determined by a trial patch.
- c. The quantity of mixing water shall be not more than necessary for handling and placing. The patching mortar shall be mixed in advance and allowed to stand with frequent manipulation with a trowel, without addition of water, until it has reached the stiffest consistency that will permit placing.
- d. After surface water has evaporated from the area to be patched, the bond coat shall be well brushed into the surface. When the bond coat begins to lose 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 one hour before being finally finished. The patched area shall be covered by approved curing compound, except as specified in Clause 9.2 g. Metal tools shall not be used in finishing a patch in a formed wall which will be exposed.
- e. Where as-cast finishes are specified, the quantity of patched area shall be strictly limited. The combined total of patched areas in as-cast concrete surfaces shall not exceed 2 square ft. in each 1000 square feet ( 2 sq. m in each 1000 sq.m) of as-cast surface. This is in addition to form tie patches, if the project design permits to fall within as-cast areas.
- f. 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, surface of patches shall be dressed manually to obtain the same texture as surrounding surfaces.
- g. 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.



### 3.9.3 Tie and Bolt Holes:

After being cleaned and thoroughly dampened, the tie and bolt holes shall be filled solid with patching mortar.

### 3.9.4 Proprietary Materials:

If permitted or required by 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 recommendation with prior approval of ENGINEER.

## 3.10. CONCRETE CONSTRUCTION TOLERANCE

Where tolerances are not stated in the Specifications or Drawing for any individual structure or feature, maximum permissible deviations from established lines, grades and dimensions shall conform to the following. The CONTRACTOR is expected to set and maintain concrete forms so as to ensure completed work within the tolerance limits. These allowable tolerances shall not relieve CONTRACTOR of his responsibility for correct fitting of indicated materials. These tolerances are not cumulative.

### 3.10.1 Variation from the plumb (or as specified for sloped walls)

- a. In the lines and surfaces of columns, piers and walls.
- In any 10 ft (3 m) of length or height: 1/4" (6 mm)
  - In any storey or 20 feet (6 meters) Max: 3/8" (10 mm)
  - Maximum for the entire length or height: 3/4" (20 mm)
- b. For exposed corner columns, control joint grooves and other conspicuous lines.
- In any bay or 20 feet (6 meters) maximum: 1/4" (6 mm)
  - Maximum for the entire length or height: 1/2" (12.0 mm)

### 3.10.2 Variation from the levels or the grades indicated on Drawings:

- a. In floors, ceilings, beam soffits, and in arrises.
- In any 10 feet (3 meters) of length: 1/4" (6 mm)
  - In any bay or 20 feet



- ( 6 meters) feet maximum 3/8" (10 mm)
- Maximum for the entire length: 3/4"(20 mm)
- b. For exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines:
  - In any bay or 20 feet(6m) maximum: 1/4" (6 mm)
  - Maximum for the entire length: 1/2"(12.0 mm)

**3.10.3 Variation of the entire building lines from established position in plan and related position of columns, walls and partitions.**

- a. In any bay or 20 feet (6 m) maximum: 1/2" (12.0 mm)
  - Maximum for the entire length: 1" (25 mm)

**3.10.4 Variation of the size and locations of sleeves, floors openings and wall openings:**

1/4" (6 m)

**3.10.5 Variation in cross-sectional dimensions of columns and beams and in the thickness of slabs and walls.**

Minus: 1/4" (6 mm)  
 Plus: 1/2" (12.0 mm)

**3.10.6 Footings:**

- a. Variations in dimensions in plan.
  - Minus : 1/2"(12.0 mm)
  - Plus (plus variation applied to concrete only, not to bars dowels): 2" (50 mm)
- b. Misplacement or eccentricity of concrete.
  - 2 percent of the footing width in the direction of misplacement but not more than 2"(50 mm)
- c. Reduction in thickness
  - Minus 5 percent of specified thickness.





### 3.10.7 Variation in Steps

a.	Rise:	1/8" (3 mm)
	Tread:	1/4" (6 mm)
b.	In consecutive steps:	
	Rise:	1/16" (1.0 mm)
	Tread:	1/8" (3 mm)

### 3.10.8 Tolerance for Precast Concrete:

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 product will be within the following limits at the time of placement of these units in the structure, unless otherwise noted on ENGINEER'S Drawings.

a.	Overall dimensions of members per 10 ft (3 mm):	+/- 1/16" (1.0 mm)
b.	Cross-sectional dimensions	
	Section less than 3" (75 mm):	+/- 1/16" (1.0 mm)
	Section over 3" (75 mm) less than 18" (450 mm):	+/- 1/8" (3 mm)
	Section over 18" (450 mm):	+/- 1/4" (6 mm)
c.	Deviations from straight lines in long sections. Not more than 1/8 inch per 10 ft (3mm / 3 m).	
d.	Deviation from specified camber +/- 1/16" (1.5 mm) per 10 ft (3m) of span. Maximum differential between adjacent units in erected position 1/4 inch (6 mm).	

### 3.10.9 Tolerance for Pavements:

- a. Ramps
- Departure from established alignment +/- 1/2 inch (12.0 mm).
  - Departure from established longitudinal +/- 1/4" (6 mm) grade on any line.
  - Departure from transverse template contour except at transverse joints +/- 1/8 inch (+/- 3 mm).
  - Departure from transverse template control at transverse joints +/- 1/4" (+/- 6 mm) in width of one traffic lane.



### 3.10.10 Pavements for Parking Areas:

Twice values listed for ramp pavements.

## 3.11. ACCEPTANCE OF STRUCTURE

### 3.11.1 General:

- a. Completed concrete work which meets all applicable requirements will be accepted subject to the other terms of the CONTRACT Documents.
- b. Completed concrete work which fails to meet one or more requirements and which has been repaired to bring it into compliance will be accepted subject to the other terms of the CONTRACT Documents.
- c. Completed concrete work which fails to meet one or more 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 complies with the requirements.

### 3.11.2 Dimensional Tolerances:

- a. Formed surfaces resulting in concrete outlines smaller than permitted by the tolerances of Section 10 considered potentially deficient in strength and subject to the provisions of Section 11.4.
- b. Formed surfaces resulting in concrete outlines larger than permitted by the tolerances of Section 10 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 Section.

### 3.11.3 Appearance:

- a. Architectural concrete with surface defects exceeding the specified limitations shall be removed in accordance with this Section.
- b. Concrete members cast in the wrong location may be rejected if the strength, appearance or function of the structure is adversely effected or misplaced items interfere with other construction.
- c. Inaccurately formed concrete surfaces exceeding the limits of Section 6 & of Section 10 and which are exposed to view, may be rejected and shall be repaired or removed and replaced if required.
- d. Other concrete exposed to view with defects which adversely affect the appearance of the specified finish may be repaired only by approved methods.
- e. Concrete not exposed to view, but of defective appearance, may be accepted at the discretion of the ENGINEER.



### 3 11.4 Strength of Structure

- a. The strength of 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 Section 7.
  - Reinforcing steel size, quantity, strength, position or arrangement at variance with the requirements of Section 4.4 & 6.2 of 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 extreme temperature during the early stages of hardening and strength development.
  - Mechanical injury, construction fires, accidents or premature removal of formwork likely to result in deficient strength.
  - Poor workmanship likely to result insufficient strength.
- b. Structural analysis and/or additional testing may be required when the strength of the structure is considered potentially deficient.
- c. Core tests may be required when the strength of the structure is considered potentially deficient.
- d. 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 results evaluated in accordance with ACI Standard 318.
- e. Concrete work judged inadequate by structural analysis or by results of a load test shall be reinforced with additional construction, if so directed by ENGINEER or shall be replaced, at the CONTRACTOR's expense.
- f. The CONTRACTOR shall pay all costs incurred in providing the additional testing and/or analysis required by this Section.
- g. THE OWNER will pay all costs of additional testing and/or analysis which is made at his request and which is not required by specifications, or the CONTRACT Documents.





### 3.12. METHODS OF MEASUREMENT OF CONCRETE WORKS

#### 3.12.1 General.

- a. Unless otherwise specifically stated in the Bill of Quantities, or herein, all items shall be deemed to be inclusive of, but not limited to, the following:
- i. Labor/plant and all costs in connection therewith.
  - ii. Materials, goods and all costs in connection therewith, e.g. conveyance, delivery, unloading, storing, returning, packing, handling, hoisting, lowering.
  - iii. All fixtures and all costs in connection therewith for precast works.
  - iv. Fitting and fixing materials and goods in position.
  - v. Waste of materials, and Square cutting.
  - vi. Mixing, transporting, hoisting, placing in from at any level, compacting through vibration & curing etc. complete including the cost of formwork & its removal (but excluding cost of reinforcement).
  - vii. Establishment charges, overhead charges and profit.
  - viii. All other expenses, charges and taxes specified in Conditions of CONTRACT.
- b. Works shall be measured net as fixed in position as per drawings and instructions of ENGINEER. Each measurement shall be taken to the nearest 1/2" (12.0 mm). This rule shall not apply to any dimensions stated in the descriptions.

#### 3.12.2 Concrete

- a. 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 4 square inch (2500 sq. mm) each in cross-sectional area.
  - Voids not exceeding 1 square foot in work given in square feet and 0.1 sq M in work given in Sq Meters. If any void exceeds above limit total void shall be deducted.
  - Voids not exceeding 1 cubic foot in work given in cubic feet, 0.03 cubic meter in work given in cubic meter. If any void exceeds above limits, unit total void shall be deducted.



- b. Voids, which are not to be deducted as per Section 12.2 a 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 deduction irrespective of size.
- c. Junctions between straight and curved works shall in all cases be deemed to be included with the work in which they occur.
- d. Concrete work shall be classified and measured separately as follows unless otherwise described elsewhere:-
- Buildings, foundation beams, foundation slabs, footings, bases of columns, machine foundations, mass concrete etc., in cubic feet (Cu Meter).
  - Floor slabs on ground with floor beams in cubic feet (Cubic Meter).
  - Walls in foundations, plinth and superstructure in cubic feet (Cubic Meter) stating thickness.
  - Columns, piers, pilasters, pillars etc., in cubic feet (Cubic meter).
  - Lintels, beams and brackets in cubic feet (Cubic Meter).
  - Suspended floors, roofs and stair landings in square feet (sq. Metre) stating thickness.
  - Stairs (excluding landing) in cubic feet (Cubic Meter).
  - Railings in cubic feet (Cubic Meter), square feet (Sq. Meter), or linear feet (Meter) stating description.
  - Parapets, purdees and the like in cubic feet (Cubic Meter) stating thickness.
  - Jali, blocks in square feet (Sq. Meter) stating thickness & description.
  - Precast concrete items shall each be enumerated except if otherwise shown in the Bill of Quantities, separately stating the description.
- e. Measurement of walls shall be taken between attached columns, piers or pilasters. The thickness of attached columns, piers or pilasters shall be taken as the combined thickness of the wall and the columns, piers or pilasters. Attached or isolated columns, piers, pilasters 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 caused by openings in walls shall be classified as walls.



Columns shall be measured from the top of footings/beams or floor surfaces to the under side of beams or slabs as the case may be. Where the width of the beams is less than the width of columns, the extra width at the junction shall be included in the beam.

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 below or above the slab.

### 3.12.3 Formwork:

- a. Formwork (if separate and extra payment is specifically stated in the Bill of Quantities) shall be measured in square feet (Sq. M) as the actual surface of the finished structure which required to be supported during the deposition of the concrete, including the upper surfaces to the work sloping more than 15 degree from the horizontal. No allowance shall be made for overlaps and passing at angles and no deduction shall be made for the following:-
  - Voids not exceeding ten square feet(1 Sq. m).
  - Intersections of main beams with walls or columns.
  - Intersections of secondary beams with main beams.
- b. Formwork shall be deemed to be inclusive of, but not limited to items detailed in section 12.1 and the following:-
  - Batten, struts, reversed cut strings, bolting, oiling, wedging, easing, striking, removing and making good exposed faces of concrete after removal of formwork. Also yokes, wales sheathing, jack rods, jacks, working platforms and finishers, scaffolds, etc.
- c. Forming chamfers not exceeding 2" (50mm) wide and forming splayed internal angles not exceeding 1/2" (12.0 mm) wide shall not be paid for extra.
- d. Temporary stop ends for constructed joints shall not be measured and paid for.
- e. Classification of formwork (if separate and extra payment is specifically stated in the Bill of Quantities) shall be as follows:-
  - To horizontal or sloping soffits of suspended slabs, floors, roofs, staircases, landings and the like.
  - To sloping upper surfaces of suspended slabs, floors, roofs and the like where more than 15 degree from horizontal.
  - To vertical or battering sides of foundations, foundation beams and slabs, ground beams machine foundations and the like.





To vertical or battering sides of walls, solid balustrades and the like

- To vertical or battering sides

- To vertical or battering sides of stanchion casings, columns, piers, pilasters and the like

- To sides and soffits of openings in walls, recesses in walls, projecting panels on walls and the like

- To sides and soffits of horizontal or sloping beam casings, beams, brackets, lintels, staircase, strings and the like.

- To sloping upper surfaces of beam casings, beams, brackets, lintels, staircase-strings and the like where more than 15 degrees from horizontal.

- To edges of beds, roads, footpaths, paving and the like.

- To edges of suspended slabs, floors, roofs, landing and the like.

- To risers of steps and staircases.

- To sides of kerbs, upstands and the like.

- f. Formwork to throats, grooves, chases, rebates, chamfers over 2" wide (50 mm) splayed internal angles over 1/2" wide (12.5 mm) moldings and the like shall each be measured separately in linear feet stating the size.

#### 3.12.4 Rate for Reinforcement:

- a. The rate tendered for any type of reinforcement by the CONTRACTOR shall also be inclusive of the cost of binding wire wastages, and the cost of concrete, metal or plastic chairs and spacers or hangers, etc.
- b. All reinforcement shall be provided in length shown in Drawings and as per Specifications.

Should the CONTRACTOR provide lengths of reinforcement which are greater than shown on the Drawings no payment of extra length shall be made. Overlaps, unless clearly shown in working Drawings, shall not be allowed and measured.

- c. The CONTRACTOR shall be paid for reinforcement by weight computed from Table-2 and from linear measurements of reinforcements actually used at SITE as per the Drawings, Specifications and instructions of ENGINEER. No payment shall be made for steel chairs or wastage. CONTRACTOR shall not claim for the difference in the actual weights of bars and their standard weights given in Table -2.



**TABLE-2:**

Nominal Bar Diameter		Weight
(inches)		lbs/ft
To the nearest 1/8 -Bar Number		
1/4"	# 3	0.167
3/8"	# 4	0.376
1/2"	# 5	0.658
5/8"	# 6	1.043
3/4"	# 7	1.502
7/8"	# 8	2.044
1"	# 9	2.670
1-1/8"	# 10	3.400
1-1/4"	# 11	4.303
1-3/8"	# 14	5.313
1-3/4"	# 18	7.650
2-1/4"		13.600

(mm)	(kg/m)
8	0.395
10	0.616
12	0.887
16	1.576
20	2.463
22	2.980
25	3.849
28	4.828
32	6.306
36	7.981

### 3.13 STRUCTURAL STEEL WORKS

#### 3.13.1 Scope

This section includes fabrication and erection of structural steel work, as shown on drawings including schedules, notes, and details showing size and location of members, typical connections, and the requirements for material, storage, preparation of fabrication

drawings, fabrication, assembly, tests/examinations, transportation, erection and painting of all types of bolted and/or welded structural steel works for general construction work.

All structural steel shall be of tested quality. The material including the rolled section and plates shall conform to the applicable latest Standards equivalent to the respective standards mentioned as follows:

- B. Structural Steel Shapes, Plates, and Bars: ASTM A36
- C. Cold-Formed Steel Tubing: ASTM A500, Grade B



- D. Hot-Formed Steel Tubing: ASTM A501.
- E. Steel Pipe: ASTM A53, Type E or S, Grade B or ASTM A501.
- F. Finish: Black, except where indicated to be galvanized.
- F. Steel Castings: ASTM A27, Grade 65-35, medium-strength carbon steel.
- G. Headed Stud-Type Shear Connectors: ASTM A109, Grade 1015 or 1020, cold-finished carbon steel with dimensions complying with AISC Specifications.
- H. Anchor Bolts: ASTM A307, nonheaded type unless otherwise indicated.
- I. Unfinished Threaded Fasteners: ASTM A307, Grade A, regular low-carbon steel bolts and nuts; provide hexagonal heads and nuts for all connections.
- J. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:
  1. Quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A325.
  2. Where indicated as galvanized, provide units that are zinc-coated, either mechanically deposited complying with ASTM B695, Class 50, or hot-dip galvanized complying with ASTM A153.
- K. Direct Tension Indicators: ASTM F959, type as required; use at Contractor's option.
- L. Electrodes for Welding: Comply with AWS Code.
- M. Structural Steel Primer Paint: Red oxide, lead- and cadmium-free, corrosion-inhibiting primer complying with performance requirements of FS TT-P-664.
- N. Nonmetallic Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining product containing selected silica sands, Portland cement,

shrinkage compensating agents, plasticizing and water-reducing agents, complying with ASTM C1107 (formerly referenced as CE CRD C621).

Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

100 Non-Shrink Grout (Non-Metallic) - Conspec, Inc.  
 Crystex - L & M Construction Chemicals, Inc.  
 Euco N-S Grout - Euclid Chemical Co.  
 Kemset - Chem-Masters Corp.  
 SonogROUT - Sonneborn Building Products Div., Rexnord Chemical Products, Inc.  
 Supreme Grout - Cornix, Inc.  
 Sure-Grip High Performance Grout - Dayton Superior  
 Vibropruf #11 - Lambert Corp.





### 3.13.2 Submittals

- A. **General:** Submit the following in accordance with conditions of Contract and as instructed/required by the Engineer:
- B. **Product Data:** Submit product data or manufacturer's specifications and installation instructions for the following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).
1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.
  2. Anchor bolts.
  3. Unfinished threaded fasteners.
  4. High-strength bolts (each type), including nuts and washers; include direct tension indicators if used.
  5. Structural steel primer paint.
  6. Nonmetallic shrinkage-resistant grout.
- C. **Material Safety Data Sheets (MSDS):** Submit MSDS for structural steel (each type), anchor bolts, unfinished threaded fasteners, high-strength bolts (each type) including nuts and washers, structural steel primer paint and nonmetallic shrinkage-resistant grout.
- D. **Shop drawings:** Submit shop drawings, including complete details and schedules for fabrication and assembly of structural steel members, procedures, and diagrams.
1. Include details of cuts, connections, cambers, holes and other pertinent data. Indicate welds by standard AWS symbols and show size, length, and type of each weld.
  2. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed as work of other sections.
- E. **Welder Certifications:** Provide certification that welders to be employed in work have satisfactorily passed qualification tests in accordance with AWS D1.1.
- If recertification of welders is required, retesting will be Contractor's responsibility.
- F. **Test reports:** Submit test reports conducted on shop- and field-bolted and welded connections. Include data on type(s) of tests conducted and test results.
- G. **Welding Procedures:** Provide written welding procedure specification (WPS) document per AWS Code requirements.



### 3.13.3 Delivery, Storage, and Handling

- A. Deliver materials to site at such intervals to ensure uninterrupted progress of work.
- B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time so that work will not be delayed.
- C. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration. If bolts and nuts become dry or rusty, clean and lubricate before use.

Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

### 3.13.4 Project Conditions

Field Measurements: Check actual locations of walls and other construction to which steel framing must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings.

### 3.13.5 Fabrication

- A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated.
  - 1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.
  - 2. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.
- B. Connections: Weld or bolt shop connections, as indicated.
  - 1. Bolt field connections, except where welded connections or other connections are indicated.
  - 2. Provide high-strength threaded fasteners, unless otherwise indicated.
- C. High-Strength Bolted Connections: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A325 or A490 Bolts".
- D. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.





E. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld shear connectors in field, spaced as shown, to beams and girders in composite construction. Use automatic end welding of headed stud shear connectors in accordance with manufacturer's printed instructions.

F. Steel Wall Framing: Select members that are true and straight for fabrication of steel wall framing. Straighten as required to provide uniform, square, and true members in complete wall framing.

Build up welded door frames attached to structural steel framing. Weld exposed joints continuously and grind smooth. Plug-weld steel bar stops to frames, except where shown removable. Secure removable stops to frames with countersunk, cross-recessed head machine screws, uniformly spaced not more than 10 inches (25 cm) o.c., unless otherwise indicated.

G. Holes for Other Work: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on final shop drawings.

1. Provide threaded nuts welded to framing and other specialty items as indicated to receive other work.
2. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.

### 3.13.6 Painting

A. General: Shop-paint structural steel, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel that is partially exposed on exposed portions and initial 2 inches (51 mm) of embedded areas only.

1. Do not paint surfaces to be welded or high-strength bolted with friction-type connections.
2. Do not paint surfaces scheduled to receive sprayed-on fireproofing.
3. Apply 2 coats of paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

B. Surface Preparation: After inspection and before shipping, clean steelwork to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Clean steel in accordance with SSPC as follows:

SP-1	"Solvent Cleaning"
SP-2	"Hand-Tool Cleaning"
SP-3	"Power-Tool Cleaning"

C. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide dry film thickness of not less than 3.0 mils. Use painting methods that result in full coverage of joints, corners, edges, and exposed surfaces.





### 3.13.7 Source Quality Control

Materials and fabrication procedures are subject to inspection and tests in mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements. Promptly remove and replace materials or fabricated components that do not comply.

### 3.13.8 Erection

- A. **Temporary Shoring and Bracing:** Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.
- B. **Anchor Bolts:** Furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.
- Furnish templates and other devices as necessary for presetting bolts and other anchors to accurate locations.
- C. **Setting Bases and Bearing Plates:** Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.
1. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.
  2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
  3. Pack grout solidly between bearing surfaces and bases or plates to insure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
  4. For proprietary grout materials, comply with manufacturer's instructions.
- D. **Field Assembly:** Set structural frames accurately to lines and elevations indicated and in accordance with AISC Specifications. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
1. Level and plumb individual members of structures within specified AISC tolerances.
  2. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.



3. Splice members only where indicated and accepted on shop drawings.
  4. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
  5. Do not enlarge unfair holes in members by burning or by using drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.
- E. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members that are not under stress, as acceptable to the SDR. Finish gas-cut sections equal to a sheared appearance when permitted. Comply with NFPA 51B for cutting processes.
- F. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.

Apply by brush or spray to provide minimum dry film thickness of 3.0 mils.

### 3.13.9 Quality Control

- A. The contractor shall submit the test certificates conforming to the relevant standards of all steel materials used for fabrication. All structural steel shall be free from blisters, rust, scales, seams, lamination, cracks, fissures and other surface defects.
- B. Correct Deficiencies in structural steel work that inspections and laboratory test reports have indicated are not in compliance with requirements. Perform additional tests, at Contractor's expense, as necessary to reconfirm any noncompliance of original work and to show compliance of corrected work.
- C. Shop-Bolted and Field-Bolted Connections: Inspect or test in accordance with AISC Specifications.
- Verify that gaps of installed direct tension indicators are less than gaps specified in ASTM F959, Table 2.
- D. Shop Welding and Field Welding: Inspect and test during fabrication for shop welding and during erection for field welding, of structural steel assemblies, as follows:
1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
  2. Perform visual inspection of all welds.
  3. Perform tests up to and including 100% of welds at SNL's option. Inspection procedures may include the following:
    - a. Liquid Penetrant Inspection: ASTM E165





- b) Magnetic Particle Inspection: ASTM E709 performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not acceptable.
- c) Radiographic Inspection: ASTM E94 and ASTM E142, minimum quality level "2-2T".
- d) Ultrasonic Inspection: ASTM E164.

4. Acceptance criteria shall be as specified in AWS D1.1.

### 3.13.10 Construction Methods

#### a) General

The Contractor shall schedule, coordinate and sequence structural steel erection in cooperation with the delivery of the structural steel by the structural steel fabricator.

Any structural steel components that in the opinion of the Engineer have been damaged or otherwise rendered useless by the improper handling by the Contractor shall be replaced by the Contractor at his own expense.

- b) Grout Pads: When shown on the Drawings or described in the Special Provisions, the Contractor shall construct grout pads using Sika 212 flowable grout or equivalent, accepted by the Engineer. Grouts shall be packaged in waterproof containers with the production date and shelf life of the material shown. It shall be mixed, placed, and cured in strict accordance with the Manufacturer's recommendations. The method of forming and pouring the grout shall be submitted to the Engineer for review and approval prior to the work being undertaken. Dry-pack methods of constructing grout pads will not be accepted.

When the daily minimum air temperature or the temperature of the girders, bearings, or substructure concrete in the immediate area of the grouting falls below 5°C, or when there is a probability of it falling below 5°C within 24 hours of grouting, the following provisions for cold weather grouting shall be implemented:

- (i) Before grouting, adequate preheat shall be provided to raise the temperature of the adjacent areas of the girders, bearings, and substructure concrete to at least 10°C.
- (ii) Temperature of the grout during placing shall be between 10°C and 25°C.
- (iii) The grout pads (and girders where appropriate) shall be enclosed and kept at 15°C to 25°C for at least five days. The system of heating shall be designed to prevent excessive drying-out of the grout.

- c) Anchor Bolts: The Contractor shall remove all anchor bolt void forming materials prior to grouting. Any residues on the concrete surface, such as oils, grease, or other contaminants that can reduce bonding characteristics, shall be removed by sandblasting.





- b) Magnetic Particle Inspection: ASTM E 709 performed on root pass and on finished weld. Cracks or signs of incomplete fusion or penetration are not acceptable.
- c) Radiographic Inspection: ASTM E 94 and ASTM E 142, minimum quality level "2-2T"
- d) Ultrasonic Inspection: ASTM E 164

4. Acceptance criteria shall be as specified in 3-WS-D1.1.

### 3.13.10 Construction Methods

#### a) General

The Contractor shall schedule, coordinate and sequence structural steel erection in cooperation with the delivery of the structural steel by the structural steel fabricator.

Any structural steel components that in the opinion of the Engineer have been damaged or otherwise rendered useless by the improper handling by the Contractor shall be replaced by the Contractor at his own expense.

- b) Grout Pads: When shown on the Drawings or described in the Special Provisions, the Contractor shall construct grout pads using Sika 212 flowable grout or equivalent, accepted by the Engineer. Grouts shall be packaged in waterproof containers with the production date and shelf life of the material shown. It shall be mixed, placed and cured in strict accordance with the Manufacturer's recommendations. The method of forming and pouring the grout shall be submitted to the Engineer for review and approval prior to the work being undertaken. Dry-pack methods of constructing grout pads will not be accepted.

When the daily minimum air temperature or the temperature of the girders, bearings, or substructure concrete in the immediate area of the grouting falls below 5°C, or when there is a probability of it falling below 5°C within 24 hours of grouting, the following provisions for cold weather grouting shall be implemented:

- (i) Before grouting, adequate preheat shall be provided to raise the temperature of the adjacent areas of the girders, bearings, and substructure concrete to at least 10°C.
- (ii) Temperature of the grout during placing shall be between 10°C and 25°C.
- (iii) The grout pads (and girders where appropriate) shall be enclosed and kept at 15°C to 25°C for at least five days. The system of heating shall be designed to prevent excessive drying-out of the grout.

- c) Anchor Bolts: The Contractor shall remove all anchor bolt void forming materials prior to grouting. Any residues on the concrete surface, such as oils, grease, or other contaminants that can reduce bonding characteristics, shall be removed by sandblasting.



Anchor bolts shall be set accurately and grouted with non-shrink cement grout accepted by the Engineer. All methods and materials for setting anchor bolts and building bearing pads shall be submitted to the Engineer for review and acceptance. The location of the anchor bolts, in relation to the slotted holes in the expansion shoes, shall correspond with the temperature at the time of erection. The nuts on the anchor bolts, at the expansion ends of spans, shall be adjusted to permit free movement of the spans.

- d) **Erection of Structural Steel Girders:** Before taking possession and erecting the girders, the Contractor shall verify that the lengths of the girders, the layout of the substructure units, the elevations of the bearings seats, and the location of the anchor bolts are in accordance with the Drawings. All discrepancies discovered by the Contractor shall be brought immediately to the attention of the Engineer.

It is essential that the girders be erected with utmost attention being given to girder positioning, alignment, and elevation. The Contractor shall adjust girder position, bearing location, and bearing elevation in order to achieve as closely as possible the lines and grades shown on the Drawings. The Contractor shall minimize any differential camber (girder to girder), and the sweep of the girders by jacking, loading of girders, winching, or whatever means are necessary, and shall provide the necessary temporary attachments to hold the girders in position. The Engineer shall approve of all proposed methods of jacking, loading, winching, etc. prior to the work being undertaken.

Loose timber blocking will not be permitted for use as temporary works for any aspect of girder erection. It is the Contractor's responsibility to ascertain the actual weight of the girders.

- e) **Equipment:** All cranes, rigging and equipment shall be in good condition and properly maintained at all times during the period of the work. All cranes, rigging and equipment shall be of sufficient capacity to complete every stage of the erection works. The Engineer shall, at his/her discretion, verify capacity and state of equipment provided and any equipment found not meeting the requirements for erection work shall be removed and replaced. Slings and other lifting devices that will be in contact with structural steelwork shall be of a type which shall not damage shop primed or painted surfaces.
- f) **Erection:** All components shall be lifted, placed, and maintained in position using appropriate lifting equipment, temporary bracing, guys, or stiffening devices so that the components are at no time overloaded, unstable, or unsafe. Additional permanent material may be provided, if approved by the Engineer, to ensure that the member capacities are not exceeded during erection. Release of temporary supports or temporary members, etc. must be gradual, and under no circumstances will a sudden release be permissible. Unless otherwise approved by the Engineer, at least 50% of the holes in the joints shall be filled with drift pins or hand tightened bolts prior to removing the crane. At least 50% the bolts required in the flanges shall be installed. For temporary fit ups, main girder splices and connections shall be aligned with drift pins and a sufficient number of fitting up bolts shall be installed to maintain the integrity of the connection. The fitting up bolts may be the high strength bolts used in the installation. Drift pins shall be 1 mm larger in diameter than the required bolts. Excessive drifting that distorts the metal and enlarges the





mm over the nominal hole diameter is permitted, except for oversize or slotted holes.

Repairs to erected material will only be permitted after the repair procedure has been approved by the Engineer.

Filling of misplaced holes by welding is permitted only with the written approval of the Engineer.

Material intended for use in the finished structure shall not be used for erection or temporary purposes unless such use has been shown on the Shop Drawings, erection diagram, or authorized by the Engineer.

Hammering that will damage or distort the members is not permitted.

Surfaces that will be in permanent contact shall be cleaned immediately prior to assembly.

The Contractor shall assume full responsibility for ensuring that all component stresses are within permissible limits at all stages of the construction work. The Contractor shall provide all necessary additional steel reinforcement, bracing or other measures required to ensure that the erection procedures do not overstress any temporary or permanent member or component at any stage of the Work.

- g) **Alignment and Camber:** The structural steel girders shall be erected to the proper alignment in plan and in elevation, taking into account the dead load camber shown on the Drawings. Members shall be aligned to the dimensional tolerances specified but in no case, shall it deviate by more than 50 mm from the theoretical location. Alignment shall be measured from survey lines joining the ends of any test length of a member.
- h) **Temporary Bracing:** The Contractor shall be responsible for the design, supply, installation and removal of all:
- 1 erection bracing;
  - 2 temporary wind bracing;
  - 3 lateral stability bracing; and
  - 4 longitudinal ties as may be required during and immediately following the erection of structural steel girders. The bracing shall be designed and installed so that it will not interfere with the installation of steel diaphragms.
- i) **Lifting Devices:** After the Engineer has approved the erection positions of the girders, all lifting devices shall be removed to the satisfaction of the Engineer.
- j) **Connections:** Holes made in the field shall be drilled or reamed. Shop reamed holes shall not be re-reamed in the field. At the time of erection, all splice plates shall be free of loose mill scale, burrs, and all contamination such as drilling shavings, oil, dirt, and paint. Surfaces to be in permanent contact shall be cleaned immediately prior to assembly. Any error in shop fabrication or any deformation resulting from handling or transportation that prevents the proper assembly and fitting of parts, especially splices of main structural members, shall be reported and the proposed method of correction shall be submitted to the Engineer. Corrective measures shall not commence until the submitted proposal is accepted by the Engineer.
- k) **Cantilever Erection:** When members or components to be erected will be cantilevered, splices that support the cantilevering member or component shall be fully bolted before extending.





- l) **Attachments:** The use of tack welds for securing temporary or permanent attachments that are not shown on submitted Shop Drawings, erection drawings or fabrication drawings shall not be permitted on any portion of girders or any other structural members.
- m) **Field Welding:** The welder undertaking field-welding shall be a certified /qualified for Fabrication of Structural Steel.
- n) **Bolted Construction:** Bolt heads shall be located on the outside faces of exterior girder webs. Bolt heads in field splices for box girders shall be located on the exterior surfaces.
- o) **Removal of Faisework and Site Clean-up:** Upon completion of the erection and before final acceptance, the Contractor shall remove all temporary falsework.

He shall remove all piling, excavated or surplus materials, rubbish and temporary supports, replace or renew any damaged fences, and restore in an acceptable manner all property damaged during the execution of the Work. Disposed of surplus materials shall be in a manner and at a location satisfactory to the Engineer. The Contractor shall leave the bridge site, roadway and adjacent property in a neat restored and presentable condition, satisfactory to the Engineer. When requested by the Engineer, the Contractor shall provide written evidence that affected property owners and/or regulatory agencies have been satisfied.

- p) **Protection of Concrete Components:** If the coating system is to be applied in the field, the substructure shall be protected during construction against rust-staining by water runoff until the structural steel has been coated.

### 3.13.11 Quality Management

After all of the structural steel has been erected, the Engineer and the Contractor shall conduct a final inspection to locate any damage or deficiencies. All visible damage or any deficiencies shall be repaired to the satisfaction of the Engineer before final approval.

End of Part 2



PART - 3  
(DIVISION-4)  
MASONRY WORKS

4.1. PRECAST CEMENT CONCRETE SOLID BLOCK MASONRY

4.1.1 Related Documents

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

4.1.2 Description of Work

Extent of each type of masonry work is indicated on drawings and schedule.

4.1.3 Concrete Blocks

Concrete masonry blocks shall be locally made and shall be in sizes required by the drawings and / or as directed by the Engineer.

The blocks shall be solid machine moulded constructed with a concrete mix of one part Ordinary portland cement, three parts of sand, and six parts of dry and properly screened aggregates (not exceeding (0.68" size) or one part Ordinary portland cement, and seven parts of dry and properly screened aggregates (not exceeding (0.68" size). Water used shall be clean and potable water from city supply, or tube well. The blocks shall be worked into the moulds, vibrated, tamped and pressed to ensure that these are dense and free from voids. All blocks shall be properly cured and dried thereafter before use in the Works.

When tested in accordance with B. S. 2028:1368 "Precast Concrete Blocks", the average compressive strength of any ten blocks picked at random after curing and drying shall be 1000 psi.

All blocks shall be true in line and face with square corners with dense faces of uniform appearance without voids, honeycomb, projections and shall be free from cracks, splits, chips, ragged edges or other defects detrimental to their use.

4.1.5 Delivery, Storage and Handling

- A. Deliver masonry materials to project in undamaged condition.
- B. Store and handle masonry units to prevent their deterioration or damage due to moisture, temperature changes, contaminates, corrosion or other causes.
- D. Store cementitious materials off the ground, under cover and in dry location.
- E. Store aggregates where grading and other required characteristics can be maintained.
- F. Store masonry accessories including metal items to prevent deterioration by corrosion and accumulation of dirt.



#### 4.1.6 Project Conditions

- A. Protection of Work: During erection, cover top of walls with heavy waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress.
- B. Extend cover: a minimum of 24" down both sides and hold cover securely in place.
- C. Do not apply uniform floor or roof loading for at least 12 hours after building masonry walls or columns.
- D. Do not apply concentrated loads: for at least 3 days after building masonry walls or columns.
- E. Staining: Prevent grout or mortar or soil from staining the face of masonry to be left exposed or painted. Remove immediately grout or mortar in contact with such masonry.
- F. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.
- G. Protect sills, ledges and projections from droppings of mortar.
- H. Hot Weather Requirements: Protect masonry work in hot weather to prevent excessive evaporation of mortar and grout. Provide artificial shade, wind-breaks and use cooled materials as required.

#### 4.1.8 Mortar and Grout Materials

- A. Portland Cement: ASTM C 150, Type I, or BS 12.
- B. Aggregates for Mortar: ASTM C 144, except for joints less than 1/4" use aggregate graded with 100% passing the No. 16 sieve.
- C. Aggregate for Grout: ASTM C 404.
- D. Water: Clean and potable.

#### 4.1.9 Masonry Cleaners

- A. Job-Mixed Detergent Solution: Solution of trisodium phosphate (1/2 cup dry measure) and laundry detergent (1/2 cup dry measure) dissolved in one gallon of water.

#### 4.1.10 Mortar and Grout Mixes

- A. General: Do not add admixtures including colouring pigments, air-entraining agents, accelerators, retarders, water repellent agents or other admixtures, unless otherwise indicated.

Do not use calcium chloride in mortar or grout.





- B. Mixing: Combine and thoroughly mix cementitious, water and aggregates in a mechanical batch mixer, comply with referenced ASTM standards for mixing time and water content.
- C. Mortar for Unit Masonry  
Use Type 1.4 cement sand mortar for masonry, unless otherwise indicated.
- D. Grout for Unit Masonry: Comply with ASTM C 476 for grout for use in construction of reinforced and non-reinforced unit masonry. Use grout of consistency indicated or if not otherwise indicated, of consistency (fine or coarse) at time of placement which will completely fill all spaces intended to receive grout.  
  
Use fine grout in grout spaces less than 2" in horizontal direction, unless otherwise indicated.  
  
Use coarse grout in grout spaces 2" or more in least horizontal dimension, unless otherwise indicated.

#### 4.1.11 Installation, General

- A. Do not wet: Concrete masonry units.
- B. Cleaning Reinforcing: Before placing, remove loose rust and other coatings from reinforcing.
- D. Thickness: Build masonry construction to the full thickness shown. Build single-way the walls to the actual thickness of the masonry units, using units of nominal thickness indicated.
- E. Build chases and recesses as shown or required for the work of other trades. Provide not less than 8" of masonry between chase or recess and jamb of openings, and between adjacent chases and recesses.
- F. Leave openings for equipment to be installed before completion of masonry work. After installation of equipment, complete masonry work to match work immediately adjacent to the opening.
- G. Cut masonry units: Provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining work. Use full-size units without cutting where possible.
- H. Matching Existing Masonry Work: Match coursing, bonding, colour and texture of new masonry work with existing work.

#### 4.1.12 Construction Tolerances

- A. Variation from Plumb: For vertical lines and surfaces of columns, walls and arrises do not exceed 1/4" in 10', or 3/8" in a story height, nor 1/2" in 40' or more. For external corners, expansion joints, control joints and other conspicuous lines, do not exceed 1/4" in any story or 20' maximum, nor 1/2" in 40' or more. For



vertical alignment of head joints do not exceed plus or minus 1/4" in 10', 1/2" maximum.

- B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines, do not exceed 1/4" in any bay or 20' maximum, nor 1/2" in 40' or more.
- C. Variation of Linear Building Line: For position shown in plain and related portion of columns, walls and partitions, do not exceed 1/2" in any bay or 20' maximum, or 3/4" in 40' or more.
- D. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus 1/4" or plus 1/2".
- E. Variation in Mortar Joint Thickness: Do not exceed bed joint thickness indicated by more than plus or minus 1/8", with a maximum thickness limited to 1/2". Do not exceed head joint thickness indicated by more than plus or minus 1/8".

#### 4.1.13 Laying Masonry Walls

- A. Layout walls in advance for accurate spacing of surface bond patterns with uniform joint widths and to accurately locate opening, movement-type joints, returns and offsets. Avoid the use of less-than-half-size units at corners, jambs and wherever possible at other locations.
- B. Lay-up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other work.
- C. Pattern Bond: Lay exposed masonry in the bond pattern shown or, if not shown, lay in running bond with vertical joint in each course centred on units in courses above and below. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2". Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4" horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Rack back 1/2-unit length in each course; do not tooth. Clean exposed surfaces of set masonry, wet units lightly (if required) and remove loose masonry units and mortar prior to laying fresh masonry.
- E. Built-in Work: As the work progresses, build-in items specified under this and other sections of these specifications. Fill in solidly with masonry around built-in items.

Fill space between steel frames and masonry solidly with mortar.

Fill cores in hollow masonry units with grout in 3 courses under bearing plates, beams, lintels, posts and similar items.

#### 4.1.14 Mortar Bedding and Jointing

- A. Lay Hollow Concrete Masonry Units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar. In starting course, spread out full mortar bed including areas under cells.





- B. Maintain joint widths shown, except for minor variations required to maintain bond alignment. If not shown, lay walls with 3/8" joints.
- C. Cut joints flush for masonry walls which are to be concealed or to be covered by other materials, unless otherwise indicated.
- D. Tool exposed joints slightly concave using a jointer larger than joint thickness, unless otherwise indicated.
- E. Remove masonry units disturbed after laying; clean and reset in fresh mortar. Do not pound corners or jambs to shift adjacent stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar and reset in fresh mortar.
- F. Collar Joints: After each course is laid, fill in vertical longitudinal joint between solidly and with mortar.

#### 4.1.15 Horizontal Joint Reinforcement (where indicated)

- A. Reinforce masonry openings greater than 1' wide with horizontal joint reinforcement placed in 2 horizontal joints approximately 8" apart, immediately above the lintel and below the sill. Extend reinforcement a minimum of 24" beyond jambs of the opening.

#### 4.1.16 Lintels

- A. Install lintels where indicated.
- B. Provide minimum bearing of 8" at each jamb, unless otherwise indicated.

#### 4.1.17 Field Quality Control

- A. Contractor shall employ, at his own expense, a testing laboratory experienced in performing types of masonry field quality control tests for masonry indicated.
- B. Test Methods

Unit Tests: For each type and grade of unit indicated, test units by methods of sampling and testing of ASTM C 140 except select 5 units at random for each 9000 sq. ft. or fraction thereof installed.

Mortar Tests: For each type indicated, test mortar by methods of sampling and testing of ASTM C 780. Conduct tests no less frequently than that required to evaluate mortar used to install each increment of masonry units indicated above from which samples are taken for testing.

Report test results in writing and in form specified under each test method, to Engineer and Contractor, on same day tests are made.

Evaluation of Quality Control Tests: Masonry work, in absence of other indications of non-compliance with requirements, will be considered





satisfactory if results from construction quality control tests comply with minimum requirements indicated.

#### 4.1.18 Repair, Pointing and Cleaning

- A. Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Point-up all joints including corners, openings and adjacent work to provide a neat, uniform appearance, prepared for application of sealants.
- C. Final Cleaning: After mortar is thoroughly set and cured, clean masonry as follows:  
  
Remove large mortar particles by hand with wooden paddles and non-metallic scrape hoes or chisels.  
  
Test cleaning method on sample wall panel; leave 1/2 panel uncleaned for comparison purposes. Obtain Engineer's approval of sample cleaning before proceeding with cleaning of masonry.
- D. Protection: Provide final protection and maintain conditions in a manner acceptable to installer, which ensures unit masonry work being without damage and deterioration at time of substantial completion.

## 4.2 BRICK WORK

### 4.2.1 Scope of work:

The work covered under this specification pertains to procurement of best quality locally available clay bricks and workmanship of building peripheral building envelop walls of various thicknesses in strict compliance with the specifications and applicable drawings.

### 4.2.2. Materials :

Brick shall be best quality locally available bricks, well burnt, hard, sound, square, clean similar to the product of Rahimyar Khan A-1 Quality Bricks as approved by the Engineer before incorporation in the work.

Facing Bricks for fair faced works to be "selected", with uniformity in evenness, texture, sharpness and colour. These shall be similar to the A-1 Quality GUTKA BRICK product of Butt Brother Bricks Co of Lahore, Pakistan and as approved by the Engineer before incorporation in the work.

Any 'cracked' brick and the bricks with high sulphate content should be rejected. The Engineer shall have the right to reject bricks obtained from any field where the soil have an appreciable quantity of sulphates and chlorides.



The nominal size of bricks (F.P.S) shall be as shown on drawings and as mentioned in the BOQ.

Permissible tolerance on dimensions shall be + 3mm. in length and + 1.5 mm in width / thickness. The contractor shall get approved the sample and source of bricks from the Engineer before procurement on large scale and shall maintain the same for the entire work.

Bricks shall be of A minimum crushing strength of not be less than 35 kg/sq cm and water absorption shall not be more than 25% by weight.

Bricks shall be thoroughly soaked in water before using till the bubbles ceases. No half or quarter brick shall be used except as closer. The closers shall be cut to required size and used near the end of the walls. The walls shall be raised truly to plumb.

The type of bond and the layout pattern shall be as shown on drawings and as decided by the Engineer.

#### 4.2.3. Workmanship :

The brick work shall be laid in 1:6 cement sand mortar, unless otherwise stated, and reinforced with M S Tie Bars . Tied to concrete columns, beams, walls etc.

The specifications for cement, sand and water shall be the same as described herein before under cement concrete. Cement and sand shall be thoroughly mixed in dry state on a pacca platform or on metallic sheets or trough Water shall be added in sufficient quantity to make the mortar workable. Water shall be added in a manner so that segregation of cement does not take place. Mixing of mortar shall produce a homogenous workable mass.

The brick work shall be kept wet for at least 7 days.

Erect no masonry when the ambient temperature is 40 degree centigrade except by permission. Build upon no frozen work and lay no masonry having a firm of frost on their surfaces.

Should cuts be required in walls for the passage of conduit etc. the entire cut out shall be filled with mortar.

All joints shall be thoroughly flushed with mortar of mix as specified and at every courses. Care shall be taken to see that the bricks are bedded effectively and all joints completely filled to the full depth

The joints of brick work to be plastered shall be raked out to a depth not less than 10mm as the work proceeds. The surface of brick work shall be cleaned down and wiped properly before the mortar sets.

The adhesion between the brick masonry surface and the concrete surface of columns, beams, chajjas, lintels etc. should be proper by ensuring that the concrete surface coming in contact with brick masonry is backed / chipped / keyed, cleaned and cement slurry is applied so that a proper bond is achieved between the two dissimilar materials.





It is the responsibility of the contractors to ensure that there will not be any cracks / fissure anywhere in the brick masonry. In case the cracks appear subsequently in those areas, they should be made good by cement grouting or epoxy putty grouting/ poly sulphide compound grouting or as per standard modern specifications/methods with the prior approval of the Engineer at the cost of the contractor.

All the courses shall be laid truly horizontal and all vertical joints shall be truly vertical. Specified mortar of good and approved quality shall be used. Lime shall not be used where reinforcement is provided in brick work. The mortar should completely cover the bed and sides of the bricks. Proper care should be taken to obtain uniform mortar joint throughout the construction. The walls should be raised uniformly in proper, approved bond. In construction of the wall, first of all two end corners are carefully laid to line and level and then the in-between portion is built, with a cord stretching along the headers or stretchers held in position at the ends for keeping the alignment of the courses and maintaining them in level. Similarly all other courses are built. Care shall be taken to keep the preponds properly aligned within following maximum permissible tolerances :

Deviation from vertical within a storey shall not exceed 6mm per 3 m height

Deviation in verticality in total height of any wall for building more than one storey in height shall not exceed 12.5 mm.

Deviation from position shown on plan of any brick work shall not exceed 12.5 mm.

Relative displacement between load bearing wall in adjacent storeys in the ended to be vertical alignment shall not exceed 6mm.

A set of tools comprising of wooden straight edge, masonry spirit level, square, 1 meter rule line and plumb shall be kept on the site of work for every 3 masons for proper check during the progress of work.

Brick work shall be carried up in a uniform manner. No portion shall be raised more than 3 feet above another at the same time. Temporary spaces left during construction shall be stepped and not toothed. Straight edges supplied to brick layer shall have courses marked on them with saw cut or measuring rod shall be provided and layer of courses shall be checked all over the building from time to time so as to help all courses level.

The brick work laid in cement mortar shall be water cured by keeping it wet for at least 10 days.

If and where required, hold-fasts and similar fixtures shall be built in with in surrounding brick work in their correct position in specified mortar. They shall be built in as the work progresses and not inserted later on into space left for them. Install reinforcing bars anchors projecting into the masonry a minimum of 6" and into the facing brick a minimum of 3" bars during the construction at 18" centres vertically and 36" horizontally.





All brick work laid during the day shall be properly covered up at night as directed by the Engineer. All brick work shall be protected during construction from the effect of rain and frost or any natural forces.

Should any brick work be damaged, the brick work shall, at the discretion of the Engineer, be pulled down and made good at the cost of the contractor.

Finally clean all brick work, specially the facing bricks, with the cleaning chemicals/materials as recommended by the brick manufacturers, to the satisfaction of the engineer.

End of Part 3



**PART - 4**  
**(DIVISION-5)**  
**METAL WORKS**

**5.01 Description of Works**

Definition: Metal fabrications include items made from iron and steel shapes (Including Stainless Steel where shown/required), plates, bars, strips, tubes, pipes and castings which are not a part of structural steel or other metal systems specified elsewhere.

Extent

Work in this section includes, but not limited to the following metal fabrications as required, and shown on drawings/mentioned in BOQ and / or as directed by the Engineer, complete with all fittings and accessories including but not limited to handles, tower bolts, heavy duty door hinges, dead-locks, etc.:

1. Hollow Metal Door Frames
2. M.S. Grill / Panel Doors
3. M.S. Gates
4. Floor Gratings
5. Staircase Railing
6. Rungs and Miscellaneous Items

All items of metal works shall be fabricated, supplied and installed as detailed on the drawings.

**5.02 Quality Assurance**

Fabricator and Installer Qualification: Arrange for fabrication and installation of metal fabrication by a firm which can demonstrate successful experience in Metal Fabrication items similar in type and quality to those required for this project.

**5.03 Materials**

Steel Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled.

Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.\* The coating weight shall meet or exceed the minimum requirements for coatings having 0.4 oz/ft<sup>2</sup> (122 g/m<sup>2</sup>)

Metal Surfaces, General For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.

Steel Plates, Shapes and Bars: ASTM A 36.



Steel Pipe: ASTM A 53, Type and grade (if applicable) as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated, standard weight (schedule 40), unless otherwise indicated.

Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported element, unless otherwise indicated.

Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A 153.

Handrail: Standard weight. Steel pipe (schedule 40) unless otherwise indicated.

Fasteners: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.

Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.

Masonry Anchorage Devices: Expansion bolts as manufactured by 'FISCHER' or 'HILTI'. Submit selected expansion bolt data for Architect's acceptance prior to incorporation in project.

Lock Washers: Helical spring type carbon steel

#### 5.04 Fabrication, General

Workmanship: Use materials of size and thickness indicated or, if not indicated, as required to produce strength and durability in finished product for use intended. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of work.

Corrosion Protection: Coat concealed surfaces which will be in contact with concrete, masonry, wood or dissimilar metals, in exterior work and work to be built into exterior and below grade walls and decks, with a heavy coat of bituminous paint. Do not extend coating onto exposed surfaces.

Fabricate steel pipe railings and handrails to design, dimensions, and details indicated. Provide railings and handrails members formed of pipe of sizes and wall thickness indicated, but not less than that required to support design loading. Finish to be as per drawings and specifications.

Arrange for fabrication and installation by a firm which can demonstrate successful experience in Metal Fabrication items similar in type and quality to those required for this project.

Use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness and submit one set of representative samples of materials and finished products, for approval of Architect.

Take field measurements prior to fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before





Steel Pipe: ASTM A 53, Type and grade (if applicable) as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated, standard weight (schedule 40), unless otherwise indicated.

Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported element, unless otherwise indicated.

Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A 153.

Handrail: Standard weight. Steel pipe (schedule 40) unless otherwise indicated.

Fasteners: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.

Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.

Masonry Anchorage Devices: Expansion, bolts as manufactured by 'FISCHER' or 'HILTI'. Submit selected expansion bolt data for Architect's acceptance prior to incorporation in project.

Lock Washers: Helical spring type carbon steel

#### 5.04 Fabrication, General

Workmanship: Use materials of size and thickness indicated or, if not indicated, as required to produce strength and durability in finished product for use intended. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of work.

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Fabricate steel pipe railings and handrails to design, dimensions, and details indicated. Provide railings and handrails members formed of pipe of sizes and wall thickness indicated, but not less than that required to support design loading. Finish to be as per drawings and specifications.

Arrange for fabrication and installation by a firm which can demonstrate successful experience in Metal Fabrication items similar in type and quality to those required for this project.

Use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness and submit one set of representative samples of materials and finished products, for approval of Architect.

Take field measurements prior to fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before



fabrication might delay work and install as per local practise acceptable to the Architect.

Corner Column Guards: Unless otherwise stated provide 2" x 2" x 1/4" thick M. S. angle fixed to column as shown on drawings or as directed by the Architect. Guards to be primed and enamel painted as directed by the Architect.

#### 5.05 Execution

Preparation/Installation: Take field measurements prior to fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work and install as per local practise acceptable to the Architect.

Painting: Immediately after erection, clean field welds, bolted connections, and prime and undercoat all abraded areas of shop paint as specified in Section-09900 of 'Painting'.

Touch-Up Painting: Cleaning and touch-up painting of field welds, bolted connections and abraded areas of the shop paint on miscellaneous metal is specified in Section of 'Painting'.

#### 5.06 Painting.

Painting as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.

Paint exposed surfaces in colours as shown or as directed by the Engineer instructions and as herein specified, in the section of painting of surfaces.

End of Part 4



fabrication might delay work and install as per local practise acceptable to the Architect.

Corner Column Guards: Unless otherwise stated provide 2" x 2" x 1/4" thick M. 5 angle fixed to column as shown on drawings or as directed by the Architect. Guards to be primed and enamel painted as directed by the Architect.

#### 5.05 Execution

Preparation/Installation: Take field measurements prior to fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work and install as per local practise acceptable to the Architect.

Painting: Immediately after erection, clean field welds, bolted connections, and prime and undercoat all abraded areas of shop paint as specified in Section-09900 of 'Painting'.

Touch-Up Painting: Cleaning and touch-up painting of field welds, bolted connections and abraded areas of the shop paint on miscellaneous metal is specified in Section of 'Painting'.

#### 5.06 Painting

Painting as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.

Paint exposed surfaces in colours as shown or as directed by the Engineer instructions and as herein specified, in the section of painting of surfaces.

End of Part 4





### 7.1.6 Application

Spread two coats of Material at the required quantity in a slurry consistency with a roofer's brush. Brush thoroughly and evenly, working into the sub strat. Apply the second coat whilst the first coat is tacky and has not dried out.

### 7.1.7 Curing and Protection

In exterior or exposed areas: Keep material damp for minimum three days. Protect areas exposed to the weather from sun, wind and frost, e.g. with polythene sheets, canvas, etc. Rewet the areas in intervals with water, starting one day after application. Fresh coating should be protected from rain at least for 24 hours. Backfilling can take place three days after the last coat. In the interior areas with high humidity, the material can cure well. In relatively dry areas, keep the coating damp for three days. Ensure that there is adequate ventilation for 24 hours in areas of poor ventilation.

### 7.1.8 Performance Requirements and Warrantee

Waterproofing systems and accessories specified in this section shall be provided and guaranteed, or approved by the manufacturer. It is required that complete treatment system be watertight and should not deteriorate in excess of limitations recommended by manufacturer. Contractor shall repair or replace (as required) deteriorated or defective work found at time of final inspection.

Upon completion of the Installation, submit to the Architect written certification by the manufacturer and Contractor that the representative of the waterproofing material manufacturer has supervised the work of this Section and that all materials were correctly installed and have passed final inspection and passed any testing required by manufacturer to obtain a complete manufacturers product/system warranty. Waterproofing manufacturer shall provide a letter certifying that all components and accessories provided by the contractor are acceptable and compatible with the waterproofing system.

## 7.2 INSULATION

### 7.2.1 Scope of Work

The Work covered in this section of the Specifications consists of furnishing all plant, labour, equipment, appliances and materials and performing all operations in connection with the supply and installation of:

- a) Peripheral Cavity Wall Insulation.
- b) Roof Insulation.

### 7.2.2 Insulation Material/Product

Subject to compliance with requirements as shown on drawings and as mentioned in the BOQ, provide and apply the following insulation material / products:

- i) Polystyrene Board Insulation: Hard, rigid, closed cell structure extruded polystyrene foam board, 50mm thick, minimum density 32 kg/m<sup>2</sup> having high resistance to water



b) Polyurethane spray foam insulation.

- Apply strictly in accordance with manufacturer's installation guidelines: complying with preparation methods outlined above
- Apply sprayed foam insulation in consecutive layers of not less than (12 mm) (½ inch) and not more than (50 mm) (2 inch) thick each to achieve total thickness required (total thickness as indicated per application. Avoid formation of sub-layer air pockets.
- Apply product in overlapping layers, so as to obtain a smooth, uniform surface.
- Maintain (75 mm) (3 inch) clearance around chimneys, heating vents, steam pipes, recessed lighting fixtures and other heat sources.
- Do not apply Product to inside of exit openings or electrical junction boxes.
- Test completed application daily for core density and cohesion/adhesion to substrate. Record results daily in daily work records.
- Maximum Variation in Applied Thickness shall be as recommended by the manufacturer
- Remove overspray from non-prescribed surfaces without causing damage to surfaces.

iv) Protection

- a) Protect completed installation per manufacturer's instructions.
- b) Protect completed installation from damage Repair as required.
- c) Any open flame or welding shall not be in contact with either Polystyrene Board or the Spray Polyurethane Foam.

## 7.3 ROOFING WORK

### 7.3.1 Roofing System

The roofing system shall be as per roofing detail shown on Drawing and as specified below for covering of the structural slab:

#### A) Spray Applied Insulation

Shall be polyurethane foam density 50mm thick applied onto a clean, dry, dust free surface as specified above by the manufacturer's specialist team.

#### B) Screed in Slope

P C C screed in slope, (minimum 1-1/2" thick at the lower end) having a cubical strength of 3000 psi at 28 days; not less than 1:2:4 concrete mix using DURACRETE fiber DCM-19 or DCF-19 as shown on drawings on top of the insulation.11.1 P C C screed in slope, (minimum 1-1/2" thick at the lower end) having a cubical strength of 3000 psi at 28 days; not less than 1:2:4 concrete mix using DURACRETE fiber DCM-19 or DCF-19 as shown on drawings on top of the insulation

#### C) Waterproofing on top of P C C screed in slope

Material - AQUAFIN-2C, (Product marketed by Millwala Building Products, Karachi)





A flexible, 2-component, polymer modified, cement-based waterproof protective coating. UV-stable, resists hydrostatic pressure (> 5 bars), abrasion resistant, self-curing, active barrier to Carbon Dioxide (CO<sub>2</sub>), provides flexible seamless protective coats and stands-up to pedestrian and light traffic.

**Application** - AQUAFIN-2C may be applied by brush, roller, trowel or appropriate compressed-air spray equipment by specialist's team as specified above.

The screed to receive the waterproofing shall be smooth, firm, clean and thoroughly dry before any waterproofing is commenced. Surface can be left brushed or smooth troweled, depending on type of application and manufacturer's instructions.

Seal horizontal wall-floor joints and internal vertical corners and repair static cracks and seal dynamic cracks and expansion joints as per manufacturer's recommendations.

Apply the second coat (or multiple coats) as soon as the first coat has sufficiently hardened or wait until next day.

Do not use in contact with alkali sensitive metals, such as copper, aluminum, galvanized or zinc treated metal. Protect and seal metal first with a Anti-corrosive primer.

**Protection** - Comply with manufacturer's instructions, except where more stringent requirements are shown or specified, and except where project conditions require extra precautions or provisions to ensure satisfactory performance of work.

The product is Self curing under normal conditions. Provide suitable protection against extreme weather. Do not expose the application to water during the setting time. If application is exposed to intense sunlight work against movement of sun. The cured application can be troweled over with rendering/ plaster after one day. Do not use in contact with alkali sensitive metals, such as copper, aluminum, galvanized or zinc treated metal. Protect and seal metal first with a Anti-corrosive primer.

#### D) Topping

12" X 12" X 1" thick clay tiles a product similar to Rahimyar Khan A-1 Quality Tiles as approved by the Engineers, shall be laid on top of the insulated surface on the roof as follows:

**Setting out:** the area to receive tiles shall be set out to correct alignment, gradients and cross-fall.

**Laying:** each tile shall be laid on 1" thick solid mortar under-bed, unless otherwise indicated, depths as specified or detailed. All adjacent vertical edges shall be mortared. Before each tile or paver is fixed to a slight concave bevel, check to insure correct alignment with adjacent tiles or pavers and that there is a no evidence of rocking or movement. Fill joints as soon as possible after tile are installed.

End of Part 5





PART 6  
(DIVISION 8)  
OPENINGS  
(DOORS, WINDOWS & VENTILATORS)

8.1 WOOD DOORS

Extent and location of each type of wood door is shown on drawings and in schedules.

Types of doors required includes Solid core flush wood doors with plastic lamination on both faces. Submit 12" x 12" sample in specified material, unfinished on one side and finished on other side.

Flush doors shall be obtained from an approved manufacturer or fabricated to the satisfaction of the Architect / Engineer if facilities exist with the Contractor. Cores shall be laid up with kiln dried core blocks glued together with resin glue, joints between blocks in adjacent rows to be staggered. Sheeshum wood edge strips, not less than 20mm thick, shall be applied to outer edge of stiles and rails at time cores are laid up. No end grain of wood is permitted to show anywhere and all exposed wood surfaces shall be polished and coated with final clear protective lacquer, Solignum Limited UK or equal to the satisfaction of the Architect / Engineer.

All flush doors so manufactured shall be allowed to season to remove excess moisture from glue before cross bandings and laminates are applied.

Cross banding on flush doors shall be 1/16" thick and be plate-dried before applying to cores to remove excess moisture. After cross banding have been applied to cores and before applying face veneers, they shall be sanded to insure a smooth surface before applying laminates.

Glues: Shall be Phenolresorcinol or Resorcinol resins.

Doors Frames shall be hollow metal door frames fabricated using first grade 16 gauge G.I. sheets free from all defects and shall be constructed as full welded units in profiles as shown on drawings.

Frame trim corners and door stops shall be mitered and continuously welded. Corner joint shall be well formed and in true alignment.

Rubber/Neoprene bumper or sound absorber shall be installed (3 per strike jamb). All contact edges shall be closed tight.

Finished work shall be strong and rigid, neat in appearance and free from defects, warps, bulges or buckles. Moulded members shall be clean cut, straight and true edges.

All cut-outs shall be protected from mortar/plaster. Put temporary restraints on frames to avoid misalignment in transportation and handling.



Installation Frames shall be installed in accordance with manufacturer recommendation and shall extend into the floor finish.

Frames shall be primed and enamel painted.

Fasteners and Anchorages Provide nails, screws and other anchoring devices of the type, size and finish required for application indicated to provide secure attachment, concealed where possible.

Hardware: All hardware shall be of acceptable brand and quality available. Each item shall be guaranteed non-corrosive and shall be of sufficient strength to suffice for the purpose for which it is to be used.

Hinges shall be 100mm (unless otherwise specified on drawings) of Stainless Steel with Stainless Steel pin and shall be used in sufficient quantities (per component) to ensure proper functioning of the component.

Handles where shown on drawings shall be best quality as approved by the Engineer / Architect.

Locks shall be of best available imported type for the said use as determined by design and the Engineer / Architect, installed to ensure complete locking.

Unless otherwise specified doors shall have mortice cylinder lockset double action thru bolt with Lever handle Yale/Corbin/Mandelli/Quickset make as shown on drawings or approved equal in Stainless Steel or any finish material selected by Engineer / Architect.

Door Closers shall be overhead mounting type, single control with door speed control as shown on drawings in aluminium finish.

Door Catchers where necessary, shall be best quality imported and approved by the Engineer / Architect.

Glass Door Closers if any, shall be floor flush mounted type of Yale, Ryobi or Star origin and locks shall be deadbolt type key operated as shown in drawings as approved by Engineer / Architect.

Screws shall be brass of approved finish and quality acceptable to Engineer.

Fitting Clearances: Provide clearances of 3mm at jambs and heads; 1.5mm per leaf at meeting stiles for pairs of doors; and 3mm from bottom of door to top of decorative floor finish or covering.

Institute protective measures as suitable and accepted by Engineer to assure that wood doors will be without damage or deterioration at time of subsequent completion and are clean in all respects.

Preservative treatment: Following basic fabrication liberally apply preservative in flood coats to all surfaces requiring treatment to ensure maximum absorptions. Subject to compliance with requirements provide products of Solignum Limited, U. K. or acceptable to Engineer.





## 8.2 ALLUMINIUM GLAZED DOORS, WINDOWS, VENTILATORS AND FIXED GLAZING

Extent and location of each type of door / glazing is shown on drawings and in schedules

Types of doors / glazing required are of Premium or Delux quality and includes frames of at least 2mm thick sections or as indicated on drawings.

Fabricate, supply and install aluminum fixed glazing as indicated on drawings, along with all related ancillaries as specified herein and required.

Framed glazing units for exterior doors and fixed panels shall be of the type with no water penetration when tested

Arrange supply and installation of Aluminum Entrances and Storefront system by a firm/s which can demonstrate successful experience in supplying and installation similar in type, quality and quantity to their required in this project.

Subject to compliance with requirements, provide products similar to those manufactured/marketed by

**Thermec, Engineering Company, ALUM-EX by Pakistan Cables LTD, KRUDDSON (Pvt) Ltd. or others subject to acceptability by Architect / Engineer.**

**Design Criteria:** Drawings indicate sizes, spacing of members, profiles and dimensional requirements of entrance and storefront work. Minor deviations will be accepted in order to utilize manufacturer's standard products when, in the Engineer's sole judgement, such deviations do not materially detract from the design concept or intended performances. Sections shall be minimum 2 mm thick.

**Aluminium Members:** Provide alloy and temper recommended by the manufacturer for strength, corrosion resistance, and application of required finish; comply with ASTM B 221 for extrusions and ASTM B 209 for sheet or plate.

**Fasteners:** Provide fasteners of aluminium, non-magnetic stainless steel, or other materials warranted by the manufacturer to be non-corrosive and compatible with aluminium components, hardware, anchors and other components.

**Brackets and Reinforcements:** Where feasible, provide high-strength aluminium brackets and reinforcements; otherwise provide non magnetic stainless steel or hot-dip galvanized steel complying with ASTM A 386.

**Concrete/Masonry Inserts:** Provide concrete and masonry inserts fabricated from cast-iron, malleable iron, or hot-dip galvanized steel complying with ASTM A 386.

**Compression Weather-stripping:** Provide the manufacturer's standard replaceable compressible weather-stripping gaskets of molded neoprene or molded PVC.





**Sliding Weather-stripping:** Provide the manufacturer's standard replaceable weather-stripping of wool, polypropylene, or nylon woven pile, with nylon fabric or aluminium strip backing.

**Glass and Glazing Materials:** Glass and glazing materials shall be generally as indicated on drawings and in thickness as follows:

6mm thick Clear or Tinted Float Glass as specified in BOQ/shown on drawings.

Provide primary glass which is clear transparent first quality free from speckles, bubbles and other defects and offers clear undistorted vision, including those indicated by reference to type, class and quality.

**Sizes:** Fabricate glass to sizes required for glazing openings indicated, with edge clearances and tolerances complying with recommendations of glass manufacturer. Provide thicknesses indicated in the drawings or, if not otherwise indicated, as recommended by glass manufacturer for application indicated.

**Sealant:** For sealants required within fabricated units, provide Dow Corning 781 or 787 or approved equal. Sealant shall remain permanently elastic, non-shrinking and non-migrating. Colour shall be as directed by Engineer.

### Components

**Glazed Panel, Framing System:** Provide inside-outside matched resilient framing system with provisions for glass replacement. Shop-fabricate and pre-assemble frame components where possible.

**Aluminium Door Frames:** Fabricate tubular and channel frame assemblies, as indicated, with welded or mechanical joints in accordance with manufacturer's standards; reinforce as necessary to support required loads.

**Glazing:** Fabricate doors to facilitate replacement of glass or panels, without disassembly of stiles and rails. Provide snap-on extruded aluminium glazing stops, with exterior stops anchored for non-removal.

**Hardware:** Provide manufacturer's heavy duty hardware units as indicated, scheduled, or required for operation of each door, including pivot sets, concealed floor closers, overhead concealed door closers, thumb turns, dead bolts, deadlatches, lever handles/door pulls and Push Plates/Pull handles etc. of sizes, number, and type as specified.

### Fabrication

**General:** Sizes of door and frame units, and profile requirements, are indicated on drawings. Variable dimensions are indicated, with maximum and minimum dimensions required to achieve design requirements and co-ordination with other work. Performance requirements, sag resistance and rigidity.

**Weather-stripping:** For exterior doors, provide compression weather-stripping against fixed stops, at other edges, provide sliding weather-stripping retained in adjustable strip mortised into door edge.



Gasket Provide EPDM or vinyl blade gasket weather-stripping in bottom door rail adjustable for contact with threshold.

#### Finishes

Natural aluminium finish or as specified/shown on drawings or as directed by the Architect/Engineer

#### Installation

Comply with manufacturer's instructions and recommendations for installation.

Set units plumb level, and true to line, without warp or rack of framing members, doors, or panels. Provide proper support and anchor securely in place.

Conduct on site test for water infiltration to exterior door and glazed panels only, in the presence of the windows manufacturer's Representative and the Engineer.

#### Cleaning

Clean the completed system, inside and out, promptly after installation, exercising Care to avoid damage to coatings.

**End of Part - 6**



**PART - 7**  
**(DIVISION 9)**  
**FINISHES**  
**(FLOORS, WALLS & CEILING COVERINGS)**

**9.1 CEMENT PLASTER WORK**

**9.1.1 Scope of work:**

The work covered under these specification consists of supplying all material for rendering all types of plaster / pointing finishes strictly in accordance with these specifications, applicable drawings and to the satisfaction of the Engineer.

Plastered ceilings and walls shall include partitions, piers, columns, pilasters, plastered jambs and other returns, reveals and backs of recesses, alcoves, and jambs and heads of windows and doors, unless otherwise specified or shown on Drawings. Plaster on walls shall be carried down to Dado, Skirting and projection bases. Plaster work shall also include all plaster work on and under all concrete surfaces to be left exposed and concrete not required Fair Faced, until and unless specified otherwise. It would be the CONTRACTOR's responsibility to ensure that all electrical conduits, hidden or items to be embedded, ducts, pipes, brackets, doors, windows, ventilators and all other fixtures on walls, ceiling, columns or required elsewhere have been fixed in place before the plastering is started.

**9.1.2 Material**

Plaster work shall be of portland cement and shall be mixed in mechanical mixers unless otherwise approved by the Engineer in the following proportions by volume:

One (1) part cement and Four (4) parts sand

Cement, and sand required for the work shall conform to specifications laid down herein before under section cement concrete

Water shall be clean, free from harmful amounts of deleterious matter and from any unusual proportion of dissolved salts. Sea water, tidal estuary or brackish water shall not be used.

Metal lathing used as back ground for plastering should not weigh less than three (5) lbs/sq. yard for sanded plaster and (3) lbs/sq. yard for light weight gypsum plasters and shall comply with B.S. 1369 Metal Lathing (steel) for Plastering.

Metal lathing minimum 8" wide to be fixed at the junction of RCC elements and block brick work shall be fixed by galvanized nails or staples at 4" centres. End laps shall not be less than 1" when laps occur in the bearers and not less than 2" when the laps occur bet ween bearers. They shall not occur at angles or grooves and shall preferably occur only at supports. The sheets shall be lapped and securely tied together with 18 SWG galvanized tie wire.

Galvanized wire netting where required to provide a mechanical key, 22 SWG galvanized wire netting of mesh not greater than 2" and complying with BS 1485.





'Galvanized Wire Netting' shall be used where necessary and as required by the Engineer.

### 9.1.3 Workmanship

The surface to be plastered shall first be thoroughly cleaned of all muck and cleaned down. All joints shall be raked to in case of brick work / stone masonry and closely hacked in case of concrete as the work proceeds. The surface to be plastered shall be well wetted for a minimum period of 6 hours before commencing to work.

Before commencement of plastering work, top most junctions / joints / sides with beam / column shall be thoroughly packed with cement mortar to prevent cracks.

Before commencement of plastering operation, the contractor shall ensure that all the service pipes, electrical conduits, boxes, switch boxes etc. have been installed in position by other agencies and the plastering surface is duly approved by the Engineer, in order to enable other service contractors to fix the electrical conduit boxes, EDB's, pipes, outlets etc. in proper level and line with reference to the finished surface of the plaster.

The finished plaster patches shall be given by the main civil contractor on walls, ceiling at regular intervals well in advance of his plaster work at no extra cost to the Employer.

Just before actual plastering work is taken up in hand, all the ceilings and walls etc. shall be marked with plaster buttons indicating the thickness of plaster required and which shall be in true line, level and plumb. The contractor shall get these marks approved by the Engineer before starting the plastering work. The contractor shall also be responsible to render final surface true to line, level and plumb.

Two coats of plaster shall be used on masonry where thickness is more than 13mm. The second finish coat shall not be applied until the first coat has seasoned for two days. Plaster shall not be applied when the surrounding temperature is below 40 ° F.

Plaster developing cracks, blisters, checks or discolouration shall not be accepted and shall be removed and replaced by the Contractor with that approved by the Engineer.

Damage if caused to any of the existing fittings, fixtures, including doors and windows etc. during the plastering operation shall be made good by the contractor at his own cost.

If the surface which is to be plastered either internally or externally is out of plumb and not in line and level and if the plastering to be done is more than specified thickness to bring the plastered surface to perfect line and levels in such specific cases, chicken wire mesh is to be provided by the contractor at his own cost and the plaster should be done to required line and level with no extra cost whatsoever.



The minute gap between window / door frames with cills and jambs should be filled up / caulked by plaster of Paris / epoxy putty / silicon sealants. Rubber based sealants by caulking guns or by approved methods as instructed / approved by the

The finished surface shall be true and even and present uniform texture throughout and all joining marks shall be eliminated. All corners, edges and angles shall be made.

## 9.2 FLOOR & WALL TILING WORKS

### 9.2.1 Scope

The work included in this section shall comprise of fixing in position tiles on floors and walls wherever shown on the drawings and/or mentioned in the Bill of Quantities in patterns and shades as instructed and approved by the Architect.

- Cement Concrete Tiles
- Terrazzo Tiles.
- Porcelain Tiles
- Ceramic Tiles
- Clay Tiles.

### 9.2.2 Tile Material

#### 9.2.2a Cement Concrete Tiles

Cement Concrete tiles shall be Premium quality square edge, locally available tiles, similar to the Terra Tiles product of Matrixx Company, Karachi, Pakistan

Cement concrete tiles shall be manufactured using wet casting methodology, to produce high performance concrete in proportions of white cement, coarse aggregates and fine aggregate, comprising of silica sand, achieving uniformity of strength, consistency, and appearance.

The manufacturer/supplier shall submit on demand, the tile's factory test results to confirm the following values:

- Transverse Strength: 4.46 N / mm<sup>2</sup> (minimum required 3 N / mm<sup>2</sup>)
- Absorption: ±1.8% (maximum allowed 8 %)

Pre-cast concrete units shall be delivered on site free from any damage and shall be stored in a manner that will minimize potential damage.

Upon delivery to the jobsite all pre-cast concrete units shall be inspected by the Engineer for quality and final acceptance.

#### 9.2.2b Terrazzo Tiles

Terrazzo tiles shall be Premium quality square edge, locally available tiles, similar to the product of Matrixx Company, Karachi, Pakistan

The tiles shall be wet mix of white or white blended with colored cement or white cement with a color pigment added and granular terrazzo aggregates applied through out the tile to provide a monolithic finish.





The tiles shall of 300 x 300 mm size unless otherwise specified, with typical thickness of 19 mm with size tolerance of  $\pm 0.5$  mm, having strength of greater than 3 N / mm<sup>2</sup> and water absorption of less than 8 %

#### 9.2.2c Porcelain Tiles

Porcelain Tiles shall be Premium quality, laser-cut, square edge, imported, locally available Porcelain Enamel Tiles similar to the product of SHABBIR TILES, KARACHI, approved by the Architect and laid in color, pattern and sizes as indicated on drawings and approved by the Architect.

#### 9.2.2d Ceramic Tiles

Ceramic Tiles shall be best quality local made glazed/matt ceramic tiles similar to the product of SHABBIR TILES, KARACHI, approved by the Architect in approved size and pattern wherever required or shown on the drawings or mentioned in the Bill of Quantities, and laid in color, pattern and sizes approved by the Architect.

#### 9.2.2e Clay Tiles

Shall be as specified under the Section of Roofing

#### 9.2.3 Tile Samples and Tests

All Tiles shall be subject to approval of samples by the Architect. The tile samples shall be furnished in sizes and colours, adequate in number for testing in the laboratory as and when required by the Architect/Engineer.

#### 9.2.4 Tile Laying, Jointing and Grouting

Notwithstanding anything written hereunder, the manufacturer's recommendations and printed instructions if any, regarding laying of tiles shall be strictly followed.

The surface of the base shall be clean and free of dirt, dust, oil, grease or other objectionable matter. The base surface shall be level and true in both directions. To form good key with the bedding mortar of tiles the base shall be scoured or scratched and cross hatched. The Tile-Work into recesses and under or behind equipment and fixtures, to form a complete covering without interruptions, except as otherwise shown. Terminate work neatly at obstructions, edges and corners without disrupting pattern or joint alignments.

Tiles that are out of true plain or misplaced shall be removed and reset. Damaged or defective tile shall also be replaced BY THE Contractor at his own cost

#### Tile Grout/ Mortar Bed

All Tiles shall be laid to the required lines, levels and grades over a setting bed of cement sand mortar comprising of 1 part of cement and 4 parts of sand by volume or with an approved Dry Bond Thin Set Mortar suitable for the purpose as specified in BOQ and as directed by the Architect.





After a minimum period of 24 hours, polishing shall be carried out wet by means of a No. 140 carborundum stone.

Terrazzo skirting 100 mm or 200 mm higher with chamfered top edge shall be produced in the same way as for tiles using the same mixes. Terrazzo tiles shall be laid and bedded with adhesive tile bond premix of approved quality on concrete sub-floor (1:4 cement and sand screed, 25mm thick). All tiles shall be laid with square joints.

All tiles shall be flouted up on completion. Care being taken to fill all joints completely.

The grout shall consist of neat cement of a color to match the tiling. Any surplus grout shall be cleaned of the face of the tiling and surrounding surfaces immediately and all tiling shall be carefully cleaned off.

All terrazzo surfaces shall be polished on completion. Large area such as floors shall be wet polished by means of approved machines using No. 140 carborundum wheel.

Any surface too small for conventional machine polished may be polished by hand using a No. 140 carborundum stone and water. Care must be taken during any polishing operation not to damage any angles or arises.

Terrazzo covering to items such as sills, thread and risers to steps skirting, etc shall generally be applied in accordance with the foregoing specification.

#### 9.2.5 Cleaning and Protecting the Tile work in Place

Upon completion of placement and grouting, clean all surfaces so that they are free of foreign material. Remove all Cement and grout residue as soon as possible. The joints shall be thoroughly cleaned with wire brush and pointed with neat joint filler of the same color as the tile.

Protect the work at all times and avoid damage to adjacent finished surfaces by covering the finished surface adequately. Completed installation shall be free of any pitted, chipped, cracked or scratched tiles.

### 9.3 VINYL FLOOR COVERING

#### 9.3.1 Material

Vinyl Floor Covering shall be homogeneous single layered vinyl flooring, slip resistant suitable for Nursery & Kindergarten Class Rooms, minimum 3mm thick in 2m wide rolls or tiles of sizes: 12" x 12" (30.5 cm x 30.5 cm) as shown on Drawings and specified in the BOQ,

The product shall be similar to the product of Tarkett Optic Acoustic Vinyl Flooring as marketed by Messrs. FIRST FOOR, Karachi and shall be layed/installed strictly in accordance with the manufacturer's recommendations and by their recommended specialist with the tools and accessories as required/recommended.



### 9.3.2 Cleaning And Protection

- A Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B Perform the following operations immediately after completing resilient product installation:
  - i) Remove adhesive and other blemishes from exposed surfaces.
  - ii) Sweep and vacuum surfaces thoroughly.
  - iii) Damp-mop surfaces to remove marks and soil.
- C Protect resilient products from marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

## 9.4 ELASTIC PLAY FLOOR COVERING

### 9.4.1 Material

Elastic floor covering material shall be suitable for indoor and outdoor children's play-court activities. The material shall be seamless, non-porous and smooth surface, resistant to typical variations of outdoor influences such as moisture, UV rays and temperatures and should have a lasting performance through outstanding mechanical strength and wear resistance, suitable for easy maintenance, repair and resurface procedures. It should be a non-glare surface for clear visibility of the durable line available in a range of colors with outstanding colour fastness. The color shall be as selected by the Architect.

The Product shall be similar to the product of **PUlastic Comfort Court 50** as manufactured by **DESSO** and marketed by **T.S. Builders (PVT) Ltd. Karachi** and shall be laid/installed with the tools and accessories as required and recommended.

### 9.4.2 Cleaning And Protection

- A Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B Perform the following operations immediately after completing resilient product installation:
  - i) Remove adhesive and other blemishes from exposed surfaces.
  - ii) Sweep and vacuum surfaces thoroughly.
  - iii) Damp-mop surfaces to remove marks and soil.
- C Protect resilient products from marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.





## 9.5 GRANITE/STONE WORKS

### 9.5.1 Scope

Work includes supplying and laying granite/stonework in types, sizes and shades as mentioned in BOQ and as shown on drawings.

- i) Granite/Stone work includes but is not limited to any of the following as applicable -

Granite on RCC Benches  
Planters  
Counter-Tops

- ii) Chakwal Stone work includes but is not limited to nosing on staircase steps.

Obtain all granite/stone from quarry/supplier acceptable to Architect/Engineer with consistent colour range and texture, veining sizes and finishes throughout the work to match Architect's Sample. All supplies will be subject to random check by the Engineer.

For stone/granite precision accuracy of size and squareness must be within a maximum tolerance of  $\pm 0.5$  mm. All edges must be evenly and uniformly leveled and glossy.

For all work pre-polished surfaces must have "mirror-like" finish through, i.e. perfectly flat reflective surface such that images are in clear and sharp focus.

### 9.5.2 Supplier and Installer:

Arrange for supplying and installation of granite/stone by a firm which has demonstrated successful experience in supplying and/or installing granite /stonework similar in type, quality and quantity to that required in the project. No other firms will be considered unless the Contractor satisfies the Engineer that the proposed firm is capable to execute the work.

### 9.5.3 Job Mock-Up:

Prior to installation of granite/stonework, provide sample panels of granite /stonework indicated with proposed range of colour, texture and workmanship to be expected in completed work. Build mock-up at site, as directed, using granite/stone jointing, as shown and specified in accordance with final drawings.

Obtain Engineer's acceptance of visual qualities of sample panels before start of granite /stonework. Replace unsatisfactory mock-up work, as directed, until acceptable to Engineer. Retain sample panels during construction as a standard for judging completed granite /stonework. Do not alter, move or destroy mock-up until work is completed.

If sealant primers, sealants, resin-adhesives, water repellents and other compounds are required in the finished granite/stonework, build mock-up and





apply compounds in sufficient time to allow for final test for staining or other deleterious effects from such applications.

#### 9.5.4 Submittals

Samples: Submit 3 sets of samples not less than 12" x 12" x 3/8" in size of each different colour, grade and finish of granite/stonework required. Include in each set a full range of exposed colour and texture to be expected in completed work.

#### 9.5.5 Product Delivery, Storage and Handling

Protect granite/stone during storage and construction against moisture, soiling, staining and physical damage.

Handle granite/stone to prevent chipping, breakage, soiling or other damage. Do not use pinch or wrecking bars without protecting edges of granite/stone with wood or other rigid materials.

Store granite/stone on wood skids or pallets, covered with non-staining, waterproof membrane. Place and stack skids and granite/stone to distribute weight evenly and to prevent breakage or cracking of granite/stone. Protect stored granite/stone from weather with waterproof, non-staining covers or enclosures, but allow air to circulate around granite/stone.

#### 9.5.6 Job Conditions

Installer must review installation procedures and co-ordination with other works, contractors and sub-contractors whose work will be effected by granite/stone work.

#### 9.5.7 Mortar and Grout

Cement: Provide grey/white cement as follows:-

Ordinary Portland Cement which shall comply with the requirements qualified under 'Concrete,' except complying with the staining requirement of ASTM C91 for not more than 0.03% water soluble alkali.

Hydrated Lime: ASTM C 207, Type S.

Sand shall be according to the specification for 'Aggregates' as mentioned in the section of 'Concrete.'

Additive for Moisture Resistance: Ammonium stearate, aluminum tristearate or calcium stearate.

Water shall be clean and shall be according to the specification for 'Water' as mentioned in section of 'Concrete.'

Mortar

For Floor Installation (Granite 3/4" and Granite/Stone 3/4" thickness)

Mortar Bed shall be non-staining 1:1:6 cement:lime:sand



Mortar shall be non-staining neat white cement

Pointing Mortar shall be similar to Mortar

#### 9.5.8 Granite/Stone Laying:

Clean surface to remove dirt, dust, debris and loose particles. Saturate granite/stone underbed with clean water several hours before placing 1:1:6 cement lime-sand setting mortar bed. About 1 hour prior to placing mortar bed remove surface water. Wet granite/stone bonding surface thoroughly, apply a thin layer of neat cement paste 0.8mm to 1.5mm thick by brushing or trowelling over the setting bed, or apply 0.8mm thick to bottom of granite/stone. Tamp and beat granite/stone for complete contact between granite/stone and setting bed. Set and level each unit immediately. Limit area of mortar bed to avoid drying out of slush coat prior to placement of granite/stone. Do not set granite/stone on dry bed. Do not set large areas and later level. But set granite/stone in pattern shown with uniform joints of the width shown or, if not with joints not more than 0.8mm wide. Prior to setting of granite/stone the edges of the granite/stone shall be dressed true and square by approved means.

Wall Installation: All granite/stone finishes irrespective of material or finish shall have an overall minimum thickness of 1.25" inclusive of the granite/stone, mortar and leveling base coat. The Contractor shall strictly follow and adhere to written instructions and modus operandi furnished by the manufacturer of the additive. All wall finishes shall be laid true to line and level and in a manner satisfactory to the Engineer.

Remove and replace granite/stone units which are broken, chipped, stained or otherwise damaged. Where directed remove and replace units which do not match adjoining granite/stonework. Provide new matching units, install as specified and point-up joints to eliminate evidence of replacement. Repoint defective and unsatisfactory joints as required to provide a neat, uniform appearance.

#### 9.5.9 Cleaning & Protection

Clean granite/stonework not less than 6 days after completion of work, using clean water and manufacturer recommended tools. Do not use wire brushes, acid type cleaning agents or other cleaning compounds with caustic or harsh fillers.

Provide final protection and maintain conditions, in a manner acceptable to fabricator and installer, which ensures granite/stonework being without damage, discolorations, or deterioration during subsequent construction and until time of substantial completion.

### 9.6 PRECAST CONCRETE PAVERS (SAND SET INSTALLATION)

#### 9.6.1 General

Precast concrete pavers shall be installed per the drawings as specified herein, including custom precast concrete amenities.

#### 9.6.2 Material / Product

Concrete Pavers & Curbs: Shall be OPC, 1000 ± 5% strength as manufactured by





ENVICRETE LIMITED, CI 6/5, Abdullah Haroon Road, Karachi-75200, Pakistan or approved equivalent in required shades of pigment as required

### 9.6.3 Installation

The entire area under external paving shall be prepared by dressing earth to a hard or graded surface. Where necessary, the prepared surface shall be made up to the required levels by filling and consolidating earth in accordance with the specifications for earth filling under floors.

Concrete pavers and curbs shall be installed over Roads and Footpaths/Walkways as indicated on the drawings. The area under the paves shall be prepared to the required levels by compacting the earth to at least 95% modified AASHO max dry density, the compacted earth shall be tested and approved before the layer of sand is placed. The prepared sub-grade shall then be covered over by 6" of sand cushion compacted, over which, the specified pavers shall be laid closely packed tamped in place and filled with sand in required sizes and pattern as shown in drawings/directed by the Architect/Engineer.

### 9.6.4 Quality Assurance

All products including (but not limited to) the requires Concrete Pavers and curbs shall be the product of specialist manufacturers and installed by the Manufacturer's specialized skill workers acceptable to the Engineer. The manufacturer's specialized team shall be responsible to take all required extra precautions where project conditions require and make provisions to ensure guaranteed safe and satisfactory performance of work.

The Contractor shall be responsible for the methods of achieving the required levels and load strength of the Roads/Parking Areas and walkways to meet performance criteria.

### 9.6.4 Measurement

Measurement for all the items covered under this Section shall be made in Sq.Ft/m. of the actual surfaces completed and approved. The rate quoted for the work items covered in this Section shall constitute full compensation for all materials, labour, equipment, plant and all incidentals to complete the works.

## 9.7 FALSE CEILING WORKS

### 9.7.1 Scope

The work under this section consists of supply and installation of all suspended ceilings as shown on the Drawings and coordination of all work and the installing in compliance with the Architect's Working Drawings and in accordance with the supplier/manufacturer's printed recommendations.

The Contractor's False Ceiling installer shall be a successful specialist with experience in the installation of ceiling suspension systems on projects with requirements similar to requirements specified and the Contractor will assume





responsibility for coordinating the installation with associated trades and make provisions for installation of Light Fixtures, AC Diffusers, Smoke Detectors, Speakers, etc in the ceiling system strictly in accordance with the requirements of the Architectural layouts and directions.

#### 9.7.2 Expanded Metal Lath Plaster Ceiling

##### a) **Materials**

**Plaster:** All plaster work, both internal and external, shall be cement plaster as specified above in relevant section.

The plaster materials will be uniform in quality and free of alkalis and salt.

**Metal Lath:** conforming to the following:

1. Diamond mesh expanded lath, fabricated from cold rolled steel.
2. Minimum weight 4.7 lbs. per sq. yd.
3. Galvanized for interior and exterior work.

**Lath Anchors:** Ferrous fasteners or anchors used to attach lath to walls shall be galvanized or shall otherwise be rustproof as approved by Architect.

**Strip lath reinforcement** conforming to the following:

1. Diamond mesh expanded lath, fabricated from cold rolled steel, min. 6" wide by 96" long.
2. Minimum weight 2.5 lbs. per sq. yd.
3. Galvanized for interior and exterior work.

**Corner Beads:** 22 guage galvanized steel with 2-3/4" expanded flanges and 1/8" radius nose, galvanized.

**Expansion Joints:** 22 guage galvanized steel with 5-3/8" wide x ground height as required.

**Casing beads:** 22 guage galvanized steel with 3-1/8" expanded flange, 3/4" size. Galvanized to BS 729: 1971 or ASTM A 525.

**Running and furring channels:**

1. 16 ga. cold rolled steel galvanized to BS 729: 1971 or ASTM A525 for interior and exterior work.
2. Minimum weight per 1000 lineal feet: Furring channels: 3/4" depth 300 lbs. Runner channels: 1-1/2" depth - 475 lbs.
3. Minumum width of flanges: 7/16".



Tie Wire: 18 ga. annealed steel wire, galvanized to BS 443: 1969, or conforming to ASTM A112.

Accessories: all fastenings such as expansion bolts, metal trim and other accessories as shown on drawings and as recommended by the manufacturer.

#### b) Access Panel

Provide in EML Ceiling on locations as shown on drawings. Also provide powder coated access panels wherever necessary as per detailed on site coordination/ information provided by Electrical and Mechanical works Sub-Contractors.

#### c) Execution

Before beginning plaster work, the Contractor shall ascertain that all electrical, plumbing and mechanical equipment, built-in items, door and window frames and all other apparatus and appurtenances are fixed in final position. The Contractor shall notify the Architect of any deficiencies and they shall be corrected before plaster work begins.

#### d) Submittals

Submit samples of all metal components, parts, accessories and fastenings to show material, gauge, size and finish for Architect's approval. Weeping and Smooth Plaster materials and installation must conform to previously accepted samples existing in and around the Private Wing at AKU.

#### e) Quality Assurance

Allowance & tolerances of completed plaster work: maximum deviation from a true plane shall be 1/8", as measured from the line of a 10 foot straight edge placed at any location on the surface.

#### f) Installation of Lathing Accessories

Corner Beads: Provide on all external corners, no need to provided at rain effected areas. Corner beads shall be attached securely in such a manner to ensure proper alignment during plastic application, and for proper plaster thickness.

Casing Beads: provide where shown on drawings, and where plaster abuts dissimilar materials.

Ceiling Control Joints: shall be installed so as to limit any span of plaster ceiling (i.e. without a joint) to be 200 to 250 sq.ft. and generally as shown on drawings.

Ceiling Expansion Joints: shall be installed at all building expansion joints.

Templates: all cased openings will be supported and braced in their true position by wooden templates so as to assure no deformation of the desired final location and quality of the cased opening. The templates will be installed in the openings prior to plastering and removed after curing.





**g) Job Protection**

Protect finished surfaces installed prior to plastering by covering with nonstaining kraft paper or plastic sheets, secured with masking tape and maintain protection until completion of plastering work.

**h) Application and Curing of Plasters**

General: surfaces shall be washed with clean water and kept damp for 2 hours before plaster is applied. Smooth surfaces of concrete cast in-situ shall be made rough by chiselling gently.

Variation of color and/or texture across the area of a wall may be the sole cause for rejection of the entire wall by the Architect.

Interior plaster on concrete, concrete block or metal lath:

First (Scratch) Coat: plaster shall be applied with sufficient material and pressure to form a good bond or key.

When the scratch coat is applied to metal reinforcement, it shall be applied with sufficient material and pressure so that it is shoved through the metal reinforcement to embed the reinforcement completely.

On all cast-in-place concrete ceilings where metal lath reinforcement is not called for, the scratch coat shall be dashed on. After dashing, the mortar shall not be trowelled or otherwise disturbed until after it has hardened.

The thickness of the scratch coat shall be approximately 3/8".

Before the scratch coat hardens, it shall be evenly scratched to provide good mechanical key for the finish. Plaster applied by dashing should not be scratched.

Scratch coat shall be moist cured for seven days.

Finish Coat: Finish coat shall be applied not sooner than seven days after application of the scratch coat.

Plastering work shall be laid out to permit the completion of an entire wall surface in one operation. If this is impracticable, the work shall be carried out to some breaking point established by the Architect prior to the commencement of work.

Before applying the finish coat, the surface of the scratch coat shall be dampened evenly to obtain uniform suction.

The thickness of the finish coat shall be approximately 3/8".

The finish coat shall be moist cured for seven days.

Exterior rendering: weeping plaster (drip dry plaster is and where shown).

Scratch Coat: same as specified in paragraph above. Coat shall be 3/8" thick and surface shall be left raked.





**Brown Coat:** Before applying brown coat, the surface of scratch coat shall be dampened evenly to obtain uniform surface. The thickness of brown coat shall be 3/8". Brown coat shall be moist cured for 48 hours and then allowed to dry.

**Finish Coat** apply mixture of Portland Cement, sand and integral color with a brush to a thickness of 1/16" to 1/8". While still wet, the mixture of same proportions shall be poured down the surface forming ridges approximately 3/8" on center. Finish coat shall conform in appearance to samples approved by the Architect.

#### i) Curing

Curing of base coats and finish coats of walls shall be by covering with burlap, kept wet at all times, shall commence as soon as plaster has set and shall continue for 8 days or as noted otherwise.

Curing of ceilings: Shall be by direct application of water so as to keep plaster damp at all times for 8 days.

#### j) Cleaning-Up

Remove protective materials and any plaster materials from adjacent surfaces.

### 9.8 PAINTING WORKS

#### 9.8.1 General

Paint work shall be complete including all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.

Except where natural finish of material is specifically noted as a surface not to be painted, paint exposed surfaces whether or not colours are designated in "schedules". Where items or surfaces are not specifically mentioned, paint the same as similar adjacent materials or areas. If colour or finish is not designated, Engineer will select these from standard colours or finishes available.

All interior surfaces shall be painted with Plastic Enamel paint and all exterior surfaces shall be painted with Weather Shield Type cementitious paint.

#### 9.8.2 Product

Subject to compliance with the requirements, provide product of:

BERGER  
ICI PAINTS

Provide primers and other undercoat paint produced by same manufacturer as finish coats. Use only thinners approved by paint manufacturer, and use only within recommended limits.



### 9.8.3 Surface Preparation

General: Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as herein specified, for each particular substrate condition.

Cementitious Materials: Prepare cementitious surfaces of concrete, concrete block and cement plaster and to be painted by removing efflorescence, chalk, dust, dirt, grease, oils, and by roughening as required to remove glaze.

Wood: Clean wood surfaces to be painted of dirt, oil, or other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sandpaper smooth those finished surfaces exposed to view, and dust off. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer, before application of priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when dried.

Ferrous Metals: Clean ferrous surfaces, which are not galvanized or shop-coated, of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning.

Galvanized Surfaces: Clean free of oil and surface contaminants with non-petroleum based solvent.

### 9.8.4 Material Preparation

Mix and prepare painting materials in accordance with manufacturer's directions.

### 9.8.5 Application

General: Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied. Do not paint when relative humidity exceeds 85%, or to damp or wet surfaces.

Prime Coats: Apply prime coat on material which is required to be painted or finished, and which has not been prime coated by others.

Stipple Enamel Finish: Brush and redistribute paint to an even and fine texture. Leave no evidence of laps, irregularity in texture, skid marks, or other surface imperfections.

Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, colour, appearance and coverage. Cloudiness, spotting, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable.

Transparent (Clear) Finish: Use multiple coats to produce glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, colour irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections.

Provide gloss finish for final coats, unless otherwise indicated.



Completed Work: Match approved samples for colour, texture and coverage.  
Remove, refinish or repaint work not in compliance with specified requirements.

#### 9.8.6 Clean-up and Protection

Clean-Up: Upon completion of painting work, clean window glass and other paint splattered surfaces. Remove splattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

Protection: Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing, and re-painting, as acceptable to Engineer.

End of Part 7

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**PART - 8**  
**(DIVISION-31)**  
**EARTH WORK**

**31.1 Excavation**

Excavation is Unclassified, and includes excavation to sub-grade elevations indicated regardless of character of materials and obstructions encountered.

Unauthorized excavation consists of removal of materials beyond indicated sub-grade elevations or dimensions without specific direction of Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be at Contractor's expense.

Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to Engineer.

Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Engineer.

Additional Excavation: When excavation has reached required subgrade elevations, notify testing laboratory and Engineer who will make an inspection of conditions.

If unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper and replace excavated material as directed by Engineer.

Removal of unsuitable material and its replacement as directed will be paid on basis of contract conditions relative to changes in work.

Stability of Excavations: Slope sides of excavations to comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.

Maintain sides and slopes of excavations in safe condition until completion of backfilling.

Excavation for Structures: Conform to elevations and dimensions shown within a tolerance of plus or minus 1-1/4" and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.

In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.

Excavation for Pavements: Cut surface under pavements to comply with cross-sections, elevations and grades as shown.

Excavation for Trenches: Dig trenches to the uniform width required for particular item to be installed, sufficiently wide to provide ample working room. Provide 6" to 9" clearance on both sides of pipe or conduit. Comply with Engineer's instructions if trench width exceeds specified maximum.

Excavate trenches to depth indicated or required. Carry depth of trenches for piping to establish indicated flow lines and invert elevations. Beyond building perimeter, keep bottoms of trenches sufficiently below finish grade to avoid freeze-ups.

For pipes or conduit 5" or less in nominal size and for flat-bottomed multiple-duct conduit units, do not excavate beyond indicated depths. Hand excavate bottom cut to accurate elevations and support pipe or conduit on undisturbed soil.

For pipes or conduit 6" or larger in nominal size, tanks and other mechanical/electrical work excavate to depths indicated, or, if not otherwise indicated, to 6" below bottom of work to be supported.

Except as otherwise indicated, excavate for exterior water-bearing piping (water, steam, condensate, Subbase) so top of piping is not less than 3'-6" below finished grade.

Grade bottoms of trenches as indicated, notching under pipe bells to provide solid bearing for entire body of pipe.

Backfill trenches with concrete where trench excavations pass within 1'-6" of column or wall footings and which are carried below bottom of such footings, or which pass under wall footings. Place concrete to level of bottom of adjacent footing.

Do not backfill trenches until tests and inspections have been made and backfilling authorized by Engineer. Use care in backfilling to avoid damage or displacement of pipe systems.

For piping or conduit less than 2'-6" below surface of roadways, provide 4" thick concrete base slab support. After installation and testing of piping or conduit, provide minimum 4" thick encasement (sides and top) of concrete prior to backfilling or placement of roadway subbase.

## 31.2 Shoring and Bracing:

Extent of shoring and bracing work includes, but is not limited to, the following:

Shoring and bracing necessary to protect existing buildings, streets, walkways, utilities, and other improvements and excavation against loss of ground or caving embankments.

Maintenance of shoring and bracing

Removal of bracing, as required.





Type of shoring and system includes, but is not limited to, the following -

Cylinder piles

Lagging

Supervision Engage and assign supervision of shoring and bracing work to qualified personnel

Layout Drawings When requested provide layout drawings for shoring and bracing system. System design and calculations must be acceptable to local authorities having jurisdiction.

Before starting work check and verify governing dimensions and elevations. Survey condition of adjoining properties. Take photographs, to record any prior settlement or cracking of structures, pavements, and other improvements. Prepare a list of such damages, verified by dated photographs, and signed by those conducting the investigation.

Survey adjacent structures and improvements, establishing exact elevations at fixed points to act as benchmark. Clearly identify benchmarks and record existing elevations. Locate datum level used to establish benchmark elevations sufficiently distant so as not to be affected by movement resulting from excavation operations.

During excavation, resurvey benchmark weekly, maintain accurate log of surveyed elevations for comparison with original elevations. Promptly notify Engineer if changes in elevations occur or if cracks, sags or other damage is evident.

Materials: Provide suitable shoring and bracing materials which will support load imposed. Materials need not be new, but should be in serviceable condition.

Shoring Work Execution: Whenever shoring is required, locate the systems to clear permanent construction and to permit forming and finishing to concrete surfaces. Provide shoring system adequately anchored and braced to resist earth and hydrostatic pressures.

Shoring system retaining on which the support or stability of existing structures is dependent must be left in place at completion of work.

Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move a brace, install new bracing prior to removal of original brace.

Do not place bracing where it will be cast into or included in permanent concrete work, except as otherwise acceptable to Engineer.

Install internal bracing, if required, to prevent spreading or distortion to braced frames.

Maintain bracing until structural elements are rebraced by other bracing or until permanent floor construction is able to withstand lateral earth and hydrostatic pressures.





Remove sheeting, shoring and bracing in stages to avoid disturbance to underlying soils and damage to structures, pavements, facilities, and utilities.

Repair and replace, as directed by Engineer, adjacent work damaged or displaced through the installation or removal of shoring and bracing work.

### 31.3 Dewatering:

General Description: The work to be performed under this item shall consist of supplying all labour, materials and plant and the performance of all work necessary for lowering and continuously controlling the piezometric levels of the groundwater in the subsurface material as well as the control and handling of surface water, in such a manner as to maintain the bottom and slopes of the excavations for the structures in a stable condition, as and when required for performing concrete works in dry conditions.

Quality Assurance: The Contractor shall build, maintain and operate all dams, channels, flumes, sumps and other temporary diversion and protective works needed to divert the surface water through or around the required excavations.

All excavations shall be dewatered and kept free of standing water. Water seeping from the sides and bottom of the excavations above the free level or excessively muddy conditions as needed for proper execution of the excavation operations. The Contractor shall furnish, install, operate and maintain all drains, sumps, pumps and other equipment needed to dewater the excavation areas. Dewatering methods that cause a loss of fines from the bottom and slopes of the excavations will not be permitted.

Should the Contractor wish consideration to be given to some properly qualified dewatering sub-contractor his name, qualifications, record of previous jobs of a similar nature, personnel to be employed on the work, and other pertinent information shall be submitted to the Engineer for approval with the tender.

Two weeks prior to commencement of installation of the Dewatering System, Contractor shall submit to the Engineer for his technical approval, complete final plans, details and descriptions of the Dewatering System.

The Contractor shall be responsible for the arrangements and locations of the various Dewatering System components necessary to accomplish the specified work.

Dewatering the Excavation : The Contractor shall install maintain and operate a system wells, trenches and pumps as required to perform the excavations for the areas and subsequent construction of the structures and placement of backfill in the dry.

The dewatering of the excavations shall be accomplished in a manner that will prevent seepage, boils, loss of fines, corrosion, softening of the strata, and that will maintain the stability of the bottom and slopes of excavation. Should any damage to work, in the opinion of the Engineer, be due to the inadequacy or failure of the Dewatering System, in part or in whole, then the supply of all labour, materials and plant & the performance of all work necessary to carry out additional or remedial

work resulting from such damage shall be undertaken by the Contractor at no additional compensation. The cost of any damage caused to the structures or the permanent works like structures and machinery and other equipment due to the failure of the dewatering system shall be borne by the Contractor and shall be covered by proper insurance to be provided by the Contractor and in accordance with insurance clauses of the "General Conditions of Contract".

The Contractor shall not permit the accumulation of surface water within the confines of the excavation areas. The Contractor shall control, remove and divert surface water runoff, and water discharging from the Dewatering System away from the excavations, to a point outside the working area as required by the Engineer.

The Contractor shall perform all work including, but not limited to, the construction and maintenance of ditches and sumps and provide, install maintain and operate pumps and pipelines of adequate capacity as are necessary for the effective control of surface runoff and groundwater not required to be intercepted by the Dewatering Systems.

The Contractor shall supply, install, maintain and operate as required, the generators for power supply which shall be of sufficient capacity to maintain all pumps and equipment for both the Basic and Standby Systems, operating on a continuous basis.

No payment shall be made for the works involved within the scope of this section of specifications unless otherwise specifically stated in the Bill of Quantities.

The cost thereof shall be deemed to have been included in the other items of the Bill of Quantities.

#### **31.4 Material Storage:**

Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade and shape stockpiles for proper subbase.

Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated.

Dispose of excess soil material and waste materials as herein specified.

#### **31.5 Compaction**

General: Control soil compaction during construction providing minimum percentage of density specified for each area classification indicated below.

Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density for soils which exhibit a well-defined moisture density relationship (cohesive soils) determined in accordance with ASTM D 1557; and not less than the following percentages of relative density, determined in accordance with ASTM D 2049, for soils which will not exhibit a well-defined moisture-density relationship (cohesionless soils).





Structures, Building Slabs and Steps, Pavements: Compact top 12" of subgrade and each layer of backfill or fill material at 90% maximum density for cohesive material or 95% relative density for cohesionless material.

Walkways: Compact top 6" of subgrade and each layer of backfill or fill material at 90% maximum density for cohesive material or 95% relative density for cohesionless material.

Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, to prevent free water appearing on surface during or subsequent to compaction operations.

Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

Soil material that has been removed because it is too wet to permit compaction may be stock piled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing until moisture content is reduced to a satisfactory value.

### 31.6 Backfill and Fill

General: Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below.

In excavations, use satisfactory excavated or borrow material.

Under grassed areas, use satisfactory excavated or borrow material.

Under walks and pavements, use subbase material.

Under steps, use subbase material.

Under building slabs, use subbase material.

Under piping and conduit, use subbase material where subbase is indicated under piping or conduit; shape to fit bottom 90° of cylinder.

Backfill excavations as promptly as work permits, but not until completion of the following:

Acceptance of construction below finish grade including, where applicable, damp-proofing, waterproofing, and perimeter insulation.

Inspection, testing, approval, and recording locations of underground utilities.

Removal of concrete formwork.

Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.





Removal of trash and debris.

Permanent or temporary horizontal bracing is in place on horizontally supported walls.

Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, or break-up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.

When existing ground surface has a density less than that specified under "Compaction" for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.

Placement and Compaction: Place backfill and fill materials in layers not more than 12" in loose depth for material compacted by heavy compaction equipment, and not more than 4" in loose depth for material compacted by hand-operated tampers.

Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

Place backfill and fill materials evenly adjacent to structures, piping or conduit to required elevations. Take care to prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping or conduit to approximately same elevation in each lift.

### 31.7 Grading

General: If and as required, uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated, or between such points and existing grades.

Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding.

Finish surfaces free from irregular surface changes, and as follows:

Walks: Shape surface of areas under walks to line, grade and cross-section, with finish surface not more than 1-1/4" above or below required subgrade elevation.

Pavements: Shape surface of areas under pavement to line, grade and cross-section, with finish surface not more than 1/2" above or below required subgrade elevation.

Grading Surface of Fill Under Building Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/2" when tested with a 10' straightedge.



Compaction After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

### 31.8 Building Slab Subbase Course

General: Subbase course consists of placement of subbase fill material, in layers of indicated thickness, over subgrade surface to support concrete building slabs.

Placing: Place subbase fill material on prepared subgrade in layers of uniform thickness, conforming to indicated cross section and thickness. Maintain optimum moisture content for compacting material during placement operations.

When a compacted subbase course is shown to be 6" thick or less, place material in a single layer. When shown to be more than 6" thick, place material in equal layers, except no single layer more than 6" or less than 3" in thickness when compacted.

### 31.9 Disposal of Excess and Waste Materials

Removal from Employer's Property: Remove excess excavated material, waste materials, including unacceptable excavated material, trash and debris, and dispose it off Employer's property in legal manner.

### 31.10 Termite Control

#### 31.10.1 The scope of work

Work for anti termite treatment includes injection of insecticide in sides and bottom of foundation trenches, spraying on stockpiled backfill material and injections of the insecticide in floor sub-grade of the building. The scope also covers treatment of all wood works with insecticides before installation in position.

Treatment to woodwork is specified under a separate section.

In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work, including preparation of substrate and application.

Engage a professional pest control operator, for application of soil treatment solution unless specifically authorized by Engineer.

To insure penetration, do not apply soil treatment to excessively wet soils or during inclement weather. Comply with handling and application instructions of the soil toxicant manufacturer.

#### 31.10.2 Products

Use an emulsible concentrate termiticide for dilution with water, specially formulated to prevent infestation by termites. Fuel oil will not be permitted as a diluent. Provide a solution consisting of the following products:



"BIFLEX" as marketed by FMC United (Pvt) Ltd, Karachi.

"AGENDA 25EC" as marketed by Jaffer Brothers (Pvt) Ltd, Karachi.

"DURSBAN TC" as marketed by Urban Solutions (Pvt) Ltd, Karachi.

The solution be applied/sprayed by the specialist hands strictly per manufacturer's recommendations.

End of Part 8

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# SPECIFICATIONS (ELECTRICAL WORKS)



## CONTENTS

S. NO.	DESCRIPTION	SECTION / PAGE
1.	NOTES	Page 1 of 1
2.	WIRING / WIRING ACCESSORIES	SECTION - 6 Page 1 of 3
3.	SWITCHES & SOCKETS	SECTION - 7 Page 1 of 3
4.	LIGHTING FIXTURES	SECTION - 8 Page 1 of 4
5.	CONDUITS & PIPES	SECTION - 9 Page 1 of 2
6.	DISTRIBUTION BOARDS	SECTION - 10 Page 1 of 4
7.	VOICE & DATA COMMUNICATION	SECTION - 11 Page 1 of 1
8.	CCTV SYSTEM	SECTION - 12 Page 1 of 1
9.	LIGHTING CONTROL SYSTEM	SECTION - 13 Page 1 of 5
10.	EARTHING & GROUNDING SYSTEM	SECTION - 14 Page 1 of 3



**SPECIFICATIONS**  
**ELECTRICAL & ALLIED WORKS**

**NOTES**

1. Items not specified in the tender will be paid at actual cost of material, labor and plus overheads and profits. The Contractor shall submit a break-up of cost for the approval of the Principal / Consultant.
  
2. All the prices and unit rates in the contract are fixed and shall remain unchanged for the entire duration of the contract. No escalation of whatsoever kinds or nature shall be admissible due to any increase in rates, custom duties, sales tax, local and federal taxes, surcharge, insurance, port and octroi charges, royalties, or the cost of utilities, facilities, wages and salaries of workers etc., including all direct and indirect cost of any items related to or connected with the completion of work.
  
3. All equipment supplied and installed by the Contractor shall be guaranteed against all defects and deficiencies for a period of six months from the date of issue of completion certificate. In the event of any defects developing within that period the Contractor shall replace the equipment or the defective components, as per the instruction of the Consultant.



## 1.1 GENERAL

### WIRING & WIRING ACCESSORIES

The Contractor shall furnish and install all wires and cables along with the accessories as specified herein, in Bill of Quantities and Drawings. Apart from the material specified, the Contractor shall provide the necessary material for termination or fixing of wires and cables such as lugs, solder, supports, bushes, glands for a complete wiring installation. Miscellaneous materials, like filling compound, identification tags, markers and earthing strips shall be furnished for completion of works in accordance with the best engineering standards and practice. The wiring installation shall be carried out in strict accordance with the scheme, cable size and circuit details shown on the drawings or as specified. The contractor is to produce purchase certificate from recommended manufacturers like Pakistan Cable or AGE Cables for each & every lot and each and every coil of wires to be stamped by consultants before it is being sent to site for use.

## 1.2 LV. CABLES AND WIRING

Cable and conductors shall be PVC insulated, PVC sheathed with copper conductors, single / multi-core, unarmored 450/750 volts grade for light and socket circuits and 600/1000 grade for motor power circuits, to BS 6004 and BS 6346.

The neutral and phase conductors shall be colored black and red/yellow/blue respectively. The circuit protective conductors shall be of green having same cross-sectional area as that of phase and neutral upto 6 sqmm and above as specified in BOQ and drawings.

Each circuit shall have its own separate neutral, and the "looping in" system for wiring shall be used. Joints shall be made at main switches, distribution boards and panels, sockets outlets, light fan points and switch boxes only, no joints shall be made in joint boxes, nor will any "through joints" be allowed.

PVC/PVC 3-core flexible cords, shall be used for connection to the luminaires and fixtures from the ceiling rose/outlet box, through 3-terminal PVC connectors. Soldered or crimped lined copper lugs, shall be used on the termination of cables and conductors 10sq.mm and larger. All multi-core cables shall be provided with compression glands, of the correct size and type, at panel entry positions.

## 1.3 INSTALLATION

The wiring through exposed or concealed conduit shall be started only after the conduit system is completely installed and all junction boxes, outlet boxes, switch boards, etc. have been fixed in proper position. For outdoor installation, where specified the cables shall be run direct in ground or in pipes as specified. The cables shall be pulled through conduit or pipes with care to prevent any damage to cables. To facilitate pulling, lubrication only as recommended by cable manufacturer may be used for decreasing friction. Under no circumstances shall oil or soap be used for cable pulling. Where several wires are to occupy the conduit or pipes they shall be pulled along together with earth continuity conductor. In general, the wires shall not be bend to radius less than ten times the overall diameter of the wire, or as otherwise recommended by cable manufacturer. The contractor shall furnish all installation material and labor for installation, testing and commissioning of cable system.

The wiring to power circuit and 15 amperes single phase socket outlet shall be run in conduit separate from light wiring conduits. Care shall be taken to ensure that all phase conductors are connected to the proper terminals and correct phase sequence is maintained. Wherever the size of conduit is not stated on drawings, it shall be in accordance with the Table based on I.E.E. Regulations.



The wires or cables shall be terminated at light points, switchboard, etc. such that the insulation is always led into the equipment to which connection is made. The cable entry hole in equipment shall be such as not to damage the cable. Inside the switchboards or control boards, the wires or cables shall be securely fanned out in a neat arrangement and faced with wax cord. The wires of different phases shall preferably be bunched separately. Identification tags or ferrules shall be provided at termination of wires in switchboards with respect to connected equipment for ease of installation and maintenance.

#### 1.4 POWER, LIGHTING AND CONTROL CABLES

PVC Cable for underground installation shall be PVC insulated and PVC sheathed.

##### 1.4.1 Surface Cables

Cables for distribution system on surface shall be either single-core or multi-core, as required and PVC insulated and PVC sheathed.

##### 1.4.2 Cables in Conduits

All cables/wires, in conduits shall be of copper, PVC sheathed or PVC insulated as specified in design drawings or BOQ.

#### 1.5 PHASE IDENTIFICATION

All cables shall have phase identification colors on insulation of each phase. The color code for three phase circuits shall be red, yellow and blue for phase conductor and black for neutral conductor.

Single phase circuits shall have red for phase and black for neutral conductor.

#### 1.6 CABLE ACCESSORIES

Best quality cable accessories should be used with the approval of consultant. The cable accessories include, cable tray, cable trunking, floor trunking, clips, saddles (all galvanized). Cable glands made of brass should be used when cable enters/leaves a panel/Distribution Board. Identification tags made of engraved brass plates to be used for all cables. All the cables should be security fixed to cable tray or trunking with help of plastic ties. Cable lugs should be compression type of BICC U.K, Elpress Sweden or equivalent. Lugs should be pressed with help of compression machine approved by consultants.

#### 1.7 CONDUIT WIRING-INSTALLATION

The wiring through conduit shall be started only after the conduit system is completely installed and all outlet boxes, junction boxes, etc. are fixed in position.

The wires shall be pulled in conduit with care and, to facilitate pulling, the cable manufacturer's recommended lubricant shall be used. Use of any kind of oil or soap will not be permitted.



Where several wires are to be drawn in the same conduit, they shall be pulled together. The wires shall not be bent to a radius less than ten times the overall diameter of the wire, unless otherwise recommended by the manufacturer.

The wiring shall be continuous between termination. The looping in system shall be followed throughout. Any joint in wires will not be allowed. The use of connectors will only be allowed at location where looping-in is rendered difficult. The consent of the Consultant in writing, will be required for using connectors.

The connector shall be of suitable rating having porcelain body, sunk-in screw terminals and terminal strips. 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 repair in future.

#### **1.8 INSULATION RESISTANCE TESTS**

Insulation resistance tests shall be made on all electrical equipment by using a megger tester of 500V for circuits upto 250 Volts and 1000V for circuits upto 500 volts.

The insulation resistance values of cables, transformers and switchgear etc., shall be as per B.S.S. and Pakistan Electricity Rules.

Before making connections at the ends of each cable run, the insulation resistance measurement test of each cable shall be made. If insulation resistance test readings are found to be less than the specified minimum, the cable shall be replaced and the new cable installed and tested.

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

If the insulation resistance of the circuit under test is less than the specified value, 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. After all tests have been made, the equipment shall be reconnected as required.

#### **1.9 CONTINUITY TEST**

Continuity test on all the sub and main circuits should be performed for phase, neutral & earth wires.

**END OF SECTION - 6**





## SWITCHES & SOCKETS

### 1.0 LOCAL SWITCHES

- 1.1 The local switches shall be 10/20 amp. Gang type - one-way, two-way, intermediate or double pole as indicated on the drawings. Where more than one switch is indicated at any position multiple gang units shall be used.
- 1.2 Switches shall be of the quick start make/break type specially designed for AC circuits to BS Standards. The operation of the switch shall depend wholly on the action of the spring. The switches shall generally be of the rocker operated type.
- 1.3 All switch boxes shall be supplied with adjustable steel grids and earthing terminals.
- 1.4 Generally, switch units shall be of the adjustable grid pattern and to be secured to the adjustable grid by means of screws. For flush mounting switches the switch-plate shall overlap all edges of the box by not less than 7mm. For surface mounting switches the switch plate shall finish flush with the edges of the switch boxes. Switches for water heaters and fan coil units shall be complete with neon indicator lights.
- 1.5 In Plant rooms the switch units shall be surface or flush as required.
- 1.6 Local switches shall be arranged in convenient positions for switching the various circuits and generally as indicated on the drawings.
- 1.7 The switches shall be of the same manufacture for a particular type of switch throughout the installation. All accessories in wet and damp areas shall be of the splash-proof type to IP54 protection standard.
- 1.8 All switch boxes should be galvanized steel.
- 1.9 To ensure easy and correct connection of the conductors during installation, the necessary terminal shall be easily identified, grouped in line, upward facing, captive and backed out prior to the installation.
- 1.10 All dimmer switches shall be suitably rated to the lighting load being Controlled with 25% spare capacity and shall be adequate for tungsten and / or fluorescent lighting as specified.

### 2.0 POWER OUTLETS

- 2.1 The switch socket outlets, shall be in accordance with BS1363 Standard as appropriate and shall be of the three pin grounding type.
- 2.2 Switch socket outlet in the different areas shall comply with section 607 BS7671 :2001
- 2.3 Live contact of the socket shall be completely shuttered such that it is not possible to engage any pin of the plug into a live contact whilst any other pin of the plug is exposed.
- 2.4 All floor mounted socket outlets shall be fixed as part of the under floor trunking service boxes.
- 2.5 These outlets shall be of the same manufacturer throughout the installation.
- 2.6 The sockets should provide a double earth terminal as per latest BS7671, 2001, Section 607.



### 3.0 FUSE CONNECTION UNITS / DP SWITCHES

- 3.1 These shall be of flush or surface mounting type as manufactured in compliance with IS Standard as appropriate. The fuse connection units shall incorporate integral switch, reset indicator and 20 amp fuse links. The 10" switch box supplied for water heaters shall be incorporated with neon indicator lights and these also shall be engraved 'Water Heater'.
- 3.2 These shall be of the same make, type for a particular type of switch throughout the installation and shall be complete with the other accessories installed.
- 3.3 Fuse selection shall be based on actual requirement of equipments.

### 4.0 GI BOXES

GI boxes to be provided with brass earth terminal to facilitate earth wire connection. The boxes to have sufficient number of 20mm and 25mm knockout. The boxes thickness shall be 1.1mm minimum and shall comply with IS 4662. Boxes to have adjustable lug for proper installations of wiring accessories. Extension ring to be used alongwith GI boxes, in places where the box is deep inside the wall, marble or concrete.

### 5.0 ISOLATORS

All external isolators must have IP-65 protection with aluminum alloy or die-cast aluminium housing with bolt on drip proof canopy. Isolators must be de-rated for 50 deg. Ambient temperature. Internal isolators shall be IP 54 / IP 65 depending on the location with polycarbonate housing for non-armoured cables.

### 6.0 FLOOR SERVICE BOXES

Floor Service Boxes shall be two-compartment type of the size 300 x 300 x 75-90mm and shall be constructed from high-pressure Zinc Alloy die casting base frame pillars. This shall be fixed on to heavy gauge galvanized steel base plate for support by support frame. Other materials adequate in strength and performance shall be used and these shall be protected against corrosion. The boxes shall be constructed with provisions for ducting or conduit access on all four sides. Unwanted entries shall be blanked off with detachable side blanks.

Cover for floor service boxes shall be made of high pressure zinc alloy die casting provided with suitable hinges designed to enable the trap cover to open through 180 degrees and giving access at all times to the power and telephone outlets.

Covers for junction boxes shall be made of high pressure Zinc Alloy die casting with 12mm recess to receive ceramic tiles or carpet tiles. Counter sunk screws shall secure the covers of boxes. All exposed portions of the boxes shall be epoxy coated in grey color.

All boxes shall have extra wide gaskets in order to minimize water seepage. Gaskets shall be made of material that is durable in order to withstand loads.

All boxes shall be adjustable in height independently of the ducting system to take account of difference in floor thickness.

Adequate segregation shall be provided between service runs within boxes by using cross-over bridges and rigid compartments.

Effective conductors shall be provided between the covers and the boxes.

Cable emerging for service boxes shall be protected against damage by means of nylon covers and grommets or equivalent and shall be reversible to close position when not in use.

## 7.0

### ACCESSORIES PLATE FINISH

All the wiring accessories shall be vandal proof. The accessories plate shall have the following finishes depending on the location where it is installed and on the feeding arrangement.

Switches to conform with BS 267:2000 and sockets to BS 1363, ceiling rose to BS 67:1999.

- a) All external outlets and outlets in pumproom and parking shall be weatherproof to IP-66.
- b) Weatherproof range should be suitable for semi recessed mounting and supplied with back boxes.
- c) An outlet above a false ceiling, store, etc. shall be white plastic.
- d) Switches and outlets in apartments shall be white plastic slim type.
- e) Main entrance, common area and lift lobbies shall be matt chrome steel face plate slim type.
- f) Outlets in Electrical rooms, Mechanical floors, Tel. Rooms, etc shall be metal clad.
- g) All switch plates including SSOs are to be coordinated with tiling layouts by prior agreement with the Architect on site.

## 8.0

### MOUNTING HEIGHTS

The mounting heights for the electrical equipment and accessories shall be coordinated with the furniture layout and shall be as per site requirements to Engineer's / ID's instruction and approval. In general the mounting heights from FFL to center of fixtures shall be as shown in legend.

END OF SECTION - 7





## LIGHTING FIXTURES

### 1.0 LIGHTING FIXTURES

#### 1.1 Scope of Works

The work under this section consists of supplying, installing, testing and commissioning of all material and accessories of the complete light fixtures as specified herein and/or shown on the drawings and given in the Bill of Quantities.

The Vendor shall discuss the electrical layout with the Engineer and co-ordinate at Site with other services for exact locations and positions of the light fixtures.

The description of light fixtures is given in the bill of quantities, and stated on the drawings, and all relevant material is described in this Section. The determination of quality is based on certified photo-metric data covering the coefficient of utilization, light distribution curves, construction material, shape, finish, operation, etc.

The Contractor shall submit at least two samples of each and every light fixture specified and obtain approval of the Engineer before purchasing. The quality and finishes of the local make light fixtures (if mentioned in BOQ) shall be same as that of standard manufacturer. The accessories such as ballast, lamp/starter holders, starters, lamps, ignitors, etc., for all type of light fixtures shall be of Philips make or approved equivalent. Approved equivalent against those specified will be accepted if the specified one is/will not be available. For any substitution the Engineer's approval is necessary. Engineer's decision will be binding and final.

All fixtures shall be finished in standard colour schemes as mentioned in the manufacturer's catalogue for respective fixtures, unless specifically stated in the Specifications, Drawings or Bill of Quantities or directed by the Engineer.

#### 1.2 Applicable Standard / Codes

The latest editions of the following standards/codes shall be applicable to the material specified within the scope of this section:

IEC 60598-2-3	-	Luminaries
IEC 60400	-	Lamp holders and starter holders for fluorescent lamps
IEC 62471	-	LED Luminaries
IEC 1048/1049	-	Capacitors for use in TL, HP mercury & HP/LP sodium vapour
BS 3677/3767/4017	-	Discharge lamp circuits
IEC 922/923	-	Ballast for discharge lamps
IEC 60662	-	High pressure sodium lamp
IEC 81 & BS 1853	-	Tubular fluorescent lamps
IEC 82 & BS 2818	-	Ballast for tubular fluorescent lamps
IEC 155 & BS 3772	-	Starters for fluorescent lamps
BS 5266	-	Emergency Lighting
BS 2560	-	Exit Signs

#### 1.3 Material

##### LED Lights (Optional)

The LED light fixtures shall have lamps of proper rating as shown on the drawings. Each lamp shall be provided with electronic gear.



The LED lamps shall be tubular, 1214/604mm long, 28-mm/16-mm. dia. for 42/25 watts respectively as specified. The LED shall be cool white/warm white, with colour rendering and light colour of 840 characteristics with an average output of more than 100 lumens/watt and life of 50,000 hours with 70% lumens maintained. The ballast shall be 'Low Loss' electronic type, totally enclosed and suitable to operate up to 250 VAC.

The lamp holders shall be rotary lock-in type. The internal wiring of the LED light fixtures shall be done with heat resistant wires at the manufacturer's factory. The internal wiring shall be clipped properly and heat resistant sleeves be provided on cables passing near ballasts. All light fixtures shall be provided with power factor improvement capacitor to give a minimum power factor of

0.90. Connectors suitable for connecting 2.5 sq.mm cable conductors shall be provided for supply connections. An earth terminal for connection to 2.5-sq.mm cable conductor shall be provided.

The body of the LED light fixtures shall be minimum 24 SWG sheet steel, derusted, degreased, finished in heat resistant paint, stove enameled. Appropriate size bushed wire entry holes, fixing holes, and earth terminal shall be provided.

Light fixtures shall be furnished with Prismatic diffusing panels, 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 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. Shop drawings shall be submitted for approval of Engineer.

### **Fluorescent Light Fixtures**

The fluorescent light fixtures shall have lamps and ballasts of proper rating as shown on the drawings. Each lamp shall be provided with independent ballast.

The fluorescent lamps shall be tubular, 1214/604mm long, 16-mm. dia. for 28/14 watts respectively as specified. The fluorescent shall be cool white, with colour rendering and light colour of 840 characteristics with an average output of 3200 lumens ( $\pm 5\%$ ) for 28 watts and 1200 lumens ( $\pm 5\%$ ) for 14 watts after 100 burning hours. The ballast shall be 'Low Loss' electronic type, totally enclosed and suitable to operate up to 250 VAC.

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. The internal wiring shall be clipped properly and heat resistant sleeves be provided on cables passing near ballasts. All light fixtures shall be provided with power factor improvement capacitor to give a minimum power factor of 0.90. Connectors suitable for connecting 2.5 sq.mm cable conductors shall be provided for supply connections. An earth terminal for connection to 2.5-sq.mm cable conductor shall be provided.

The body of the fluorescent light fixtures shall be minimum 24 SWG sheet steel, derusted, degreased, finished in heat resistant paint, stove enameled. Appropriate size bushed wire entry holes, fixing holes, and earth terminal shall be provided.





Light fixtures shall be furnished with Prismatic diffusing panels, 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 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. Shop drawings shall be submitted for approval of Engineer.

#### **Incandescent / Incandescent reflector/ Compact fluorescent Light Fixtures/ Decorative Light:**

The incandescent/incandescent reflector/compact fluorescent light fixtures shall be as stated on drawings and bill of quantities. The light fixture shall be finished in standard colours unless otherwise stated on drawings or directed by Engineer. All incandescent/incandescent reflector/compact fluorescent light fixtures shall be of international standard and quality. The types of fixtures with manufacturer's 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 photometric curves to show that the fixture proposed are of the same type, construction and quality.

The body of the light fixtures shall be minimum 18 SWG sheet steel, de-rusted, degreased, finished in heat resistant paint, stove enameled. Appropriate size bushed wire entry holes, fixing holes, and earth terminal shall be provided.

The lamps for incandescent/incandescent reflector/compact fluorescent light fixtures shall be compact fluorescent lamp with normal or electronic control gear and shall be supplied and installed according to the wattage/type as indicated on drawings.

Weatherproof light incandescent/compact fluorescent light fixtures shall comprise of UV treated plastic body or aluminium body and gasketed clear glass cover secured to the body by means of wing nuts/screws to give a weatherproof and watertight fit. The gasket shall be weather resistance type.

The glass shade of the light fixtures shall be opal white or clear as furnished by the manufacturer with the light fixture unless specified 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.

## **2.0 LIGHTING EQUIPMENT, GENERAL REQUIREMENTS**

- 2.1 Complete manufacturers data shall be supplied along with the proposal of luminaries.
- 2.2 Lighting equipment and lighting fixtures shall be as called for on plans by designated symbols and type. Said equipment shall embody the highest standards of electrical and mechanical design with maximum efficiency obtainable and all shall be subject to the approval of the Engineer.
- 2.3 All hangers, cables, supports, channels, frames and brackets of all kinds for safely erecting this equipment in place, shall be furnished from the standard manufacturer's product range and shall be erected in place under this Section.
- 2.4 Each lighting fixture shall have a manufacturer's label affixed to it and shall comply with the requirements of all authorities having jurisdiction.





- 25 The right to select other fixtures of the same quality, without additional cost to the Employer is reserved by the Engineer regarding the shape of the lighting luminaires.
- 26 The supply to lighting fittings mounted on or recessed into a false ceiling shall be effected by means of a ceiling rose on a conduit box within the false ceiling space with a three core heat resisting flexible cable connection. When fixtures are surface mounted to the ceiling, Ceiling rose to be provided adjacent to the fitting. In plasterboard ceiling areas, ceiling rose to be installed and supported next to the luminaire with a back box to terminate the flexible conduit from the conduit box within slab at high level.
- 27 All prismatic controllers for fluorescent fittings shall be of the injection moulded acrylic type to obviate discoloration. Plastic diffusers will not be accepted.

### 3.0 INSTALLATION

The light fixtures shall be installed on trunkings / ceiling or recessed in false ceiling. All surface mounted fixtures shall be installed by means of galvanized steel screws or bolts depending on the type of fixture and as advised by the Consultant. Light fixtures installed in the false ceiling shall be supported to the roof in order to avoid loading on false ceiling.

**END OF SECTION - 8**



## CONDUITS & PIPES

### 1.1 GENERAL

The work under this section consists of supplying, installing, and commissioning of all material and services of the complete conduit & pipe system as specified herein and/or shown on Tender Drawings and stated in the Bill of Quantities.

The Contractor shall discuss the electrical layout with the Engineer and co-ordinate at site with other services for exact route, location and position of the electrical lines.

### 1.2 PVC CONDUITS

All wiring for light, power, control and other circuits shall be carried out in **class-B** PVC pipe otherwise stated in BOQ, minimum 25mm dia. The conduits and pipes shall be supplied complete with all accessories including bends, joints, junction boxes of identical material as that of conduit and all cutting, repair, excavation, backfilling, etc., required for complete installation. The conduits for internal wiring to lights, sockets and power circuit shall be of approved brand.

Manufactured smooth bends shall be used wherever conduit change direction. The sharp 90 degree bends or tees shall not be allowed. All conduit accessories shall conform to same material specification as given above for conduit.

The bends shall have enlarged ends to receive conduit without any reduction in the internal diameter at joints.

The round junction box for ceiling light points shall be of PVC having minimum dimensions of 63 mm diameter and 63mm deep. The outlet box at wall light points shall be general purpose type having minimum dimensions of 63 mm diameter and 38 mm deep. Pull boxes and inspection boxes shall be installed in conduit runs where required to limit the pulling of the cables or for inspection purposes. The pull boxes shall be square having minimum dimension of 100mm and 50 mm deep. In all cases, the minimum length of inspection boxes shall be not less than four times the cable manufacturers recommended bending radius of the cable. These dimensions are minimum only and the Contractor shall determine the exact size keeping in view ease of maintenance and installation. In general the use of pull boxes and inspection boxes shall be avoided. The pull boxes and inspection boxes shall be of 1&SWG sheet steel provided with anti-rust paint and finished in gray enamel paint. Wherever installed, pull boxes and inspection boxes shall have a cover of 3 mm thick ply board with white formica sheet glued firmly to it. The face plate shall be secured to the box by means of flat head galvanized screw.

### 1.3 INSTALLATION

#### 1. Conduits

The conduit shall be installed concealed in wall, column, ceiling or under floor, on surface, above the false ceiling or as stated on the drawings. The drawings are diagrammatic and do not indicate the location of junction boxes, pull boxes or inspection boxes which shall be provided to suit site conditions.

The concealed conduits shall have a minimum of 25 mm concrete cover, when concealed in R.C.C works. The conduits in R.C.C works shall be laid before pouring of concrete. Chases shall not be made in R.C.C structure for conduits and accessories after pouring of concrete. In slab, conduits shall be laid over the bottom reinforcement steel and tied firmly to it. The conduit outlet boxes shall be held firmly to finish with the surface of the slab or beam. At expansion joints, flexible conduits or alternate arrangement shall be provided.





Where conduits have to be concealed in cement concrete work after concreting or in block masonry, chases shall be made with appropriate look and of required depth. The conduit shall then be fixed firmly in the recess and covered after plastering. All chases for concealing conduits shall be carried out by the Contractor. The Contractor will be responsible for bringing back the general finish to the condition that it was before the cutting and chiseling by the Contractor.

The work of conduit installation and cutting in cement concrete work or brick work shall be coordinated with civil construction so as not to cause any undue hindrances and delays in progress. The Contractor shall obtain approval of the Consultant for route, etc. to suit the site conditions before starting chasing and cutting. All junction boxes, outlet boxes, pull boxes etc., shall be installed concealed so as to finish with the surface.

Conduits installed on surface shall be fixed by means of black enamelled steel saddles and clamps having thickness of 3 mm. The clamps shall be installed at a distance of not more than 600 mm.

All conduit bends shall be made with an approved conduit bending machine or hickory.

The radius of curvature of the inner edge of any bend shall not be less than the following table :

Conduit size	Radius
25 mm (1")	Not less than 150 mm.
32 mm (1-1/4")	Not less than 200 mm.
38 mm (1-1/2")	Not less than 255 mm.
50 mm (2")	Not less than 305 mm.
70 mm (2-1/2")	Not less than 380 mm.
82 mm (3")	Not less than 460 mm.
100 mm (4")	Not less than 610 mm.

After completion of conduit installation, the system shall be checked for any charred or twisted portion prior to the pulling of wire. At all joints PVC jointing solution or cement must be used.

The termination of conduits is shown diagrammatically on the drawings. The exact final location of the termination shall be coordinated with the equipment to be installed. Conduit ends 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 conduit, 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. Brass glands of appropriate sizes (as per size of conduit) with proper chuck nuts shall be used for fixing of conduits in junction boxes.

The entire conduit system shall be installed and tested before wiring is carried out. Any obstruction found shall be cleared by use of a cutting or other approved device and the conduit be cleaned out before the installation of cable.

#### 1.4 OTHER ACCESSORIES

Outlet boxes, pull boxes, inspection boxes, switch and socket outlet boxes, fan regulator boxes, shall be of 16 SWG sheet steel, derusted, degreased, rust-proof with two coats of zinc chromate primer and painted with enamel, complete with earthing terminal. All boxes shall have ample wiring space, and boxes used outdoors shall be weather-proof.

All the pull boxes are to be properly labeled according to the type of services for which it is installed.

END OF SECTION - 9





## 1.0 POWER DISTRIBUTION PANELS

### 1.1 Scope of Works

The work under this section consists of manufacturing, fabricating, supplying, installing, testing and commissioning of all material and services of the complete Low Voltage LV Distribution Boards as specified herein, shown on the Single Line Drawings and stated in the Bill of Quantities.

The Contractor shall discuss the electrical layout with the Engineer and co-ordinate at site with other services for exact location and position of the each LV Distribution Board.

The Low Voltage Distribution Board with accessories shall also comply with the General specifications for Electrical Works, section - 01 and with other relevant provisions of the Tender Document.

The Low Voltage Distribution Board (DB) shall be sheet steel fabricated suitable for surface/recessed mounting on wall or floor standing; totally enclosed, dust and damp proof. It shall be complete in all respect with material and accessories, factory assembled, tested and finished according to the Specifications and to the normal requirements.

The Low Voltage Distribution Board shall be front operation type and shall:

- have a rated service short circuit breaking capacity, as per IEC 947-2 unless stated otherwise on the drawings / in the BOQ,
- be suitable for 400 Volts, 3 phase 4 wire, 50 Hz system,
- be designed for flush mounting of all instruments on the front side,
- have incoming and outgoing cable termination arrangement, terminal block/line up terminals,
- be provided with stainless steel name plate on the front side of door and wiring diagram on inside of door,
- have all incoming and outgoing connections from top or bottom according to site requirements,
- have door grounded by flexible copper strip/cable,
- have wiring diagram in the pocket inside the door of Distribution Board.

### 1.2 Applicable Standards / Codes

The latest editions of the following standards and codes shall be applicable for the materials specified within the scope for this section:

- |           |   |   |
|-----------|---|---|
| IEC 51    | - | Direct setting electrical measuring instruments |
| IEC 73    | - | Colours for indicator lights and push buttons   |
| IEC 947-2 | - | Low voltage switchgear and control gear         |



IEC 439.1	-	Low Voltage Switchgear and Control gear Assemblies.
BS 3871	-	Miniature & Moulded Case Circuit Breakers
BS 88	-	HRC fuses
BS 89/90	-	Ammeters and Voltmeters
BS 3928	-	Low voltage current transformers
BS 1432	-	Bus Bars

### 1.3 Fabrication

The Low Voltage Distribution Board (DB) shall be fabricated with 16 SWG sheet steel recess / surface mounting as approved by the Engineer. All the components shall be installed on a common component mounting plate inside the enclosure and protected from the front with screwed sheet steel front plate. The enclosure shall be provided with rubber gasketing and a lockable hinged door with cam fastener.

The distribution board shall be supplied complete with all installation materials as recommended by the manufacturer. The incoming and outgoing cable connections shall be according to the wiring requirements. If required, an adapter box for accommodating the cables and conduits may be provided. The box shall be of the same material and finish as the DB. All holes, cut-out etc. shall be tool or jib manufactured and free from burrs and rough edges.

The cabling inside the DB shall be suitably harnessed by means of straps or cords. An earth bar shall be provided for connection of incoming and outgoing earth conductors. The earth bar shall be permanently connected to the body of DB at two points. Flexible copper strip shall be provided for earthing of the door of DB.

Circuit numbers/ designation on all circuits shall be conspicuously marked to facilitate connection and maintenance.

All metal work of the DB shall be cleaned down to bare shining metal phosphated and the surfaces chemically prepared for powder coating. Then these shall be coated with powder of colour RAL 7032 and then baked in oven. The thickness of powder coating shall not be less than 100 microns.

### 1.4 Components

The Low Voltage Distribution Boards (DB) shall be provided with components as specified, as shown on the Tender Drawings and required for the satisfactory operation of the distribution board and of the electrical system.

Typical component specifications are given below:

#### Bus Bars

The Bus bars shall be made of 99.9% pure high conductivity electrolytic copper and shall be completely isolated and mechanically braced for the specified fault level. The identification of bus bars shall be by providing colours sleeves on bus bar ends and these shall be red, yellow and blue for phases and black for neutral. The earth bus bar shall be green.



The bus bars shall be for three phase, neutral and earth and shall be of appropriate size to meet the electrical and mechanical requirements of the system. The temperature rise shall not exceed 45°C at rated current.

#### **Moulded Case Circuit Breaker (MCCB)**

The MCCBs shall be moulded case triple pole 440 Volts of current ratings as shown on the drawings. These shall have fixed magnetic short circuit and adjustable/fixed thermal overload protection.

The MCCBs shall be installed such that their switching levers are accessible through the front plate for operation.

The single and triple pole MCCBs shall have short circuit rupturing capacity suitable for the distribution system as approved by the Engineer or as shown on the drawings. The MCCBs shall be suitable for working on lighting and power circuits.

#### **Ammeters and Voltmeters**

All meters shall be flush mounting, moving iron, spring controlled. The front dimensions shall be 96 x 96 mm for meters.

The meters shall be of accuracy class 1.5 according to BS-89 and 90. The ammeter shall be suitable for connection to 5 Amps secondary of current transformers or directly through shunt as shown on drawings. The ammeters and voltmeters shall have measuring range as indicated on the drawings.

#### **Current Transformers**

Air cooled, ring type current transformers shall be provided having transformation ratio as indicated on the drawings. The current transformers shall be of suitable burden having accuracy class 1.0 according to BS 3938. The current transformers shall have 5 amps secondary.

#### **Selector Switch**

The voltmeter selector switch shall be complete with front plate, grip handle, and RY-YB-BR-RN-YN-BN and OFF position.

#### **Air Break Contactors**

The contactor shall be air break, triple pole, 400 Volts. Each contactor shall be provided with a 230 Volt operating coil, one 6 Watt, 230 Volt red coloured signaling lamp, control fuse and two normally open and two normally closed type auxiliary contacts wired up to terminals for electrical interlocking.

#### **Push Buttons**

Push Button shall be momentary contact type and suitable for flush mounting on the door of panel and on remote area. The push button for ON and OFF switching shall be spring loaded.

#### **Indicating Lamps**

Indicating lamps shall be suitable for flush mounting, complete with base and 230 Volts incandescent lamp. It shall have rosettes of suitable colours as approved by the Engineer.





## 1.5 Installation

Low Voltage distribution board for recessed mounting in wall shall be installed such that the door shall finish flush with the surface of wall. The recess mounted distribution board shall be installed before the plastering of walls. The DB shall be protected to avoid any damage due to the civil work.

All loose parts despatched separately with the DB shall be installed as per manufacturer instructions and all adjustments or setting shall be made as required. All screws, nuts and bolts used for fixing the distribution board shall be galvanized.

The distribution board installation shall include connecting all incoming and outgoing cables. The cable entry in the boards shall be provided from top or bottom as required.

The distribution boards shall be tested as per instructions contained in article "Testing" of General Specifications for Electrical Works, Section-D) of these Specifications.

All labor, equipment and tools required for complete installation and shall be provided by the CONTRACTOR as well as all shimming of the supporting floor steel that may be required to set the switch gear in level position. The LV Panel shall be fixed firmly on the floor according to the manufacturer's recommendations. All outgoing and incoming cable connections shall be made and special care shall be taken in fixing cable boxes and in cable connections so as to have no danger of leakage during operation. Earthing connection shall be made according to the earthing instructions.

**END OF SECTION - 10**



## VOICE & DATA COMMUNICATION SYSTEM

### 1.1 GENERAL

The work under this section includes all material and labor required for complete installation of this system as shown on Drawings and as contained in Bill of Quantities.

This shall include the telephone exchange, telephone instruments, laying of conduit, outlet boxes and telephone distribution boards and other facilities as required for completion of system. The Contractor shall be required to pull in 16SWG galvanized steel wire wherever empty telephone conduits are required. The Contractor is to co-ordinate and comply with the requirements Issued by Telegraph & Telephone Department in all respect.

### 1.2 TELEPHONE EXCHANGE (PABX)

50-400 lines.

### 1.3 TELEPHONES SET

Owner Supplied.

### 1.4 TELEPHONE CABLE

CAT-6 e

### 1.5 CONDUIT & CONDUIT ACCESSORIES

The specification for conduits conduit accessories shall be same as contained in section conduits & pipes of these specifications. The telephone outlet boxes shall be 63mm x 63mm deep made of 16 SWG (1.63mm) sheet steel and provided with earth terminal and 3mm white plastic front plate.

### 1.6 TELEPHONE JUNCTION BOXES

This shall comprise 16 SWG (1.63mm) sheet steel box with hinged cover to be fixed flush with the wall. The copper terminal strips shall be installed on insulated material sheet inside the sheet steel box and the number of terminals shall be as contained in the Bill of Quantities.

### 1.7 INSTALLATION

All complete telephone system, i.e. telephone exchange, conduits, outlet boxes, telephone junction boxes etc., shall be installed in complete conformity with the drawings and recommendations details in relevant section of these specifications of equipment manufacturer.

Identification marking shall be given on the free end of conduit both by color or suitable approved tag.

END OF SECTION - 11



## CCTV SYSTEM

### 1.1 GENERAL

The work under this section includes supply and installation of all the equipment of the CCTV System which shall be UL listed. The contractor shall furnish with the tender bill of material for all the equipment's material. All products shall be made by one manufacturer and shall be supplied by the authorized sale agent of the manufacturer.

### 1.2 SYSTEM

The CCTV System shall be consisted of Color Cameras with brackets, Color monitor, LAN / WAN / DIAL UP facility and VGA monitor, etc. as per bill of quantities.

### 1.3 EQUIPMENTS

#### 1.3.1 COLOR 1 / 3" CCD CAMERA

The color 1 / 3" CCD Camera should be of CCIR Standard. The Camera shall be equipped with Backlight compensation. The Camera should be solid state color interline-transfer type 1 / 3" CCD (Charged Coupled Devices). Images shall be free from blur, distortion and screen burning. The sensitivity of the camera shall be such that a full video signal (1.0 V p-p 75 ohms composite) is produced when a minimum scene illumination of 0.1 Lux, incandescent lighting at highest gain. The Picture Element shall be 768(H) x 494 (V). It shall be External sync, capability VBS (Video Burst Sync.) or BB (Black Burst) signal (Genlock capability). The Lens shall be CS Mount or standard C mount lens (using 5 mm accessory ring), flange back adjustable (12.5 mm + 0.5 mm). It shall have superior picture quality with 420 TV lines horizontal resolution. For optimum economy, Camera shall have built-in lens iris control. The video Signal-to-noise ratio of Camera shall more than 44db at normal gain. Camera shall operates on 24 V AC 50 Hz. Camera shall be strong, lightweight diecast aluminium case protects from electrostatic interference. The operating environment for inside Camera shall be -20 C to 55 C and up to 95 degree humidity.

#### 1.3.2 CCTV COLOR MONITOR

The Video Color Monitor shall be high performance with high resolution. Its image signal input / output port terminal allow bridge connection. Its cabinet should be of solid metal construction. The Video monitor shall have operating controls & shall be mounted below-front of its screen and covered with plastic cover which could be open / close by light push. It should have 450v lines Resolution and variable control Knobs to control contrast, V-hold, H-Hold & brightness. A push button switch to control power On / Off and separate LED pilot light. The video monitor screen size shall be 14 inches flat & square tube shall produce clear distortion less viewing at the way out to the edge and corners of the screen. It shall consist of S-video input / output connectors separated output. Input signal shall be 1.0V p-p and impedance 75 ohms. The power source shall be AC 198-264 auto and power consumption shall be not more than 36 W. It shall consist of Automatic Voltage selector (AVS) to level voltage fluctuation instantly and automatically.

#### 1.3.3 DIGITAL VIDEO RECORDER FOR ONLINE OPERATION ( DVR )

16 Channel Video Recorder shall be microprocessor based with the capacity to extend upto 16 camera inputs. The DVR must have recording and playback simultaneously with LAN / WAN facility. It should be MPEG4 compression and INTEL CPU incorporated. On power failure the system will automatically reboot and resume the recording with in minutes of power return. Unit should have the facility of auto recovery, digital motion detection, remote monitoring and playback, swappable HDD and optional CD-RW support.

END OF SECTION - 13.





## 1.0 LIGHTING CONTROL SYSTEM

### 1.1 Scope of Works

The work under this section consists of supplying, installing, testing and commissioning of all material and accessories of the complete Lighting Control System as specified herein and that 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 other services for exact locations and positions of the Lighting Control Touch Screen.

The description of the complete lighting control system is given in the Bill of quantities, and stated on the drawings, and all relevant material is described in this Section. The determination of quality is based on certified photo-metric data covering the coefficient of utilization, light distribution curves, construction material, shape, finish, operation, etc.

### 1.2 General Requirements

The lighting control system shall be a network of input and output units, with microprocessors built into input and output control device.

The system hardware shall be substantially electronic and firmware in its nature of operation. The interface of electro-mechanical devices (e.g. timer, etc) to overcome limitations in system electronics (and imbedded firmware) will not be accepted.

### 1.3 Technical Requirements

The protocol shall use high speed, full duplex communications. The system shall provide constant feedback on the operational status of inputs and outputs, plus the ability to interrogate the status of specific modules.

The system protocol shall utilize communication algorithms based on Synchronous Carrier Sense, Multiple Access with Collision Detection, implemented with Collision Avoidance (CSMA/CD-CA) standards (IEEE Standard 802).

The control system protocol shall implement the International Standards Organization (ISO) 'Open Systems Interconnection' seven-layer reference model for communication protocol.

The system protocol shall utilize checksum algorithms to ensure incorrect data input is ignored.

There shall be no visible delay between command being issued and action executed. It shall typically be less than 2mS. The control system shall utilize a data transfer rate of at least 4,500 Baud.

The system protocol shall be available to third party companies to develop interfaces to the installed system.

The system shall be capable of 'high-level' integration to Building Management Systems and other proprietary control systems.

#### **Addressing capabilities**

The control system shall have the ability to assign 255 unique Unit Addresses per network, with up to 255 unique networks per installation.



The control system shall have the addressing capabilities to define 255 unique control addresses on each of 255 unique networks per installation.

### ***Interfacing to the Control System***

The system shall allow multiple RS232 access points to perform control, maintenance or reprogramming from multiple locations on the network, or from any single point on the network.

### ***System Control Requirements***

The system shall be able to perform control in all of the following ways:

- Centralized control from a PC enabling over-ride control of individual units, groups, zones, buildings, sites.
- Any input device shall be able to be programmed as a master control point. Master over-rides shall be able to be positioned anywhere in the network, and control any other unit or units on any connected network.
- An unlimited number of master or override controls.
- The system shall allow unlimited switching configurations: Any number of switches shall be able to be programmable for a common load or loads (i.e. multi-way switching) and all switches shall indicate the load status.
- The system shall have a multiple over-ride control hierarchy allowing zonal control, area master control, building master control and site master controls.
- Over-rides shall be able to be re-programmed at any time without any wiring changes.

### ***Distributed Intelligence***

The system shall operate without a computer connected, including the operation of all manual switches. It is not acceptable for the logical relationship between input devices and output loads to be fully reliant on a computer being connected.

All devices shall be able to communicate directly with each other without the need for a computer or a centrally based processor to receive and transmit signals.

### ***Reconfiguration requirements***

It shall be possible for additional system modules or control requirements to be added or changed without powering down the control bus or any other device.

No reconfiguration of existing units or network shall be required during any system reconfiguration. All existing units shall be left undisturbed.

No additional wiring or connections shall be required during reconfiguration.

The control network shall automatically recognize new control modules.



### **Safety requirements**

The bus shall be short circuit protected to ensure that accidental short circuit will not damage any system components.

The system shall have a fail-safe default mode.

The failure of a module on the system shall not affect any other module.

Modules shall be able to be programmed to re-start to 'on', 'off', or resume in previous state after a power failure.

There shall be optical isolation between system sub-networks.

### **Networking and Expansion Capabilities**

The system shall have a software controlled network structure. Any input device shall be able to control any output device, or any group of devices. The devices shall be able to be located anywhere on the network without a direct connection. The relationship shall be able to be changed at any time without re-wiring.

The system bus wiring shall utilize unshielded twisted pair (UTP), Category 6 data cable. Systems utilizing shielded cable will not be accepted. There shall be no requirements for end-of-line bus terminations for impedance matching.

There shall be no restrictions on bus wiring configuration. Star, daisy-chain or any combination thereof shall be possible.

The System shall be able to be easily expanded. Additional units shall be able to be added at any time at any point without re-configuration of any other component or the control devices. An existing system shall not need to be powered down if expansion is being carried out in the future.

The total bus cable length per sub-Network shall be 1000 metres.

The minimum allowable number of units per sub-network shall be 100 units.

The system shall be capable of operating on a bus voltage of 15-36V dc. However, at any point in the installed Network, the voltage across a system unit shall be in the range of 20V d.c. to 36V d.c. System modules (input and output devices) shall be able to be located up to 1000m apart on the bus cable. Only one control bus cable (consisting of two, twisted pairs) shall be required to link any number of rooms, buildings, projects or sites. Localized input devices (e.g., switches or PIR Sensors) shall be able to be added at any time, and shall be able to be programmed to perform any function.

For logistical reasons, it is acceptable to use a modem connection to communicate to remote devices or sites, but this shall be at the user's discretion rather than an inherent limitation of the Control System.

Output relay units shall be able to be connected to different phases or voltage sources, yet be controlled from any location on the network.

The system shall have distributed intelligence to allow full control over any module even if on another electrical sub-system.





### **Input and output Configurations**

It shall be possible to provide input control of the system via the following system devices:

- 0-1V, 0-5V, 0-10V, 0-20V and 4-20mA analogue
- Digital Contact Closures (pre-programmable base function)
- Light Level - analogue and digital
- GUI Touch Screens

It shall be possible to provide output control of the system via the following system devices:

- 0-10V dc analogue outputs
- Relay switch digital outputs
- Phase control leading edge dimmed outputs (incandescent and 12V ELV lighting)

### **Configuration and commissioning software**

This software will be used to:

- Individually address all control units on an installed system.
- Set the required control relationships between input and output devices.
- Define the Functional Control
- Set Power-Up status of Loads

All the above parameters will be set from within a graphical user interface, with separate configuration templates being provided for each type of control unit.

All control addresses will be definable with 'read' descriptive names based on an ASCII string with at least 20 characters.

The software shall have the ability to export and import complete databases from within the software interface.

There shall be the ability to automatically detect and resolve address conflicts between any control units in an installation.

A 'project manager' utility shall be available to allow project names, system topology, application names and address names to be setup.

The software shall have the ability to interrogate an attached installation, upload individual unit parameters from all attached equipment, change these parameters and download the new information to the units.

The software shall allow for multiple configurations of any installation to be maintained.

The software shall include a network communications analysis tool.

The system control configuration shall be recoverable from the network using the software, even in the event of data loss.



The software shall be modular and allow for forward compatibility.

The software shall allow for on-screen (manual) control.

The software shall allow for offline design/modification/manipulation, then download.

The software shall allow for live design/modification/manipulation.

**END OF SECTION - 13**



## EARTHING & GROUNDING SYSTEM

### 1.0 GENERAL

An integrated Grounding System is one that establishes a single point ground (or earthing) system that achieves an exceptionally low resistance ground and provides for a low surge impedance path from any point in the system. This concept is often referred to as a *Common Point Grounding (CPG)* system.

### 2.0 EARTHING SYSTEM COMPONENTS

Grounding system shall be composed of the following components:

- Chemically activated grounding electrodes, commercially known as CEE (Chemically Enhanced Electrode).
- Thin wall, soft copper tubing of at least one half-inch diameter, of at least ninety-nine (99%) percent pure copper.

### 3.0 EARTH INSTALLATION

1. Chemically Enhanced Earth (CEE) is an electro-chemical grounding electrode that automatically conditions the soil/rod interface. This is accomplished by absorbing local moisture to facilitate the electrolytic process. The installation must be accomplished in such a manner as to encourage this process.
2. To install the CEE, first bore a hole in the selected location to a diameter of not less than six (6) inches to accommodate the Earth Conductivity Enhancement Compound ( ECEC ) and a depth equal to the length of the selected rod plus one foot.
3. Remove all of the tapes covering the absorption and electrolyte holes.
4. Insert the electrode in the bored hole to its full length. It is preferable to leave the top exposed and protected by the special wall assembly, as illustrated. Pour 2 to 4 liters of water in the hole as it is being back filled.
5. Tamp the earth in place, leaving space to reach the connections and to install the well access assembly.
6. Make the connection to the CEE copper electrode.
7. Do not install in a place where watershed or downspout carry-off will flood the unit. Provide for carry-off when you install. The unit may be cemented or paved around, providing above instructions are followed and may be installed indoors.
8. Upon completion of installation of the earthing system, resistance-to-ground (earthing connection) shall be tested with a resistance tester. Where tests indicate resistance-to-ground is over 5 ohms, appropriate action shall be taken to reduce resistance to 5 ohms or less, by installing additional, properly spaced, ground electrode and treating soils in proximity to ground electrode. A retest shall be performed to demonstrate compliance.

### 4.0 TEST POINTS





These points are for testing of earthing systems. At these points hot work can be separated and can be tested for continuity and resistance. Test points should be made of brass and solidly fixed to wall at a height of 1.5 meter.

## 5.0 EARTH PITS

These should be made of pre-cast concrete with a cover lid and should be placed over the electrode in level with the finished ground level. The cover lid should have marking showing its number and written "Earth Electrode".

## 6.0 MAIN EARTHING SYSTEM

- 1.1 The contractor shall adequately allow in his tender for the provision and the installation of a complete earthing system required to meet the following requirements and shall ensure that the entire electrical installation is effectively bonded to earth as per BS 7430 Standards.
- 1.2 The contractor shall ensure that the whole of the electrical installation is both mechanically and electrically continuous throughout and is bonded to a suitable main earth in compliance with the IEE regulations and BS Code of Practice. Complete installation shall comply with BS7671: 2001 Chapter 54.
- 1.3 A test connection link shall be provided for testing purposes.
- 1.4 The nominal cross-sectional area of all earth continuity conductors shall be in accordance with the IEE regulations with the minimum size being 2.5 mm<sup>2</sup>.
- 1.5 All switchboards shall be provided with copper earth bar continuously run along the switchboard frames. Main earth electrodes via earthing cables shall be connected to in accordance with requirements.
- 1.6 All switchgear, metal conduit and trunking systems, metal frames, enclosures, lighting fittings and cables sheaths shall be bonded together and connected to the earth tapes of the appropriate switchboard. Similarly all earth pins and metallic plates of socket outlets, switches, accessories and enclosures shall be bonded to earth with earth continuity conductors. Each individual earth path shall be electrically continuous throughout its length from the farthest point of the associated part of the system back to the main earth.
- 1.7 All earthing cables shall be installed in accordance with the relevant requirements called for in the cables section of this specification.
- 1.8 All bonding leads in the form of cable having a standard conductor shall be terminated in "sweated" sockets and shall be rigidly bolted to earthing terminals.
- 1.9 All earthing cables shall be insulated with a PVC sheath. Where connection of the earth lead to the main earth is made with a stranded cable, the earth lead shall be double insulated with PVC.

Mechanical protection must be provided for all external run earth cable as specified.

- 1.10 Earth cable shall have same construction details as of phase cables.
- 1.11 The main earth pits shall be rod complete with all accessories. The value for earth resistance shall be 1 ohm or less.



- 1.12 Equipotential bonding conductors (6 mm<sup>2</sup> minimum) must be provided for metal pipes, leading pipes, metal doors and other extraneous conductive parts and brought to the main earthing terminal in ground floor electrical room for final connection to the main earth pits. They must be concealed in slab / wall upto final connection point.
- 1.13 The metal floors, curtain wall, building structure, door frames in electrical room, substations shall be provided with equipotential bonding and connected to the main Earthing System. Contractor should prepare and submit separate shop drawings with details for the earthing system.
- 1.14 Main equipotential bonding conductors in relation to the neutral of the supply shall be as per table 1 of IS 7671 : 2001.
- 1.15 The earth rods shall be copper, corrosion resistant.
- 1.16 Provide separate earth pits as required and shown in schematic for Generator, etc.
- 1.17 Contractor shall be responsible for Substation earthing as per IESCO requirements.
- 1.18 The main earth pits shall be installed in roof slab. The earth pits shall be double seal type designed to withstand water pressure up to 80PSi equal to 55m head of water.
- 1.21 The extraneous conductors parts in the building shall be bonded together.
- 1.22 The metal underside of raised floor and support elements shall be bonded to the common bonding network in addition to the following:  
Trunking, Tray, Chilled water / Sprinkler / Fire Fighting Pipe Work / Ductwork / HVAC Equipment, etc.
- 1.23 For substation and main Telecom earth pit arrangement in roof slab double sealed earth pit shall be used.
- 1.24 Earth Bar shall be provided with test links for each upstream cable.
- 1.25 Telecom earthing, LV Panel earthing shall be bonded together.

## 7.0 CLEAN EARTHING SYSTEM

- 7.1 Clean earthing system must be provided for Telecommunication System, Data Communication etc. as per system's requirements and connected to a separate earth pit. The low current panels shall be connected to separate dedicated clean earthing system.

## 8.0 CODES & STANDARDS FOR ELECTRICAL, FIRE DETECTION AND EARTHING NETWORK:

All works mentioned below will be designed in strict compliance with the applicable sections of the codes and standards and the design guides issued by the following agencies.

BS 7430	-	Code of practice for protective earthing of electrical installations
IEC 60364-5-54	-	Earthing arrangements and protective conductors
IEC 60479	-	Effects of currents flowing through the human body
BS EN 62305	-	Lightning protection System
IEEE std. 142:2007-	-	Recommended Practice for Grounding of Industrial and Commercial Power Systems

END OF SECTION 14



# **SPECIFICATIONS (PLUMBING WORKS)**





SPECIFICATIONS  
PLUMBING WORKS

1. GENERAL

- 1.1 The Scope of Works includes supply and installation of all material and equipment and testing, commissioning and making ready for operation, complete in all respects the following systems with 12 months maintenance of the same.

Plumbing Fixtures, Fittings & Accessories  
Sewerage & Rain Water Drainage Works  
Cold Water Piping Works  
Natural Gas Piping Works  
A C Drain Piping Works

- 1.2 Each of the herein before listed systems shall be completed in every respect and terminated outside the building as shown on the drawings and as hereinafter specified. Each system shall then be connected onwards to the Employers existing service points/facility under a separate Contract. However, testing and adjusting of each system component and equipment installed, shall be done properly so that the same is in perfect operating condition to the satisfaction of the Engineer.
- 1.3 The work throughout shall be executed in the best and most thorough manner, under the direction of, and to the satisfaction of the Engineer, who will interpret the meaning of the drawings and specifications and shall have the power to reject any work and materials which in his judgment, are not in full accordance therewith. All sleeves for pipes and boxes shall be set accurately on the forms so as to leave openings before the concrete slabs are poured. Voids shall be filled and all surfaces shall be restored to finished condition to the satisfaction of the Engineer.
- 1.4 The specifications and drawings are complementary and together interpret the works. Specific notations given on the drawings for any individual item take precedence over the specifications where there is any conflict. No interpretation shall be made from the limitations of symbols and diagrams such as to exclude any element, necessary for proper completion and best operation of each system of the works.
- 1.5 The Contractor shall be responsible for all items, equipment and materials until they are erected or installed in satisfactory condition and accepted by Employer in writing including the period of maintenance. All defective items of works shall be rectified/replaced by the Contractor without any cost to the Employer, during this period to the satisfaction of the Engineer.
- 1.6 It is specifically intended, and must be agreed to by the Contractor submitting a bid under this specifications that anything (whether material or labour) which is



usually furnished as a part of such equipment as is hereinafter called for and which is necessary for its proper completion and best operation shall be furnished as a part of this Contract without additional cost, whether or not shown in detail on the drawings or described in detail in the specifications. This provision is in consideration of the fact that, in many cases, the use of apparatus of different makes may be considered, which differs in detail from that described (although intended to fulfill the same functions).

- 1.7 The Contractor shall thoroughly acquaint himself with the work involved, and must verify at the building all measurements necessary for proper installation of his work. Sketches and drawings indicating proposed changes/departures from contract drawings necessary if any, due to actual site conditions shall be submitted by the contractor for approval by the Engineer prior to commencement of the works.
- 1.8 All work must be in full accordance with the intent of the drawings and specifications, complete in all respects. All equipment and material should be supplied and installed to fit into the space allotted allowing adequate clearance required for servicing and maintenance. Corrective measures or changes if necessary for equipment supplied shall be the responsibility of the Contractor. Such changes should only be carried out with the consent and approval of the Engineer given on the Shop Drawings and without any additional cost to the Employer.
- 1.9 The Contractor should obtain a written approval from the Engineer for each item of equipment and material prior to supply and installation of the same. To enable the Engineer to give such approval, the Contractor shall submit to the Engineer a complete set of manufacturer's technical literature indicating the necessary installation dimensions, weights and performance information including capacities, RPM, BHP, pressure and temperature data, electrical data etc., where pertinent, electrical and performance diagrams shall also be provided. Literature sheets shall be marked to indicate the specific equipment offered. Samples of material shall also be provided as and when desired by the Engineer.

Approval of material and equipment by the Engineer however, shall not absolve the Contractor of their responsibility of furnishing the same of proper size, quality, quantity and of efficiency to perform to the requirements and intent of the Contract Documents.

#### 1.10 As-Built Drawings

All information of the works as-built on site shall be recorded by the Contractor regularly and on completion of the works or part thereof, the Contractor shall transfer the information on contract drawings/shop drawings and submit three copies of the same for approval to the Engineer.

On receipt of the Engineer's approval, the Contractor shall submit one original tracing of good acceptable quality and six copies of the as-built drawings to the Engineer for onward transmission to the Employer.





## 2. PLUMBING FIXTURES AND FITTINGS

### 2.1 Scope

The work includes providing and installing complete array of plumbing fixtures, fittings and accessories as per drawings and specifications including all labour, equipment and materials required for the satisfactory operation and installation of plumbing fixtures in all respect.

### 2.2 Material

Vitreous China Fixtures shall be locally available and approved models of Chinese origin PORTA in White Colour and the fittings shall be of approved Makes of ROCA & MASTER as per models mentioned below and also in the schedule of Fixtures on the Architectural Drawings and as quantified in the Plumbing Works' BOQ.

### 2.3 Types of Fixtures

The types of fixtures shall be as follows:

#### 2.3.1 Western style water closets complete with appurtenances

- 1 Wash Down close coupled Toilet PORTA Model HD257N with Hydraulic Seat
- 2 Wash Down close coupled Toilet PORTA Model HD229A Baby Commode.
- 3 Wash Down close coupled Toilet PORTA Model HD2N

#### 2.3.2 Eastern style squatting type water closets complete with appurtenances:

- 1 Squatting Pan PORTA Model HD13 complete with HD3 Wall Hung Cistern

#### 2.3.3 Urinals complete with appurtenances

- 1 Pedestal Urinal PORTA Model HD850

#### 2.3.4 Wash Basins complete with appurtenances

- 1 Vanity Wash Basin PORTA Model HD3
- 2 Wash Basin with Pedestal PORTA Model HD11
- 3 Wash Basin with Half Pedestal PORTA Model HDLP203AH
- 4 Vanity Wash Basin PORTA Model HDL

#### 2.3.5 Stainless Steel Sink complete with appurtenances

- 1 Single bowl, single drain, brushed-satin finished 16 gauge Stainless Sink of approved make

### 2.4 Types of Fittings

#### 2.4.1 Pillar Cocks for Wash Basins

- 1 Master Make, Model 063CP

#### 2.4.2 Sink Mixer/Faucet

- 1 Master Make, Model 022CP





### 2.4.3 Hand-Held Shower for Toilets

1 Roca Make, Model 589130C00.

### 2.4.4 Bib Cocks

1 Master Make, Model 107CP

## 2.5 Types of Bathroom Accessories

### 2.5.1 Towel Rail

1 Master Make, Model ROYAL 101CP

### 2.5.2 Coat Hooks

1 Master Make, Model 101CP

### 2.5.3 Toilet Paper Holder

1 Master Make, Model 101CP

### 2.5.4 Liquid Soap Dispenser

1 Master Make, Model 05000CP

### 2.5.5 Hand Drier

1 Zilver Make, Model 20004-S

### 2.5.6 Mirror

1 Mirror shall be of Belgian or Japanese origin, frameless first quality glass, 6mm thick, without waves, installed with stainless steel tamper proof mounting as shown on Architectural Drawings.

All accessories and incidental items mentioned above, and required to complete the plumbing installation in all respect such as but not limited to all pipes and fittings, showers, gate valve, flexible connections, hangers, gaskets, threading tape, caulking materials, paint work etc. shall be included. The fittings for coloured fixtures shall have matching coloured knobs.

## 2.6 Fixture Supports/Settings

Provide all required hangers, supports, brackets etc. for the proper installation of water closet, urinals, lavatories, sinks etc. Supports shall be in accordance with the manufacturer's recommendation and as approved by the Engineer, and where necessary built into partitions or walls and shall be set as the construction progresses.

Fixtures shall be set in a neat, finished and uniform manner making the connections to all fixtures of right angle to the wall unless otherwise directed by the Engineer. Roughing for this work must be accurately laid out so as to conform to finished wall materials.

Each fixture or equipment including floor drain, requiring connections to the drainage system shall be equipped with a trap, unless otherwise indicated.



Traps are to be supplied with the fixtures. Each trap shall be placed as near to the fixtures as possible, and no fixtures shall be double trapped except otherwise indicated.

All fixtures and trimmings in so far as practicable shall be of one manufacturer.

All exposed pipes, valve etc., shall be chromium plated and shall be protected immediately after installation. During installation strap or padded wrenches shall be used on chrome plated pipe fittings etc.

All fixtures shall be set straight and true. The setting shall be level and flush with finished floors and partitions.

Plumbing fixtures shall be supplied complete with all required trimming. Fixtures shall be of first class quality with smooth glazed surfaces, free from warps, cracks, discolorations or other imperfections and shall be subject to approval by the Architect/Engineer.

Fixture mounting heights and spacing shall be as detailed on the architectural drawings or as directed by Engineer.

Fixtures shall be protected from damage before and after installation.

Fixture carriers shall be fastened securely to structure with power driven expansion shields and bolts.

## 2.7 **Cleaning and Testing**

All fixtures and accessories shall be cleaned adjusted and trimmed and the fixtures shall be flow-tested for proper dynamic action of the set. Defects found any shall be repaired and/or adjusted before the fixtures and accessories are finally handed over to the Employer.

## 3. **SEWERAGE, RAIN WATER & A.C. DRAINAGE WORKS**

### 3.1 **Scope**

The work included in this section of contract consists of providing and installation of a complete sanitary and storm drain system as per drawings and specifications including all labour, equipment/materials required for the satisfactory execution, testing, commissioning and making ready for operation of the system complete in all respects.

### 3.2 **Pipes/Fittings material**

All waste pipes, sewer pipes, storm drainage pipes, vent pipes shall be Similar or superior to DADEX Nikasi Type B, non-pressure, chemical resistant, Self-extinguishing Non- conductive uPVC pipes conforming to B.S.- 3505. Fittings shall be matching uPVC DADEX Nikasi fittings with solvent cement socket.





### 3.3 Installation

Sewerage drainage system is of two-stack design, one for soil and the other for waste piping to the B.S. standards of C.O.P. 304:1968. All drainage lines shall be accurately laid true in line and levels from point to point. The pipe-work shall be laid both above ground and underground as generally shown on drawings and fittings, supports, valves, specialities, etc. required and necessary as per the manufacturer's recommendations, shall be provided without any additional cost to the Employer for a complete working system whether or not shown on drawings.

Pipes and fittings material shall be handled with care to avoid impact and deformation and should be stored and installed such that it does not remain into direct exposure with Sunlight. **Defective pipes shall never be installed and shall be immediately removed from site**

Pipes and fittings jointing shall be carried out generally as follows but strictly in accordance with the manufacturer's instructions:

- Cut the pipe perpendicular to the axis and chamfer.
- Properly clean outside of the pipe spigot end.
- Clean inside of the sealing groove of the fitting.
- Apply the lubricant uniformly to the spigot end and sealing ring of pipe.
- Pass the spigot end into the socket containing sealing ring until fully home.
- Mark the position of the socket edge with a pen on the pipe then withdraw the pipe from the socket approximately 10mm (towards thermal expansion gap).

For jointing uPVC pipe to cast iron socket or fittings if and where required, use purpose made uPVC sleeves solvent welded to the pipe run into the Cast Iron socket with approved cold caulking compound. For jointing Cast spigot to uPVC form an appropriate socket in uPVC pipe by using hot air blower and slip the socket over the Cast Iron spigot with neoprene "O" ring, after cooling. **(Use of naked flame is strictly forbidden)**

Pipe supports shall be of sufficient strength to carry the weight of the pipe and its contents and shall be securely attached to the building structure. For horizontal runs above ground, pipe supports shall be spaced at intervals of not more than 10 times the pipe diameter to keep the pipe straight preventing sagging. Vertical lines shall be supported at intervals of 4 Ft.

Roof and wall penetrations shall be thru sleeves having an internal diameter of at least 50mm larger than the outside diameter of the pipe. The length of every such sleeve shall be of the full width or thickness of the wall and in the case of a roof, ceiling or floor shall be at least 38mm longer than the thickness thereof and shall project to the extent above the upper surface unless the Engineer orders to the contrary. Sleeve shall be set in place before pouring concrete or securely fastened and grouted in with cement. The sleeves materials shall be medium





weight steel pipe with a continuously welded water stop of 4.76mm steel plate extending minimum of 75mm all around from outside of sleeve all completely galvanized.

Provide proper waterproofing around all sleeves and sheet metal flashing on each pipe passing through exposed roofs for proper waterproofing as necessary and as directed by the Engineer

Rain water drainage pipes shall be installed for discharging rain water from roof top to ground level as shown on drawings.

Provide fool proof water seal thru a gully trap for each waste water connection to the sewerage system.

Independent 6" deep traps shall be provided in the floor for connection of A. C. drains to the waste pipe lines as shown on drawings.

Terminate Vent pipe atleast 12 inches above roof finishes such as to prevent clogging.

All black iron hangers including rods, inserts, clamps, brackets etc. shall be primed by dipping in zinc chromate steel protective primer paint before installation.

No pipes shall pass over and/or under the electrical bus duct and switchgear panels. However where it becomes absolutely necessary without any choice, protective pans shall be provided under and/or over pipes passing electrical bus duct and switchgear panels. The pan shall be of 12 gauge M. S. Sheet with a 150mm lip having welded water-tight corners and painted with three coats of rust proof paint. The pan supports shall be the same as pipe hangers and the pan shall be sloped to drain away from the bus duct and switchgear panel.

### **Buried Pipelines**

**Excavation:** Excavate in such a manner that buried pipework can be laid on even and stable bedding free from hard objects or sharp projections and to the alignment and depths as required for regular gradients to continuously support the pipe and as directed. Scallop out a bell hole in the bedding for joining of pipes and fittings and ensure filling of bell holes so that the sockets are also continuously supported after jointing.

Width of trench shall be sufficient at the bottom to allow adequate working space for the pipe jointing and should not be less than 24 inches or pipe diameter plus 18 inches. Trenches are to be kept clear of water by pumping out water, if necessary. Support sides of excavated trenches with Planking and Strutting, if necessary, to ensure a proper and speedy execution of the work.

**Back Filling:** Before backfilling, remove debris, trash and other foreign material from trenches, test the pipework and obtain approval from the engineer for commencing backfilling.



Fill material shall be free from timber, rocks 3 inches or larger, organic material and other unsuitable material. Earth filling to the bottom of the trenches and to a height of 12 inches above the top of the pipes shall be of selected materials hand packed, moistened, if necessary, and well rammed on either side of the pipe. Care shall be taken to obtain proper compaction under the pipe haunches if any. The remainder of the earth filling shall be in 6-inch layers, each layer moistened, if necessary, and well rammed to achieve the required compaction. Mechanical taping should only be used after the pipes are covered with at least 24 inches of consolidated material and if recommended by pipe manufacturers/suppliers. Where vegetable soil has been removed, it shall be replaced at top of the trench and similarly consolidated. Surplus earth shall be disposed off as directed.

Restore to original condition existing pavements, roadways, walkways, curbs and landscaped areas disturbed during the excavation and back filling. The trenches under pavings shall be back filled by 10 cal sand, and well compacted.

**Buried Services:** Provide proper support to all existing underground pipes, cables, main and other services, if exposed by excavation until the trenches are backfilled and re-stored.

3.4 **Floor Drain:** Floor drains shall be of 4"  $\phi$  stainless steel cylindrical body with perforated top and hexagonal nut screwed to heavy duty brass ferule fixed into painted cast iron deep seal trap. All floor drains shall be set 1/8" below the normal finished floor with water-stop collars.

3.5 **Cleanouts:** Cleanout shall be provided where required for proper maintenance of the system and at all changes in pipe direction and as indicated on the drawings. Cleanout shall be of 4"  $\phi$  stainless steel cylindrical body with solid top and hexagonal nut screwed to heavy duty brass ferule fixed into painted cast iron long radius elbow.

3.6 **Roof Drain:** Roof drain where shown shall be cast iron with 4"  $\phi$  sump, removable dome-type grating having roof waterproofing flange with caulked outlet to fit into C. I. Roof Drain Pipe.

3.7 **Vent Stack Fitting:** Vent fitting on top of vent stack shall be Polished bronze with vandal proof screws.

### 3.8 **Manholes & Gulley traps**

Manholes shall be provided in accordance with the drawings, to the inverts and sizes shown.

Manholes and gulley traps shall be constructed of 6" thick block masonry wall in sizes as shown on drawings with inside and outside plaster in 1:4 mixing ratio and about 3/4" thickness including 1:3:6, 3" thick PCC concrete bed. Manholes shall have smooth benching inside with 1:3:6 concrete. The flow channels of manholes shall be smooth and accurately shaped to a semi-circular bottom.

Changes in size and grade shall be made gradual and even. Changes in direction of the sewer and entering branches shall have true curves of as large





radius as practical. Manholes 3 Ft and deeper shall be provided with built-in-steps of galvanized wrought iron. The rungs shall be 12 inches in width and spaced approximately 12 inches apart and alternate rungs shall be staggered or offset 6 inches. Bars or rods used for steps shall not be less than 1 inch diameter.

Medium weight C.I. covers including frame shall be provided on all manholes and gully traps. The frame shall be carefully embedded in top slab very neatly so that the cover and frame are flushed with the finished surface.

Apply atleast two coats of bituminous water proofing material on exterior surfaces of manholes and grease traps as directed and approved by the Engineer.

Test all manholes for water tightness by filling with water and checking the level after two hours. Fall in level if any, should be filled back with water to the original level and checked again after half an hour. The water level should hold this time.

After the pipe is laid, the joints completed and the trench partially backfilled leaving the joints exposed for examination the newly laid piping shall be checked for alignment by flashing light between manholes. If illuminated interior of the pipe line shows poor alignment, the displaced pipe shall be realigned to correct position and defect shall be repaired.

### 3.9 Septic Tank

Septic Tank shall be a two-chamber tank (Sludge Chamber and Effluent Chamber) constructed of SR cement in-situ class "A" high density concrete with RCC base in sizes as shown on drawings or as approved and shall be plastered from inside and outside with water proof material.

Sludge chamber shall have a suction pipe extended upto the grade level for periodic cleaning with a suction pump. The effluent chamber shall have the provision for pipe inserts for compressed air and/or chlorination if required in future.

Each chamber of the tank shall have manhole covers of cast iron double seal heavy duty type with frames. The frame shall be carefully embedded in top slab very neatly so that the cover and frame are flushed with the finished surface.

### 3.10 Cleaning

Before acceptance of sewerage/drainage system it shall be cleaned to the satisfaction of the Engineer. The pipe line shall meet the test of alignment and grade after pipe line has been backfilled, dewatering devices removed and manholes completed.





#### 4. WATER SUPPLY SYSTEM

##### 4.1 Scope

The work included in this section of contract consists of providing and installation of domestic Cold Water and Hot Water Pipe works as per drawings and specifications including all labour, Fittings, Specialities, equipment and material required for the satisfactory execution, testing, commissioning and making ready for operation of the water supply system for the plant building.

##### 4.2 Pipes/Fittings material

All pipes and fittings used in this section of plumbing work whether exposed, hidden in block/concrete work or running underground shall be equivalent to DADDEX POLYDEX PP-RANDOM or KELEN of Austria (Polypropylene type 3) PN20 pressure pipes manufactured to DIN standards 8077 & 8078 and fittings manufactured to DIN standards 16962.

##### 4.3 Installation

The pipe-work shall be laid both above ground and underground as generally shown on drawings and fittings, valves, hooks/clips, brackets, etc. required and necessary as per the manufacturer's recommendations, shall be provided without any additional cost to the Employer for a complete working system whether or not shown on drawings.

Pipes and fittings material shall be handled with care to avoid impact and deformation and should be stored and installed such that it does not remain into direct exposure with Sunlight. **Defective pipes shall never be installed and shall be immediately removed from site**

Pipes and fittings jointing shall be carried out by heat fusion (welding) strictly in accordance with the manufacturer's instructions and with a manufacturer's supplied self regulating plynfusion welding machine.

**Pipe welding procedure:** The welding procedure shall be strictly followed as recommended by the manufacturers for electrofusion socket joints ensuring that:

- Proper tools are used to cut the pipe perpendicular to the axis and to chamfer.
- The welding surfaces of pipes and fittings are cleaned free from grease with manufacturer's recommended cleaning chemical.
- Proper Marking of welding depth on the pipe end.
- Simultaneous heating of pipe and fitting according to the required heating time with the manufacturer's supplied welding machine and
- Pushing the pipe end into the fitting and alligning within the specified time and allowing required time to cool the joint.



All joints shall be made on the work-bench except a few necessary to be made in place on the wall after installation. Such points shall be kept in the areas as accessible as possible.

**Pipe bends:** Pipe bends can be done within the limits in accordance with the manufacturer's recommendations by cold forming or by using hot air blower for short bends. **Use of naked flame is strictly forbidden.**

Valves and specialties shall be fitted with threaded fittings. All threaded inserts in the fittings and joints shall be made of nickel plated brass and machined from solid bars. The joints shall be sealed with TEFLON sealing tape. The threads shall in no case be over-tightened.

**Pipe Supports:** Install all pipes as straight and direct as possible to form right angles or parallel lines with building walls and other pipe lines unless otherwise necessary or shown. All pipes shall be neatly spaced and the risers shall be erected plumb and true parallel to other pipes. The installation of pipes shall be thoroughly coordinated with that of all other services to avoid interference and all pipe work shall be arranged and assembled so as to prevent undue strain or leak caused by expansion and contraction.

For open installation and for the pipes in the shafts, pipe hangers and supports / clamps shall be determined as fixed points and sliding points and shall be furnished complete with rods, bolts, locks, nuts, swivels, couplings, brackets and all other components and accessories of standard products meeting manufacturer's recommended standards and good engineering practice adequate to take the supported loads.

Valves and connections resisting to bending stress have to be fastened by means of fixed points. In particular cases the fixed points shall be positioned close to branches or wall passages.

The sliding points must keep the system aligned and support it and allow the axial sliding of the pipes as well. The slidings shall be firmly mounted in order to prevent vibration and transmission of noise. All changes in direction can be used to accomodate linear expansion. However if necessary, expansion loops be provided for pipes above 2"ø with a fixed point in the center. Expansion loops shall also be provided at building expansion joints.

Distance between the support points shall not exceed the following:

<u>Pipe ø</u>	<u>Spacing(Ft.)</u>
1/2" & 3/4"	2
1"	2.5
1-1/4"	2.5
1-1/2"	3









Width of trench shall be sufficient at the bottom to allow adequate working space for the pipe jointing and should not be less than 24 inches or pipe diameter plus 18 inches. Trenches are to be kept clear of water by pumping out water, if necessary. Support sides of excavated trenches with Planking and Strutting, if necessary, to ensure a proper and speedy execution of the work.

**Back Filling:** Before backfilling, remove debris, trash and other foreign material from trenches, test the pipework and obtain approval from the engineer for commencing backfilling.

Fill material shall be free from timber, rocks 3 inches or larger, organic material and other unsuitable material. Earth filling to the bottom of the trenches and to a height of 12 inches above the top of the pipes shall be of selected materials, hand packed, moistened, if necessary, and well rammed on either side of the pipe. Care shall be taken to obtain proper compaction under the pipe haunches if any. The remainder of the earth filling shall be in 6-inch layers, each layer moistened, if necessary, and well rammed to achieve the required compaction. Mechanical tamping should only be used after the pipes are covered with at least 24 inches of consolidated material and if recommended by pipe manufacturers/suppliers. Where vegetable soil has been removed, it shall be replaced at top of the trench and similarly consolidated. Surplus earth shall be disposed off as directed.

Restore to original condition existing pavements, roadways, walkways, curbs and landscaped areas disturbed during the excavation and back filling. The trenches under pavings shall be back filled by 10 cal sand, and well compacted.

**Buried Services:** Provide proper support to all existing underground pipes, cables, main and other services, if exposed by excavation until the trenches are backfilled and re-stored.

#### 4.4 Pressure Testing

All installed pipework must be ventilated and subjected to pressure testing, as per pipe Manufacturer's recommendations. However, the minimum test pressure must be 10 bar. Following is the procedure:

- a. After the pipe have been installed and before they are concealed, the system shall be filled with water and vented at high points to remove air.
- b. If possible the Pressure Pump should be placed at the lowest point in the system.
- c. A suitable Pressure Gauge which is capable of reading changes in pressure of 0.1 bar should be used and should be placed at the lowest point of the pipework being tested.
- d. Build up to the specified test pressure. Begin the test one hour later. The pressure should not be increased to compensate for pressure lost during this period. (A small increase in temperature will alter the test Pressure -  $\Delta 2^\circ C =$  Change in pressure of 0.2 bar)



- e The test lasts one hour. To pass the test the change in pressure must be  $\leq 0.2$  bar.

#### 4.6 Rinsing

After pressure testing the drinking water pipes must be rinsed. Each riser is rinsed in turn (the length of paperwork should not exceed 300 Ft.), starting at the lowest draw-off point and working up to highest draw-off point. All draw-off points should be opened. The rinsing time at each draw-off point should be at least 2 minutes. After the pipe has been rinsed for approx. 2 minutes at the last draw-off point, all draw-off points are closed in the reverse order to which they were opened.

#### 4.7 Pipe Line Disinfection

The Contractor shall furnish all equipment, labour and materials for the proper disinfection of the pipe line. Disinfection shall be accomplished by chlorination after the lines have been tested for leakage but before they have been connected to the main system. Disinfection of the pipe lines shall be done in presence of the Engineer with equipment approved by him.

A chlorine and water mixture shall be supplied by means of a solution feed chlorination device. The chlorine solution shall be applied at one end of the pipe line through a trap, in such a manner that as the pipe line is filled with water, the dosage applied to the water entering the pipe shall be at least 25 mg/l or enough to meet the requirements given hereinafter.

Chlorinated water shall be retained in the pipe line for a period of at least 24 hours. After the chlorine treated water has been retained for the required time, the chlorine residual at the pipe extremities and at such other representative points shall be at least 10 parts per million. This procedure shall be re-tested until the required residual chlorine concentration is obtained.

During the process of chlorination, the pipe line and all valves or other appurtenances shall be operated while the pipe line is filled with the heavy chlorinated water.

Following complete disinfection of the pipe lines, all treated water be thoroughly flushed from the pipe line at its extremities. Treated water and water used for flushing the pipeline shall be disposed off in a proper manner. Fresh treated water shall be filled in the line and water shall be tested for presence of coliform. The test result should indicate negative coliform presence. If the test indicate positive coliform the entire process of disinfection shall be repeated or improved upon until coliform free samples are obtained.

#### 4.8 Valves and Specialties

All valves, Drain cocks, Vents and pipe specialties required for proper operation of the water supply system whether or not shown on drawings shall be provided by the Contractor without any additional cost to the Employer. These shall be of USA, European or Japanese origin having identification plates indicating name of manufacturer and working pressure.





4.8.1 Globe valves shall be provided for regulating water supply at water pump discharge and shall be of the best quality with screwed ends, non-rising stem and double wedge or disc type, bronze body and trim in sizes as required by the piping system. The working pressure shall be 1-1/2 times greater than the system pressure. Valve construction to be such as to allow re-packing of glands while open under pressure. Valve for underground services shall be provided with a valve box and cover. Valves shall be similar to those manufactured by Kitzwawa, Econosto, Tomohe, Jenkins, Crane or Walworth.

4.8.2 Gate valves shall be provided as shut-off valves for control of water supply system and shall be of the best quality with screwed ends, non-rising stem and double wedge or disc type, bronze body and trim in sizes as required by the piping system. The working pressure shall be 1-1/2 times greater than the system pressure. Valve construction to be such as to allow re-packing of glands while open under pressure. Valve for underground services shall be provided with a valve box and cover. Valves shall be similar to those manufactured by Kitzwawa, Econosto, Tomohe, Jenkins, Crane or Walworth.

4.8.3 Foot Valve with Strainer shall be Unique seating design providing positive seating action at both low and high quality pressures without slamming at all pressure ranges without additional loading on the seal, Silent Operation - Short linear stroke, used in priming of split case pumps; with cast iron body, silicon bronze seat and disc and heavy-duty stainless steel screen and screen retainer basket; flow area 3 to 4 times that of the pipe area.

4.8.4 Automatic air vents shall be provided on the highest point on mains and shall be inverted ball-float trap type where required.

4.8.5 Expansion Joints shall be bellows type suitable for the operating pressure and temperature of the system. Expansion joint shall be provided on the mains as required and/or as indicated on the drawings. Complete with pipe alignment guide and the anchors necessary to contain the movement where required.

4.8.6 Check Valves shall be light weight compact design full swing check valve for easy installation without added support to maintain pipeline integrity suitably sized and installed in pump discharge line from U G tank to O H tank as required.

#### 4.9 Painting and Identification

All supports, hangers, clamps etc. shall be painted with two coats of primer and two coats of enamel finish paint.

Primer for iron surfaces shall be "KROMIC" steel protective primer of Jenson & Nicholson and for galvanized surfaces it shall be "KROMIC" galvanized iron primer of Jenson & Nicholson.

Finish paint shall be an enamel paint of approved manufacturer.

For identification of the services, the colour scheme of the piping system shall be based on the American Standard ASA A-13.1 of 1975.





- 3 Provide factory-applied, three-layer coating of epoxy, adhesive, and PE or field applied primer and epoxy paint coating on all pipe and fittings. Field applied coating is restricted to fittings and short sections of pipe necessarily stripped for threading or welding. Field coating shall be manufactured by Amercoat Type 240 or approved equal and applied in accordance with manufacturer's recommendations. Galvanizing shall not be considered adequate protection.

#### Above Ground Piping Exposed Inside of Building:

- 1 Piping 1½ inches and smaller shall be seamless Schedule 40 black steel, ASTM A106 or ASTM A53 Type "S", Grade A or B, with Class 150 black malleable iron threaded fittings or as approved by the local gas authorities.
- 2 Piping 2 inches and larger shall be Type "S" seamless or Type "E" electric resistance welded Schedule 40 black steel, ASTM A53, Grade A or B, with Schedule 40 wrought carbon steel fittings, or as approved by the local gas authorities.
- 3 All natural gas piping serving labs from main natural gas riser shall be routed exposed to view below ceiling and painted in accordance with Division 09.

### 5.3 Execution

- 1 Natural gas piping works shall be carried out by an authorized contractor approved by the local gas authorities.
- 2 Install emergency gas shut-off valve in each line serving individual laboratory rooms. Locate shut-off actuator within lab area adjacent to each room exit at 54 inches above finished floor. Location of emergency shut-off shall be accessible to occupants for shutting off the natural gas supply under emergency conditions and comply with Texas Accessibility Standards Accessible Elements and Space requirements.
- 3 Gas piping joints shall be welded from main natural gas riser to each emergency shut-off valve. Piping from the emergency shutoff valve to the outlets shall be assembled with threaded fittings provided all joints are exposed to view or within the confines of laboratory furniture.
- 4 Install flexible stainless steel appliance/equipment connector at each fume hood and biological safety cabinet requiring natural gas service. Connectors shall not be concealed within or extended through wall, floor or partition and shall be located entirely in the same room as the connected equipment. Provide an accessible shut-off valve not less than the nominal size of the equipment connector, immediately ahead of the connector.

### 6 Fire Extinguishers

- 6.2 Provide 25 Kg each, all purpose Dry Powder Fire Extinguisher for suppression of Class A, B & C fires involving wood, textiles, paper, flammable liquids, gases, etc in Laboratories and libraries, mounted on trolley, complete with a hose and nozzle.



6.2 Provide 2 Kg each, all purpose Dry Powder Fire Extinguisher for suppression of Class A, B & C fires involving wood, textiles, paper, flammable liquids, gases, etc in corridors/circulation areas, mounted on walls.

7. LIST OF APPROVED MANUFACTURERS (ALTERNATES SUBJECT TO APPROVAL OF THE ENGINEER)

7.1 PIPES

A UPVC CLASS "D" PIPE & FITTINGS FOR COLD WATER & STORM WATER SYSTEM: AGM / NEPRO / HEPWORTH / NIKASI - DADEX / APPROVED EQUAL OR PPRC CLASS PN20 OF KELIN/HEPWORTH

b PPRC CLASS PN20 PIPE & FITTINGS FOR HOT WATER SYSTEM: KELIN / AGM / NEPRO / HEPWORTH / NIKASI - DADEX.

c PVC CLASS "D" PIPE & FITTINGS FOR INTERNAL SOIL, DRAINAGE AND VENT SYSTEM ABOVE GROUND OR IN FALSE CEILING OR IN SHAFTS ETC: AGM / NEPRO / HEPWORTH / NIKASI - DADEX.

7.2 GUN METAL VALVES.

FOR HOT / COLD WATER SYSTEM: OVEN TROP / HATTERSLEY / ECONOSTO / CRANE.

7.3 FLOOR/ROOF DRAINS :

ALPINE/NIKASI-DADEX/HEPWORTH/FIRAL-TURKEY/APPROVED EQUAL.

7.4 FLOOR/WALL CLEAN-OUTS :

ALPINE/A.A.SANITARY..

7.5 MANHOLE/GULLEY TRAP COVERS :

CME/TEEPU

End of Plumbing Specs





# SUKKUR IBA UNIVERSITY

## Project

Construction of Hostel at IBA Public School Sukkur



Volume-IV  
Tender Drawings

CONSULTANT:



NBK CONSULTANTS  
Consulting Engineers, Architect &  
Planners





SUKKUR IBA UNIVERSITY  
NISAR AHMED SIDDIQUI ROAD  
SUKKUR

CONSTRUCTION OF HOSTEL at IBA PUBLIC SCHOOL SUKKUR  
MILITARY ROAD SUKKUR

TENDER DRAWING  
ARCHITECTURE, STRUCTURE, ELECTRICAL & PLUMBING



CONSULTANT:



NBK CONSULTANTS  
Consulting Engineers, Architects &  
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MILITARY ROAD SUKKUR

TENDER DRAWING  
ARCHITECTURE



CONSULTANT:



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Consulting Engineers, Architects &  
Planners

ARCHITECTURE			
S.NOS.	DRG. NOS.	DRAWING TITLE	REV.
1	AR01	CEILING FLOOR PLAN	
2	AR02	ROOF PLAN AND ELEVATION	
3	AR03	SECTION Y-Y	
4	AR04	FLOOR PLAN (GROUND FLOOR)	
STRUCTURE			
S.NOS.	DRG. NOS.	DRAWING TITLE	REV.
1	ST01	FOOTING PLAN	
2	ST02	COLLAR PLAN	
3	ST03	TYPICAL COLUMN & Lintel REINFORCEMENT DETAIL	
4	ST04	WALL REINFORCEMENT DETAIL	
5	ST05	FLOOR SLAB PLAN	
6	ST06	FLOOR SLAB TYPICAL SECTION AND REINFORCEMENT DETAIL	
7	ST07	FLOOR SLAB REINFORCEMENT PLAN	
8	ST08	STAIR TOWER (FIRST AND STAIR SECTION)	

ELECTRICAL			
S.NOS.	DRG. NOS.	DRAWING TITLE	REV.
1	EL01	Legend & Convention Chart	
2	EL02	Single Line Diagram (SLD)	
3	EL03	GROUND FLOOR & FIRST FLOOR	
4	EL04	FIRST FLOOR CHART LAYOUT	
5	EL05	GROUND FLOOR	
6	EL06	CONDUIT LAYOUT	
7	EL07	GROUND FLOOR	
8	EL08	CONDUIT POINT & CONDUIT LAYOUT PLAN	
9	EL09	ROOF FLOOR	
PLUMBING			
S.NOS.	DRG. NOS.	DRAWING TITLE	REV.
1	PO1	LIST OF SYMBOLS & GENERAL NOTES	
2	PO2	GROUND FLOOR PLAN, SOIL & WATER PIPING LAYOUT	
3	PO3	GROUND FLOOR	
4	PO4	FIRST FLOOR PLAN, SOIL, WATER & WATER PIPING LAYOUT	
5	PO5	FIRST FLOOR	
6	PO6	GROUND FLOOR (SOIL & HOT WATER PIPING LAYOUT)	
7	PO7	GROUND FLOOR	
8	PO8	TYPICAL DRAIN, WASTE & VENT PIPING PLANS & SECTIONS	

**GENERAL NOTES**

- UNLESS OTHERWISE STATED ALL FLOOR FINISHES ARE 1" THICK. ALL ARCHITECTURAL DRAWINGS SHOW FINISHED FLOOR LEVELS & STRUCTURAL LEVELS ARE ADJUSTED ACCORDINGLY.
- CONTRACTOR TO CHECK AND VERIFY ALL DIMENSIONS AND LEVELS BEFORE WORK.
- ALL ERRORS ARE CORRECTED TO BE REFERRED TO THE CONTRACTOR PRIOR TO EXECUTION OF WORK.
- ALL DIMENSIONS TO BE READ IN CONJUNCTION WITH DIMENSIONS OF OTHER TRADES.
- DO NOT SCALE DRAWINGS. FOLLOW WRITTEN DIMENSIONS ONLY FOR MISSING DIMENSIONS REFER TO CONSULTANT.
- AS INDICATED OR OTHERWISE, THE CONTRACTOR SHALL FURNISH ALL ITEMS REQUIRED FOR THE PROPER EXECUTION AND COMPLETION OF THE WORK. ITEMS OF THE CONTRACTOR'S RESPONSIBILITY SHALL BE INDICATED WITHIN THE DOCUMENT, SHALL BE FINAL AND BINDING ON THE CONTRACTOR.
- ALL WORK PERFORMED SHALL COMPLY WITH THE CONTRACT DOCUMENTS, DRAWINGS, SPECIFICATIONS, AND NOTES.
- ALL MATERIALS AND WORKMANSHIP SHALL CONFORM TO THE DRAWINGS AND SPECIFICATIONS. DISCREPANCIES BETWEEN DRAWINGS, NOTES & SPECIFICATIONS TO BE BRIDGED TO THE KNOWLEDGE OF ARCHITECT PRIOR TO EXECUTION OF THE WORK.
- ANY DETAILS (SYSTEMS, MATERIALS, WORK) ARE PROPOSED TO BE CHANGED, MUST FIRST BE REVIEWED AND APPROVED BY THE ARCHITECT.
- NOTES APPEARING ON VARIOUS DRAWINGS FOR DIFFERENT SYSTEMS AND MATERIALS SHOULD BE TO BE REVIEWED AND NOTED ON ANY ONE DRAWING AND TO BE APPLIED TO RELATED DRAWINGS AND DETAILS.
- THE STRUCTURAL, MECHANICAL, AND ELECTRICAL DRAWINGS ARE SUPPLEMENTARY TO THE ARCHITECTURAL DRAWINGS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATION WITH THE ARCHITECTURAL DRAWINGS AND MAKE OF ANY DISCREPANCY BRING IT TO THE KNOWLEDGE OF ARCHITECT/ENGINEER PRIOR TO EXECUTION OF WORK.
- THE CONTRACTOR SHALL COORDINATE ALL MECHANICAL, PLUMBING AND WALL, SLICES AND DETAILS IN CONCRETE SLAB AND SHALL BE RESPONSIBLE FOR THE MECHANICAL, ELECTRICAL, STRUCTURAL, AND ARCHITECTURAL DRAWINGS AND BE AWARE OF ANY DISCREPANCY BRING IT TO THE KNOWLEDGE OF ARCHITECT/ENGINEER PRIOR TO EXECUTION OF WORK.
- WHERE A TYPICAL SECTION IS DETAIL, IT SHALL BE UNDERSTOOD THAT ALL LIKE OR SIMILAR DETAILS ARE THE SAME UNLESS SPECIFICALLY NOTED OR OTHERWISE OTHERWISE.
- THE CONTRACTOR SHALL PROVIDE TEMPORARY FENCING / CONSTRUCTION BARRIERS TO ENSURE PUBLIC SAFETY.
- PROTECTIVE EQUIPMENT AND SERVICES SHOULD BE PROVIDED THROUGH THE CONSTRUCTION PERIOD AS REQUIRED.
- ALL TIGHT FINISHES WILL BE SHOWN ON SEPARATE DETAIL DRAWINGS.
- ALL WORKMANSHIP TO BE REVIEWED BY ARCHITECT & FINISHED CHECKS OTHERWISE SHOWN.
- PLASTER OVER FABRICATIONS SHOULD ONLY BE SHOWN ON DRAWING.

**DIMENSION NOTES**

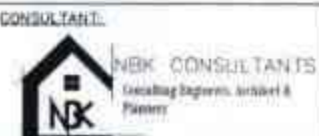
- DIMENSIONS ARE IN FEET UNLESS NOTED OTHERWISE.
- DIMENSIONS SHALL TAKE PRECEDENCE OVER SCALE SHOWN ON DRAWINGS. CONTRACTOR SHALL VERIFY ALL DIMENSIONS, LEVELS ETC. AT SITE PRIOR TO COMMENCING THE WORK. SCALE OF ANY DISCREPANCIES BRING IT TO THE KNOWLEDGE OF ARCHITECT.
- THE WALLS ARE DIMENSIONED TO THE UNFINISHED FACE OF THE BRICKWORK UNLESS NOTED OTHERWISE.
- PARTITIONS AND WALLS SHOWN ARE DIMENSIONED IN COLUMN OR FINISH FACE WITH STRUCTURAL COLUMNS AND ARE NOT DIMENSIONED.
- DOOR OPENINGS ARE GENERALLY DIMENSIONED TO THE UNFINISHED FACE OF THE INTERNAL DOOR OPENING THAT ARE NOT DIMENSIONALLY LOCATED ARE TO BE CENTERED BETWEEN WALLS OR PARTITIONS, IF CENTERED, WIDTH FROM AN UNFINISHED WALL AS SHOWN ON THE PLANS AND DETERMINED FROM THE DETAILS.
- DOOR OPENING WIDTH & HEIGHT SHOWN ON THE SCHEDULE OF DOORS ARE CLEAR OPENINGS IN BETWEEN THE FACES OF THE SUB-FRAMES (IF ANY).
- PIF DIMENSIONS (COLUARS) AND LEVELS OF ALL STRUCTURAL MEMBERS REFER TO STRUCTURAL DRAWINGS. DISCREPANCIES ARE TO BE BRIDGED TO THE KNOWLEDGE OF THE ARCHITECT PRIOR TO EXECUTION.
- ALL ELEVATIONS ON DRAWINGS ARE SHOWN IN FEET & INCHES.
- ALL FLOOR LEVELS SHOWN ON ARCHITECTURAL BUILDING ELEVATIONS AND SECTIONS ARE TOP OF FINISHED FLOOR LEVEL UNLESS NOTED OTHERWISE.



**CLIENT:**  
Sukkur IBA University

**PROJECT:**  
CONSTRUCTION OF HOSTEL @ IBA PUBLIC SCHOOL, SUKKUR

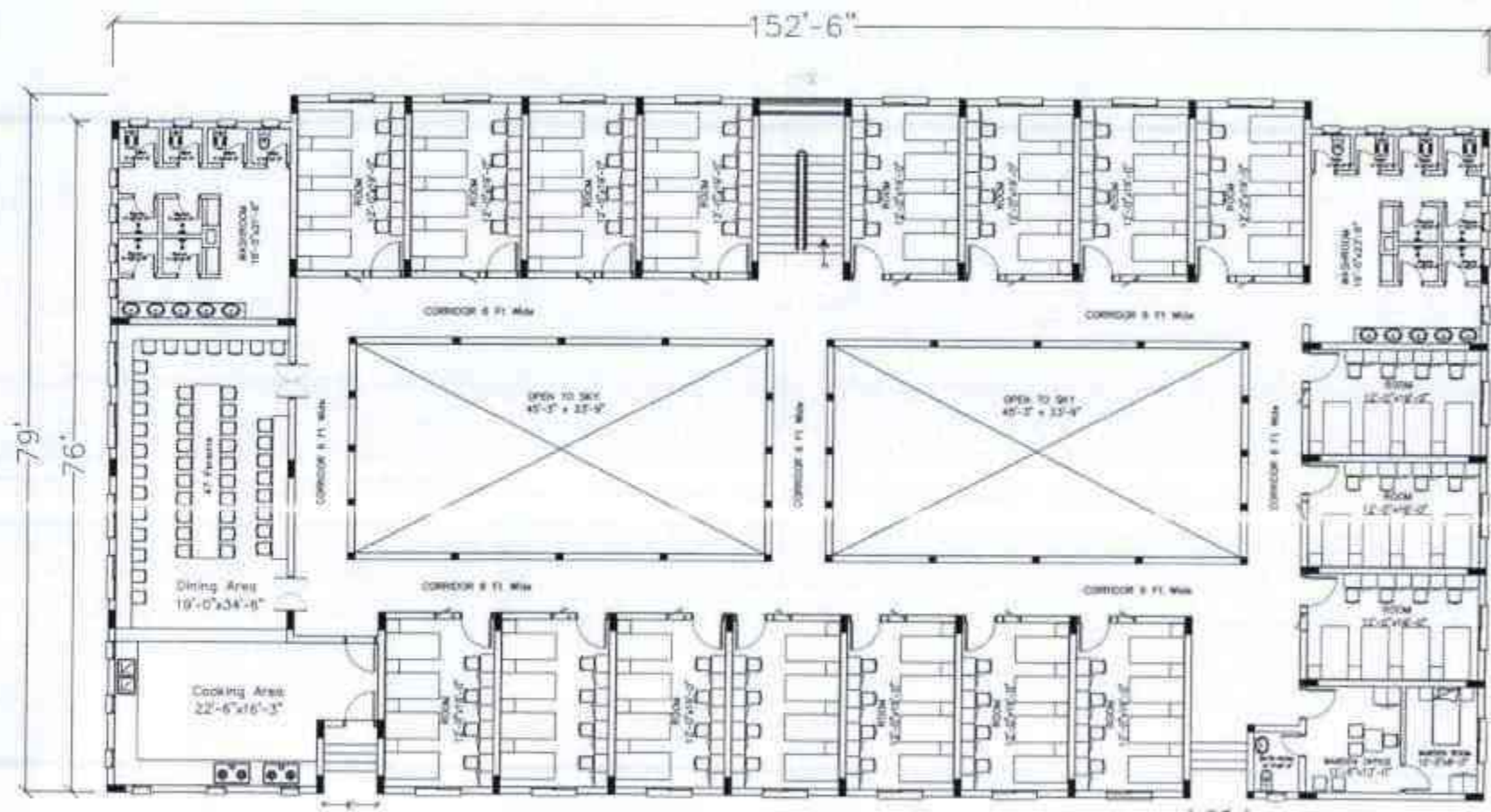
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**Note:**


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<b>Dwg. No.:</b>	<b>Revision:</b>	<b>Issued for:</b> TENDER



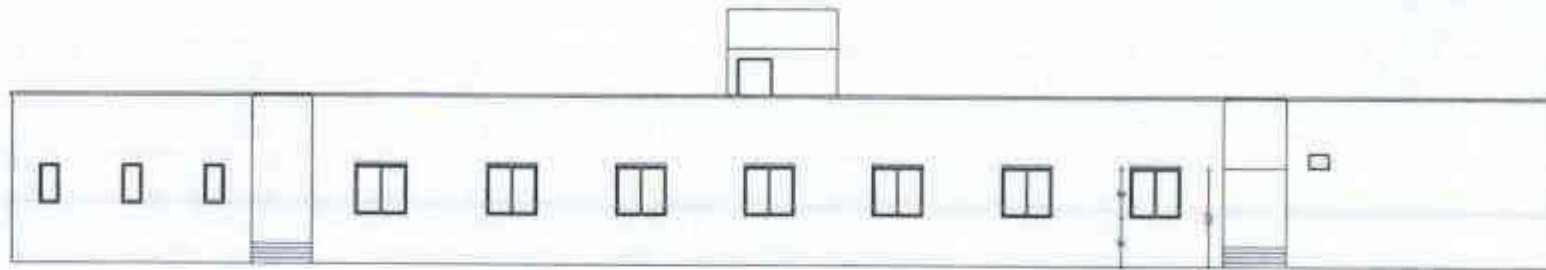


GROUND FLOOR PLAN

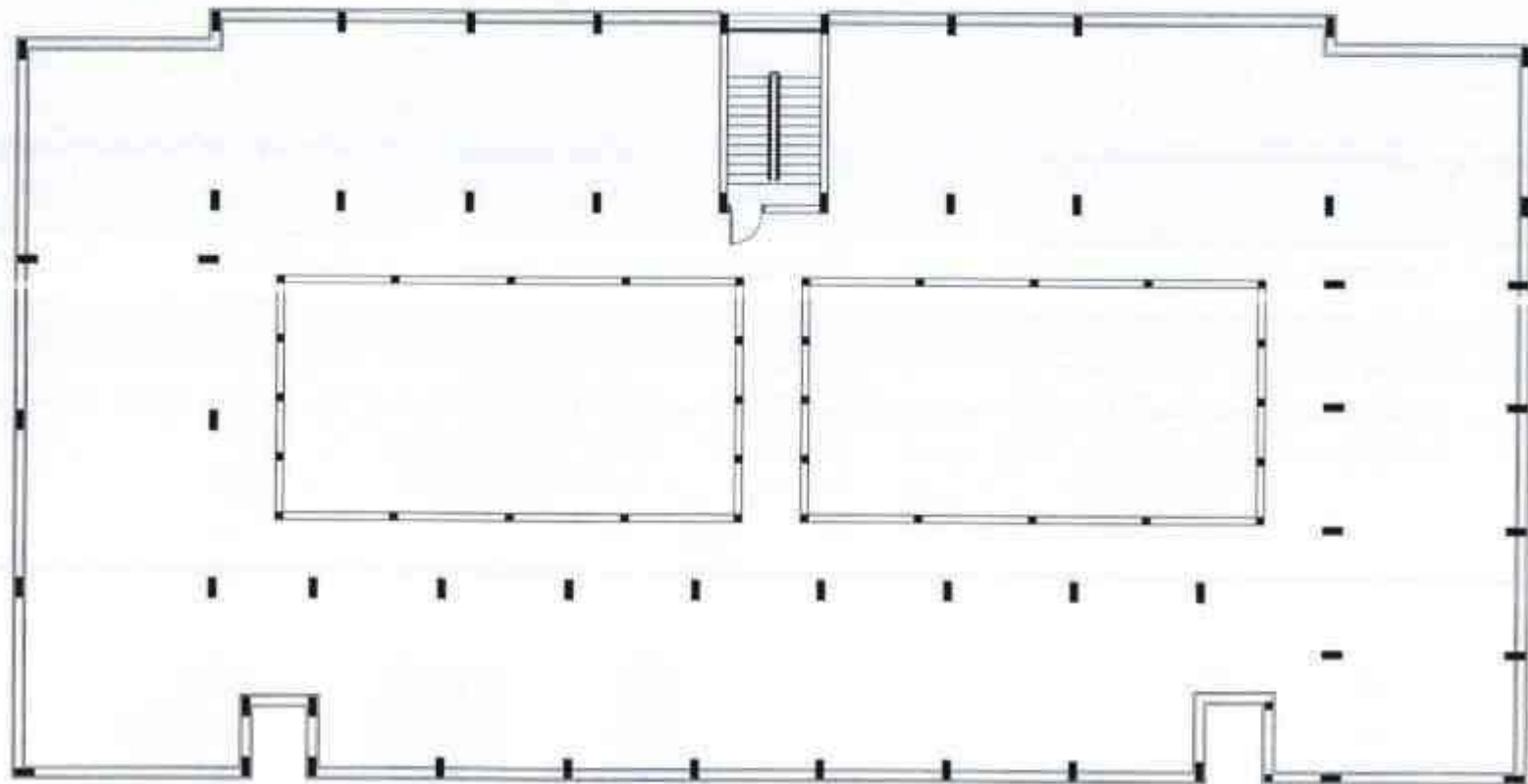


<b>CLIENT:</b>  Sukkur IBA University	<b>PROJECT:</b> CONSTRUCTION OF HOSTEL @ IRA PUBLIC SCHOOL SUKKUR	<b>CONSULTANT:</b>  NBK CONSULTANTS (Creating Engineers, Builders & Planners)	<b>PROJECT DETAIL:</b> HOSTEL CAPACITY: 72 Student ROOM CAPACITY: 4 Student WARDEN ROOM: 1 No WARDEN OFFICE: 1 No Covered Area: 9,688 SFT	<b>Notes:</b>	<b>Drawing Title:</b> GROUND FLOOR	<b>Scale:</b> NTS	<b>Date:</b> 03 April 2024
	<b>ADDRESS:</b> MILITARY ROAD SUKKUR				<b>Draw. No.:</b> AR-01	<b>Revision:</b> 01	<b>Issued for:</b> TENDER

11'-0"  
 11'-0"  
 11'-0"  
 11'-0"  
 11'-0"  
 11'-0"



FRONT ELEVATION



ROOF FLOOR PLAN



**CLIENT:** Sukkur IBA University  
**PROJECT:** CONSTRUCTION OF HOSTEL @ IBA PUBLIC SCHOOL SUKKUR  
**ADDRESS:** MILITARY ROAD SUKKUR

**CONSULTANT:**  

**NBK CONSULTANTS**  
 Consulting Engineers, Architects & Planners

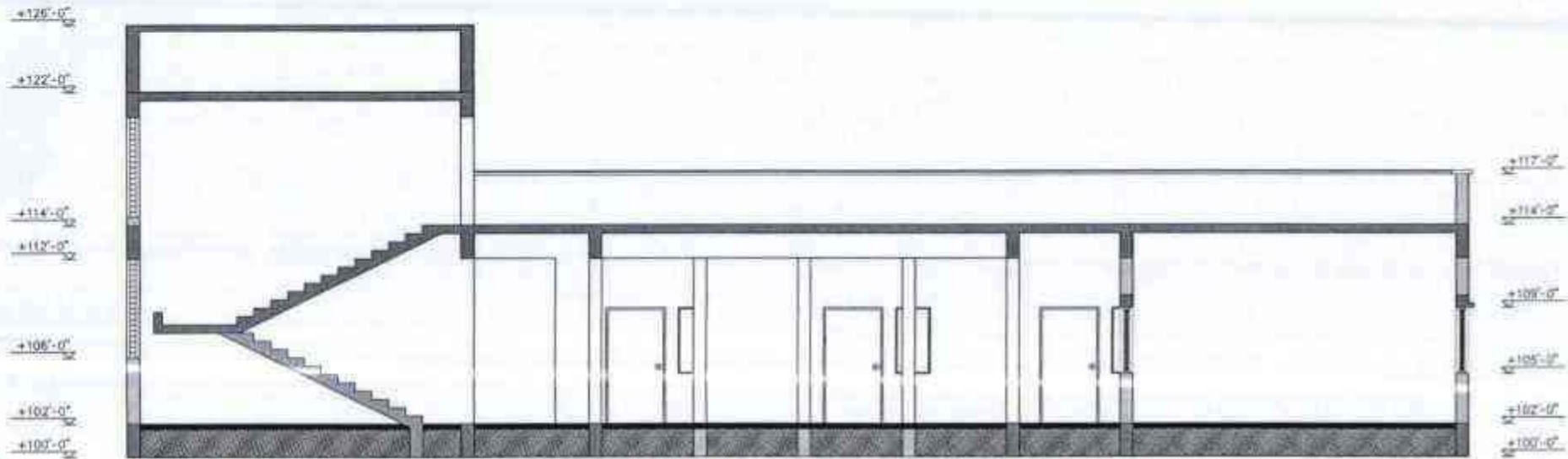
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 Covered Area: 102 SPT

**Note:**  
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**Drawing Title:** GROUND FLOOR  
**Comp. No.:** AR-02

**Scale:** NTS  
**Revision:** 01

**Date:** 03 April 2024  
**Issued for:** TENDER

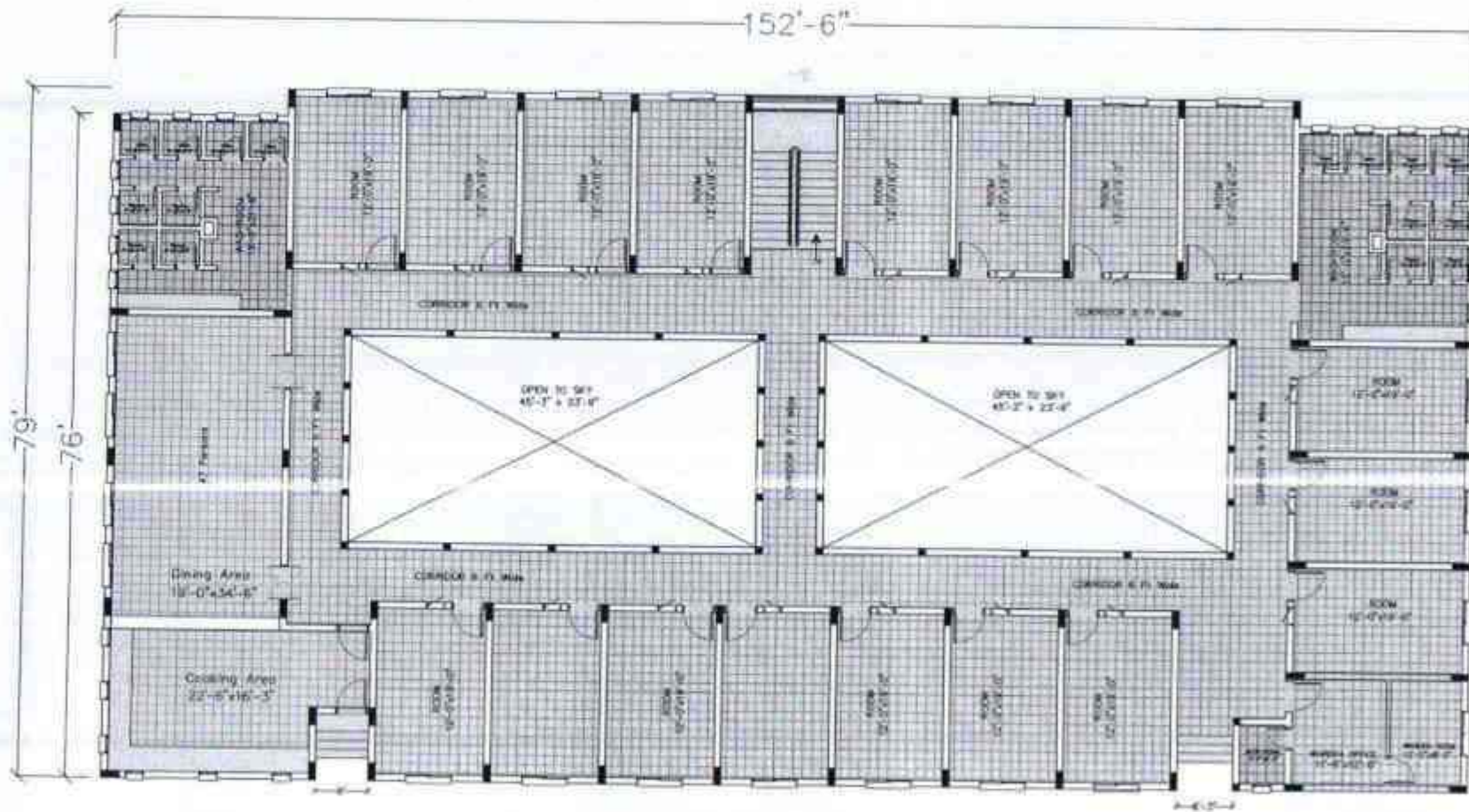


Section Y-Y





CLIENT: 	PROJECT: CONSTRUCTION OF HOSTEL @ IBA PUBLIC SCHOOL, SUKKUR	CONSULTANT:  NBK CONSULTANTS Consulting Engineers, Architects & Planners	DATE:	Drawing Title Section Y-Y	Scale NTS	Date 04 April 2024
	ADDRESS: MILITARY ROAD SUKKUR			Dep. No AR-03	Revision	Issued for





GROUND FLOOR PLAN



<b>CLIENT:</b>  Sukkur IBA University	<b>PROJECT:</b> CONSTRUCTION OF HOSTEL @ IBA PUBLIC SCHOOL SUKKUR	<b>CONSULTANT:</b>  NKR CONSULTANTS Consulting Engineers, Architects & Planners	<b>PROJECT DETAIL:</b> HOSTEL CAPACITY: 72 Student ROOM CAPACITY: 4 Student WARDEN ROOM: 1 No WARDEN OFFICE: 1 No Covered Area: 9,604 SFT	Date:	Drawing Title GROUND FLOOR	Scale: NTS	Date: 03 April 2024
	<b>ADDRESS:</b> MILITARY ROAD SUKKUR				Desig. No. AR-01	Revision: 01	Issued for: TENDER



SUKKUR IBA UNIVERSITY  
NISAR AHMED SIDDIQUI ROAD  
SUKKUR

CONSTRUCTION OF HOSTEL at IBA PUBLIC SCHOOL SUKKUR  
MILITARY ROAD SUKKUR

TENDER DRAWING  
STRUCTURE



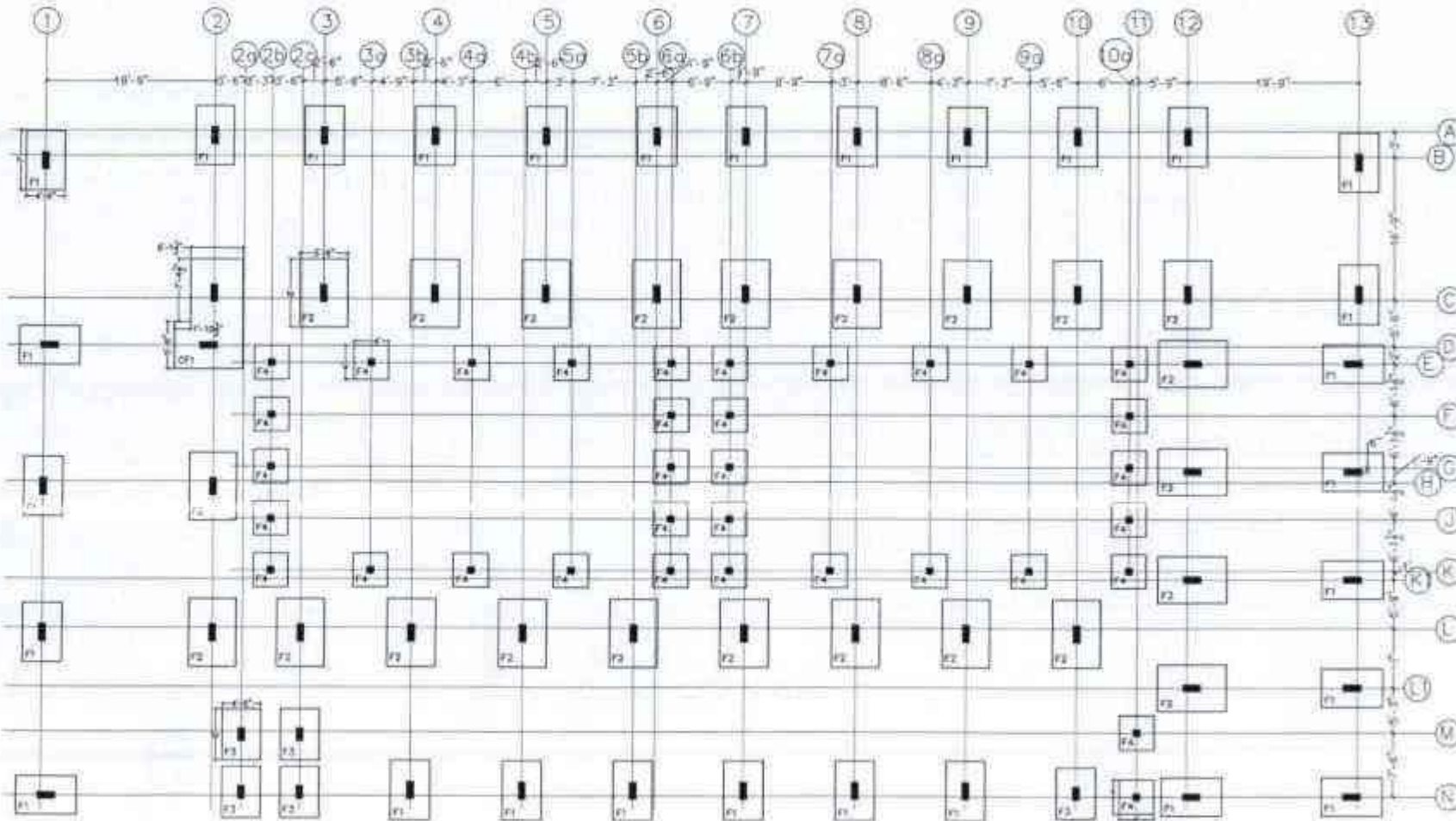
CONSULTANT:



NBK CONSULTANTS  
Consulting Engineers, Architects &  
Planners







CLIENT:  
  
 Sukkur  
 University

PROJECT:  
 CONSTRUCTION OF HOSTEL @ IBA  
 PUBLIC SCHOOL, SUKKUR  
 ADDRESS:  
 MILITARY ROAD SUKKUR

CONSULTANT:  
 NPK CONSULTANTS  
 Creating Engineers, Architects &  
 Planners

NO.:

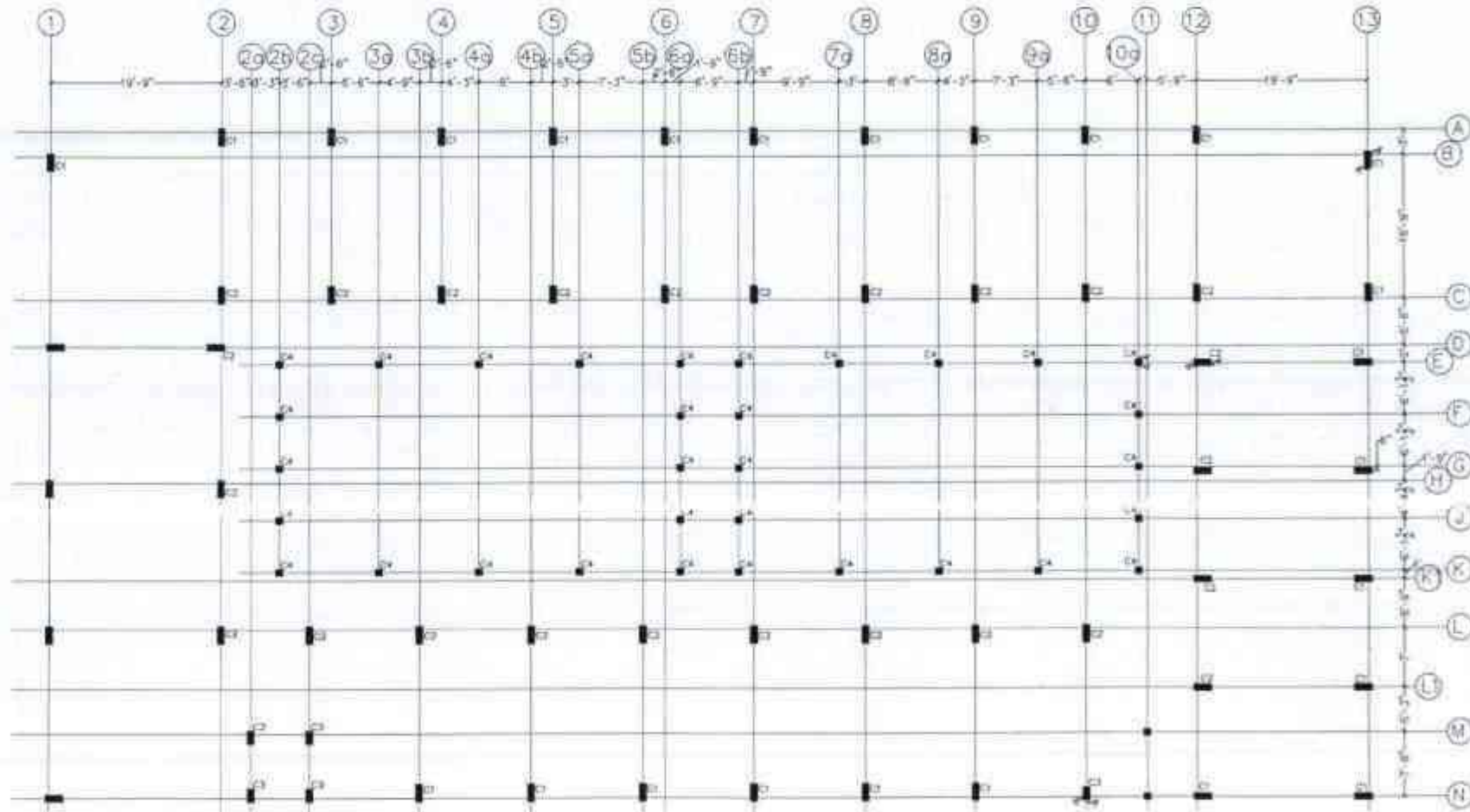
Drawing Title:  
 STRUCTURE Footing Plan

Scale:  
 NTS Date:  
 03 April, 2024

Draw. No.:

ST-01

Revision:  
 Issued by:  
 TENCER



PROJECT:  
CONSTRUCTION OF HOSTEL @ IBA  
PUBLIC SCHOOL, SUKKUR  
ADDRESS:  
MILITARY ROAD SUKKUR



Note:

Drawing Title

Column Plan

Des. No.

ST-02

Scale:

NTS

Revision:

Date:

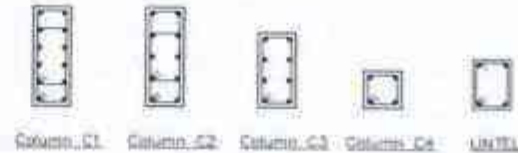
03 April, 2024

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REVIEW

### COLUMN DETAIL

S-No	Column	Size	Main Bar	Stirrups
1	C1	9x24	10#4	#3@6"c/c
2	C2	9x24	12#4	#3@6"c/c
3	C3	9x18	8#4	#3@6"c/c
4	C4	9x9	4#5	#3@6"c/c
5	LINTEL	9x12	2+2#4	#3@6"c/c



### FOOTING DETAIL

S-No	Footing	Size	Depth	Bottom Reinforcement		Top Reinforcement	
				Short	Long	Short	Long
1	F1	4'-6" x 7'-0"	1'-6"	#4@4"c/c	#4@6"c/c		
2	F2	5'-6" x 8'-0"	2'-0"	#4@6"c/c	#4@6"c/c	#4@6"c/c	#4@6"c/c
3	F3	4'-6" x 6'-0"	1'-6"	#4@6"c/c	#4@6"c/c		
4	F4	4'-0" x 4'-0"	1'-0"	#4@6"c/c	#4@6"c/c		
5	CF1	Varying	2'-0"	#4@6"c/c	#4@6"c/c	#4@6"c/c	#4@6"c/c



CLIENT:  
Sukkur IBA University  
PROJECT:  
CONSTRUCTION OF HOSTEL @ IBA  
PUBLIC SCHOOL SUKKUR  
ADDRESS:  
MILITARY ROAD SUKKUR



NOTE:

Drawing Title:  
Footing & Column  
Reinforcement Detail

Scale:  
N.T.S.

Date:  
03 April, 2024

Dep. No.

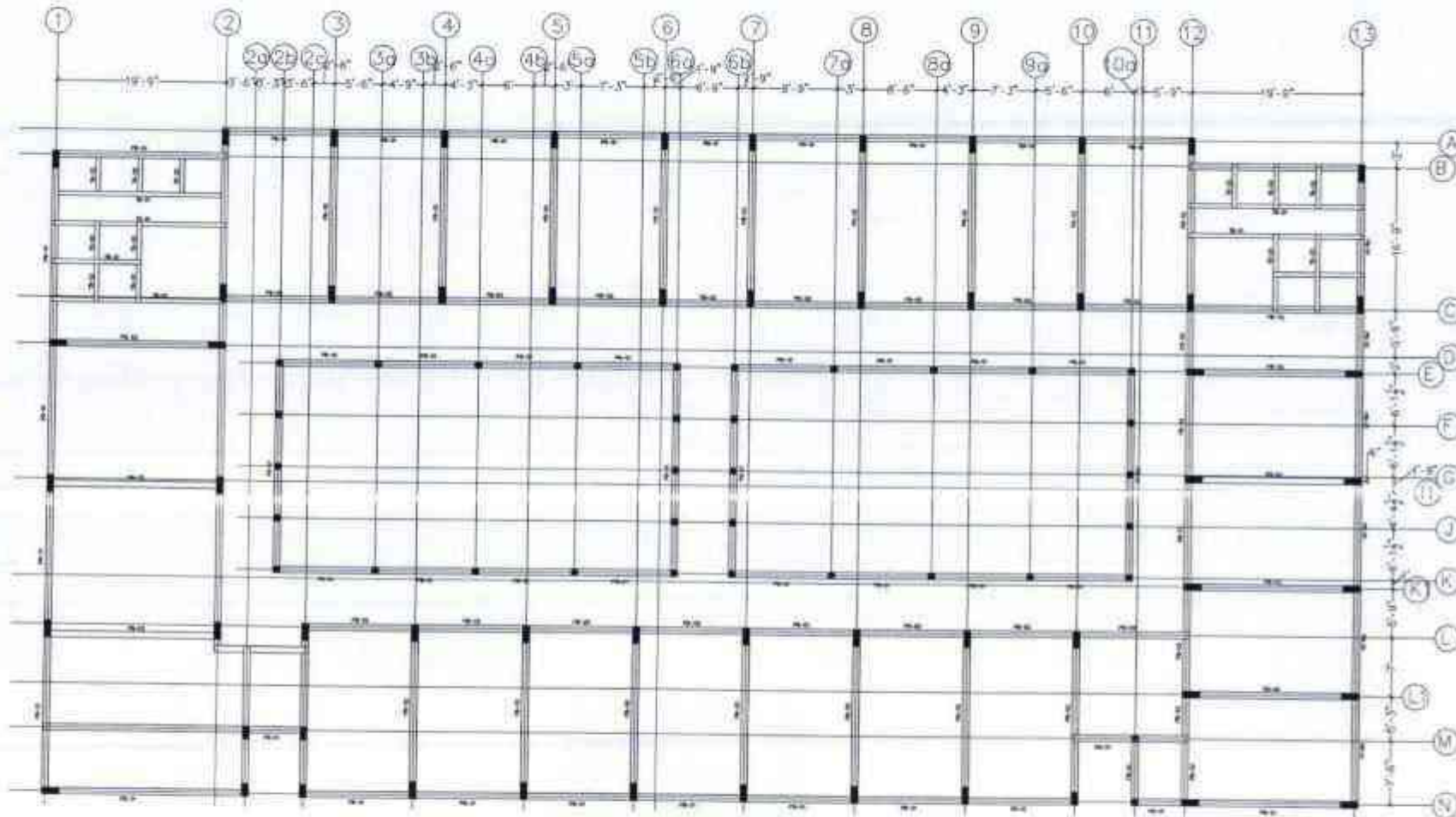
51-03

Revision:

Issued for:

TEACHER





**PLINTH BEAM REINFORCEMENT DETAIL**

Sl. No.	Plinth Beam	Size	Top Steel	Bottom Steel	Remarks
1	PB-01	300x	2#4	2#4	2500/110
2	PB-02	300x	2#4	2#4	2500/110
3	PB-03	450x	2#4	2#4	2500/110
4	PB-04	450x	2#4	2#4	2500/110



**CLIENT:**  
Sukkur IBA University

**PROJECT:**  
CONSTRUCTION OF HOSTEL @ IBA PUBLIC SCHOOL SUKKUR

**ADDRESS:**  
MILITARY ROAD SUKKUR

**CONSULTANT:**

 **NBK CONSULTANTS**  
Consulting Engineers, Architects & Planners

**Note:**

**Drawing Title:**  
Plinth Beam Plan

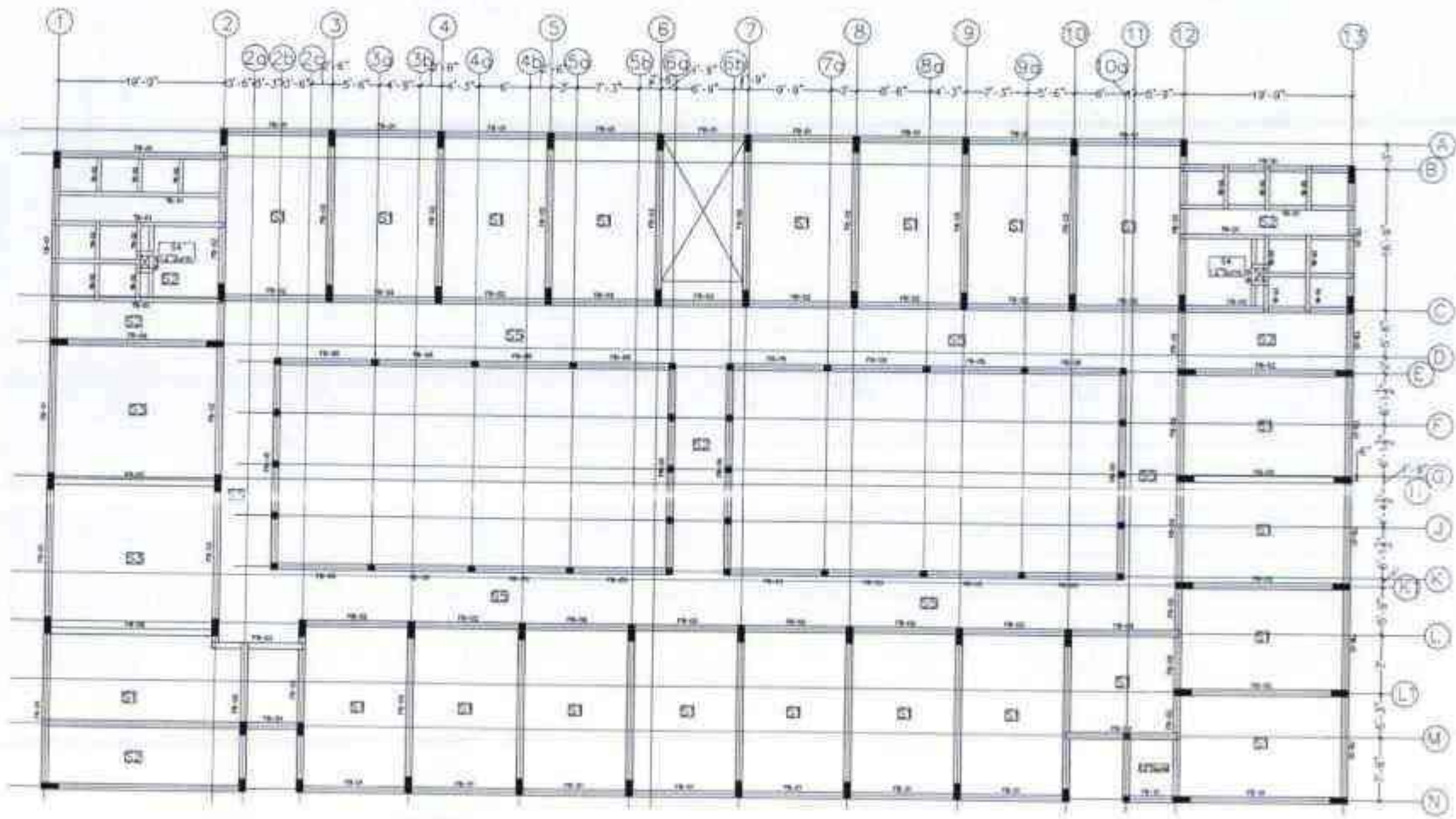
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ST-04

**Scale:**  
N.T.S.

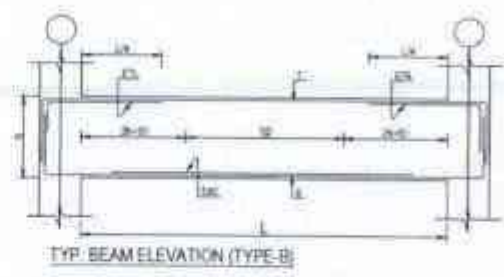
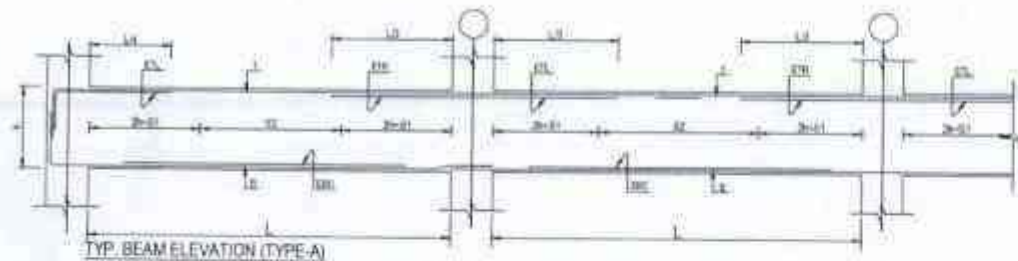
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03 April, 2024

**Revision:**

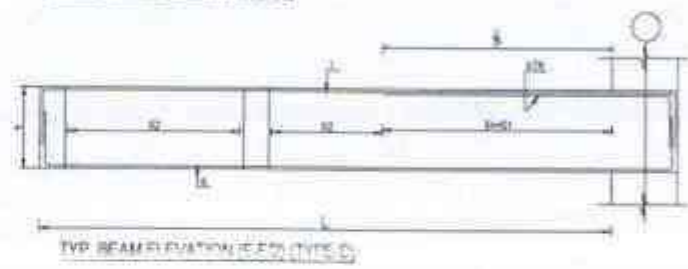
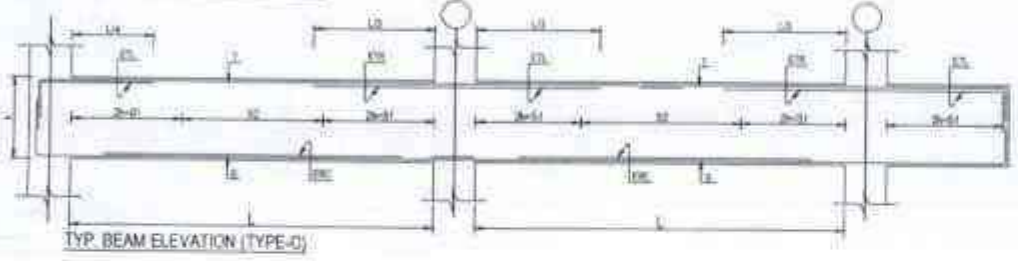
**Issued for:**  
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<b>CLIENT:</b> 	<b>PROJECT:</b> CONSTRUCTION OF HOSTEL @ IBA PUBLIC SCHOOL SUKKUR	<b>CONSULTANT:</b>  <b>NGK CONSULTANTS</b> Consulting Engineers, Architects & Planners	<b>Note:</b>	<b>Drawing Title:</b> Floor Beam Plan	<b>Scale:</b> NTS	<b>Date:</b> 03 April, 2024
	<b>ADDRESS:</b> MILITARY ROAD SUKKUR			<b>Des. No:</b> ST-05	<b>Revised:</b>	<b>Issued For:</b> TENDER



- NOTES:-**
- 1. CLEAR SPAN
  - 2. BOTTOM BARRIN (BT) LAPPING
  - 3BL. EXTRA BOTTOM BARS AT LEFT SUPPORT
  - 3BR. EXTRA BOTTOM BARS AT RIGHT SUPPORT
  - 3MC. EXTRA BOTTOM BARS AT MID OF THE SPAN
  - 7. CONTINUOUS TOP BAR
  - 3TL. EXTRA TOP BARS AT LEFT SUPPORT
  - 3TR. EXTRA TOP BARS AT RIGHT SUPPORT
  - 3L. STIRRUPS AT SUPPORTS
  - 3R. STIRRUPS AT MID SPAN

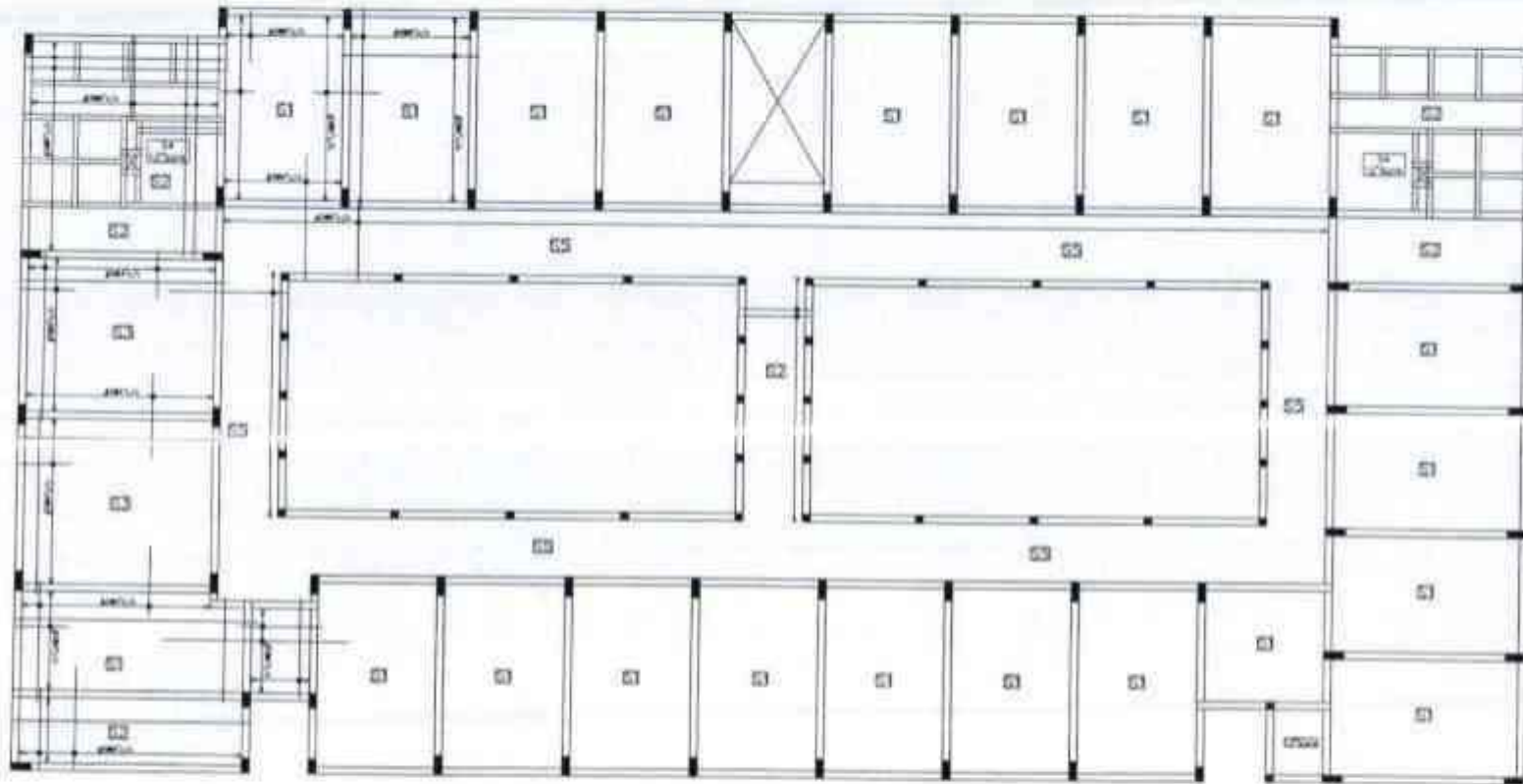


FLOOR BEAM REINFORCEMENT DETAIL									
S-No	Floor Beam	Size	Top Steel	Bottom Steel	Extra Top Left	Extra Top Right	Extra Top mid-Span	Bottom Curtail	Stirrups
1	FB-01	9x30	3#4	3#4	2#4	2#4	2#4	--	#3@6" c/c
2	FB-02	9x30	2#5	3#5	2#5	2#5	2#5	--	#3@6" c/c
3	FB-03	9x30	3#4	3#4	--	--	--	--	#3@6" c/c
4	FB-04	9x30	3#4	3#4	--	3#4	3#4	--	#3@6" c/c
5	FB-05	9x24	3#4	3#4	2#4	2#4	2#4	--	#3@6" c/c
6	TB-01	6x24	2#4	2#4	--	--	--	--	#3@6" c/c
7	TB-02	6x24	2#4	2#4	--	--	--	--	#3@6" c/c



<b>CLIENT:</b> 	<b>PROJECT:</b> CONSTRUCTION OF HOSTEL @ IBA PUBLIC SCHOOL SUKKUR <b>ADDRESS:</b> MILITARY ROAD SUKKUR	<b>CONSULTANT:</b> NBK CONSULTANTS Consulting Engineers, Architects & Planners	<b>Note:</b>	<b>Drawn by:</b> Floor Beam Reinforcement Detail	<b>Scale:</b> NTS	<b>Date:</b> 03 Apr/2024
				<b>Desg. by:</b> ST-06	<b>Revision:</b>	<b>Issued by:</b> TENGIR





Note:  
 Bottom Reinforcement = #3048@2'5" (Except Noted)  
 Top Reinforcement = #306@2'5" (Except Noted)  
 Holding Bar = #3010@2'5"  
 Slab Thickness = 8-inch (Except Noted)

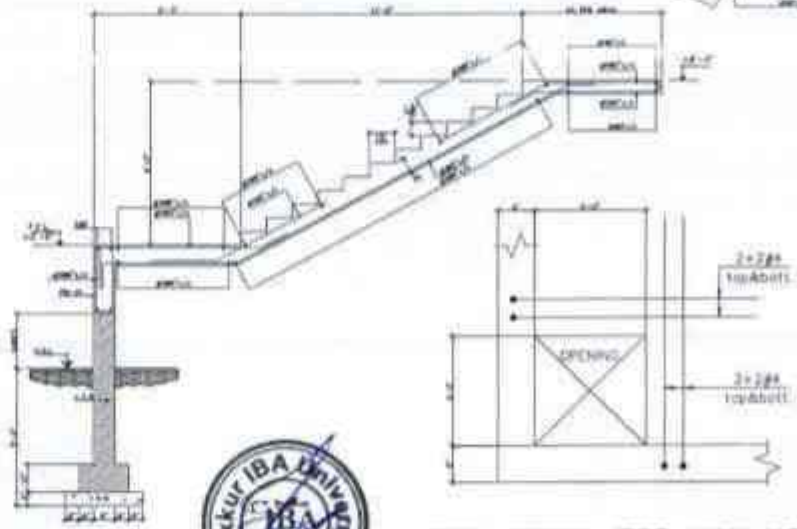
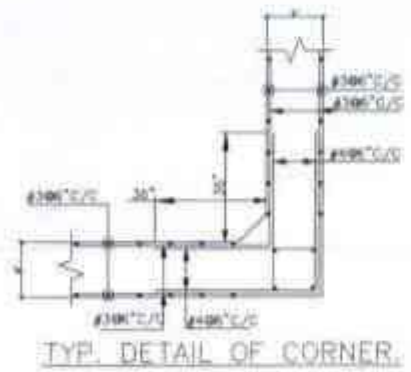
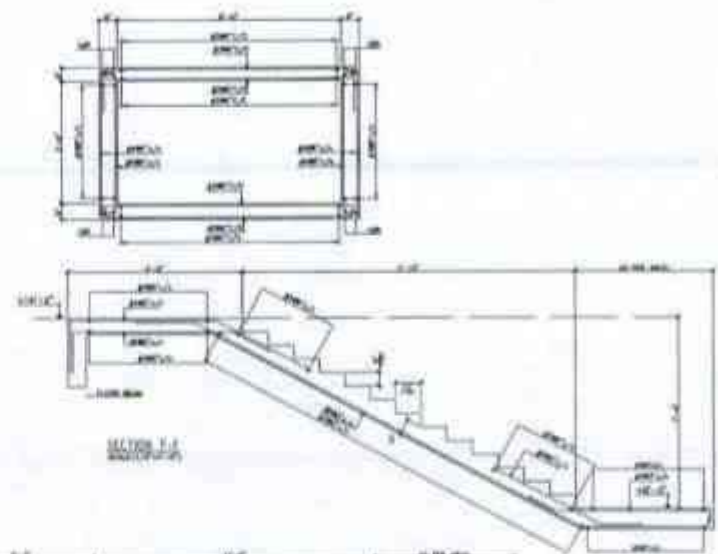
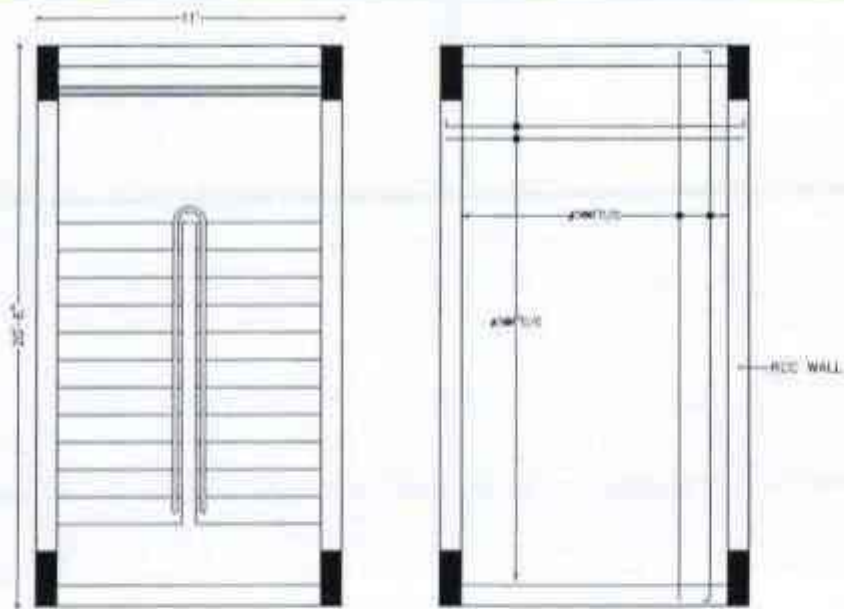


PROJECT:  
 CONSTRUCTION OF HOSTEL @ IBA  
 PUBLIC SCHOOL SUKKUR  
 ADDRESS:  
 MILITARY ROAD SUKKUR



Note:

Drawing Title	Scale	Date
Floor SLAB PLAN	NTS	03 April 2024
Drawn No	Revised	Drawn By
ST-07		TENDER



CLIENT: 	PROJECT: CONSTRUCTION OF HOSTEL @ IBA PUBLIC SCHOOL, SUKKUR	CONSULTANT:  NPK CONSULTANTS Consulting Engineers, Architect & Plumber	Role:	Drawing Title: STAIR & CHWT STRUCTURE Sections	Scale: NTS	Date: 03 April 2024
	ADDRESS: MILITARY ROAD SUKKUR			Doc. No: ST-08	Revision:	Issued For: (ENGR)



SUKKUR IBA UNIVERSITY  
NISAR AHMED SIDDIQUI ROAD  
SUKKUR

CONSTRUCTION OF HOSTEL at IBA PUBLIC SCHOOL SUKKUR  
MILITARY ROAD SUKKUR

TENDER DRAWING  
PLUMBING

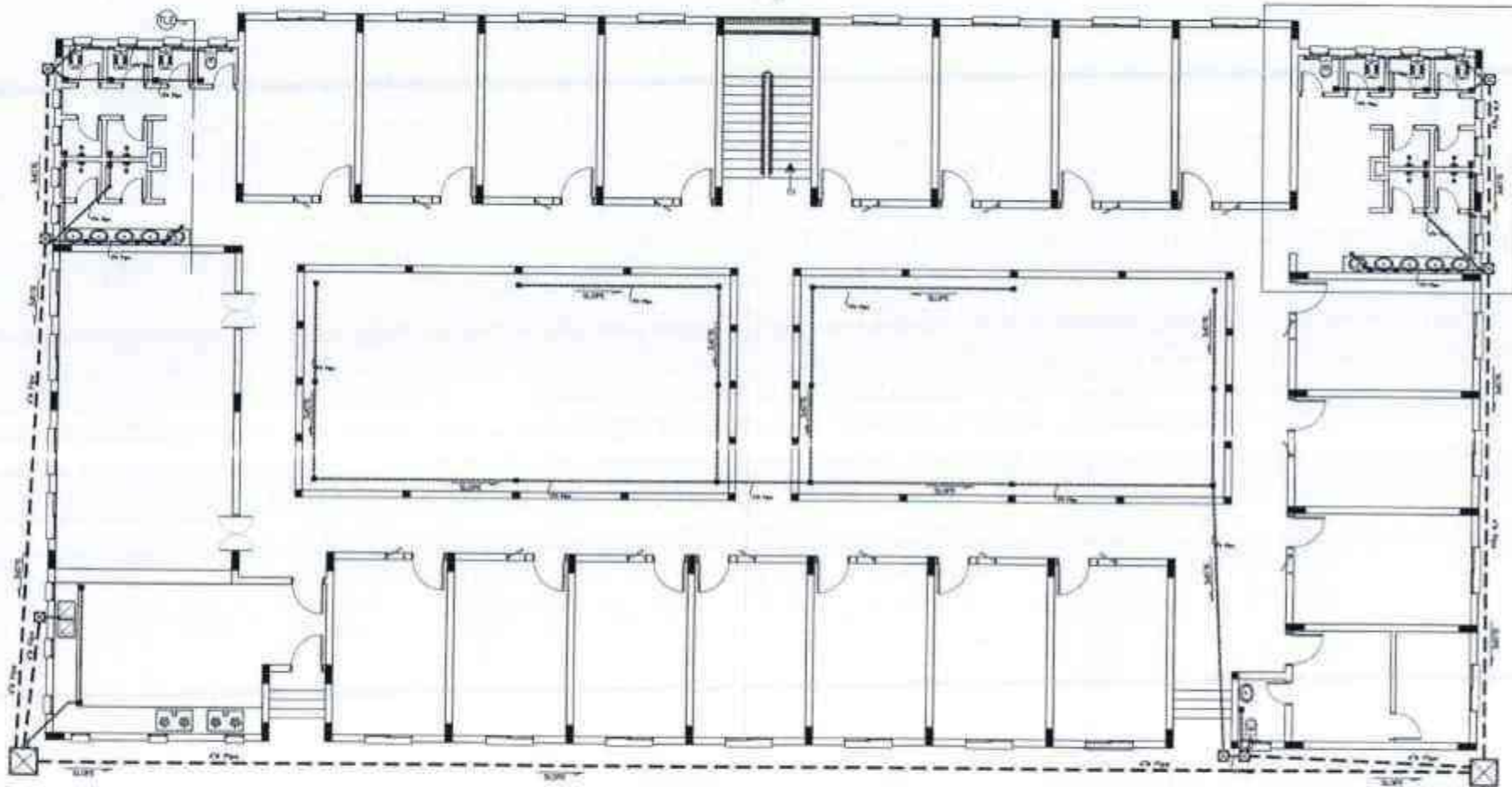


CONSULTANT:



NBK CONSULTANTS  
Consulting Engineers, Architects &  
Planners



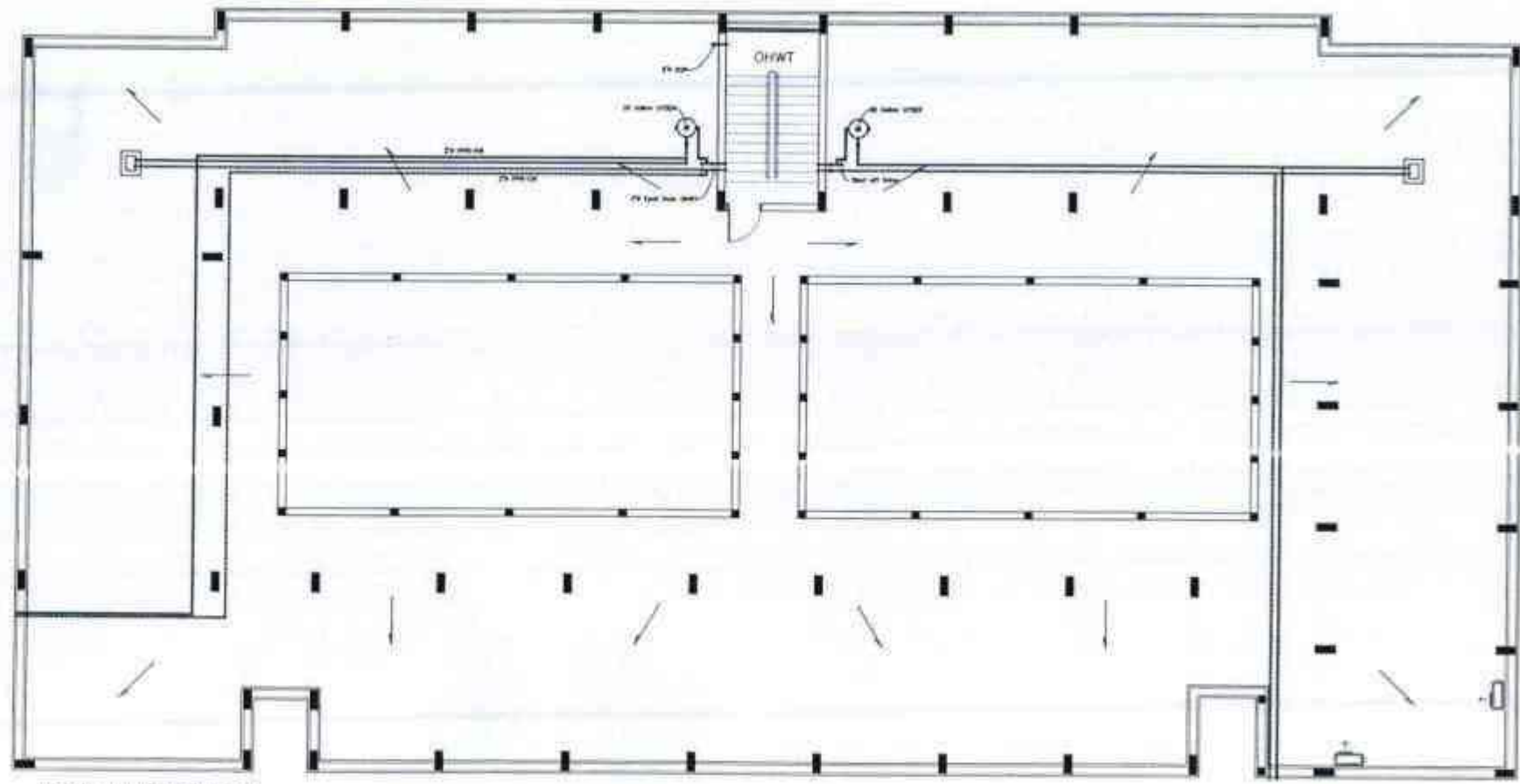


**CLIENT:** Sukkur IBA University  
**PROJECT:** CONSTRUCTION OF HOSTEL @ IBA PUBLIC SCHOOL-SUKKUR  
**ADDRESS:** MILITARY ROAD SUKKUR

**CONSULTANT:** NBK CONSULTANTS  
 Installing Equipment, Interior & Paints

**Note:**  
 All Pipe # Mentioned in drawing is Internal

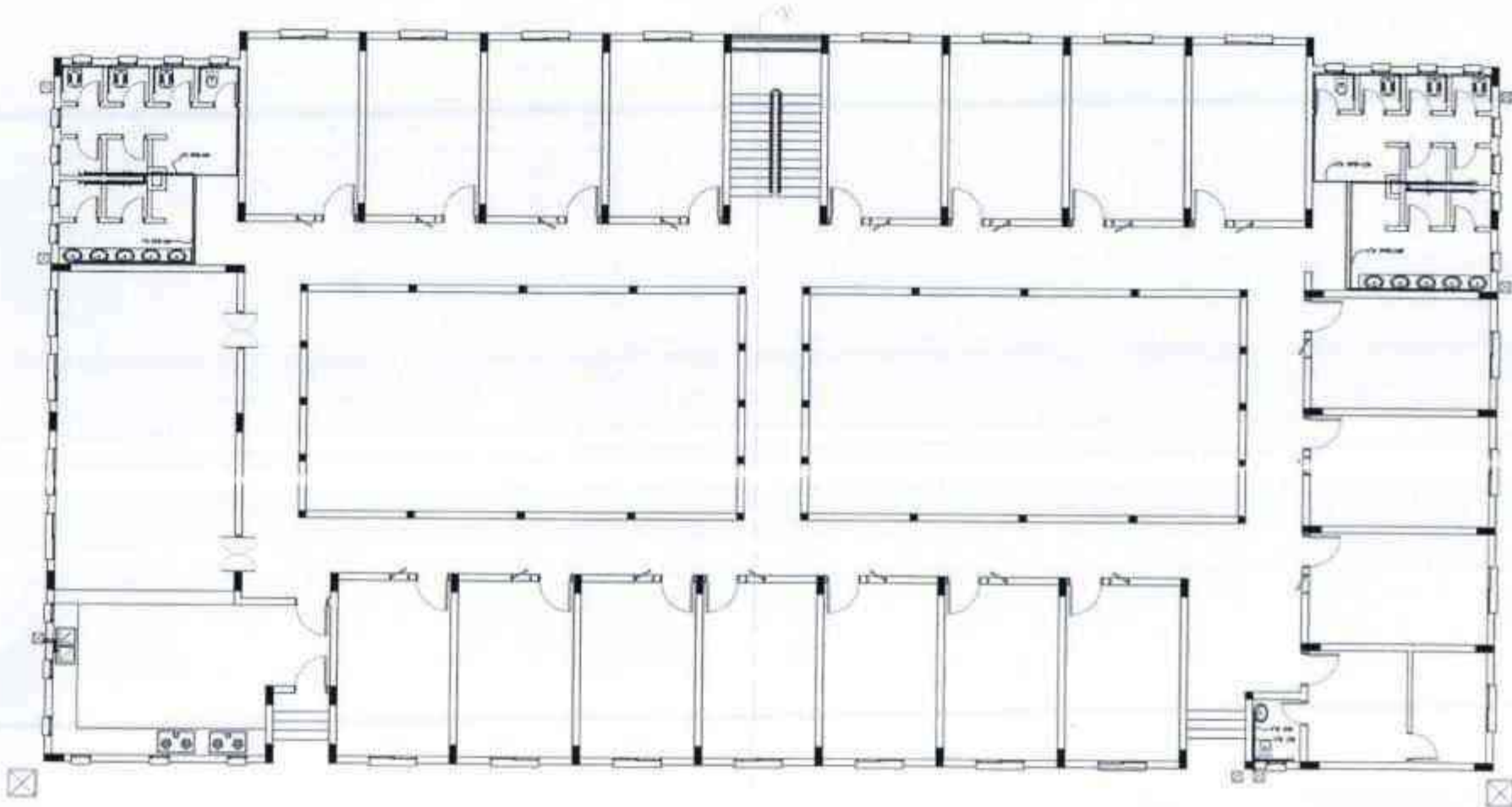
Drawings Title Plumbing	SOL & WASTE	Scale: NTS	Date: 17 April, 2024
Dep. No.	PI-01	Revision:	Issued for: TENDER



ROOF FLOOR PLAN

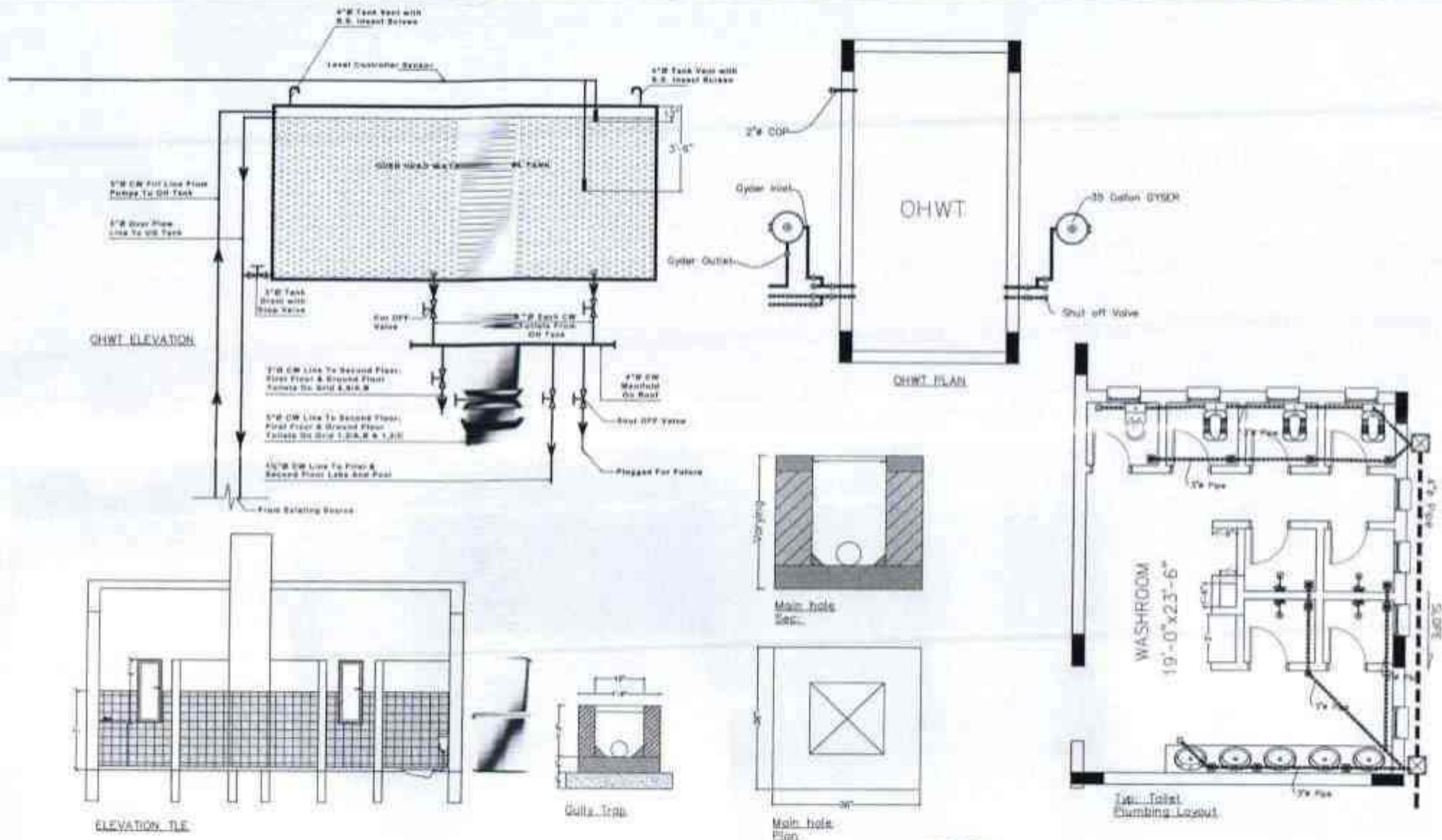


<b>CLIENT:</b> 	<b>PROJECT:</b> CONSTRUCTION OF HOSTEL @ IBA PUBLIC SCHOOL SUKKUR	<b>CONSULTANT:</b>  <b>NBK CONSULTANTS</b> Consulting Engineers, Architects & Planners	<b>Note:</b>  	<b>Drawing Title:</b> Roof Drain & Hot & Cold Water <b>Plumbing</b>	<b>Scale:</b> NTS	<b>Date:</b> 17 April 2024
	<b>ADDRESS:</b> MILITARY ROAD SUKKUR			<b>Draw. No.:</b> PI-02	<b>Revision:</b>	<b>Issued For:</b> TENDER



CLIENT: 	PROJECT: CONSTRUCTION OF HOSTEL @ IBA PUBLIC SCHOOL, SUKKUR	CONSULTANT:  NRK CONSULTANTS Consulting Engineers, Architects & Planners	State:	Drawing Title Plumbing	hot & Cold water Distribution	Scale: NTS	Date: 17 Apr 2024
	ADDRESS: MILITARY ROAD SUKKUR			Dept. No. PI-03	Revision:	Issued for: TENDER	





**CLIENT:** Sukkur IBA University  
**PROJECT:** CONSTRUCTION OF HOSTEL @ IBA PUBLIC SCHOOL SUKKUR  
**ADDRESS:** MILITARY ROAD SUKKUR

**CONSULTANT:** NDK CONSULTANTS  
 Consulting Engineers & Plumber

**NOTE:**



<b>Drawing Title</b> Plumbing	<b>Sections</b>	<b>Scale</b> NTS	<b>Date</b> 17 April 2024
<b>Dep. No.</b>	<b>Revision</b>	<b>Drawn by</b> PI-C4	<b>Issued for</b> TENDER



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SUKKUR

CONSTRUCTION OF HOSTEL at IBA PUBLIC SCHOOL SUKKUR  
MILITARY ROAD SUKKUR

TENDER DRAWING  
ELECTRICAL



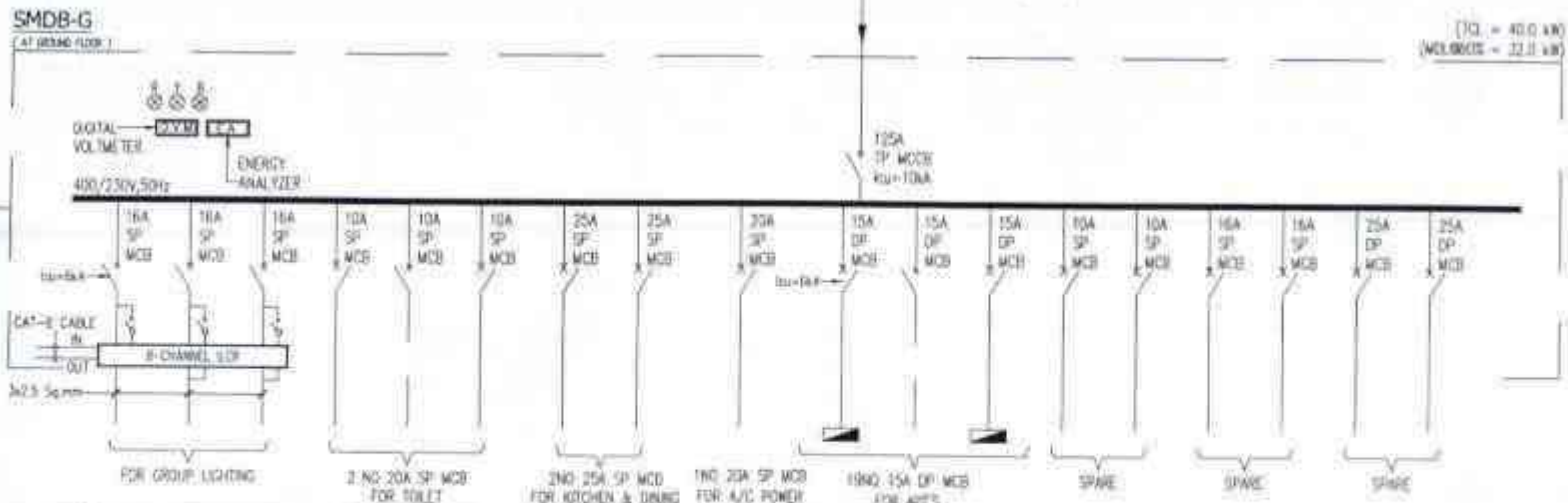
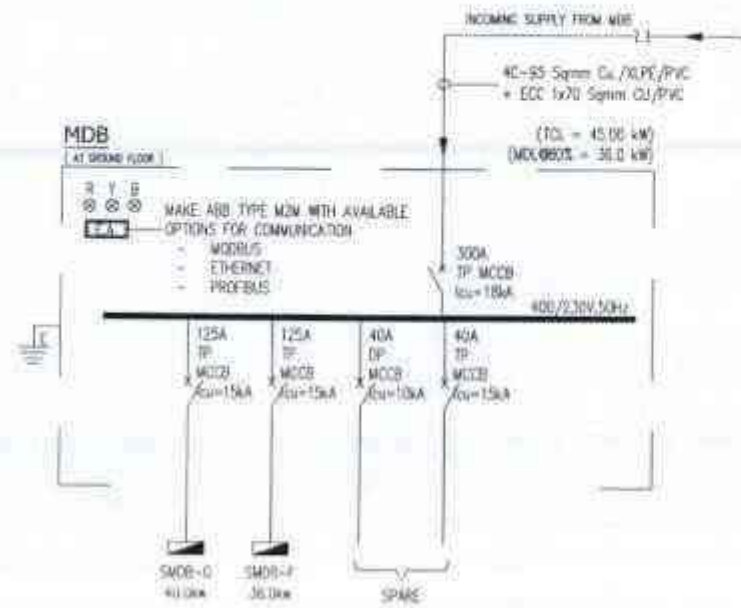
CONSULTANT:



NBK CONSULTANTS  
Consulting Engineers, Architects &  
Planners







**CLIENT:**  
Sukkur IBA University

**PROJECT:**  
CONSTRUCTION OF HOSTEL @ IBA PUBLIC SCHOOL SUKKUR

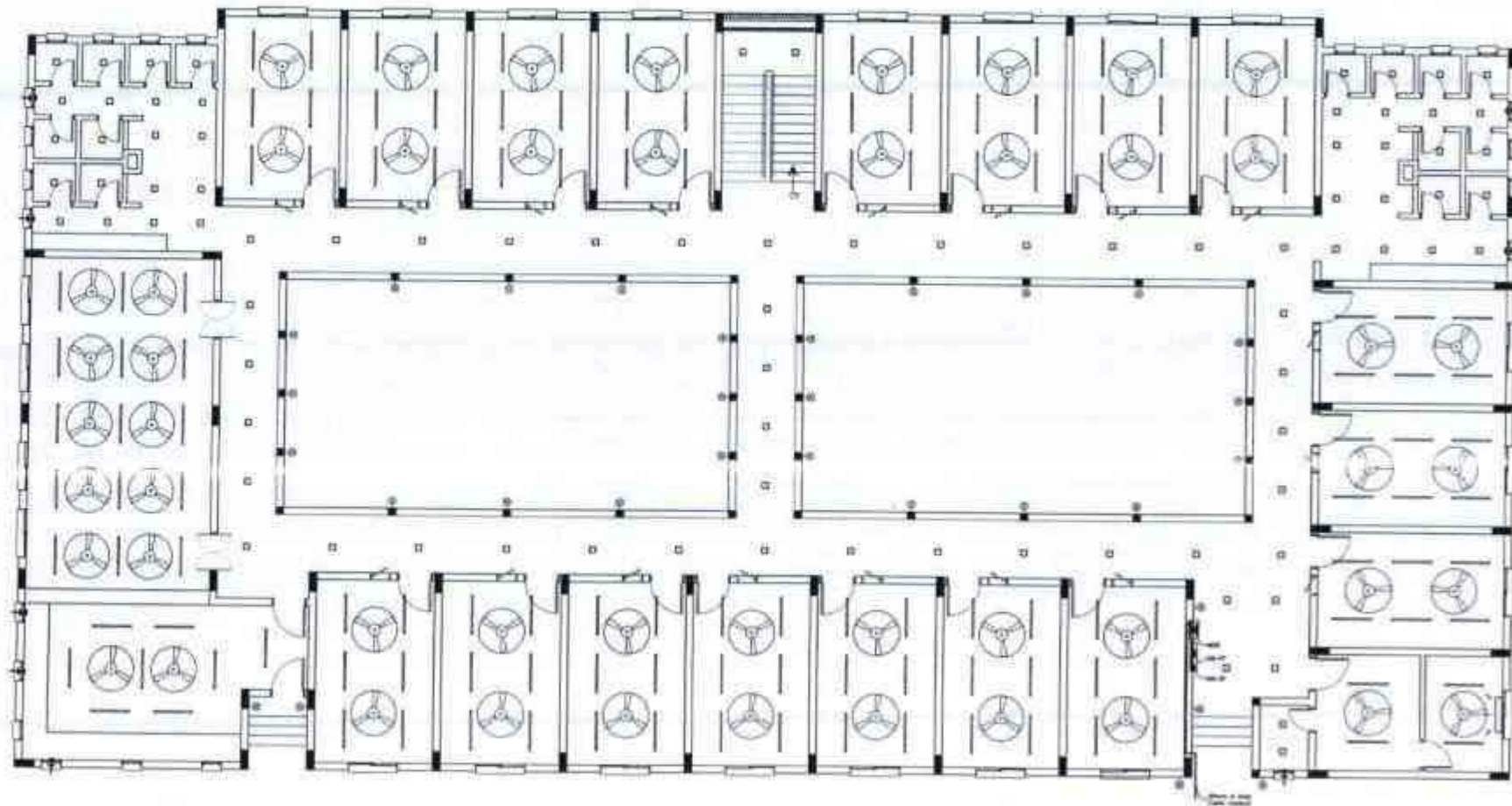
**ADDRESS:**  
MILITARY ROAD SUKKUR

**CONSULTANT:**

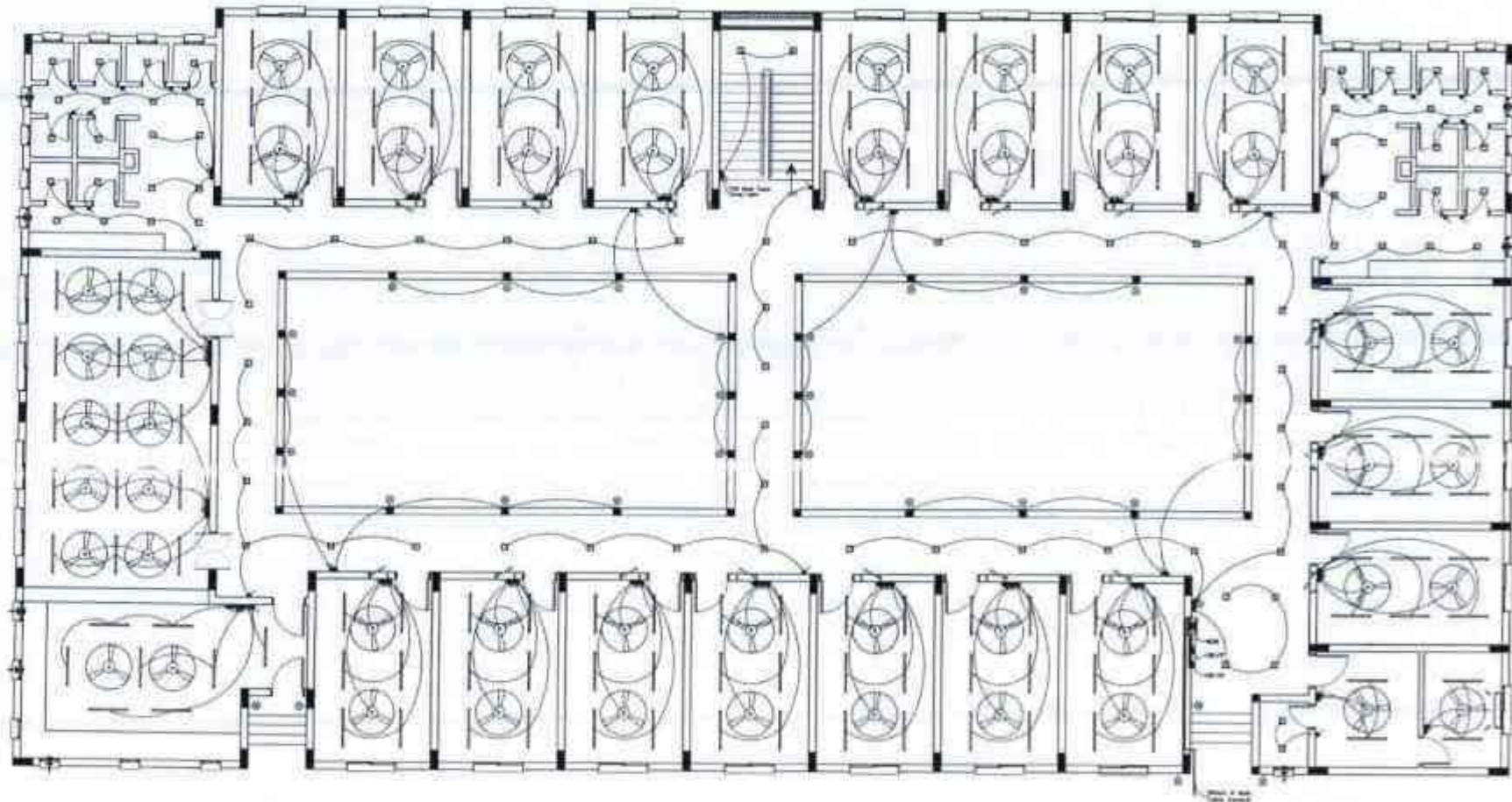
**NGK CONSULTANTS**  
Consulting Engineers, Architects & Planners

**Note:**

<b>Drawings Title:</b>	ELECTRICAL	<b>Scale:</b>	NTS	<b>Date:</b>	17 April, 2024
<b>Draw. No.</b>	EL-01	<b>Revision:</b>		<b>Issued for:</b>	TENDER



CLIENT:  Sukkur IBA University	PROJECT: CONSTRUCTION OF HOSTEL @ IBA PUBLIC SCHOOL SUKKUR	CONSULTANT:  NBK CONSULTANTS Consulting Engineers, Architects & Planners	Note:	Drawing Title: ELECTRICAL	Light & Fan Layout	Scale: NTS	Date: 17 April, 2024
	ADDRESS: MILITARY ROAD SUKKUR			Dep. No: EL-02	Revision:	Issued for: TENDER	



CLIENT:  
Sukkur  
**IBA**  
University

PROJECT:  
CONSTRUCTION OF HOSTEL @ IBA  
PUBLIC SCHOOL SUKKUR  
ADDRESS:  
MILITARY ROAD SUKKUR



CONSULTANT:  
**NBK CONSULTANTS**  
Consulting Engineers, Architects &  
Planners

Note:  
Conduit size = 25mm dia. (Otherwise Noted)

Drawing Title  
**ELECTRICAL CONDUIT LAYOUT**

Scale:  
NTS  
Date:  
17 April 2024

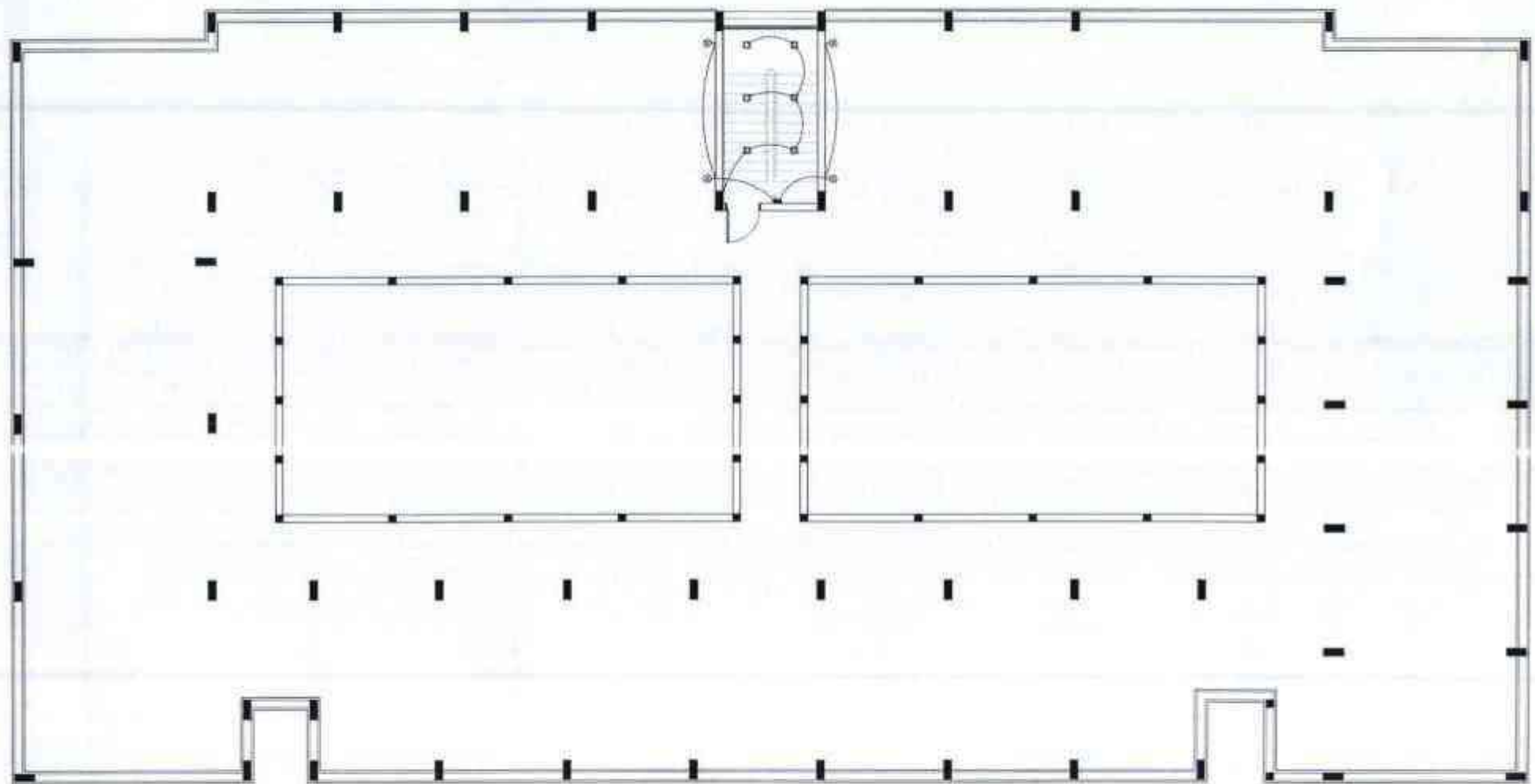
Drawn By:

EL-03

Revision:

Issued For:  
TENDER





<p>CLIENT: Sukkur IBA University</p>	<p>PROJECT: CONSTRUCTION OF HOSTEL @ IBA PUBLIC SCHOOL SUKKUR</p> <p>ADDRESS: MILITARY ROAD SUKKUR.</p>	<p>CONSULTANT: NPK CONSULTANTS Geotag Engineers, Architects &amp; Planners</p>	<p>PROJECT DETAIL:</p>	<p>Note:</p>	<p>Drawings Title: ELECTRICAL</p> <p>Draw. No.</p>	<p>Light Point &amp; Consult</p> <p>Scale: MTS</p> <p>Revision: EL-04</p>	<p>Date: 20 April, 2024</p> <p>Issued for: TENDER</p>
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