

SUKKUR IBA UNIVERSITY

Merit – Quality - Excellence



**Tender documents for AC Work and Remaining
Electrical and Allied works of BBSIMS Dadu
Campus.**

(Tender # PROC/259)

BBSIMS CAMPUS DADU

Duabo Road, near Shahjehan Park, Dadu

Volume I

Conditions of Contract

Email: nazik.hussain@@ibacc.edu.pk

Web: www.iba-suk.edu.pk

Tel. No. 025-4551552

1. Background

As Sukkur IBA University intends to get the work done of **AC Work and Remaining Electrical and Allied works of BBSIMS Dadu Campus** (detail in BOQ), so a tender is called for execution of said work.

2. General Terms and Conditions

The following General Terms and Conditions apply:

- 2.1.** The last date of receipt of Bids is **27th November 2021 at 1300 hours**
- 2.2.** Detail of manufacturing facilities.
- 2.3.** Structure /Organizational Chart.
- 2.4.** An affidavit to the effect that the firm has not been blacked listed by any Government /semi government organization.
- 2.5.** Sukkur IBA University or its representative shall have the right to inspect the material at site, check its quality reports and confirm their conformity to the contract specification.
- 2.6.** The Bidder shall provide following information with respect to its Company Profile.
 - 2.6.1.** Registered Name of the Organization.
 - 2.6.2.** National Tax Number, Sales Tax Number.
 - 2.6.3.** Head Office address.
 - 2.6.4.** Management structure & organization Chart.
 - 2.6.5.** Name, Address with Telephone/ Telex and Fax numbers of the contract person.
- 2.7.** Financial status of the Bidders Organization with supporting documents and last two years annual reports.
- 2.8.** Provide a certificate from your bank certifying your sound financial position and credit limits from the bank.
- 2.9.** List of clients and their Acceptance of deliverables, showing separately the items provided and value thereof.
- 2.10.** Company incorporation Certificate and Company Profile.
- 2.11.** The Bidder shall furnish a comprehensive list of reference sites where the likewise tender work has completed already.
- 2.12.** Sukkur IBA University, reserves the right to reject any or all Bids/ Offers without assigning any reason or cancel the process at any time.

2.13. Sukkur IBA University reserves the right to increase/ decrease the quantity of items / scope of the work. Bidder has no right to challenge the decision.

3. Proposal Submission Requirements

- 3.1. For this tender PPRA's **Single stag-two envelope Procedure** as per clause 36 (b) for open competitive bidding is adopted. The bid shall comprise a single package containing two separate envelopes. Each envelope shall contain separately the financial proposal and the technical proposal;
- 3.1.1 The envelopes shall be marked as "FINANCIAL PROPOSAL" and "TECHNICAL PROPOSAL" in bold and legible letters to avoid confusion;
- 3.1.2 Initially, only the envelope marked "TECHNICAL PROPOSAL" shall be opened;
- 3.1.3 The envelope marked as "FINANCIAL PROPOSAL" shall be retained in the custody of the procuring agency without being opened;
- 3.1.4 The procuring agency shall evaluate the technical proposal, without reference to the price and reject any proposal which do not conform to the specified requirements;
- 3.1.5 During the technical evaluation no amendments in the technical proposal shall be permitted;
- 3.1.6 The financial proposals of bids shall be opened publicly at a time, date and venue announced afterwards technical assessment and evaluation is completed.
- 3.1.7 After the evaluation and approval of the technical proposal the procuring agency, publicly open the financial proposals of the technically accepted bids only. The financial proposal of bids found technically non-responsive shall be returned un-opened to the respective bidders.

3.2. Technical Proposal

- 3.2.1. Technical proposal must include the complete solution proposed by the Bidder.
- 3.2.2. If the specification sheets ask for any detail, those should be provided as attachment to the Technical Proposal.
- 3.2.3 Technical proposal shall comprise the valid Registration certificates of PEC and taxation departments, details of Equipments and material available with the company, details of supervisory technical staff, Completed works details and works in hand of similar nature, Bank statements, enlistment list if with any other department etc. so that a fair scrutiny shall be done.
- 3.2.4 Description of material and equipment specific for this work.

3.2.5. Completion schedule on Bar chart, Primavera or other software.

3.2.6 Technical proposal shall provide the details of company, its office location, numbers etc.

3.2.7. Financial Proposal of only those Bidders will be considered who's Technical Proposal qualify.

3.2.8. Bidders must possess the valid PEC license in such category in which the total bid cost falls, if not than his financial proposal will be rejected.

3.3. Financial Proposal

3.3.1. Financial proposal will include the prices quoted for each item (including all taxes).

3.3.2. For each category the quoted prices must include all taxes, customs and freight charges for delivery at the required locations at own risk and cost of material required for the work.

3.3.3 Financial proposal of the bidders found technically non responsive will be returned unopened.

3.3. 4. The Bidder shall furnish s earnest money equivalent to 2% of the total value of bid in the form of Bank Draft issued by a scheduled bank of Pakistan in favor of **“Sukkur IBA University Sukkur”** along with financial proposal. **No Bid shall be entertained without earnest money.**

3.4. Evaluation Criteria

I. MANDATORY REQUIREMENTS BEFORE EVALUATION OF TENDER

- (a) Bidder must be registered with Pakistan Engineering C-4 (ME-01.)
- (b) Bidder should have completed minimum five (5) similar nature of work(s) of same / above capacity in the last 3 Years (complete detail with completion letter required)
- (c) The Interested bidders should have presence / support / branch offices in Karachi.
- (d) Bank Statement for Last 2 Years, Minimum turnover of Rs. 200 Million for at least any one year
- (e) The Firms / Bidders / Suppliers blacklisted by any Government / Semi Government Organizations shall not be eligible to bid. Affidavit to be submitted.
- (f) The Firms / Bidders / Suppliers in litigation with any Government / Semi Government Organizations shall not be eligible to bid. Affidavit to be submitted.
- (g) The Firms / Bidders / Suppliers who have failed to perform as per Contract with the Government / Semi Government Organization will not be eligible to bid. Affidavit to be submitted.
- (h) Organization structure of the "Contracting Firm" (whether the firm is a partnership or Limited Company etc.
- (i) Programmer of work to ensure that the work will be completed within the stipulated time on the prescribed format.

NOTE. THE EVALUATION OF ANY THESE BIDDERS SHALL BE CARRIED OUT WHO WILL COMPLY WITH THE ABOVE PARAMETERS.

TECHNICAL EVALUATION OF TENDER

A It will be examined in detail whether the goods offered by the bidder comply with the technical provisions of the technical bidding documents. For this purpose, the bidder's data submitted with the bid will be compared with the specific work data prescribed by the Employer and technical, feature / criteria of the Goods detailed in the technical provisions. Other technical information submitted by the bidder regarding the scope of work will also be reviewed. In addition to this following Technical Details / Requirement must be provided / complied with the Tender Documents (Technical Bid).

B Tender shall be rejected if it is Non-submission of verifiable proofs against the mandatory as well as general documentary, qualification and eligibility related requirements.

C. Technical Evaluation:

The firm cleared from initial screening will be evaluated as per following criteria:

The total marks shall be 100. Minimum score for competing in the next stage is 75 %. The Financial Proposal of only the Audit Firm will be opened which secures 75 % or more in the Technical Evaluation.

S.NO	DETAILS	POINTS
1	Draft of Earnest Money	Mandatory
2	Bid /Quotation (As per pattern)	Mandatory
3	Certificate of Registration In Pakistan Engineering .	Mandatory
4	Income Tax Registration	Mandatory
5	General Sales Tax Registration	Mandatory
6	Proof of Non-Blacklisting: Affidavit on legal paper of appropriate value (duly attested from notary public)/letterhead that the Firms / Bidders / Suppliers blacklisted by any Government / Semi Government Organizations shall not be eligible to bid.	Mandatory
7	Proof of Non-Blacklisting: Affidavit on legal paper of appropriate value (duly attested from notary public)/letterhead that The Firms / Bidders / Suppliers in litigation with any Government / Semi Government Organizations shall not be eligible to bid. Affidavit to be submitted.	Mandatory
8	The Contractor /Bidders must be the sole distributor of the Split equipment since last Four Years (4Years) of the offered	Mandatory

	brand/system.	
9	Bidder should have completed minimum eight (8) similar nature of work(s) of same / above capacity in the last 5 Years (complete detail with completion latter required)	Mandatory
10	Bank Statement for Last 3 Years, Minimum turnover of Rs. 200 Million for at least any one year	Mandatory
11	The Interested bidders should have presence / support / branch offices in Karachi.	Mandatory
12	Technical Compliance Sheet Provide Technical Compliance Sheet in Tabulated Form specifying the compliance of each and every quoted item with minimum specification of required items mentioned in Bill of Quantity (BOQ) of this document.	Mandatory
13	Annual turnover (Max Points 15) a. 200 Millions (10 Points) b. 200 to 300 Millions (12 Points) c. Above 300 Millions (15 Points)	
14	No of similar nature of same or above capacity project in 5 Years. (Max Points 15) a. 6 Project (10 Points) b. 7 to 10 Year (12 Points) c. 10 to 15 Year (15 Points)	
15	Total No of employees (Max Points 10) a. 40 Employees (6 Points) b. 50 to 60 Year (8 Points) c. 70 to 100 Year (10 Points)	
16	Warranty/Guarantee Terms. (Max Points 30) a. 2 Years' service & Repair Warranty (20 Points) b. 3 Years' service & Repair Warranty (25 Points) c. 4 Years' service& Repair t Warranty (30 Points)	
17	No of similar nature of project in 10 Years with Government & Public sector. (Max Points 15) a. 5 Project (10 Points) b. 6 to 7 Project (12 Points) c. 8 to 10 Project (15 Points)	
18	Bidder already work with Sukkur IBA University. (15Points)	

- a. Bids will be evaluated in fair, transparent and non-discriminatory manner. For the purpose of determining the Most Advantageous bid, following above mandatory scales of evaluation shall be taken into consideration for technical and financial bids.
- b. Failing to fulfill ANY of the Mandatory Requirement will disqualify the bidder from the process.

- c. After evaluation/marking of bidders in technical evaluation process, financial bids of technically qualified bidders only will be opened later on prior notice.
- d. For final grading of bidders towards contract award, Most Advantageous bid prices will be calculated to ascertain lowest bid for placement of procurement contract.

4. Terms of Payment

Payment of contract price shall be made in the following manner:

4.1 Running payments will be made to contractor after satisfaction of quality, quantity as per the terms conditions and specification of the contact, then final payment.

1. FORM OF TENDER

Project Director

Benazir Bhutto Shaheed Institute of Management Sciences,
Dadu Sindh,

Dear Sir,

- 1.1 Having inspected the SITE and checked all local conditions affecting the WORK, and having also examined all Tender Documents including the Drawings, Instructions for Tenderers, Conditions of CONTRACT, Special Conditions of CONTRACT, Specifications, Bill of Quantities, for the above named WORK, we the undersigned offer to execute and maintain the whole of the said WORK, in conformity with the said Tender Documents, for the price as mentioned below:

No	Description	Amount (Rs.)
1	AC Work and Remaining Electrical and Allied works of BBSIMS Dadu Campus	Rs:
In words		

As agreed upon under the CONTRACT or such other sums as may be ascertained in accordance with the said CONDITIONS of CONTRACT.

- 1.2 We accept the above-mentioned Tender Documents as valid and binding including parts not countersigned in full by us. This also includes all Appendices to the Form of Tender attached hereto.
- 1.3 We confirm that we have satisfied ourselves about the SITE, climatic, traffic and all other conditions in Pakistan in general and the SITE of the PROJECT, and related works in particular, which influence, or may influence the work, and that we do not require any further clarification and additional information thereto, and that we cannot raise any claim for not knowing them.
- 1.4 We undertake to carry out such alterations, additions or curtailments of the WORK as may from time to time be determined and ordered in writing, in accordance with the CONTRACT, and at the rates in the Bill of Quantities.
- 1.5 The rates and prices which we have entered in the Bill of Quantities and Schedule, and all information and data attached with our Tender are complete and without any hidden or technical and/or financial reservations or implications. They have been duly checked, and are correct in every aspect.
- 1.6 The rates and prices which we have entered in the Bill of Quantities and Schedule, are firm and shall remain fixed for the entire duration of the CONTRACT, and are inclusive of custom duties, sales tax, local and federal taxes, Iqra surcharge, insurance, port and

octroi charges, royalties, except change in direct taxes.

- 1.7** We attached herewith a **Bid Bond** for **2%** of the contract in shape of Demand draft/ Pay order by scheduled Bank of Pakistan

We agree that should we withdraw the offer within the aforesaid period, and/or fail to sign the formal Agreement of CONTRACT, and/or fail to submit the Performance Bond; the OWNER shall be at liberty to appropriate at his absolute discretion such aforesaid Bid Bond.

We also agree that if we don't mobilize/ or start the work within fifteen days, our earnest money should be forfeited.

- 1.8** A certificate attesting the signatures of our authorized representatives is enclosed.

- 1.9** We undertake, if our Tender is accepted, to commence the WORK at within **3 (Three) Calendar days** of the date of issue by the OWNER of the Letter of Award, and to sign the Agreement for the CONTRACT within **07(seven) Calendar days** of the date of issue by the OWNER of the Letter of Award, and to complete the supply, installation and execution of the whole of the said WORK, in conformity with the said Tender Documents, within **06 (Six) calendar months** of the date of issue by the OWNER of the Letter of Award, or such extended time as may be allowed by the OWNER from time to time under the CONTRACT.

- 1.10** If our Tender is accepted, we shall furnish a **Performance Bond** as per the format as in Appendix II to these CONDITIONS of CONTRACT, from a Scheduled Bank which shall be valid from the date of issue by the OWNER of the Letter of Award, till the expiry of the PERIOD of MAINTENANCE in accordance with the CONDITIONS of CONTRACT.

- 1.11** We agree to pay all costs towards the preparation of the Agreement for the CONTRACT and get duly stamps on prevailing stamp duty rates on the agreement.

- 1.12** We further agree to abide by this Tender for a period of **completion time** from the date of opening of this Tender, and we agree to be bound by this Tender for that period.

- 1.13** Until and unless the Agreement is signed (but not later than one week), this Tender and the OWNER's written acceptance thereof shall constitute a binding CONTRACT between us.

- 1.14** We understand that the OWNER is not bound to accept the lowest or any Tender he may receive.

- 1.15** It is agreed that quoted rates includes all taxes, i-e Income tax, SST prevailing and imposed by government now.

Dated this ____ day of _____, 2021,

Name (in block letters) _____

Signature

Designation _____

Address _____ Seal of the Tenderer

Duly authorized to sign the Tender on behalf of:

_____ (Name of the Tenderer in Block Letters)

Address _____

Witness

Name (in block letters) _____

Designation _____

Address _____

2. INSTRUCTIONS TO TENDERERS

2.1 Definitions and Interpretations:

In the CONTRACT (see the following for definition of the term "CONTRACT") the following words and expressions shall have the meaning hereby assigned to them except where the context otherwise requires:

2.1.1 "GOVERNMENT" means the Government of Pakistan

2.1.2 "OWNER" means
Sukkur IBA University
Nisar Ahmed Siddiqui Road, Sukkur Sindh.

2.1.3 "CONTRACTOR" means the firm or company, group of companies, who's Tender has been accepted by the OWNER. The term CONTRACTOR, includes sponsor/representative of the company, firm/consortium their successors and his approved authorized representatives.

2.1.4 "WORK" means all supplies and performances, which are to be executed by the CONTRACTOR in accordance with the CONTRACT. Insofar as to be understood from the wording of the text, WORK also means the entirety of all or individual components which are to be completed and maintained until finally accepted within the scope of CONTRACT.

2.1.5 "CONTRACT" means the contractual agreement between the OWNER and CONTRACTOR for the execution of the WORK and includes the following documents:

- .1 The Agreement of CONTRACT;
- .2 The Form of Tender and its Appendices, filled in and signed by the CONTRACTOR;
- .3 The Instructions to Tenderer;
- .4 The Conditions of CONTRACT and Appendices to the Conditions of Contract;
- .5 The Specifications;
- .6 The Bill of Quantities priced by the CONTRACTOR;
- .7 The Tender Drawings;
- .8 The correspondence of the ARCHITECT and/or before finalization of the Tender;
- .9 The Special Correspondence with the CONTRACTOR, inclusive of the covering letter with the Tender;
- .10 The Final Drawings issued for construction;
- .11 The Shop Drawings prepared by the CONTRACTOR and approved for construction by the ARCHITECT and/or Client.
- .12 The Addendum/Corrigendum, related correspondence.

- 2.1.6 "CONTRACT PRICE"** means the price as in the Tender, inclusive of all additions or deletions foreseen in the CONTRACT, but without Liquidated Damages.
- 2.1.7 "CONSTRUCTION PLANT"** means all tools, machinery, equipment appliances or things of whatsoever nature, required for the execution, completion or maintenance of the WORK or Temporary WORKs (as hereinafter defined), but does not include materials or other things intended to form or forming part of the permanent structures.
- 2.1.8 "TEMPORARY WORKS"** means all temporary works of every kind, inclusive of the materials therefore, required in or about the execution, completion and maintenance of WORK until final acceptance. It also includes any material becoming part of the completed WORK, and any performances therewith, required and used only due to, or in consequence of, the construction methods, construction stages etc.
- 2.1.9 "DRAWINGS"** - The term "Drawings" wherever referred to in CONTRACT shall include in addition to those listed in the CONTRACT such additional scale and full size detail drawings as will be furnished by the ARCHITECT and/or from time to time as WORK progresses to amplify drawings listed.
- 2.1.10 "BILL OF QUANTITIES"** - The term Bill of Quantities shall mean that part of the CONTRACT documents under Section 5 outlining the quantities of the various items of WORK to be performed under the various sections of the Specifications, and the respective per unit prices for these items of work, quoted for by the Tendered.
- 2.1.11 "APPROVAL"** - The term "Approval" or "approved" shall be interpreted to mean "written approval".
- 2.1.12 "EQUAL", "EQUIVALENT", "SATISFACTORY", etc.** When the terms "or equal", "approved", "acceptable", "satisfactory", "proper" or other general qualifying terms are used in CONTRACT, it shall be understood that reference is made to ruling and judgment of ARCHITECT and/or The term "equivalent" where used in this Specifications, in general sense shall not mean "similar", but on the contrary, "conforming to, of like kind, quality and function". Proprietary items and trade names are used for the purpose of establishing a standard of "kind, quality and function", and "equivalent" items, articles, things or materials will be approved, if held to be "equivalent" by ARCHITECT/CLIENT.
- "SITE"** - The **"SITE" shall mean the "BBSIMS Dadu" , Old Sehwan Road, Dadu,** Where the WORK is to be executed.
- "SITE" also means land on, under, in or through which the WORK are to be executed or carried out, as well as all land or buildings provided by the OWNER for the purpose of the CONTRACT, and furthermore, all terrain as may be expressly designated in the CONTRACT as forming part of the SITE.
- 2.1.13 "Rupees"** means Pakistani currency Rupees. It is the currency basis of the CONTRACT.

2.1.14 "MONTH" means thirty (30) calendar days.

2.1.15 "DAY" means calendar day.

2.1.16 Words used only in the singular, also include the plural, and vice versa where required by context.

2.2 General:

Technically prequalified firms will take part in said tender.

2.3 Confidentiality:

The Tenderer, whether or not he submits a Tender shall treat the details of the Documents as strictly confidential.

2.4 Tender in Accordance with Documents:

The Tender shall be made in accordance with the Tender Documents and the requirements stipulated therein. Any proposed alternate or alternatives for the execution of work will be considered only if it meets the minimum stated requirements for, and is at least equivalent to, its counterpart shown on Drawings and/or Specifications. All costs for the preparation and submitting of the proposed alternates and/or alternatives will be borne by the Tenderer and the Tenderer will not be reimbursed for anything connected with alternate and its submittal.

2.5 List of Tender Documents:

Each Tenderer shall receive **1 (one)** complete set of the Tender Documents, as in Clause 2.1.13 herein.

2.6 Accuracy of Tender Documents:

The Tenderers should carefully examine the Conditions of CONTRACT, the Specifications, the individual Bill of Quantities and the Drawings and all relevant parts of the Tender Documents. The OWNER does not guarantee the accuracy of the Tender Documents or any part of them or any statement made or information given therein, or of the estimated quantities given in the Bill of Quantities, or of any other information supplied by or on behalf of the OWNER in respect of the Work.

2.7 Inspection of SITE:

The Tenderer should visit and inspect the SITE on his own responsibility and at his own expenses, to obtain all the information, which may be necessary for the purpose of anticipating all conditions that may prevail during the course of construction. The Tenderer must satisfy himself as to the nature and extent of existing structure, facilities and other operations in the vicinity of the proposed Work, the nature of the existing roads or other means of transportation, the access to, and the egress from, the SITE and the Work. The OWNER shall not entertain any representations or claims at any time which result out of the Tenderer's not having information which could have been obtained prior to submittal of his Tender.

2.8 Utilities at SITE:

The Tenderer must enquire and satisfy himself as to the sources of supply, the sufficiency of the means of obtaining and transporting at his cost all plant, materials, labour, etc., and other things, required for or in connection with the Work. He must consider all other matters and possible contingencies affecting the execution, completion and maintenance of the Work.

2.9 Neglect to obtain information:

Any neglect or failure on the part of the Tenderer to obtain reliable information on the spot or elsewhere upon the foregoing or any other matters affecting the execution, completion and maintenance of the Work, the rates, total amounts and the CONTRACT shall not relieve the Tenderer whose Tender is accepted, from any risks or liabilities or from the responsibility of completing, handing over and maintaining the Work, including during the Period of Maintenance, all as defined in the CONTRACT.

2.11 Clarification and Queries:

If the Tenderer wishes to seek clarification of meaning of any Specifications, Drawings, or other data, he may, at the same time address his enquiry in writing to the CLIENT/ such questions shall be received before the date announced for this purpose. All explanations and amendments respectively, given by the ARCHITECT and/or shall be sent at the same time to all Firms invited to submit tender.

2.12 Difficult Design or Specifications

If, in CONTRACTOR's opinion, any WORK is shown on Drawings or called for in Specifications in such a manner as to make it impossible for him to produce a first-class piece of WORK, he shall refer such facts in writing to ARCHITECT so that they may issue revisions/modifications, as he considers necessary.

2.13 Fullness of Rates:

The rates and prices set down by the Tenderer against all the items in the Bill of Quantities are to be the full inclusive value of the finished work described there under and shall cover profit and all obligations of every kind whatsoever which under the CONTRACT are to be borne by the CONTRACTOR.

2.14 Form of Entry into Tender Documents:

Tenders must be prepared only on the Documents supplied herewith.

2.14.1 Language

All entries are to be made in English and clearly in ink.

2.14.2 Tenderer's Name, Signatures and Stamps

All covers of the bound Tender Documents shall be marked with Tenderer's name and signed, with full signature of the authorized person(s). All pages and Drawings of the Tender Documents as well as erasures and/or corrections, if any, are to be initialized by the same representative(s). The Tenderer or his authorized representatives shall sign in full, stamp and date each page of the Tender Documents and in the spaces for the purpose, as well as all separate documents and drawings which shall be in English and form as supplement to Tender.

2.15 Alterations or Comments:

No alteration unless authorized in writing by ARCHITECT may be made in any of the Tender Documents. Any technical or other comments which are desired to be made, shall not be placed on any of the Tender Documents, but shall take the Form of a separate statement, as brief as possible and referenced to items, Clauses and pages of the Tender Documents.

2.16 Completeness of Tender:

Tenders must be complete, in all respects, including but not limited of the following:

2.16.1 The Bill of Quantities must be fully priced in all items, and totaled as required.

2.16.2 All Schedules and Appendices of the Tender Documents must be properly filled in, completed and signed as required.

2.16.3 All drawings, descriptions, time schedules and data to be supplied additionally by the Tenderer must be in English.

2.17 Additional Submissions:

The Tenderers must supply with their Tenders:

2.17.1 Contractual Reservations

Compilation of contractual reservations, if any, in technical and/or financial respect.

2.17.2 Information of Suppliers

Information brochures of the considered suppliers, along with descriptions, specifications, certificates, sketches or drawings on their respective supply items.

2.17.3 Standards for Materials

Information on any standards and codes, equivalent but other than those prescribed in the CONTRACT for the supply of materials or for the execution of the construction Work.

2.17.4 Time Schedule

Bidder must furnish a Completion Time schedule on specific software format (Primavera, etc) along with the bid submitted.

2.17.5 Special Sequences and Methods

Description and justification of any method or sequence for the manufacture or fabrication of any part of Work along with a binding statement that all additional suppliers and performances required in connection with such special methods or sequences have been included in the respective rates filled by the Tenderer in the Bill of Quantities.

2.18 Bid Bond:

Each Tender must be accompanied with a **Bid Bond for 2% of contract in shape of DD/Pay order by any scheduled Bank in favor of Sukkur IBA University.**

The Bid Bond of un-successful Tenderers shall be returned:

1. After execution of agreement with the successful Tenderer, or
2. If all Tenders are rejected, after such rejection, or
3. After thirty (30) days from the opening of Tenders.

The Bid Bond of the successful Tenderer will be released only after the Agreement of CONTRACT has been signed and the Performance Bond has been deposited by him.

2.19 Delivery of Tender Documents:

Tender Documents is to be sealed in a separate envelope and is to bear the name and address of the Tenderer, and is to be inscribed as follows:

Work for “AC Work and Remaining Electrical and Allied works of BBSIMS Dadu Campus”

The Tenders should be submitted at the following address:

**Project Director
Benazir Bhutto Shaheed Institute of Management,
Sciences,
Dadu**

2.20 Time of Delivery:

The original Tender set must reach the Addressee above, before the time & date fixed in writing by CLIENT for opening of the tenders (As Advertised in Newspapers). Tenders received after such time and date will be rejected.

2.21 Checking and Evaluation of Tender:

Subsequent to their opening, Tenders will be checked and evaluated by the CLIENT/ARCHITECT. The Tender of any Tenderer who has not fully conformed with these instructions may be rejected.

2.22 Arithmetical Corrections:

The CLIENT shall have the right to adjust arithmetical errors in any Tender. If the CLIENT/ ARCHITECT discover major errors and/or omissions in any Tender, he may require the Tenderer to adjust the same, but in such cases the Tenderer will not be permitted to change the basic rates. If any discrepancy is found, the relevant rates in words so arrived at will be considered in assessing the Tender.

2.23 OWNER's right of Rejection:

THE OWNER RESERVES THE RIGHT TO REJECT ANY TENDER WITHOUT GIVING ANY REASON, OR TO ACCEPT ANY TENDER IN WHOLE OR IN PART AND DOES NOT BIND HIMSELF TO ACCEPT THE LOWEST OR ANY TENDER AS PER RULES.

2.24 Discussions after Acceptance of Tender:

The Tenderer, whose Tender may be accepted will be required to send authorized representatives at their own expense for necessary technical and contractual discussions, as the case may be, for drafting the Agreement of CONTRACT.

2.25 Letter of Award of Work:

The Tenderer whose Tender may be accepted will, after all discussions as in 2.25, receive a Letter of Award of Work, after which Tenderer will be deemed to have been awarded the Work, and all covenants of the CONTRACT Documents will be applicable immediately on all parties concerned, until the formal Agreement of CONTRACT has been signed.

2.26 Enter into Agreement:

The Tenderer who has been issued Letter of Award of Work will be required to enter into the Agreement of CONTRACT, the form of which (subject to any necessary adoptions), will be as set out in APPENDIX I to the Conditions of CONTRACT, within Seven(07) days after issue of Letter of Award of Work.

2.27 Amendments, Addenda, Corrigenda:

The right is reserved to amend any of the Tender Documents or to issue additions to them prior to the due date for submitting Tenders. All such amendments and/or additions will be advised not later than **3 (Three) days** before Tenders are due. It is mandatory that the Tender shall include the latest amendment and/or additions to the Tender Documents. The drawings mentioned in 2.5 of the Tender Documents as revised during the aforesaid period shall be deemed to be Drawings referred to in the CONTRACT upon which the sums named in the Tender are based.

When the Tenderer is informed of any amendment, addition or revision of the Tender Documents, he is required to immediately acknowledge receipt of same to Consultant.

3. CONDITIONS OF CONTRACT

3.1 Distribution of Correspondence:

CONTRACTOR shall prepare 6 (Six) copies of all correspondence with Client. This is in addition to copies which may be required to be sent to other parties as the case may require.

3.2 Drawings and Specifications:

3.2.1 Issue and quantity of Drawings

After receiving a letter of Award, Contractor shall submit shop drawings to CLIENT for approval and this is mandatory, failing any deviation found on site that should be corrected and rectified by contractor on his own cost as suggested by engineer Incharge.

3.2.2 Specification

As per BOQ and attached sheet of General source of Material

3.2.2 Difficult Design or Specifications

If, in CONTRACTOR's opinion, any WORK is shown on Drawings or called for in Specifications in such a manner as to make it impossible for him to produce or guarantee a first-class piece of WORK, and which, in spite of all reasonable care and diligence, could not have been identified at the time of preparing his Tender, he shall refer such facts in writing to CLIENT and wait for reply before proceeding with the execution of such WORK.

3.2.3

Lack of information from CLIENT If at any time CLIENT shall fail to supply sufficient or clear information to enable CONTRACTOR to proceed with WORK, CONTRACTOR shall immediately notify the CLIENT in writing, and in no case, will lack of such information, or any failure to understand Drawings or Specifications or ignorance of contents of either, be considered or received as an excuse for improper or inferior design, workmanship or materials, or for any delay in performing WORK, or as a justification for any claim for extra work or materials. Should any question or disagreement arise concerning meaning of Drawings or Specifications, such questions or disagreement shall be settled by CLIENT, whose decision in writing shall be final.

3.2.4 Extra Specification WORK

In the case of any class of WORK for which there are no specifications in the Tender, such work is to be carried out in all respects as per the instruction and requirement of the ARCHITECT and/or OWNER. 15% markup will be given to the Contractor on prime cost of items of work which are not included in BOQ's & the OWNER has asked Contractor to perform. However, any job, which is required

by the OWNER to be done on daily work basis, shall be paid 22% extra to cover the over head and for the coordination supervision on actual cost of material and basic labor rates as below

Un-skilled labor	Rs. 600 per 8 hrs.
Semi skilled labor	Rs. 800 per 8 hrs
Skilled labor	Rs. 1200 per 8 hrs.

3.2.5 Conflict with Trade Unions

Wherever the provision of any section of Specifications may conflict with any agreements or regulations of any kind in force among members of any Trade Associations, Union or Council which regulate or distinguished what work shall or shall not be included in the work of any particular trade, CONTRACTOR must make all necessary arrangements of his own to reconcile any such conflict of provisions without recourse to the OWNER, CLIENT.

3.3 Shop Drawings:

3.3.1 General

Wherever in the execution of the CONTRACT, nature of WORK makes it necessary, and where specifically required by the Specifications, CONTRACTOR shall himself or cause his material vendor, fabricator or sub-Contractor to submit 3 sets of scale and full-size Shop Drawings of his WORK to the CLIENT. Shop Drawings must be complete in every detail including provision required of various trades, connections with other work, all cutting, fitting and drilling required and any and all other necessary information in accord with usual and customary trade practice as particularly required for any special purposes.

3.3.2 Submission to Authorities

When drawings are required to be submitted to Authorities, it shall be duty of the CONTRACTOR to submit them to secure approval of said Authorities and notify OWNER and CLIENT of action taken.

3.3.3 OWNER/ARCHITECT's Approval

It is to be understood that prior to manufacture, fabrication or installation of WORK under CONTRACT, Shop drawings shall be prepared and reproducible of each submitted to CLIENT for approval. No WORK will be executed in any instance prior to approval by the CLIENT of any respective Shop drawings. CLIENT's approval, however, shall not relieve CONTRACTOR of responsibility for accuracy, as such approval of Shop drawings is only general and is not intended to serve as a check, and does not relieve CONTRACTOR from furnishing the materials and performing the WORK as required by Drawings and Specifications.

3.3.4 Cross Reference to ARCHITECT's Drawings

So far as practicable, each Shop drawing shall bear a cross reference note referring to sheet number or numbers of CLIENT's Drawings showing same WORK in order to facilitate checking of Shop drawings in CLIENT's office and their prompt return to CONTRACTOR.

3.3.5 Verification and Timely Submission

It is CONTRACTOR's obligation and responsibility to check and verify all dimensions and be fully responsible for them and for their coordination with connecting WORK. CONTRACTOR is responsible for submission of vendors' and/or fabricators' Shop drawings in proper rotation, that is, where Shop drawings of one trade are dependent upon Shop drawings of another trade, proper Shop drawings shall be submitted first. No extension of time in respect to the Final Completion date will be granted to CONTRACTOR because of failure to have any Shop drawings submitted in ample time to allow for checking and approval. The CONTRACTOR along with program of work in 3.6.2. will also submit within 7 days after the issue of Letter of Award the dates when the shop drawings will be submitted for approval.

3.3.6 CONTRACTOR's Stamp for approval

All Shop drawings submitted by CONTRACTOR shall bear approval of CONTRACTOR as evidence that drawings have been checked by CONTRACTOR.

3.3.7 Letter of Transmittal

Each consignment of Shop drawings submitted for approval must be accompanied by a letter of transmittal itemizing applicable work and number of the drawings.

3.3.8 Coordination between various Trades

CONTRACTOR shall obtain all prints from sub-Contractors as necessary for purpose and the coordination of other trades and distribute them to all parties concerned.

3.4 Record:

3.4.1 General

CONTRACTOR during progress of WORK, shall keep a careful record of Drawings or all changes and corrections on Drawings. Upon completion CONTRACTOR shall mark up a set of reproducible furnished by the CLIENT, showing the WORK as actually constructed. These drawings shall be delivered to the CLIENT as a condition of "Final Payment".

3.5 Materials and Workmanship:

3.5.1 General

All types of materials, articles, or processes shall be of the respective kinds or brands relating to kind, quality, function and characteristics required by the Specifications or specified hereinafter. Where various kinds and brands are not so specified they shall be the best obtainable for required purposes. Where a specific item or type of material is specified in any portion of the Specifications and/or followed by the words "or equivalent" or "as equal" or words of similar intent, CONTRACTOR shall base his Bid Proposal upon said item or type of material as specified. The CONTRACTOR may, however, submit a written request, seeking permission to utilize a substitute item or material. The CONTRACTOR shall handle and take care of all materials used by him in

performance of his WORK, whether furnished by him or by other parties; as such materials are delivered at SITE, and shall pile, store, handle and protect them from injury. He shall deliver all materials at such times and in such quantities as will insure speedy and uninterrupted progress of WORK.

3.5.2 Samples

Where required in Specifications for various trades or otherwise required by **OWNER, samples of any materials to be used and of the finish to be applied in the WORK, shall be submitted by the CONTRACTOR for approval. Samples of all materials submitted for approval to the CLIENT** shall be supplied, wherever reasonable, **in duplicate**, unless specified otherwise elsewhere in this CONTRACT, each sample bearing a neatly typed label bearing CONTRACTOR's name, name of sub-Contractor or producer of materials, kind, quality and finish or formula (where applicable, as in the case of liquids or paints) intended use or location, date of submission. Written approval shall be obtained prior to processing or fabrication of any materials for which samples are submitted and all finished WORK shall conform thereto and/or comply with characteristics of approved samples. In no instance shall approval of samples relieve the CONTRACTOR of full compliance with any Specification requirement.

3.5.3 Inspection

For purpose of inspection OWNER and CLIENT and their representatives shall, at all times, have access to WORK, wherever it is in preparation or progress, and CONTRACTOR at his expense, shall provide proper facilities for such access and for inspection; but such right of inspection and any actual inspection, shall in no way relieve the CONTRACTOR from performance of the WORK in accord with requirements of CONTRACT or from any other duty, obligation or liability imposed upon him by the CONTRACT. The fact that materials have been accepted at shop or wherever the WORK is in preparation or progress shall not prevent its rejection under provisions hereto at building either before or after its installation. If any such WORK should be covered up without approval or consent of the CLIENT, it must, if required by OWNER, and/or CLIENT, be uncovered for examination at CONTRACTOR's expenses. Wherever so required by OWNER and/or CLIENT shall render a detailed report of condition of WORK in shop or at SITE.

3.5.4 CLIENT/ CONSULTANT sole judge for Quality

The intent herein is that each and every type and/or kind of material shall be fabricated and finished and erected and/or installed in best known possible manner by skilled artisans and mechanics, or so as to be rated "first class" in the opinion and judgment of CLIENT and whose judgment and opinion shall be conclusive and final and not a subject for arbitration or appeal.

3.6 Construction Procedures:

3.6.1 Commencement of WORK

The CONTRACTOR shall commence WORK within a period of **Three (03) days** after the receipt by him of Letter of Award of WORK from OWNER.

3.6.2 Workmen and Public:

Take all usual and necessary precautions to prevent accidents or injury to all persons, and any damage to property on, about or adjacent to premises where WORK is being performed and erect and keep in place at all times all usual, proper, necessary and required danger signs, safeguards and fencing. CONTRACTOR shall indemnify

OWNER and ARCHITECT, and all their authorized representatives, against any claim, suits, damages and judgments, including Counsel fees and disbursements incurred in defense of any action, of which they may be subjected or which they may suffer by reason of any injury to persons or property resulting from negligence or carelessness on part of the CONTRACTOR or his sub-Contractors, agents or employees, in performance of WORK, or arising out of WORK performed hereunder.

3.6.3 Emergencies: In any emergency affecting safety of life or of WORK or of adjoining property, CONTRACTOR without special instruction or authorization from OWNER or CLIENT, is hereby permitted to act at his discretion, to prevent such threatened loss of injury, and he shall so act, without appeal if so instructed / authorized.

3.6.4 Accidents: Should a serious or fatal accident occur during execution process, CONTRACTOR shall immediately notify OWNER and CLIENT and cause an investigation to be conducted at once into cause of such accident and full testimony taken with photographs, and tests, to determine complete cause thereof. Such investigations shall be reported in writing upon Insurer's "Accident Report Forms", and/or as may be authorized otherwise. Insurance of all employed will be made by the CONTRACTOR as per Labor Laws.

3.6.5 Utilities and WORK: In addition to requirements indicated herein, protect any utilities and WORK of any kind against damage or interruption of service except as specifically directed or authorized. Damage or interruption of service resulting from failure so to do shall be repaired and/or restored promptly by or at the expense of the CONTRACTOR without cost to the OWNER.

3.6.6 Fire Provide: Adequate protection against fire hazards and observe all care precautions against such hazards. CLIENT shall be the sole judge as to the adequacy or otherwise of such measures. Damage by fire will be made good by the CONTRACTOR at his own expense.

3.6.7 Watchmen: Provide adequate and competent watchmen, to guard the WORK from time the WORK is commenced until "Certificate of Final Acceptance" is issued and/or until CLIENT directs otherwise. In the event that the CLIENT at any time determines the watchmen's service inadequate or incompetent, and after notifying the services or corrective action as deemed necessary by the CLIENT and all costs thereof shall be deductible from any sums due to the CONTRACTOR.

3.7.1 General

Should CONTRACTOR desire to sublet any portion of the WORK, he shall make such request to CLIENT in writing, giving name and address of proposed Sub-Contractor defining portion of WORK desired to be sublet. This shall be done before CONTRACTOR in any manner obligates himself to any Sub-Contractor.

OWNER reserves the right to add to CONTRACTOR's Tendering list names of other Sub-Contractors in any or all branches of the WORK of Sub-Contractors mentioned in CONTRACTOR'S proposals. No WORK shall be sublet without approval, in writing, of the CLIENT where materials are being furnished. CONTRACTOR agrees to be bound by terms of the CONTRACT as far as applicable.

3.8 Bad WORK, Default, etc.

3.8.1 General

If it shall appear to the CLIENT that any WORK has been executed with unsound, imperfect or unskilled workmanship, or if materials of any articles provided by the CONTRACTOR for the execution of the WORK are unsound or of a quality inferior to that contracted for, or otherwise not in accordance with the CONTRACT, the CONTRACTOR, shall, on demand in writing from the CLIENT specifying the WORK or materials or articles complained of, notwithstanding that, the same may have been inadvertently passed, certified and paid for, forthwith rectify, or remove and reconstruct the WORK so specified in whole or in part, as the case may require, remove the articles or materials so specified and provide other proper and suitable articles or materials at his own charge and cost. In the event of CONTRACTOR's failing to do so, no payments shall be made for the same till defects are rectified as per instructions of the ARCHITECT and/or OWNER, and in case where rectification or removal of defects or materials is not possible and work can be accepted otherwise, the rates for such items shall be reduced. In all such cases the decision of OWNER shall be final and binding on the CONTRACTOR.

3.8.2 Rectification by OWNER

If CONTRACTOR or his workmen or employees, while performing this CONTRACT shall break, deface, injure or destroy any part of a building, road, road curbs, fence, enclosure, water pipes, cables, drains, electric or telephone posts, wires, trees, grass or grassland or on which the WORK or any part of it is being executed; or if any damage shall happen to the WORK, while in progress, from any cause whatsoever, or any imperfections become apparent in it within "Period of Maintenance" CONTRACTOR shall make the same good at his own expense, or in default, OWNER, may cause the same to be made good by other workmen and deduct the expense, of which the certificate of CLIENT shall be final, from any sums that may be then or at any time thereafter may become, due to the CONTRACTOR or from his Security Retention or the proceeds of sale thereof, or of a sufficient portion thereof. The Security Retention of

CONTRACTOR shall not be refunded before the expiry of satisfactory "Period of Maintenance" as in Clause 3.17.4 after the issue of the Final Certificate or otherwise of completion of WORK.

3.9 Completion

3.9.1 Final Certificate of Completion

On completion of WORK the CONTRACTOR shall so notify the CLIENT in conducting inspections and any final tasks that may be prescribed by the CONTRACT to determine successful completion of the WORK. CONTRACTOR shall be furnished with a Certificate by the OWNER of such completion, but no such Certificate shall be given, nor shall the WORK be considered to be complete until CONTRACTOR shall have removed from the premises on which the WORK shall be executed all surplus materials and rubbish, and cleaned off the SITE in, upon or about which the WORK is to be executed or which he may have had possession for the purpose of the execution thereof, nor until the WORK shall have been certified by the CLIENT whose certificate shall be binding and conclusive against CONTRACTOR. If the CONTRACTOR shall fail to comply with the requirements of this Clause as to removal of surplus materials and rubbish, and cleaning off SITE on or before the date fixed for the Completion of the WORK, OWNER, and/or CLIENT may, and at the expense of CONTRACTOR order removal of materials and rubbish and disposal of the same as they think fit to clean off such dirt as aforesaid, and CONTRACTOR shall pay the amount of all expenses so incurred, and have no claim in respect of any such surplus materials as aforesaid except for any sum actually realized by the sale thereof. The "Period of Maintenance" of the WORK as specified in Clause 3.17.4 of these Conditions shall commence from the date of issue of such Final Certificate of Completion.

3.9.2 SITE Clearance

On Completion of WORK, or earlier as directed by the CLIENT or as otherwise specified, CONTRACTOR shall remove all construction plant, Temporary structures erected by him at the SITE of WORK. Remove all debris, and shall leave the SITE in a neat and tidy condition to the satisfaction of the ARCHITECT and/or OWNER. All such WORK, however, shall be in conformity with Clause 3.6.15 of these Conditions of CONTRACT.

3.10 Payments

3.10.1 Interim Payments.

3.10.1.1 General:

After verification of bill at site, its quality and quantity as per the specification, entire satisfaction of CLIENT, within two weeks after bill submittal.

3.10.2 Reduction of Rate

The OWNER shall have full power to reduce the rates for such items which have not been properly carried out but can be accepted otherwise. The decision of OWNER with respect to reduction of rates will be final and binding on the

CONTRACTOR. This will apply to such items also which might have been paid in full earlier but defects are detected later.

3.10.3 Form of Payment

3.10.5.1 General: Payments due to CONTRACTOR will be made by crossed cheques only.

3.10.5.2 Interest : No interest will be paid to the CONTRACTOR or any body else, on CONTRACTOR's Earnest Money, Security Retention, amounts of bills or any other amounts of CONTRACTOR remaining with the OWNER for any period.

3.10.4 Deduction from Payments

Interim Payments will be made after deduction of the Retention Money and the like, as follows:

3.10.4.1 Security Retention: Deduction from the first and the following running bills of the CONTRACTOR as Security Retention at 10% (Ten percent) of gross amount of such running bills.

3.10.5 Final Payments

The CONTRACTOR shall submit to the CLIENT following documents before receiving the final payments from the OWNER.

3.10.5.1 Completion Certificate: Completion Certificate for the whole of the WORK issued by the OWNER which shall signify the complete handing over of all parts of the WORK, under the CONTRACT, by the CONTRACTOR to the ARCHITECT and/or OWNER.

3.10.5.2 Affidavit to Quality: An affidavit by the CONTRACTOR, that the WORK has been executed according to a first-rate standard and sound engineering practices and have no concealed defects known to him.

3.10.5.3 Certificate of Agreement: Cert. of Agreement with all measures and decisions taken by the OWNER and their representatives in the course of and in connection with the WORK and the execution of the CONTRACT.

3.10.5.4 Release from Lien and Charge Release of Lien and Charge, according to which there is no lien or charge from him or from a third party, on any delivery or performance of the CONTRACT, in connection with the CONTRACT. The final payment will be made after all the above documents and Final Bill of the CONTRACTOR have been approved by the OWNER.

3.10.6 Liquidated Damages

3.10.6.1 Liquidated Damages If CONTRACTOR shall fail to complete the WORK within the time prescribed, he shall pay to the OWNER as liquidated damages for such a default and not as a penalty, the following sum of money for every calendar day or part thereof which shall elapse between the time prescribed by the Conditions and respective dates of completion of the total WORK:

(0.1 % (point one percent) of Total Contract Price at the time of signing of CONTRACT, per day or up to maximum of 10% (ten percent) of the contract value)

OWNER may without prejudice to any other method of recovery deduct the amount of such damages from any moneys in his hand due or which may become due to the CONTRACTOR. The payment or deduction of such damages shall not relieve CONTRACTOR from his obligations to complete the WORK, or from his obligations and liabilities under this CONTRACT.

3.10.7 Escalation:

All prices and unit rates in the CONTRACT are fixed and shall remain unchanged for the entire duration of the CONTRACT. If any Direct Tax is imposed by the Government on any of the items included in the CONTRACT, rates shall be adjusted accordingly, this does not include Indirect Tax this adjustment shall be made only upon CONTRACTOR's furnishing to the OWNER sufficient documentary evidence of the rate of tax per item.

3.11 Insolvency, Breach of CONTRACT, Bankruptcy, etc:

3.11.1 CONTRACTOR's non-performance

3.11.1.1 Insolvency If CONTRACTOR shall become insolvent or have an order admitting a petition in insolvency made against him or shall present his petition in insolvency or shall made an agreement with assignment in favour of his creditors or shall agree to carry out the CONTRACT under a committee of inspection of his creditors or (other than a voluntary liquidation for purpose of amalgamation or reconstruction) assign the CONTRACT, without the consent in writing of OWNER first obtained or shall have an execution levied on his goods, or if CLIENT shall certify in writing to OWNER that in his opinion CONTRACTOR:

3.11.1.2 Abandonment of CONTRACT has abandoned the CONTRACT; or

3.11.1.3 Failure to Commence WORK

without reasonable excuse has failed to commence WORK or has suspended the progress of WORK for twenty eight (28) days after receiving from OWNER written notice to proceed; or

3.11.1.4 WORK not in accordance with CONTRACT

is not executing WORK in accordance with CONTRACT or is persistently or flagrantly neglecting to carry out his obligations under the CONTRACT; or

3.11.1.5 Sub-letting

Has to the detriment of good workmanship or, in defiance of OWNER's and/or ARCHITECT's instructions to contrary, sub-let any part of the CONTRACT; or

3.11.1.6 Breach of CONTRACT

has committed breach of any of the terms and conditions of CONTRACT or in any case in which the CONTRACTOR shall have rendered himself liable to pay compensation.

3.11.2 OWNER's Rights

OWNER shall have power to adopt any of the following (or all courses as they may deem best suited to the interest of OWNER:

3.11.2.1 Rescission of CONTRACT, Forfeiture of Security Retention To rescind the CONTRACT (to which rescission, notice in writing to the CONTRACTOR under the hand of OWNER shall be conclusive evidence) and in which case the Security Retention of CONTRACTOR shall stand forfeited, and be absolutely at the disposal of OWNER.

3.11.2.2 WORK by OWNER To employ labour paid by OWNER and to supply materials to carry out the WORK, or any part of the WORK debiting CONTRACTOR with the cost of the labour and the price of materials (of the amount of which cost and price, a Certificate of OWNER and/or CONSULTANT shall be final and conclusive against the CONTRACTOR in all respect as if it had been carried out by the CONTRACTOR under the terms of his CONTRACT. The Certificate of the OWNER as to the value of the WORK done shall be final and conclusive against the CONTRACTOR.

3.11.2.3 WORK by Others To measure up the WORK of the CONTRACTOR and to take such part thereof as shall be unexecuted out of his hands, and to give it to another Contractor to complete, in which case any expenses which may be incurred in excess of the sum which would have been paid to CONTRACTOR if the whole would have been executed by him (of the amount of which excess the Certificate in writing of the CLIENT shall be final and conclusive) shall be borne and paid by the CONTRACTOR and may be deducted from any money due to him by OWNER under the CONTRACT otherwise, or from his Security Retention or the proceeds of sale thereof or a sufficient part thereof. In the event of any of the above courses being adopted by OWNER, CONTRACTOR shall have no claim to compensation for any loss sustained by him by reason of his having purchased or procured any material, or entered into engagements, or made by advances on account of, or with view to the execution of the WORK or the performance of the CONTRACT, and in case the CONTRACT shall be rescinded under the provision aforesaid, CONTRACTOR shall not be entitled to recover or to be paid any sum for any WORK thereto or actually performed under this CONTRACT unless and until CLIENT will have certified in writing the performance of such WORK and the value payable in respect thereof, CONTRACTOR shall only be entitled to be paid the value so certified on the completion of "Period of Maintenance".

3.11.3 Non-exercise by OWNER of his Rights

In any case in which any of the powers conferred upon OWNER by Clause 3.11.2 thereof shall have become exercisable and the same shall not be exercised, the non exercise thereof shall not constitute a waive of any of the conditions thereof and such powers shall notwithstanding be exercisable in the event of any future case of default by the CONTRACTOR for which by any Clause or Clauses hereof he is declared to pay compensation amounting to the whole of his Security Retention, and the liability of the CONTRACTOR for past and future compensation shall remain unaffected.

3.11.4 Forfeiture and Disposal of Plants, Tools and Stores

In the event of OWNER putting in force any of the powers vested in them, under the preceding Clause 3.11.2, he or his duly authorized representatives may enter upon the WORK and use all temporary buildings and they may if they so desire, take possession of all or any tools, plants, materials and stores, in or upon the WORK, or the SITE thereof or belonging to the CONTRACTOR or procured by him and intended to be used for the execution of WORK or any part thereof, paying or allowing for the same in account at the CONTRACT rates or, in case of these not being applicable, at current market rates to be certified by ARCHITECT and/or OWNER, whose certificate thereof shall be final, otherwise OWNER may, by notice in writing to the CONTRACTOR or his supervisor, foreman, or other authorized agent require him to remove such tools, plant, materials or stores from the premises (within a time to be specified in such notice) and in the event of CONTRACTOR failing to comply with any such requisition, OWNER may remove them at CONTRACTOR's expenses or sell them by auction or private sale on account of CONTRACTOR and at his risk in all respect and the Certificate of the OWNER as to the expense of any such removal and the amount of the proceeds and expenses of any such sale shall be final and conclusive against CONTRACTOR.

3.11.5 OWNER's Remedy of Default

If CONTRACTOR shall fail duly to observe or perform any requirements, instructions, directions or the order of the CLIENT duly made or given in accordance with the CONTRACT, or shall otherwise fail to fulfill any obligation imposed upon him by the CONTRACT, OWNER may without prejudice to any other rights or remedies he may have, himself or by his servants or agents remedy such default and all expenses consequent thereon or incidental thereto shall be borne by the CONTRACTOR and shall be recoverable from him or may be deducted by OWNER from any money due to the CONTRACTOR.

3.11.6 Termination of CONTRACT on Sub-letting, Assigning or Bribing, etc.

The CONTRACT shall not be assigned or sublet without written approval of the OWNER. If CONTRACTOR shall assign or sublet his CONTRACT, or attempt to do so, or become insolvent or commence insolvency proceedings or mark any composition with his creditors, or attempt to do so, or if any bribe, gratuity, gift, loan, reward or advantage, pecuniary or otherwise, shall either directly or indirectly be given, promised or offered by the CONTRACTOR, or any of his servants or agents to any officer or person in the employment of OWNER or CLIENT in any way relating to their office or employment, OWNER may

thereupon by notice in writing, terminate the CONTRACT and the Security Retention of the CONTRACTOR shall thereupon stand forfeited and be absolutely at the disposal of the OWNER and the same consequences shall ensue as if the CONTRACT had been rescinded under, and, in addition, to recover or be paid for any WORK, actually performed under the CONTRACT.

OWNER may terminate contractor for convenience which will mean that if the OWNER decides to change its plan or is forced by the appropriate authority to suspend work then the OWNER may terminate the contract for convenience and so notify the CONTRACTOR etc.

3.12.1.1 Payment of Damages Should the WORK or any part thereof or all or any of the Temporary Works or any part thereof or materials on SITE for incorporation in the WORK be damaged or lost during the continuance of insurance effected under Clause 3.12.1, any risk insured against, CONTRACTOR shall proceed with utmost dispatch to make good the damage or loss aforesaid and every sum of money received under the policy or policies shall be paid of money received under the policy or policies shall be paid to OWNER and be paid by OWNER to the CONTRACTOR in such installments as the OWNER shall upon recommendation of CLIENT think proper and certify having regard to the progress made by the CONTRACTOR in making good the damage or loss aforesaid in and so far as such damage or loss ought in the opinion of CLIENT to be made good for the proper execution of the WORK.

3.12.2 Damage to Persons and Property

The CONTRACTOR must indemnify and keep indemnified the OWNER and the CLIENT against all losses and claims for injuries or damage to any person or any property whatsoever, which may arise out of or in consequence of the construction and maintenance of the WORK and against all claims, demands, proceedings, damages, costs, charges, and or in relation thereto. The CONTRACTOR is not allowed to claim any personal liability for or with regard to any matter or thing which can be made binding hereby for the OWNER and/or CLIENT from either any member or official nor from the OWNER, nor from the CLIENT.

3.12.3 Third Party Insurance

Before commencing the execution of the WORK, CONTRACTOR shall insure with Eastern Federal Insurance Co. Ltd. Or Adamjee Insurance Company Ltd., Duly attested by their Head office against any damage, loss or injury which may occur to any property (including that of OWNER or to any person) including any employee of OWNER and/or CLIENT, by or arising out of the execution of the WORK or Temporary Works or in carrying out of CONTRACT. Such insurance shall be affected with an insurer and at terms approved by OWNER and for at least the amounts stated in Appendix 'A' to the Form of Tender. The CONTRACTOR must, whenever required produce to the OWNER the policy or policies of insurance and receipts for payment of the current premiums.

3.12.4 Accidents or Injuries to Workmen

3.12.4.1 OWNER's and ARCHITECT's Liabilities The CLIENT do not assume any liability for damage or compensation as a result of accident or injuries or epidemic illness of workmen or any other person in service of CONTRACTOR or Sub-Contractor. The CONTRACTOR must indemnify and keep indemnified OWNER and CLIENT with regard to all damages and liabilities of this type as well as with respect to any claims, demands, proceedings, damages, cost, charges and expenses there from or in connection therewith.

3.12.4.2 Approved Insurers The CONTRACTOR shall insure against such liability with Eastern Federal Insurance Co. Ltd., Duly attested by EFU Head Office or Adamjee Insurance Company. The insurance is to be maintained by CONTRACTOR during the entire duration of the CONTRACT. CONTRACTOR shall when required, produce to OWNER such policy or policies of insurance and the receipt for payments of the current premiums.

3.12.4.3 Sub-Contractors and Suppliers The insurance of CONTRACTOR must also include the personnel of all Sub-Contractors and suppliers, insofar as they WORK on SITE, so that OWNER and CLIENT are also kept indemnified in this respect.

3.12.4.4 Safety Precautions The insurance obligations under Clause 3.12.4.2 in no case release CONTRACTOR from the obligation to reasonably safeguard conditions at SITE against danger of accident. The CONTRACTOR must therefore take reasonable precautions to guard his personnel who are engaged in the execution of the WORK, as well as third parties, from accidents and physical injuries, as well as from contagious diseases at the SITE. The CONTRACTOR must take steps to see that all sources of danger at the SITE are watched and secured. He must take care that satisfactory and proper lighting conditions exist at the SITE and on all equipment when used for night WORK. All storage and working areas are to be kept clean, in order to avoid the danger of diseases and epidemics.

3.12.4.5 Safety Meetings CONTRACTOR shall convene safety meetings at the SITE not less frequently than once a month which shall be attended by the CONTRACTOR's agent, key construction personnel ARCHITECT and/or OWNER. Should the CLIENT have cause to represent at any such meeting that safety rules and regulations are not being complied with or that unsafe practices are being adopted by the CONTRACTOR, then the CONTRACTOR shall immediately proceed to remedy the situation.

3.12.4.6 Failure to Correct Safety Violations. In the event that the CONTRACTOR fail promptly to remedy the situation and WORK proceeds in the opinion of the CLIENT in a hazardous and dangerous manner then the OWNER upon recommendation of the CLIENT may shut down that WORK and thereafter there will be no resumption of that WORK until the CONTRACTOR makes necessary corrections to bring that WORK in compliance. The CONTRACTOR shall not be entitled to any compensation or extension of time for performance under the CONTRACT in the event the OWNER has to shut down the

CONTRACTOR's WORK because of safety violations.

3.12.4.7 First Aid Training A reasonable number of the CONTRACTOR's employees must be trained in First Aid. First aid kits of the type, equip. and number approved by the CLIENT must be furnished properly equipped by the CONTRACTOR, at all construction SITES and working areas. The CONTRACTOR must arrange that each injured or epidemically ill person is immediately transported to a nearby suitable hospital.

3.12.4.8 Accident Report The CONTRACTOR shall immediately make a written report to the OWNER, CLIENT on all accidents, which result from or in connection with the execution of the WORK, regardless of whether on or near the construction SITE, and which result in injuries, death or damage to property inclusive of all details and statements of witnesses.

3.12.4.9 Payment for Injury or Death The CONTRACTOR is obliged to make payment to his Pakistani workers, staff, their dependents or heirs for any injuries or death which may have occurred to them during the execution of the WORK, in accordance with the provisions of the "WORKMEN'S COMPENSATION ACT 1912" and other laws in the duration of the CONTRACT.

3.12.4.10 Epidemics In case of diseases or plagues of epidemic nature, CONTRACTOR must observe all rules, regulations or instructions issued by the competent authorities charged with the controls, and must in any case take all measures necessary to prevent the spreading of such diseases or plagues among other employed at the SITE.

3.12.4.11 Applicable Government Regulations Nothing under this Clause shall be so interpreted to mean that the CONTRACTOR is relieved from the complete fulfillment of the applicable Government or local rules, directives, laws and instructions in this respect.

3.12.4.12. HSE measures Contractors are bound to take all health, safety measures of the workers at site, officers and adjacent properties in all respects as per the HSE laws and measures, as per the entire satisfaction of Client.

3.12.5 Legal Remedy on CONTRACTOR's failure to Insure

If the CONTRACTOR shall fail to effect and keep in force the insurances referred to in Clause 3.12.1 to 3.12.3 hereto, or any other insurance which he may be required to effect under the terms of the CONTRACT, then in any such case, OWNER may effect and keep in force any such insurance and pay such premium or premiums as may be necessary for that purpose, and from time to time deduct the amounts so paid by the OWNER as aforesaid from any monies due or which may become due to the CONTRACTOR or recover the same as debt from the CONTRACTOR.

3.13 Performance Bond

3.13.1 General

Before the signing of the CONTRACT, the CONTRACTOR must deposit a **Performance Bond** in the amount of 10% (ten percent) of the price of the CONTRACT prevailing at the time of signing of the Agreement of the CONTRACT for the proper, conscientious and faithful execution of the WORK. This Performance Bond must be given from a **Scheduled Bank**. After the final completion and formal acceptance of all parts of the WORK, the Bond sum can be reduced to 5%(five percent) of the price of the CONTRACT applicable at the time of signing of the Agreement of CONTRACT, whereby this reduced Bond is to be made available until the end of the **Period of Maintenance**. It will, thereafter, be released by the OWNER in accordance with the terms otherwise in the Conditions of CONTRACT.

The Performance Bond is binding, irrespective of variations, changes or time extensions, which are granted or agreed upon. It shall be formulated according to the form prescribed in Appendix 'II' to the Conditions of CONTRACT and shall contain the statement, that OWNER can complete that portion of the WORK, which the CONTRACTOR has not commended or not satisfactorily executed, up to the amount of the Performance Bond, at the expense of the insurer or bank giving the guarantee.

3.14 Laws and Regulations

3.14.1 General

CONTRACTOR shall conform in all respects with the provisions of all Federal, Provincial and Local Laws, Rules and Regulations including all regulations and bye-laws of all local or other duly constituted authority within Pakistan which may be applicable to the execution of the WORK, and shall give all notices and pay all fees required to be given or paid thereby and shall indemnify OWNER against all penalties and liabilities incurred by reasons of any such provisions.

3.14.2 Patents, Trademarks, Brand names, etc.

CONTRACTOR shall hold harmless, and indemnify, OWNER and ARCHITECT from and against all claims and proceedings for or on account of infringement by CONTRACTOR of any patent rights, designs, trademarks or brand names, or other protected rights in respect of any constructional plant, machine, WORK, process, or material used for the purpose of, or in connection with the CONTRACT and from and against all claims, demands, proceedings, damages, costs, charges, and expenses whatsoever in respect thereof or in relation therewith.

3.14.3 OWNER's Right under Law

Nothing contained in this CONTRACT shall in any way affect or impair, any rights

or remedies to which the OWNER may be entitled under law.

3.15 Additions, Alterations, Omissions

3.15.1 General

Variation of the form, quality or quantity of the WORK or any part thereof, can be affected through a written order to the CONTRACTOR signed to show the recommendations of the CLIENT and the authorization of the OWNER. For the purpose, or if it appears desirable to them for any reasons, they shall have the power to issue following binding directives:

3.15.1.1 Quantitative Change to increase or decrease the quantity of any WORK included in the CONTRACT;

3.15.1.2 Omission of any WORK to omit any such WORK;

3.15.1.3 Qualitative Change to change the character or quality or kind or any such WORK;

3.15.1.4 Change in dimension to change the dimensions of any part of the WORK; and

3.15.1.5 Additional, Ancillary WORK to execute additional WORK of any kind, in connection with ancillary to the WORK.

3.15.2 No Invalidation of CONTRACT

The CONTRACT and specially the unit rates are not in any way vitiated or invalidated by the aforesaid variations, but the value (if any) of all such variations shall be kept into account in ascertaining the amount of the final price of the CONTRACT and the payments of account hereof.

3.15.3 Variations only on Orders in Writing

No such variation shall be made by the CONTRACTOR without any order in writing of OWNER. However, no order in writing shall be required for increase or decrease in the quantities of any WORK, where such increase or decrease is not the result of an order under this Clause given by the OWNER but is the result of the quantities being less or more than stated in the BOQ's.

3.15.4 Valuation of Variations and Claims

3.15.4.1 Basis of Valuation CLIENT shall determine the amount (if any) which in their opinion should be added to or deducted from the price of CONTRACT, in respect of any extra or additional WORK done or WORK omitted by OWNER's order. All such WORK shall be valued at the unit rates set out in the CONTRACT, if in the opinion of ARCHITECT and/or OWNER, the same shall be applicable. If the CONTRACT shall not contain any unit rates applicable to the extra or additional WORK, then suitable prices and variation orders shall be recommended by ARCHITECT for owner approval. In the event of disagreement, OWNER shall fix such prices as shall in their opinion be reasonable and proper.

The rates and prices in Section 5B of the Bill of Quantities shall be deemed to consist of procurement, supply and incorporation of materials in the WORK, including but not limited to the following costs:

Item (1) Material cost FOB Supplier in Pakistan;

Item (2) CONTRACTOR's overheads, risk and profit in connection with the supply as surcharged to (1) above.

Item (3) Insurance, all taxes, import duties and the like.

Item (4) all landings, clearance and transport costs in Pakistan as well as expenditures for handling, storage and incorporation of materials into the permanent WORK at SITE etc., inclusive of all required construction plant and equipment and labour/staff costs, as well as of other SITE overheads, risks and profit.

Item (5) all costs for incorporation of materials into the WORK completed according to Bill of Quantities, Drawings and Specifications. Any material deviating from Specifications and the individual Bill of Quantities must be delivered on instruction of ARCHITECT and/or OWNER, and will be paid for the above cost items as follows under variation order:

Item (1) As per actual costs.

Item (2) With the percentage of (1) above as agreed by OWNER.

Item (3) As per actual costs.

Item (4) As contained in comparable items of the individual Bill of Quantities or if not existing as approved by OWNER.

3.15.4.2 CONTRACT Price Rendered Unreasonable If the pre-requisites under Clause 3.15.4.4 have been fulfilled, i.e., if the total amount of omissions or additions relative to the amount of the whole of the WORK of the CONTRACT shall be such that in the opinion of OWNER the rates or prices contained in the CONTRACT are by reason of such omissions or additions rendered unreasonable or inapplicable then an adjustment of the final price of the CONTRACT without any changes in the unit rates shall be made by the OWNER upon recommendations of the CLIENT considering the prevailing conditions and having regard to the circumstances.

3.15.4.3 Notices Before Change in CONTRACT Price A change in the price of CONTRACT under Clause 3.15.4.1 or an adjustment of the final price of the CONTRACT in accordance with Clause 3.15.4.2 shall only then take place if as soon after the date of signing of the CONTRACT, as is practicable and in the case of extra or additional WORK before the commencement of the WORK or as soon thereafter as in practicable, the following notice shall have been given in

writing:

(1) by CONTRACTOR to OWNER through CLIENT of his intention to claim extra payment or an adjustment of the final price of the CONTRACT; or

(2) by OWNER through CLIENT to CONTRACTOR of his intention to issue a variation order as per Clause 3.15.4.1 or to adjust the final price of CONTRACT in accordance with Clause 3.15.4.2.

3.15.4.4 Variation exceeding 20% If the net effect of all variations (other than those arising by reason of any Clause relating to variations in price of materials and/or labour) shall be found on completion of the whole of the WORK to result in a reduction or an addition greater than 20% (twenty percent) of the sum named in the Tender, the amount of CONTRACT Price shall be amended by such sums as shall be agreed upon between CLIENT and CONTRACTOR. In the event of disagreement, OWNER shall fix such sum as shall in his opinion be reasonable and proper consideration being given to all material and relevant factors including CONTRACTOR's own costs and overheads and his decision shall be final and binding to CONTRACTOR.

3.15.4.5 Account of Additional Expenses CONTRACTOR shall send to OWNER through CLIENT once a month an account giving particulars (as full and detailed as possible) of claims for any additional expense to which CONTRACTOR may consider himself entitled and of all extra and additional WORK which he has executed during the proceeding month. No claims for payment for any such WORK will be considered which has not been included in such particulars. The CONTRACTOR shall not be entitled to demand payment for the period before the claim has been approved by the ARCHITECT and/or OWNER.

3.16 Suspension of WORK

3.16.1 General

CONTRACTOR shall, on the written order of OWNER, suspend the progress of the WORK or any part thereof for such time or times and in such manner as OWNER may consider necessary and shall during such suspension properly protect and secure the WORK so far as is necessary in the opinion of CLIENT or as required under the CONTRACT.

3.16.2 Costs for Suspension

The extra cost including demurrage (if any) incurred by CONTRACTOR in giving effect to OWNER's instructions under this Clause shall be borne and paid by the OWNER unless such suspension is:

(1) Otherwise provided for in the CONTRACT, or

(2) Necessary for the proper execution of the WORK for any reason whatsoever or by reason of weather conditions affecting the safety or quality of the WORK, or by some default on WORK, or by some default on the part of CONTRACTOR, or

(3) Necessary for the safety of the WORK or any part thereof.

3.16.3 Notice to File Claims

A pre-requisite for CONTRACTOR's claim for compensation of additional costs is, that he informs CLIENT in writing, within twenty eight (28) days after receipt of the directive of OWNER, of his intention of file claims. A further pre-requisite is that the claim shall be filed within fourteen (14) calendar days of the written notification to CONTRACTOR by OWNER that the partial or total suspension has been ended. CLIENT will assess and recommend the extra payment (if any) to be made to CONTRACTOR in respect of any claim, which in the opinion of CLIENT is fair and reasonable. However, final decision will be made by the OWNER which must be accepted by the CONTRACTOR. In the event of CONTRACTOR failing to inform in writing or failing to lodge claim within the stipulated time all of his claims shall be deemed to have been abandoned and extinguished.

3.16.4 Avoidable Costs

In case a suspension of the WORK will result in additional costs for OWNER, CONTRACTOR is obligated to keep these extra costs as low as possible through pertinent arrangements at the SITE. The CLIENT will not accept any additional claims from CONTRACTOR, which could have been avoided with better arrangements.

3.17 Date and Time Periods

3.17.1 Date of Commencement of WORK

The date of issue of Letter of Award of WORK by OWNER.

3.17.2 Completion Period

The time allowed for carrying out the WORK as entered in the CONTRACT shall be **360 days** and be reckoned from the date of issue of Letter of Award. The WORK shall throughout the stipulated period of the CONTRACT be processed with all due diligence (time being deemed to be the essence of the CONTRACT).

3.17.3 "Period of Maintenance"

3.17.3.1 The "Period of Maintenance" shall mean a period of **12 months** as calculated from the date of issue of "Final Certificate of Completion". The WORK shall at, or, as soon as practicable after the expiry of the "Period of Maintenance", be delivered to OWNER to his satisfaction in as good and perfect condition (fair wear and tear excepted) as that in which they were at the commencement of the "Period of Maintenance". The CONTRACTOR shall execute all such WORK or repair, amendment, reconstruction, rectification and making good of defects, imperfections, shrinkage or other fault as may be required by OWNER and/or CLIENT during the "Period of Maintenance" or within thirty (30) calendar days after its expiration as a result of an inspection made by or on behalf of the OWNER and/or CLIENT prior to its expiry.

3.17.4.2 If, for any material or equipment supplied by CONTRACTOR, the OWNER

is entitled to a guarantee or warrantee by manufacturer or supplier, the validity of which is greater than 24 (twenty Four) months, CONTRACTOR shall be bound to ensure the realization of all such guarantees or warrantees, until the expiry of their validity.

3.18 LEGAL BASES; SETTLEMENT OF DISPUTES; ARBITRATION:

3.18.1 The CONTRACT shall be and be deemed to be a Pakistani CONTRACT and shall accordingly be governed by and construed according to the laws for the time being in force in Pakistan. Should any more Conditions of CONTRACT be lacking in legal effectiveness on account of ambiguity or for any other reason whatsoever the same shall not impair the validity of any other conditions or of the CONTRACT as a whole. Any conflict which cannot be resolved mutually will be referred for arbitration under the arbitration Act. In case of default or conflict the Chairman of Client shall be the Arbitrator and his decision shall be final and binding.

3.18.2 if any or differences of any kind whatsoever shall arise between the ARCHITECT / CONSULTANT and CONTRACTOR in connection with or arising out of the CONTRACT, or the carrying out of the WORK (whether during the progress of the WORK or after the termination, abandonment or breach of the CONTRACT), it shall in the first place be referred to and settled by OWNER who within a period of ninety (90) days after being requested to do so, shall give written notice of his decision to the CONTRACTOR. Such decision in respect of every matter so referred shall be final and binding upon the CONTRACTOR until the completion of the WORK and shall forthwith be given effect to by the CONTRACTOR, who shall proceed with the WORK with all due diligence.

3.19 LEGAL NOTICES

3.19.1 Any notice be given to the CONTRACTOR under the terms of the CONTRACT shall be served, by sending the same to the CONTRACTOR's Head Office as well as to his local Site Office, by Registered Mail, or to leave it at the Head Office and the local Site Office against receipt.

3.19.2 Any notice to be given to the OWNER and/or CONSULTANT by the CONTRACTOR is to be sent to him by Registered Mail (as in Clause 3.19.1), or to be left against receipt.

3.19.3 Simultaneously with the sending of notice, as aforesaid, copies thereof shall be dispatched to the CONTRACTOR, the OWNER and CONSULTANT as the case may be.

3.20 PHOTOGRAPHS

3.20.1 Contractor should put the photographs of all fabrication / manufacturing process of all items

3.21 COORDINATION MEETINGS

3.21.1 Shortly after issue of the Letter of Award of the CONTRACT, the CLIENT will require a meeting with the CONTRACTOR at OWNER's office at Karachi/Sukkur, to discuss equipment methodology and scheduling of WORK and other similar matters which may be pertinent for the execution of the WORK.

3A. SPECIAL CONDITIONS OF CONTRACT
(Blank spaces to be filled in by the Tenderer)

<u>Subject</u>	<u>Provision</u>
3.A.1 Amount of Bid Bond	2% (Two Percent) of the Contract value in shape of DD/Pay order by scheduled bank
3.A.2 Amount of Performance Bond	10% of the Price of the CONTRACT at the time of Signing the Agreement of CONTRACT.
3.A.3 Securities for the proposed Performance Bond (state name and address of the proposed Scheduled Banks from Whom Performance Bond shall be obtained).	1. Name _____ _____ Address _____ _____ _____
3.A.4 Minimum Amount of Third Party Insurance.	As per contract and legal Requirements
3.A.5 Proposed Time of Completion of the work.	(Twelve Months)
3.A.6 Billing mode	No bill shall be accepted Whose value is less than Rs. 1.0 million.
3.A.7 Interim payment	As per condition of contract
3.A.8 Amount of Liquidated Damages for late completion, for each calendar day thereof, after the completion date	0.1% per day up to max. of 10% of the Final Contract Price
3A.8.a. Mobilization Advance payment against Guarantee from a schedule bank (Performa attached)	10% (ten percent) of the total price of the CONTRACT at the time of signing of the Agreement of CONTRACT
3A.8.b Deduction of Mobilization Advance	10% (Ten percent) of the Gross value of the first and subsequent

Interim running payments until the Mobilization Advance has been wholly recovered.

3.A.9 Percentage of Retention.

Shall be deducted @ 10% of the value of all running bill. **50%** retention money shall be released at substantial completion and **50%** will be paid after the laps of maintenance period.

3.A.10 Period of Maintenance

12 months

3.A.11 CONTRACTOR's address for service of notices.

3.A.12 OWNER's address for service

Benazir Bhutto Shaheed Institute of Management Sciences, Dadu

3I.APPENDIX 'I' TO THE CONDITIONS OF CONTRACT

AGREEMENT

THIS CONTRACT ("Contract") is made at Sukkur this ____ day of _____, 2020 by and between:

1. **Sukkur IBA University**

AND

2. **M/S _____**

SUKKUR IBA and M/S _____ are collectively referred hereto as the "Parties" and individually as the "Party".

WHEREAS:

1. Sukkur IBA University intends to get the work done of **AC Work and Remaining Electrical and Allied works of BBSIMS Dadu Campus, Duabo Road Dadu.**

2. M/S _____ represents that it has the requisite experience and expertise to undertake to do the said work ("Project"), Sukkur IBA University and M/S _____. Consider it expedient to enter into this Contract to set out the terms and conditions for the construction by M/S _____.

3. The cost offered by bidder for this work is Rs: _____
(In words _____)

NOW THEREFORE:

In consideration of the mutual covenants and agreements contained herein, SUKKUR IBA and M/S _____, agree as follows:

1. In this Contract words and expressions shall have the same meanings as are respectively assigned to them in the "Conditions of Contract" annexed hereto as per tender documents
2. This Contract shall be effective from _____ ("Effective Date").
3. In consideration of M/S _____ carrying out the Project in accordance with the Terms of Contract and Scope of Work, SUKKUR IBA shall make payment to M/S _____ for the work done, as per the rates of BOQ.
4. M/S _____ shall commence the said work with THREE days of the receipt of employers written order to proceed, and shall complete the work on or before the date stated in the work order, the maintenance of rate of progress which will result in completion of the works within the time specified in the tender is an essential feature of this contract. The Contractor agrees to proceed with all due diligence and care to take all precautions to ensure completion in accordance with the specified time, and shall not to lag at any stage.
5. Before start of work, the "Contractor", shall submit the work completion schedule.
6. M/S _____ agrees to wok completion schedule and also submit supply of items in details and time.
7. M/S _____ agrees to provide samples all fixtures and fittings and other items , and final sample approved and certified at site for final approval of the Client prior to execution of reaming quantities..
8. Shop drawings must be submitted before execution of any activity, get its approval from the client and Consultants.
9. M/S _____ agrees to abide by the BOQ, specifications and drawings complete in all respects.
10. M/S _____ shall be solely responsible for the Project and other works and services set out in this Contract.
11. Liquidated damages in case of non completion of the work or for delay, must be 0.1% of contract amount per day or part of day up to maximum of 10% of contract amount for whole work as finalized by the OWNER.
12. Retention money would be @05% of gross amount of work done is to be deducted from the bill.

13. Completion period of the work in all respects i-e its functioning is 06 (Six Months)
 14. Defect Liability and maintenance period would be 12(Twelve) months
 15. Month from the date of issue of Completion certificate.
 16. If the performance of the Project is delayed, with reference to the Project Execution Schedule, on account of M/S _____ default, by FOUR (04) weeks, SUKKUR IBA shall have the right to terminate this Contract.
 17. Time shall be of the essence of this Contract.
 18. Following documents shall be deemed to form and be read and construed as part of this agreement.
 - a) The conditions of contract.
 - b) Specification
 - c) The drawings.
 - d) Bill of quantities.
16. This agreement shall not stand discharged on any account, but shall remain binding on the contractor.

IN WITNESS WHEREOF, this Contract is executed at Sukkur as of the day and year hereinabove, first written.

For and on behalf of M/S _____

1. Mr. _____
 Proprietor
 M/ _____

Mr. _____
 Project Manager
 M/S _____

Signature: _____
 Date: _____

Signature: _____
 Date: _____

For and on behalf of SUKKUR IBA

2. Engr. Nazik Hussain Kalhoro
 Project Director
 BBSIMS Dadu

Professor Dr Syed Mir Muhammad Shah
 Vice Chancellor
 Sukkur IBA University

Signature: _____
 Date: _____

Signature: _____
 Date: _____

(Note: This agreement should be signed on stamp paper of Rs: 500/-)

PERFORMANCE BOND

SUKKUR IBA UNIVERSITY	GUARANTEE NO.	:	_____
SUKKUR	DATE	:	_____
	AMOUNT	:	RS _____
	EXPIRY DATE	:	_____

THIS BOND is executed at _____ on this ____ day of _____ 2021 by _____, having its registered Office at _____ (hereafter called the "Surety" which expression shall include its successors and assign) and M/S _____, whose registered Office is _____ (hereafter called the "Contractor" which expression shall include its successors and permitted assigns) in favor of Sukkur IBA University, Sukkur hereafter called the "Employer" which expression shall include its successors and permitted assigns).

WHEREAS the contractor by an agreement which shall be signed between the employer of the one part and the contractor of the other part (hereafter called the "Contractor" has agreed AC Work and Remaining Electrical and Allied works of BBSIMS Dadu Campus as therein mentioned viz Sukkur IBA University (hereafter called the "Works" in conformity with the precisions of the said contract.

AND WHEREAS one of the conditions of entering into contract Agreement is that the contractor shall provide to the Employer a performance Bond in the sum of Rs. _____ (Rupees _____) for due fulfillment of the contract.

AND WHEREAS, the surety has agreed to give to the employer this performance Bond on the terms and conditions mentioned hereinafter.

NOW THEREFORE, THIS BOND WITNESSETH:

1. That the contractor shall duly perform and observe all the terms, provisions, conditions, stipulations and his obligations contained in the contract according to the true purport, intent and meaning thereof or as may be determined by the Employer who shall be the Sole Judge in the matter.
2. In the even of default being committed by contractor of which the Engineer shall be the sole exclusive Judge, the surety shall satisfy and discharge within three days after demand of all the damages sustained by the employer on account of the default of the contractor, as may whatsoever to the contractor and without any question whatsoever and whether or not the contractor disputes his liability in respect thereof and whether or not any arbitration or occur case is pending in respect of dispute.
3. That the liability of the surety under this performance Bond shall be up to the amount Rs. _____ /- (Rupees _____) and this Bond shall become null and void if the contractor has carried out the works and also performed his obligation strictly in accordance with the contract to the full satisfaction of the engineer, who will be sole and exclusive judge to determine whether or not the contractor has carried out the works and fulfilled his obligation in accordance with the contract.
4. The Engineer can complete that portion of the works, which the contractor has not commenced or not satisfactory executed, up to the amount of the performance Bond, at the Expense of the surety.

5. No alteration in the term of the said contract made by agreement between the Employer and the contractor or in the extent or nature of the works to be executed there under and no allowance of time by the Employer or the Engineer under the said contract nor any forbearance or forgiveness in or in respect of any matter or thing concerning the said contract on the part of the Employer or the Engineer shall in any way release the surety from any liability under this Bond
6. That the payment under this Bond shall be made by surety in the name of the Employer and a receipt issued by the Employer shall discharge surety from his liability to the Employer under this Bond.
7. That any notice or demand under this Bond may be made by the Employer and may be left at surety address mentioned herein or at any changed address as may be communicated by Surety to the Employer in writing against receipt of the Employer, or the said notice of demand may be sent by registered post Surety addressed as afore said and shall be deemed to have been at the time when it should have been delivered in due course of the post and a corticated signed by the Employer that the envelop containing the notice was posted shall be conclusive.
8. Our obligations under this guarantee shall at all times within the validity period of this guarantee not exceed the Guaranteed Amount of Rs. _____/- (Rupees _____) and that this guarantee shall remain valid up to **xx-xx-xxxx**. Claim of outstanding dues if any, under this guarantee must be received by us during business hours on or before **xx-xx-xxxx**. Should we receive no claim from you on or before **xx-xx-xxxx**, our liability under this guarantee will become null and void whether this original Guarantee is returned to us or not

Signed, Sealed and delivered

BY

For and on behalf of
(Surety)
In the presence of

Name:

Designation:

Signed, Sealed and delivered

BY

For and on behalf of
(Contractor)
In the presence of

Name:

Designation:

MOBILIZATION ADVANCE GURANTEE

Guarantee No. :
Date :
Amount :
Expiry :
Contract :
Contractor :
Surety :
To :

Whereas M/s _____ having business address _____ (hereinafter called the "Contractor") having entered into an agreement (the "Contract") with you M/s Sukkur IBA University (hereinafter called the "Owner") for the work of AC Work and Remaining Electrical and Allied works of BBSIMS Dadu Campus.

AND whereas the Owner has agreed to pay the Contractor an amount of Rs: _____ /-(Rupees _____) being 10% percent of the accepted Contract price as Mobilization Advance against an irrevocable Guarantee for actual losses (Except Opportunity Cost) suffered and determined by you not exceeding the amount of Rs: _____ /-(Rupees _____) or any part thereof which may be outstanding against the Contractor without any reference to the Contractor or any other person whosever and this Guarantee shall not be affected by Owners granting time extension or any other indulgence to the said M/S _____

We _____ Bank(the "Surety") in consideration of your having awarded the Contract to the Contractor M/S _____, do hereby undertake and guarantee irrevocably and unconditionally on demand by the Owner to pay forthwith the Owner the amount of advance up to and not exceeding Rs. _____ /-(Rupees _____) or any part thereof which may be outstanding against the Contractor without any reference to the Contractor or any other person whosever and this Guarantee shall not be affected by Owners granting time extension or any other indulgence to the said M/s _____

The amount of this Guarantee shall be reduced progressively as the recoveries towards the advance are affected by the Owner from the Contractor through their running bills in accordance with the terms of the said agreement and our liability at no time shall exceed the amount of Rs. _____ /-(Rupees _____) or the balance recoverable amount as may be certified by you as the case may be and your certified to the effect shall be conclusive and binding upon us we agree to keep the Guarantee valid and in full force from this date up to the time of deduction made by the Owner by way of advance have equaled the amount of this Guarantee.

NOW THE CONDITION of the above written BOND is such that.

- a) If the Owner shall certify in writing that entire mobilization advance has been recovered from the Contractor or
- b) If upon the written certificate of the Owner stating that the mobilization advance or any part thereof is due to the Owner under the Contract such sum not exceeding the amount of the above written bond as the Owner demand in writing.

Then either in case of the Owner certifying clause (a) hereinabove or where the Owner has enforced this bond under clause (b) hereinabove and has received the requisite payment from us this obligation shall be null and void otherwise it shall be and remain in full force and mobilization advance is made or in the terms of the Contract or the conditions on which the mobilization advance is made or in the extent and nature of the works shall in any release the surety from any liability under the above written bond.

This Guarantee is binding on us and our successors in interest our obligations hereunder shall be as if we are principal debtor and shall be under unconditional and continuing obligation and will remain in force notwithstanding any time extension given indulgence forbearance shown or any amendments or alterations made in the obligation or the terms conditions and covenants between the Owner and the Contractor and / or any Contract documents.

NOTWITHSTANDING any thing contained herein before our liability under this guarantee is restricted to Rs. _____ /-(Rupees, _____) and in time up to xx.xx.xxxx .This Guarantee is valid upto xx.xx.xxxx all claims under this guarantee must be received by the Bank in writing on or before the said expiry date i.e xx.xx.xxxx, within banking ours where after no claim of whatsoever nature will be entertained and our Bank will be relieved from all liabilities of this Guarantee whether the original Guarantee Instrument is returned to us or not.

Moreover this Guarantee is governed by and shall be construed in accordance with, the laws of Pakistan provided that such laws do not contradict the Islamic Shariah.

Name of Bidder with seal and signature: _____

**Benazir Bhutto Shaheed Institute of Management &
Sciences, Dadu**

**Technical Specification of
AIR CONDITIONING WORK, REMAINING
ELECTRICAL AND ALLIED WORK**

Volume II

1. GENERAL SPECIFICATIONS

1.1 General:

1. The Tender Drawings, Specifications and Bills of Quantities are to be considered as supplementing each other to jointly define and describe the scope and quantum of work to enable the Contractor establish his bid.
2. It is the intent of the Tender to call for finished work, tested, complete in all respects and ready for operation and performance as intended.
3. The Tender Drawings, Specifications, and Bill of Quantities are not to be construed as to provide assurance for complete accuracy and validity in all details which may depend for proper execution upon interpretation by Owner's Representative.
4. The Contractor shall:
 - Undertake any and all small items of work not specifically called for, but required completing the intended installations.
 - Coordinate his work or adjust the same so as to avoid conflicts with Contractors / workmen of other trades involved at the Project.
 - Shall plan and layout his work to best suit the site conditions.

1.2 Approval of Work:

All workmanship and material supplied under this contract shall be acceptable to the Owner's Representative or the Consultant, who shall have the power to reject any items which in their judgment are not in accordance with the plans and specifications.

1.3 Guarantees and Certificates:

All work shall be guaranteed to be free from defects. Where required by the Owner's Representative the Contractor shall give such guarantees in writing. Any defective materials and workmanship shall be replaced or repaired by the Contractor as directed by the Owner's Representative during the maintenance period.

1.4 Samples for Approval:

The Contractor is required to submit on one or more wooden boards, one sample each of different sizes of conduits, conduit fittings, wires, junction boxes, back boxes, switches, sockets, etc. No material of any kind shall be procured or

Benazir Bhutto Shaheed Institute of Management & Sciences, Dadu

installed without approval of such samples. All samples will be returned to the Contractor at the end of the contract on satisfactory completion of the work.

Approval of any item shall not relieve the Contractor from the responsibility of furnishing proper items.

1.5 Interpretation of Drawings and Specifications:

Except where modified by a specification notation to the contrary, it shall be understood that the indication and/or description of any item; in the drawings, Bill of Quantities and/or Specifications carried with it the instructions to furnish and install the item.

It shall be understood that the specification drawings and Bill of Quantities are complimentary and are to be taken together for a complete interpretation of the work. Exceptions are that notes on the drawings, which refer to an individual element of work and take precedence over the Specifications.

No interpretation shall be made from the limitations of symbols and diagrams that any elements necessary for complete work are excluded.

Certain details appear on the drawings which are specific with regard to the dimensioning and positioning of the work. These details are intended only for the purpose of establishing general feasibility. They do not obviate field coordination for the indicated work.

The latest standards and codes of reputable institutes shall be applicable to all items and installation work. Wherever these specifications differ from contract specifications, the higher specifications shall prevail.

1.6 Shop Drawings:

The Contractor shall prepare shop drawings for the electrical installations showing the exact routes of all conduits, position and size of cable pull / junction boxes, the number and size of wires in each conduit, position of outlets, fixtures, and the final connection arrangements at switchboards/distribution boards etc. for the approval of Engineer before commencing any portion of the works. Cost of preparing shop drawings is deemed to be included in the quoted price.

1.7 Record/As Installed Drawing:

As Built / record drawings shall be initiated / prepared from the start of the work and be progressed towards completion.

The drawings shall provide an accurate and complete record of the work as installed. The Contractor shall submit two complete sets of record drawings showing final arrangement of circuits, disposition of devices etc. The As-built drawings shall be developed by the Consultant on the basis of verified record drawings.

1.8 Clearing and Protecting:

1. Store all materials and items in a manner that will maintain an orderly clean appearance and cover and protect them.
2. Protect the complete work from damage throughout the contract period.
3. After completion of the project, clean the exterior surface of equipment and fixtures including concrete residue.

1.9 Operating and Maintenance Instructions:

Furnish three copies of manuals to the Owner in bound form containing data covering capacities, manufacturer's instructions and maintenance of operation of all equipment and apparatus.

1.10 Painting:

Deliver all equipment with standard factory finish or as specified. Clean all equipment before acceptance by the Owner.

1.11 Equipment and Materials:

1. All items required for installation under these Specifications shall be new without blemish or defect. Where no specific indication as to the type or quality of item is indicated, the item shall be furnished in accordance with the latest applicable BS Standards.
2. It is the intent of these Specifications that wherever a manufacturer of a product is specified, and the terms, "Other Approved", or "Approved Equipment", or "equal", are used, the substituted item must conform in all respects to the specified items.

Performance and capacities as delineated in schedules and in the Specifications shall be interpreted as minimum performance.

3. All items of one type shall be the products of one manufacturer.
4. Substitution of electrical equipment for that shown on the schedules or designated by model number in the specifications will not be considered if the item is not a regular item shown on the current catalogue of the manufacturer and has been successfully used for period of not less than (5) years.

1.12 Test, Acceptance and Certificates:

1. All tests necessary to show proper execution of work shall have been performed before final acceptance of work. Carry out these tests in the presence of the Owner's and/or Consultants representatives. Provide any assistance required in this regard including necessary arrangement of labour and measuring instruments.

2. It is the Contractor's responsibility to insure that all components of the system including the controls are operating satisfactorily before any of the work shall be considered completed.

Test the installation for grounds and short circuits. If tests indicate inadequate insulation resistance, corrections shall be made accordingly. Any defects or deficiencies discovered in any of the electrical work shall be promptly corrected.

1.13 Limiting Noise Produced by Electrical Installation:

1. Perform the necessary work shown below to ensure that minimum noise is produced by any of the electrical equipment supplied and installed under this contract.
2. Check and tighten the fastenings of sheet metal plates, covers, doors and trims used in the enclosure of electrical equipment.
3. Remove and replace any individual device containing one or more magnetic flux path metallic cores (e.g. discharge lamp ballast, transformer, dimmer, etc.), which is found to have a noise output exceeding that of other identical installed at the project.

1.14 Systems Data:

1. Unless specifically mentioned elsewhere, all equipment and items shall be designed to operate satisfactorily without any derating for following tolerance levels:

Voltage rating of LT Equipment.

Three phase: 400 volts \pm 5% at 50 Hz

Single phase: 230 volts \pm 5% at 50 Hz

2. All equipment and items shall be suitable for smooth operation between temperature range 0 to 50 degrees Celsius and at relative humidity of up to 90 percent.

1.15 Identification:

1. Following items of materials need identification individually:
 - i) Each primary and secondary switch board
 - ii) Each switchboard and DB
 - iii) Each primary and secondary distribution switches and circuit breaker regardless of whether separately mounted or grouped with others in a single housing.
 - iv) Each wire or cable in each primary and secondary feeder.

2. The identification of all above items shall be as explained under this section.
3. The nomenclature used to identify power centres, network, units, switchboards panel-boards shall confirm to the nomenclature used on the drawings.
4. The nomenclature used to identify switches or circuit breakers shall:
 - i) Where they disconnect mains or service, designate this service or main involved.
 - ii) Where they control feeders, designate the feeder number and the name of the space and the load supplied.
 - iii) Where they control lighting and appliance branch circuitry, designate the name of the space and the load supplied.
5. The nomenclature used to identify feeder wires and cables shall designate the feeder number. Identification for power centers, switch-boards and panel-boards shall be by means of engraved lamcoid nameplates showing ¼" high white lettering on a black background fastened face of the front.
6. Identification for distribution boards or circuit breakers shall be by means of the following:
 - i) Where individually enclosed use engraved lamcoid nameplates showing 1/8" high white lettering on a black background fastened on the outside front the face of the enclosure.
 - ii) Where in power centers, use directories mounted behind transparent plastic covers, in metal frames fastened on the inside face of the doors.
7. Identification for the wires and cables of feeders shall be by means of wrap around labels.
8. Phase identification letters shall be stamped into the metal of the bus-bars of each phase of the main busses of each switch-board (distribution board) and panel board. The letters shall be visible without having to disassemble any current carrying or supporting elements.
9. Provide type written directories for panel-boards.
10. All electric switch boards, rooms, electric closets, etc. shall be equipped with enameled sheet metal, red on white signs reading "Electrical Equipment Room – No Storage Permitted". Signs shall be mounted at clearly visible locations within the rooms.
11. Identify each junction box; pull box, and empty conduit systems for wires of a future system.

12. Prior to installation of identifying tags and nameplates, submit their nomenclature for acceptance of the Consultant.

1.16 Rules Regulations and Codes:

The entire electrical installation works shall be carried out by licensed contractor authorized to undertake such work under the provisions of the Electricity Act 1910 and The Electricity Rules 1937 as adopted and modified to-date by the Government of Pakistan. The Contractor must follow all requirements of local authorities.

1.17 Work Included:

The work shall broadly include but not be limited to the following:

- Low Tension feeders, branch circuits for light and power and connection to distribution boards and outlets and equipment and systems consuming electric power.
- Lighting fixtures, lamps, switches, receptacles, etc.
- Fire Alarm System
- Public Address System
- Earthing
- Preparation of "Shop Drawings / Record Drawings"

The Contractor shall coordinate with special equipment suppliers, such as those of CCTV, Fire Alarm etc. and carry out all wiring and installation in close liaison with them and as per the original manufacturers' recommendations, and or instructions. Any works rejected by the equipment suppliers for reasons of non-conformity shall be made good without any extra claim.

Testing and commissioning of special equipment shall be carried out by the respective suppliers with the assistance of the Contractor.

2. CONDUITS & ACCESSORIES

2.1 General

1. The work under this section consists of supplying, installing and commissioning of all materials and services of the complete system of conduits and pipes as specified herein and / or shown on Tender Drawings and stated in the Bill of Quantities.
2. 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.
3. The drawings do not indicate the exact position of conduits, pipes and trays. The Contractor shall ensure exact location and route of conduits, pipes and trays in coordination with other services, as per site requirements and as directed by the Engineer.
4. All conduits, accessories such as junction boxes, sockets, tees, bends elbow, shall be of similar quality and properly sized to perfectly match with the sizes of conduits to which they are installed.
5. Conduits shall not be of less than 25 mm diameter.
6. Unless the size of conduit is specified, the maximum allowable percent of conduit fill shall conform to the following:
 - 2 Conductors - 30 percent
 - 3 or more conductors - 40 Percent

2.2 Applicable Cable Standards & Codes:

The latest editions of the following standards and codes shall be applicable for the materials specified within the scope of this section:

BS 31	-	Steel conduits and fittings for electrical wiring.
BS 4607	-	Rigid PVC conduits and conduit fittings.
BS 4568	-	Steel conduits, bends and couplers.

2.3 Materials:

2.3.1 PVC Conduits:

1. All PVC conduits/pipes shall be of electrical, Class-C or D as approved by Consultant. Use PVC bends with enough enlarged ends to receive conduit without reduction in the internal diameter at joints.
2. Use only manufactured smooth bends where conduits change directions.
3. Do not use direct heating method for making bends in conduit. Use hot air and fill the conduit with sand for forming bends in the conduit. The minimum bending curvature shall not be less than 6 times the conduit diameter.

4. For light points in ceiling, use powder coated 4"x4"x3" junction boxes made of 16 gauge sheet steel.
5. For light points in wall, use powder coated 4"x4"x2" junction boxes made of 16 gauge sheet steel.
6. Use solvent cement or proper glue at all joints so as to make joints water right.

2.3.2 Galvanized Iron (GI) Pipes & Accessories:

The G.I. pipes shall be made of mild steel, galvanized inside and outside by hot dip galvanizing process. The pipes shall be free from stains, burrs or any other defect. The accessories for G.I. Pipes such as sockets, bends, etc. shall be also galvanized inside and outside and shall be of same quality and specifications as the pipes.

The pipes and accessories shall be provided with one thick coat of bituminous paint on the outer surface prior to installation. All pipes shall be secured in position by means of galvanized clamps, supports, etc. Seam welded conduits are not acceptable.

2.3.3 Inspection and Pull Boxes:

1. Use pull boxes/inspection boxes along the conduit runs to facilitate pulling operation of wires. These pull boxes/inspection boxes are not necessarily shown on drawings.
2. Use pull boxes made from 16 gauge sheet steel.
3. Provide pull boxes in accessible locations but avoid aesthetic area. Show locations of pull boxes on the shop drawings.
4. Use PVC adaptor with proper chuck nuts for fixing of conduits in junction/pull boxes.

2.3 Installation:

2.3.1 General:

1. At all termination points of PVC / GI conduits and pipes, smooth out the rough edges and make conduits free from burrs and sharp edges.
2. All conduits and pipes shall be installed empty and all conduit/pipe work must be completed prior to carry out of wiring operation.
3. Run conduits at a minimum of 6" from hot water or steam pipes. However where crossing is unavoidable, run conduit at least 1" away from covered insulation of pipes.

4. Fasten all conduits rigidly into all outlet boxes, LT switchboard, distribution boards, cable boxes, pull boxes, junction boxes, safety switches and other devices in the conduit system.
5. Plug or cap open ends of conduits in course of construction and keep them, until the wires are pulled in.
6. Use approved sleeves where conduits are routed through concrete walls and slabs.
7. Use 18 SWG G.I. wire or nylon fish tape in all empty conduits to facilitate wiring operation.
8. Run all conduits carefully to avoid piping, valves, ducts and other mechanical and plumbing equipment in the building.
9. Do not use more than (4) four bends in any conduit run from outlet to outlet.
10. Do not use sharp 90 degrees bends and tees.
11. Take care to adequately protect conduits form mechanical damage.

2.3.2 Concealed Conduit Work:

1. Where conduit is to be concealed, provide a minimum of 32 mm cover of concrete measured from the top of conduit to finished surface.
2. In RCC work, lay all conduit work prior to pouring. In slab, support all conduits on top of bottom reinforcement. Firmly support all outlet boxes and install them in a way that the finish flush with the soffit of slab or beam.
3. Do not make any recess in RCC structure for concealing conduit work without prior approval of the Engineer.
4. When conduits have to be concealed in cement (CC) do not make a recess deeper and wider than required and use appropriate tools to make the recess. Do not make unnecessary cutting.
5. Normally run all branch lighting and receptacle circuit conduits concealed in concrete slabs or in hung ceiling.
6. Minimize crossovers of conduits.
7. Adequately support conduits in hung ceiling by means of approved clamps or heavy iron wire tied to structural members supporting the ceilings. Paint these clamps and rods with one coat of prime paint. Supporting of conduits by wire shall not be allowed.

2.3.3 Surface Conduit Work:

1. Install conduit either parallel and/or perpendicular to the surface of wall and structural members.
2. Use saddles not less than 6 mm thickness and clamps made of 16 SWG sheet steel to fix the conduits on surface.
3. Use other accessories, necessary to install conduits properly.
4. Provide proper support (saddles and clamps) to surface conduits. The maximum spacing between center to center of these supports shall be as follows:

¾" to 1" Φ	-----	3 feet
1½" Φ	-----	5 feet
2" Φ	-----	6 feet
3" to 4" Φ	-----	7 feet

2.3.4 Painting / Colour Identification:

All surface conduits (PVC/steel) shall be applied with colour identification marks at (one) meter interval and at all bends, J/boxes etc as follows:

- Electrical ----- Blue
-

For other systems get colour approval from the Consultant.

3. CABLE TRAY & ACCESSORIES

3.1 GI (Galvanized Iron) Cable Trays:

3.1.1 General:

Where specified, the cables shall run on perforated G.I. cable trays supported to the wall or ceiling. The cable trays shall be fabricated from 14 SWG perforated G.I. sheet bent to shape and having required dimensions. The cable trays shall be fabricated in sections not exceeding 2 meters in length. The sections shall be connected together using G.I. connecting plate, G.I. nuts, bolts, etc. Suitable tray

design shall be provided for bends, crossing, etc. keeping in view allowable bending radius of respective cables. The cables shall be firmly tied with the tray using cable - ties of approved design.

3.1.2 Tray Size and Fill:

- a) The number of multi conductor cables in cable trays shall be as shown on the drawings.
- b) The tray fill shall not extend above the side rails of tray even under maximum allowable tray fill.

3.1.3 Tray Location and Routing:

Cable tray shall run parallel to the structure and shall avoid passing from any fire hazard equipment or other equipment that may produce temperatures detrimental to cables. Routing of the cable tray should not cause hindrance to process piping and other process facilities.

The cable trays shall be installed on supports fixed to the wall and/or ceilings. The support shall be of structural steel fixed to civil works by means of rawl bolts. The supports/hangers and other metal work required for installation of the trays shall be painted and finished by methods as specified for the cable trays.

3.1.4 Supports:

- a. Cable tray shall be supported by non-combustible racks, hangers, structural steel, etc. and shall have maximum 3 m spacing on horizontal runs and 2 m spacing on vertical runs.
- b. Tray splice points should not be located directly over supports or at mid-span. The ideal location will be within the one quarter point of the span measured from the support. Cantilever tray section shall be limited to 900 mm. Additional support shall be provided for longer sections.
- c. Hold down clamps or tray fasteners shall be used at each support point. Vertical cable tray fasteners shall not rely on friction to secure the cable to the support.
- d. Cable tray splice plates, expansion joints, and connectors shall join tray sections so that the rated vertical and horizontal load of the tray is not diminished.
- e. Tray covers shall be secured with H-shaped cover clamps (not clips). The clamps shall be spaced approximately 1.2 m apart on horizontal tray runs and 600 mm apart on vertical runs with 2 clamps for each bend.
- f. Preferably, supports are welded to the structures. If welding is not possible fixing the cable tray supports using beam clamps, hanger rods, brackets, etc. shall be adopted.

3.1.5 Fittings, Elbows, Bends and Drops:

- a. Where a change in direction occurs in the cable tray system, a horizontal or vertical elbows (as applicable), having minimum radius of 300 mm may

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be used.

- b. Where vertical drop exceeds 1.5 m, outside vertical elbows and drop out fittings may be used at the higher elevation, and where vertical drop exceed 4.5 m inside vertical elbows may be used at lower elevation.

3.1.6 Grounding:

- a. Cable trays shall be bonded to the plant grounding systems at intervals not to exceed 15 m. This shall be in addition to grounding metallic connections / to building columns or structural columns supporting the cable trays.
- b. Bonding jumpers shall be used with every expansion joints.

3.1.7 Inspection, Testing and Commissioning:

Inspection, testing and commissioning shall be carried to the complete satisfaction of the Engineer.

4. WIRING ACCESSORIES

4.1 General:

1. Coordinate with architectural and other services drawings and site conditions for exact locations of switches, sockets, etc.
2. Use single pole switches rated for 10 AMP at 250 volts AC, unless specially noted on drawings.
3. The face plate for switches, outlets and receptacles shall have specified colour.

4.2 Applicable Standards & Codes:

The latest editions of following standards and codes shall be applicable for the materials specified within the scope of this section:

BS 3676	-	Switches for household and similar fixed electrical installations.
BS 2135	-	Capacitors for radio interference suppression.
BS 67	-	Specifications for ceiling roses.
BS 546	-	Socket outlets and socket outlet adapter

4.3 Accessories:

1. One Way Switches/Two Way Switches Indoor Type:
 - i) Each switch shall make and break contact between the "live" wire only, unless indicated otherwise. Mount the switch on galvanized sheet steel outlet box.
 - ii) Use switches of specified makes only.
 - iii) Submit appropriate sample and obtain colour approval prior to ordering.
2. Switch Socket Outlet:
 - i) For indoor type, use 3/5 pin, 13/15 Amp, 250 V / 400 V AC type switched socket outlet. Mount this outlet on sheet steel outlet box.
3. Steel Sheet Boxes for Switches and Outlets:
 - i) Use all steel boxes made from 16 SWG galvanized steel. The boxes shall have pre-punched knockouts to receive exact sizes of conduits and for connecting earthing wire/cables.
 - ii) Earth each steel box with proper earth wire/ cable.
 - iii) Get approval of samples of their quality and thickness.

- iv) Use boxes of sufficient depths to accommodate all connecting cables.
- v) Support these boxes independently to building structure with no weight bearing on conduits.
- vi) In addition to those shown on drawing, use junction box and pull boxes wherever it is necessary to pull the cable/wire conveniently.

4. Ceiling Roses:

The ceiling roses shall be suitable for 5 Amp, 250 volt, single phase AC and shall have white plastic moulded base plate and copper or brass terminals for connecting at least two wires of 2.5 sq.mm size. The ceiling rose shall have a cover with cable inlet hole suitable for multicore PVC insulated and PVC sheathed cable.

5. Industrial Sockets:

Industrial sockets 5 Pin 16/32/63 Amp, 250 V / 400 V AC shall be installed on surface mounted back boxes as shown on drawings.

4.4 Installation:

The mounting heights of all wiring accessories and fixtures are stated on the drawings. In case the mounting height is not mentioned prior instructions of the Engineer shall be obtained.

All wiring accessories shall be installed on 16 SWG Galvanized steel boxes. Fixing of plates on sheet steel boxes shall be by means of flat head galvanized screws sunk in the plastic plates as to finish flush with its surface. The edges of the plastic plates shall be chamfered.

5. LOW TENSION CABLES

5.1 General:

1. Use 450/750 volts grade single core cables for light circuits, socket outlets and circuits operating up to 250 volts.
2. Where single core sheathed cables are indicated on drawings, use 600/1000 volts grade cables.
3. For main and sub-main use 600/1000 volts armoured/non-armoured stranded cables as indicated on drawings.
4. Take actual measurements and site conditions into consideration prior to ordering any cables.
5. Prior to and after installation, ensure that the entire length of each cable is undamaged.
6. Identify each phase by colour code: Red, Yellow, Blue for phase and black for neutral and green or yellow green for earth conductor.
7. For single phase circuit, use red colour for phase/line, black for neutral and green yellow for earth conductor.
8. Tag each circuit with designation exactly as indicated on the drawings.

5.2 Installation:

5.2.1 General:

- 1) Carry out pulling of cables, terminations and connection in a neat and clean manner.
- 2) All terminations shall be mechanically and electrically sound.
- 3) Install cables in such a way that no mechanical strain is imposed on the terminals.
- 4) At every cable termination, do not remove the sheath and insulation farther than is necessary.

5.2.2 Cables in Conduit:

Where cables are to be drawn in conduit, use only single core cables, unless specifically indicated otherwise on drawings.

Pull cables in conduit with care. Where lubricant is necessary for pulling cables, use lubricant recommended by cable manufacturer.

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Do not make joints in cables. Cables connector may be allowed only where looping-in of cables is rendered very difficult. Use only suitable rated connectors with prior approval.

Leave a minimum 150 mm of loose cables at each termination point.

5.2.3 Cables Run on Surface:

Where cables are to be run on surface directly on walls or ceilings, get the method of installation approved prior to actual start of installation work.

6. MEDIUM VOLTAGE CABLE

6.1 Scope of Work:

This work under this section consists of supplying installing, testing and commissioning of Medium Voltage (MV) Cable and Accessories as specified herein or as stated on the Tender Drawings and in the Bill of Quantities.

The Contractor shall discuss the Electrical Layout with the Engineer and coordinate at site with other services for exact route, location and position of the Electrical lines.

6.2 Cable:

6.2.1 Type:

The cable shall be multi-core, suitable for nominal service voltage of 11 KV, have stranded copper conductor and be cross-linked polyethylene (XLPE) insulated, shielded. The cable shall conform to IEC-502 recommendations. Each core shall have phase identification.

6.2.2 Capacity and Basic Data:

The cable shall meet the following specifications:

Nominal/System Voltage	: 11 KV
Frequency	: 50 Hz
System	: 3 - Phase with solidly grounded star point of Transformer
Conductor Size	: Sq.mm as given in Bill of Quantities
Cores	: 03 Nos.
Rated Voltage	: 11/6.35 KV Phase to Phase/Phase to Ground
Continuous Operating Temperature of Conductor	: 90 °C
Material	
Conductor Material	: Copper Stranded
Insulation	: Cross linked polyethylene
Shielding	: Copper tape
Jacket	: PVC
Armouring	: Galvanized double steel tape
Oversheating	: Extruded PVC
Phase Identification	: Red, Yellow, Blue

6.2.3 Conductor:

The conductor shall be of high conductivity electrolytic copper, stranded in accordance with specified strand.

6.2.4 Insulation:

The insulation shall be cross linked polyethylene extruded over the conductor. The insulation shall be laid to avoid any Gap/Air Packets between the conductor and insulation. The insulation shall be easy to strip from individual conductors and to separate for jointing/termination purposes.

6.2.5 Shielding:

Each core shall be shielded by a layer of semi-conducting material applied directly over the insulation. The semi-applied with suitable overlapping.

6.2.6 Assembly:

The three insulated conductors shall be assembled with PVC or any non-hygroscopic filler and bounded with tape. The tape binder shall then be covered with extruded PVC jacket. The PVC jacket shall be padded with a suitable material before application of armor.

6.2.7 Armour:

Armouring shall be provided with double layer of galvanized steel tape to provide cable protection and also act as a low resistance earth return path. The armouring shall be of appropriate size to carry the system fault current.

6.2.8 Oversheath:

The entire cable assembly shall be covered with a PVC jacket of thickness not less than 2.5 mm. The colour of the jacket shall be black. The size of cable and voltage grade shall be given on the oversheath at every 3 meter interval, in addition to any other marking.

6.2.9 Factory Tests:

Physical and electrical acceptance tests in accordance with applicable standards shall be carried out at the manufacturer work. Three copies of test reports will be furnished to the Engineer, which shall include brief description of tests, test records and results.

6.3 Termination Kits:

The termination kits shall be shrink type indoor or outdoor as per size recommended by cable manufacturer and as approved by Engineer. The termination kits shall be complete with material and accessories.

6.4 Cable Reels:

The cable shall be supplied in non-returnable, mechanically strong, sea/rail/road worth, wooden or metallic cable drums, protected against weather. The cable drum should bear the marking for cable type, cable size voltage grade, year of manufacturer, name of any other additional marking normally provided by the manufacturer. Cable ends on cable reels shall be protected by means of suitable seal.

6.5 Cable Cut Length:

The exact cut lengths for each cable reel shall be confirmed by the Contractor by actual measurements at site prior to the commencement of manufacturing. The cable lengths where shown on the drawing are tentative and only for general guidance. The Contractor shall be solely responsible for furnishing correct lengths of cable to avoid joints in cable length except where necessary, after obtaining approval of the Engineer.

6.6 MV Cable Installation:

All installation material, labour, tools and accessories for cable installation shall be furnished by the Contractor. The cable and accessories shall be installed in strict accordance with manufacturer recommendations and generally as described in accordance with the installation instructions given in these specifications, drawings and in accordance with manufacturer instructions. Prior to installation the cable lengths shall be checked and tested to ensure that the cable are suitable for installation.

The cable shall be supported on cable reels while unwinding from the drum to avoid twist or tension on cable. The cable shall be pulled through the existing trenches/conduits taking all necessary steps and complying to all manufacturer's recommendation.

After the installation the entire lengths of cable shall be tested according to cable manufacture's instructions.

7. LIGHT FIXTURES, FANS & HAND DRYERS

7.1 General:

1. All incandescent / fluorescent light fixtures installed in humid or external areas shall be cast metal type or made of heavy gauge non ferrous metal, weather proof / water tight type, and all light fixture installed in the hazardous areas to be as per BS 5345 and requirement of the authorities.
2. The surface mounting incandescent or fluorescent light fittings shall be installed with the fixture back, flush with the ceiling surface. Nylon plugs shall be used for fixing the fixture on the ceiling or wall. The pendant type fluorescent light fittings shall be hung from the ceiling by two 20mm Φ 16 SWG white enameled tubes having swivel-joint type hanger at the top for fixing directly on to the recessed outlet box on the ceiling. The Installation will include all required fixing hardware.
3. The recessed mounting fluorescent or incandescent light fittings shall be installed recessed in the false ceiling by cutting the false ceiling to the required dimensions, such that the frame of the fittings overlaps the ceiling and fit exactly into the false ceiling. All recessed fittings shall be supported from the structural ceiling, independent of the false ceilings.

7.1 (A) For Indoor Light Fixtures

	Specification
EMERGENCY EXIT. MODEL ECO LIGHT OLYMPIA GREECE (E.U HELLAS) HIGH INTENSITY LEDs (8SMD LEDs)	
Philips Surface Mounted LED 4000K 10W	<p>The light fixture shall be surface Mounted having Dia of 5 inch. The Beam Angle of the light fixture shall not be less than 90 Deg. The luminous efficacy of the light fixture will be >80 lm/W having system luminous flux output of 800 lumens & power consumption of 10W. The color temperature of the light fixture is 4000K having SDCM of the light fixture shall not be greater than 5.</p> <p><u>Electrical requirements*</u>: Power supply: electronic LED gear for 220 V - 240 V/50~60Hz.</p> <p>The light fixture shall be conforming to following standard. EN60598-1 EN60598-2-1 EN62471 IEC 61347 EN61000-3-2 EN61000-3-3</p>
	The light fixture shall be surface Mounted

<p>Philips Surface Mounted LED 4000K 17W</p>	<p>having Dia of 7 inch. The Beam Angle of the light fixture shall not be less than 90 Deg. The luminous efficacy of the light fixture will be >80 lm/W having system luminous flux of 1200 lumens & power consumption of 17W. The color temperature of the light fixture is 4000K having SDCM of the light fixture shall not be greater than 5.</p> <p><u>Electrical requirements*</u>: Power supply: electronic LED gear for 220 V - 240 V/50~60Hz.</p> <p>The light fixture shall be conforming to following standard. EN60598-1 EN60598-2-1 EN62471 IEC 61347 EN61000-3-2 EN61000-3-3</p>
<p>Philips Green-up Batten B LED 15W 4000K</p>	<p>The light fixture shall be surface mounted having 4' length having 4000K Color Temperature & lumens output of atleast 1450 lumens with system luminous efficacy >95 lm/W & SDCM of atleast <=5 with power consumption of 15W. The front cover will be made of diffuse polycarbonate cover. The LED luminaire should have a lumen maintenance of L70 or 70% at the end of useful life at ambient temperature of 25 deg C. The complete luminaire should have an useful life of 30,000 hrs burning hours. The luminaire including the driver will include an warranty of 3 years against manufacturing defects. The luminaire should fully conform to following specification :</p> <p>IEC 60598-1 (Ed 7) IEC 60598-2-2 (Ed 2) – Electrical Insulation Class I</p> <p>LED driver: The LED driver should fully conform to following specification EN 55015 : 2009 – Emission – Electrical lighting and similar equipment EN 61547: 2009 – Immunity – Equipment for general lighting purpose EN 61000-3-2 : 2009 – Limits for harmonic currents emissions. EN 61000-3-3 : 2008 – Limits for voltage fluctuation and flicker. EN-62471 2008 :Photo biological safety of lamps and lamps systems</p> <p>LED: The luminaire should have LED chip from following acceptable manufacturers</p>

	Philips Lexon ,Cree, LG, Nichia
Philips Prewired 2x14.5W Master LED TL	<p>The light fixture shall be surface mounted having IP65 rating made of Polycarbonate front cover with Stainless Steel mounting bracket & clips. The light fixture shall be pre-wired for the LED tube rods. Cable gland shall be provided for the wiring facility. The LED Tube rod shall have 4ft length 4000K color temperature & luminous efficacy of not less than 80 lm/W, having front polycarbonate diffuse cover. The avg life of the lamp will be 30,000 at junction temp of Tc=60 Deg.</p> <p><u>Electrical requirements*</u>: Power supply: electronic LED gear for 220 V - 240 V/50~60Hz.</p> <p>The light fixture shall be conforming to following standard. EN60598-1 EN60598-2-1 EN62471 IEC 61347</p>
Philips Green-up Batten LED 28W 4000K	<p>The light fixture shall be surface mounted having 4' length having 4000K Color Temperature & lumens output of atleast 2700 lumens with system luminous efficacy >95 lm/W & SDCM of atleast <=5 & power consumption of 28W. The front cover will be made of diffuse polycarbonate cover. The LED luminaire should have a lumen maintenance of L70 or 70% at the end of useful life at ambient temperature of 25 deg C. The complete luminaire should have an useful life of 30,000 hrs burning hours. The luminaire including the driver will include an warranty of 3 years against manufacturing defects.</p> <p>The luminaire should fully conform to following specification :</p> <p>IEC 60598-1 (Ed 7) IEC 60598-2-2 (Ed 2) – Electrical Insulation Class I</p> <p>LED driver: The LED driver should fully conform to following specification EN 55015 : 2009 – Emission – Electrical lighting and similar equipment EN 61547: 2009 – Immunity – Equipment for general lighting purpose EN 61000-3-2 : 2009 – Limits for harmonic currents emissions. EN 61000-3-3 : 2008 – Limits for voltage fluctuation and flicker.</p>

	<p>EN-62471 2008 :Photo biological safety of lamps and lamps systems</p> <p>LED: The luminaire should have LED chip from following acceptable manufacturers Philips Lexon ,Cree, LG, Nichia</p>
<p>Philips Coreline Surface Mounted SM100C 42W 1'x4'</p>	<p>The light fixture can be surface mounted having dimension of 1'x4'. Adopting future proof LED technology to realize system efficacy of 90lm/W, 50% energy-saving compared with conventional Fluorescent light fixture. The retrofit tube rod solution shall not be acceptable. The product must provide specification grade details like CRI of> 80, UGR25, PF > 0.9 & system power 41W with LOR 3700 lumens output.</p> <p>The LED luminaire should have lumen maintenance of L70 or 70% at the end of useful life at ambient temperature of 25 deg C. The complete luminaire should have useful life of 50,000 burning hours. The luminaire including the driver will include warranty of 3 years against manufacturing defects. The luminaire should fully conform to following specification :</p> <p>IEC 60598-1 (Ed 7) IEC 60598-2-2 (Ed 2) – Electrical Insulation Class I</p> <p>LED driver: The LED driver should fully conform to following specification EN 55015 : 2009 – Emission – Electrical lighting and similar equipment EN 61547: 2009 – Immunity – Equipment for general lighting purpose EN 61000-3-2 : 2009 – Limits for harmonic currents emissions. EN 61000-3-3 : 2008 – Limits for voltage fluctuation and flicker. EN-62471 2008 :Photo biological safety of lamps and lamps systems</p> <p>LED: The luminaire should have LED chip from following acceptable manufacturers Philips Lexon ,Cree, LG, Nichia</p> <p>Housing: The housing will include integrated heat sink and optical system. The housing and heat sink will be made of aluminum for better heat transfer. The light cover made up of PC. The fixing mechanism will be through spring</p>

	<p>fasteners .</p> <p>Luminaire Optics : The system will use Remote Phosphor optics to have a smooth white light of high colour consistency with high system efficiency. For the better UGR control one, the luminaire optics should fully comply with office lighting norms with UGR value (Unified Glare Rating) < 25.</p> <p><u>Electrical requirements*:</u> Power supply: electronic LED gear for 220 V - 240 V/50~60Hz.</p>
<p>Philips Green-up Batten LED 15W 4000K</p>	<p>The light fixture shall be surface mounted having 4' length having 4000K Color Temperature & lumens output of atleast 1450 lumens with system luminous efficacy >95 lm/W & SDCM of atleast <=5 with power consumption of 15W. The front cover will be made of diffuse polycarbonate cover. The LED luminaire should have a lumen maintenance of L70 or 70% at the end of useful life at ambient temperature of 25 deg C. The complete luminaire should have an useful life of 30,000 hrs burning hours. The luminaire including the driver will include an warranty of 3 years against manufacturing defects. The luminaire should fully conform to following specification :</p> <p>IEC 60598-1 (Ed 7) IEC 60598-2-2 (Ed 2) – Electrical Insulation Class I</p> <p>LED driver: The LED driver should fully conform to following specification EN 55015 : 2009 – Emission – Electrical lighting and similar equipment EN 61547: 2009 – Immunity – Equipment for general lighting purpose EN 61000-3-2 : 2009 – Limits for harmonic currents emissions. EN 61000-3-3 : 2008 – Limits for voltage fluctuation and flicker. EN-62471 2008 :Photo biological safety of lamps and lamps systems</p> <p>LED: The luminaire should have LED chip from following acceptable manufacturers Philips Lexon ,Cree, LG, Nichia</p>

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Philips LED Under Water LED600/WW PSU 12V
12 IP68
along with PS60 12VDC 100-240VAC 50/60HZ

The housing of the light fixture shall be made of copper/brass to protect it from rust having front tempered glass cover. The light fixture shall be IP68 having ambient temperature range of -20Deg ~35 Deg. The color temperature of the light fixture is 4000K. The fixture shall be 12V DC operated through external power supply. The system power of the light will be 15W having life of at least 25000 hrs . The luminaire including the driver will include an warranty of 3 years against manufacturing defects.

7.1 (B) For Outdoor Light Fixtures

(c) Flood Light Specifications

Product type		BVP 162/163		Memo
Application		Billboard, General outdoor area lighting, Crossroad high pole , parking lot, Outdoor stadium(non-professional),		
LED	CCT	WW:3000K, NW:4000K , CW: 5700K		
	CRI	Typical 70		
Optics	Lumen Output	11,000lm	22,000lm	
	Lense	Billboard optimize + Multipurpose LED Flood light		
Electric	Power	110w	220w	
	Input voltage	220-240V,50/60hz,		
	PF	Min 0.9		
Efficiency		100 lm/w		
Working temperature		- 40°C < Ta< 45°C		
IP level		IP65		Philips test report
Surge protection		6KV		Philips SPD
Salty spray		200 hrs		
IK level		IK07		Philips test report
Wind proof		Can protect under 14level typhoon		Philips test report
Vibration proof		Pass Philips internal vibration proof test		

7.2 Fans:

Fans, to BS 5060, shall be of the capacitor type, with ball bearings, complete with appropriate sized down rods, canopies, mounting brackets, 5 speed regulators or solid state fan speed regulator (with radio interference suppression to BS800), self-closing louvers, etc. Mounting of all fixtures and fittings shall be mechanically and electrically sound.

7.3 Hand Dryers:

1. The warm-air hand dryer shall be of the surface mounting heavy-duty, vandal-resistant type, of impact-resistant plastic or die-cast aluminum. The sound level shall not exceed 70dBA at 1 meter.
2. The fan motor shall be protected by an internal circuit breaker or fuse, and shall be maintenance free suppressed to BS 800. The heater shall be rated 1200W, 230V, 50Hz and shall be protected with a safety temperature limiter. It shall be warranted for 2 years after commissioning.
3. Operation of the unit shall be controlled automatically ("no touch") by an infrared admitting/receiving electronic (proximity switch), control device, positioned to turn the dryer ON when the person enters the drying zone.

The dryer shall continue to operate until the person leaves the drying zone, but for no more than 50 seconds of continued use.

7.4 Installation:

1. The fixture locations shown on the drawings are diagrammatical. The Contractor shall verify exact locations from architectural, ceiling and elevation plans, and will coordinate with other trades for installation of the fixtures.
2. Use 3-core, 2.5 sq.mm flexible PVC insulated PVC sheathed cables laid in flexible conduits between ceiling rose/light point and fixtures.
3. Screws for fixing of light fixtures shall be chromium plated.
4. All fixtures shall be carefully aligned before fixing in position.
5. Pendant light fixtures shall have two holes in the top of each casing for supporting to the ceiling by a $\frac{3}{4}$ " Φ , galvanized pipe or any other standard method as approved by the Engineer. Wiring from ceiling rose to the fixtures shall be installed through the pipe. Proper arrangements such as long threads with check nuts, etc. for minor adjustment in the mounting heights of the fixtures and its alignment shall also be provided.
6. The incandescent light fixtures on the false ceiling shall be installed in a manner as described for fluorescent light fixture.

8. GROUNDING

8.1 General:

8.1.1 Summary:

1. This section includes grounding and bonding of electrical system and equipment and basic requirements for grounding and bonding for protection of life, requirement, circuits, and systems. Grounding and bonding requirements specified are indicated by drawing and scheduling and as specified herein.
2. Applications of electrical grounding and bonding work in this section include the following (as a minimum).
 - i) Underground metal water piping.
 - ii) Metal building frames.
 - iii) Electrical power systems.
 - iv) Grounding electrodes.
 - v) Raceways.
 - vi) Service equipments.
 - vii) Enclosures.

- viii) Equipments.
- ix) Lighting fixtures..
- x) Landscape lighting.

8.2 Products:

8.2.1 Grounding And Bonding Products:

1. Materials and Components.
 - i) Governing Requirements: Where types, sizes, ratings, and quantities indicates are in excess of National Electrical Codes (NEC) requirements, the more stringent requirements and the greater size, rating, and quantity indications govern.
2. General: Except as otherwise indicated provide electrical grounding and bonding systems indicated; with assembly of materials, including, but not limited to cables/wires connectors, solderless lug terminals grounding electrodes and plate electrodes, bonding jumper braid, surge arresters and additional accessories needed for a complete installation. Where more than one type components product meets indicated requirements, selection is installer's option. Where materials or components are not indicated, provide products which comply with NEC, UL and BSS requirements and with established industry standards for the applications indicated.
3. Conductors: Unless otherwise indicated, provide electrical grounding conductors for grounding system connections that match power supply wiring materials and are sized according to NEC.
4. Ground Electrodes: Solid copper. 20mm diameter and 3000mm long minimum.

8.3 Execution:

8.3.1 Application:

1. Equipment grounding and bonding Conductors: Comply with NEC Article 250 for types sizes, and quantities of equipments grounding and bonding conductors, except where types, larger sizes, or more conductors than required by NEC are indicated.
 - i) Install equipment grounding conductor with circuit conductor for the items below in addition to those required by NEC:
 - a) Feeders and branch circuits
 - b) Lighting circuits
 - c) Receptacle circuits
 - d) Single-phase motor or appliance branch circuits
 - e) Three-phase motor or appliance branch circuits
 - f) Flexible raceway runs

g) Armored and metal-clad cable runs

- ii) Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.
2. Air Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices operating at 120 V and above, including air cleaners, heaters, and smoke detectors, Bond conductor to each unit and to air duct.
 - i) Water Heater, Heat-Tracing, and Antifrost Heater Circuits: Install a separate equipment grounding conductor to each electric water heater, heat-tracing assembly, and antifrost heating cable. Bond conductor to heater units, piping, connected equipment, and components.
 3. Separately Derived System: Where NEC requires grounding, ground according to NEC paragraph 250-26.

8.3.2 Installation:

1. General: Ground and bond electrical systems and equipment in accordance with NEC requirements, except where Drawings or specifications exceed NEC requirements, manufacturer's instructions and recognized industry practices to ensure that products comply with requirements.
2. Grounding Rods: Locate a minimum of 1-rod length (10 ft) from each other and at least the same distance from any other grounding electrode.
 - i) Drive until the top is 2 inches below finished floor or final grade, except as otherwise indicated.
 - ii) Interconnect with grounding-electrode conductor.
 - iii) Use 2 parallel grounding rods if a single grounding-rod electrode resistance to ground exceeds 25 ohms.
3. Grounding Conductors: Route along the shortest and straightest paths possible, except as otherwise indicated. Avoid obstructing access or replacing conductors where they may be subjected to strain, impact, or damage.
4. Metal Water Service Pipe: Provide insulated copper grounding conductor, sized per NEC in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main water service pipes by grounding-clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Do not install a grounding jumper across dielectric fittings. Bond grounding-conductor conduit to conduit to conductor at each end.

5. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.
6. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans blowers, electric heaters, and air cleaners. Use braided-type bonding straps.

8.3.3 Connections:

1. General: Make connections so that possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, and connection methods so that metals in direct contact will be galvanically compatible. Make connections with clean, bare metal at points of contact.
2. Exothermic-Welded Connections: Use for connections to structural steel and for under connections, except those at test wells. Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
3. Equipment Grounding-Wire: For 10 sqmm and larger, use pressure type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
4. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. Where these requirements are not available, use those specified in UL 486 A and 486 B.
5. Compression – Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connections. Use tools and dies recommended by manufacturer of connectors. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
6. Moisture Protection: Where insulated grounding conductors are connected to grounding rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.



9. LOW VOLTAGE SWITCHBOARDS AND DISTRIBUTION BOARDS

9.1 Switchboards:

9.1.1 General Requirements:

The LV switchboard shall be suitable for 400 volt, 50 Hz, 3 phase, 4-wire system. It shall be fabricated from sheet steel, floor mounting, cubicle type, totally enclosed, dust tight and vermin proof. It shall be complete in all respects with material and accessories, factory assembled, tested and finished according to the specifications. For switchboards intended for indoor installations the ingress protection classification shall be IP54, whereas for outdoor installations, it shall be IP64.

The switchboard with all components and accessories shall be suitable for front operation only and shall:

- have a rated service short circuit breaking capacity as stated in the Technical Particulars and/or shown on the drawings conforming to IEC 60947-2, with $I_{cu} = I_{cs}$.

- be provided with adequate clearance from live parts so that flashovers cannot be caused by switching, vermin, pests, etc.

- have all components rated for an insulation class of 600 volt (minimum);

- be designed for flush mounting of all instruments, selector switches and indicators on the front;

- have all incoming and outgoing cable entries from the top or bottom as stated in Technical Particulars or on Drawings.

- have the components mounted so as to facilitate ease of maintenance from the front;

- have common lamp test facility for all lamps;

- have wiring diagram and as-built drawings securely placed in a sheet metal pocket in the inside of door of the switchboard.

- be labeled with flame retarding material name plates on the front side of door for each incoming and outgoing circuit;

- have doors grounded by flexible copper cable/strip.

- have provision for extension of switchboard panel busbars in future.

9.1.2 Sheet Metal Work:

The switchboard shall be fabricated from 12/14 gauge sheet steel with welded, grinded, and finished angle-iron frame work. It shall be suitably divided into panels and compartments for accommodating the required number of circuit components, instruments and accessories.

The switchboards shall have metal cover plates inside the outer door to fully cover all live terminations, contacts and busbars.

Proper sized cable clamp channels shall be provided. An earth bar of appropriate cross section shall be provided and connected to the bodies of all sections of the switchboard. Two external earth terminals shall be provided for main earth connection to the body of switchboard. Each door shall be grounded by means of flexible copper strip.

An LV switchboard specified for indoor installation shall be provided with a removable sheet steel plate at the bottom or top as specified, punched with knockouts to enable cable entry through glands. The knockouts shall be of correct size as per the type and size of cable and correctly located on the plate so that both incoming and outgoing cables could easily be accessed to the respective circuit breaker for interconnection.

An LV switchboard specified for outdoor installation shall be suitable for installation on a hollow cement concrete foundation which will be fully covered by the switchboard to avoid ingress of rainwater. Therefore the switchboard with bottom cable entry is required to have sufficient vertical space in its lower portion to enable handling of cables during their interconnection with the circuit breakers.

The cabling inside the switchboard shall be suitably numbered and harnessed by means of straps or cords. Wiring to door mounted components shall be in flexible PVC conduit. All indicating, selecting and control equipment shall be suitably arranged and clearly labeled with indelible labels indicating the rating of fuses, switches, etc. The name-plates provided in the front of panel shall be of flame retarding material preferably stainless steel. Use of plastic or any inflammable material is not permitted for nameplates.

All metal work shall be cleaned down to bare shining metal, and the surface chemically prepared for powder coating. It shall be electrostatically coated with powder of colour RAL 7032 and then oven baked. The thickness of powder coating shall not be less than 120 microns.

9.1.3 Busbars:

The bus bars shall be of 99.9% pure, high conductivity electrolytic copper and shall be installed and mechanically braced for the specified fault level. The phase identification of bus bars shall be red, yellow and blue painted for phase and black for neutral. The earth bus bar shall be green.

The bus bars shall be triple pole and 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 degree centigrade at rated current, and at an ambient temperature of 45°C for indoor and 50°C for outdoor switchboards.

9.2 Distribution Boards:

9.2.1 General Requirements:

The distribution board shall be of sheet steel fabricated, suitable for recessed or surface mounting as indicated in Technical Particular or shown on Drawings, totally enclosed, dust tight and vermin proof. It shall be complete in all respects with material and accessories, factory assembled, tested and finished according to the specifications.

For distribution boards intended for indoor installations the International Protection classification shall be IP54, whereas for outdoor installations, it shall be IP64.

The distribution board with all components and accessories shall be suitable for front operation only and shall:

- have a rated service short circuit breaking capacity as stated in the Technical Particulars and/or shown on the drawings conforming to IEC 60947-2 with $I_{cu} = I_{cs}$.
- be provided with adequate clearance from live parts so that flashovers cannot be caused by switching, vermin, pests, etc.
- have all components rated for an insulation class of 600 volt (minimum);
- be designed for flush mounting of all instruments, selector switches and indicators on the front;
- have incoming and outgoing cable termination arrangement, terminal block/line up terminals;
- have all terminals and busbars fully covered under the protective sheet steel plate which will be screwed with the body of the board;
- have insulation barriers between the single/double pole circuit breakers installed on different phases and adequate clearance between triple pole breakers;
- have all incoming and outgoing cable entries from the top or bottom as required.
- have the components mounted so as to facilitate ease of maintenance from the front;
- have wiring diagram and circuit directory placed in a plastic bag firmly attached to the inside of door;
- be labeled with flame retarding material name plates on the front side of door and wiring diagram on inside of door;

have doors grounded by flexible copper cable/strip;

square brass busbars for Neutral and Ground shall not be accepted.

9.2.2 Sheet Metal Work:

The switchboard shall be fabricated from 16/14 gauge sheet steel with welded, grinded, and finished angle-iron frame work.

The cabling inside the distribution board shall be suitably harnessed by means of straps or cords. An earth bar or terminal strip shall be provided for connection of incoming and outgoing earth conductors. The earth bar or terminals shall be

permanently connected to the body of distribution board at two points. Flexible copper strip shall be provided for earthing of the door of distribution board.

All metal work shall be cleaned down to bare shining metal, and the surface chemically prepared for powder coating. It shall be electrostatically coated with powder of colour RAL 7032 and then oven baked. The thickness of powder coating shall not be less than 120 microns.

9.3 Power Factor Improvement Plant (PFI):

The PFI shall be of Auto-cum-Manual type and shall be provided in separate Panel(s) integral with the LV Switchboards as shown on the drawings. The complete Plant should operate satisfactorily under the environmental conditions and its components should be suitable for an operating temperature of 70°C.

The capacitors shall be suitable for the rated voltage and frequency and of capacity stated in the drawings. They shall be insensitive to over-voltage, temperature and would be inflammable as well as resistant to aging.

The capacitors shall be self cooled and suitable for indoor use, fitted with discharge resistor and internal fuse. The capacitors for the required stages shall be in the form of banks.

The Plant shall be supplied complete with bus-bars of required size, interconnection cables, sockets for cables and earthing and other necessary accessories.

It shall consist of the following major items:

- 1 Power Factor correction relay for auto-cum-manual operation
- 1 Unbalanced load power factor indication(3-phase, 4 wire, 415 V)
- 1 Current transformer with 5A secondary current
- 3 Instrument protection MCB's
- 1 Auto-Off-Manual switch

Each bank of capacitors to contain:

- 1 Contactor of required size & type for capacitor switching with auxiliary contacts (2 NO + 2 NC)
- 1 TP fused switch with 3 Nos HRC fuse of required size.
- 1 Set of ON-OFF Push Buttons
- 1 Indicating lamp for "ON" indication

12. Earthing:

The earthing conductors shall be of stranded hard drawn copper and of size as shown on the drawing/BOQ. The earthing conductors shall be connected with the body of DG Set and ATS panel using high quality lugs which will either be compression fitted (using appropriate tools) or duly soldered with the earthing conductors. The earthing plates shall be of electrical grade copper and of size 2' x 2' x 1/8" or as specified on the drawing/BOQ. The earthing leads (i.e. the conductors which join the earthing conductors with the copper earth plates) shall be of size not less than 120 sq. mm or as shown on the drawing/BOQ.

The body earthing system shall be duplicate i.e. the body of DG Set and ATS panel shall be separately earthed at two points, using separate earthing conductors. Each earthing conductor shall be followed by two earthing leads, with each earthing lead connected to a separate earth plate at two points.

12.3.4 Testing:

The Contractor shall also test earthing of the installation and shall ensure that the earth resistance is less than one ohm. Following successful testing of the installation of DG Set and ATS panel, the Contractor shall undertake commissioning of the installation and will ensure that the complete installation functions as intended.

All testing and commissioning of the DG Set shall be carried out in the presence of the Owner's representative/Engineer.

10. FIRE DETECTION SYSTEM

10.1 Cabling:

1. All fire alarm cable shall be Fault Tolerant loop twisted pair type. Termination to the cable shall be carried out to the equipment manufacturer's Specifications. LSF/PVC shrouds shall be used. Alternatives may be acceptable subject to the manufacturer's and consultant's approval.
2. Cable size shall match its use and calculations recorded and submitted for review. All circuits shall be a minimum of 14 SWG, and shall be installed in accordance with latest IEE regulations and BS 5839.

10.2 System Circuit Supervision

- i) The C.I.E shall supervise all circuits to intelligent devices, repeaters and conventional peripherals and annunciate loss of communications with these devices. The CPU shall continuously scan devices for proper system operation and upon loss of response or an incorrect response from a device shall sound an audible fault, indicate that device or devices are not responding and print the information on the printer.

10.3 Field Wiring Terminal Blocks

For ease of service all wiring terminal blocks shall be the plug-in type. Terminal blocks permanently fixed or mounted are not acceptable.

10.4 Execution:

10.4.1 Installation:

1. Installation shall be in accordance with the BS 5839 and current IEE regulations as recommended by the equipment manufacturer.
2. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

10.4.2 Typical Operation:

Actuation of any manual call point, smoke detector or heat detector shall cause the following operations to occur unless otherwise specified:

1. Activate all programmed indicating circuits until silenced.
2. Activate all strobe units until the panel is reset/silenced.
3. Annunciate the active initiating devices and zones.
4. Release all magnetic door holders on doors to adjacent zones on the floor from which the alarm was initiated.
5. Return all elevators to the primary or alternate floor of egress.
6. Duct type smoke detectors shall, in addition to the above functions shut down the ventilation system or close associated control dampers

10.4.3 Test:

Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and commissioning of the system.

1. Before energizing the cables and wires, check for correct connections and test for short circuits, earth faults, continuity, and insulation.
 2. Open initiating device circuits and verify that the fault signal actuates.
 3. Open signaling line circuits and verify that the fault signal actuates.
 4. Open and short indicating appliance circuits and verify that fault signal actuates.
 5. Earth initiating device circuits and verify response of fault signals.
 6. Earth signaling line circuits and verify response of fault signals.
 7. Earth indicating appliance circuits and verify response of fault signals.
 8. Check presence and audibility of tone at all alarm notification devices.
 9. Check installation, supervision, and operation of all intelligent smoke sensors during a walk test.
10. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the C.I.E and the correct activation of the control points.
11. When the system is equipped with optional features, the manufacturer's manual should be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification of functionality and similar.

10.4.4 Final Inspection and Hand Over:

At the final inspection a factory trained representative of the manufacturer shall demonstrate in the company of the clients representative and the fire officer, that the system function is correct in every respect.

14.4.5 Instruction:

1. Provide instruction as required for operating the system. "Hands-on" demonstrations of the operation of all system components and the entire system shall be provided to the client staff.
2. The Contractor and/or the Systems Manufacturer's representatives shall provide a type written "Sequence of Operation" to the Owner.

11. PABX

11.1 Installation:

The Supplier shall prepare shop drawing laying out the work, with comprehensive technical submittals in duplicate for the approval of the Engineer/ Consultant. The final shop drawing & technical submittals shall be submitted in triplicate.

All installation and termination work shall be undertaken by the Contractor, under the supervision of a qualified Engineer who has been trained by the manufacturer.

11.2 Testing & Commissioning:

Complete planning, installation, and operating manuals/documentation shall be made available in triplicate to the Owner through consultant, and the Owner's security personal shall be trained in the operation, programming, and maintenance of the system.

11.3 Guarantee & Maintenance:

The Supplier shall provide an on-site warranty and free maintenance (1 visit/3 moths), covering materials and labour, valid for 1 year from date of commissioning, for the entire security alarm system.

18. CLEANING, TESTING & ADJUSTING

18.1 General:

1. The Contractor shall, during construction, properly cap conduits and raceways to prevent the entrance of dirt. etc. Each conduit and raceway circuit shall be blown through, after completion, for as long a time as necessary to thoroughly clean that circuit.
2. The Contractor shall test all electrical items as underlined in the specifications and drawings including electric wiring and earthing and furnish test records to the Engineer.
3. After the entire installation has been completed, the Contractor shall commission the equipment, making all necessary adjustments in the equipment, as called for and submit reports of performance tests as specified elsewhere in this specification.

18.2 Commissioning and Performance Tests:

1. The electrical system described in this specification and shown on the drawings shall be commissioned. A programme for the commissioning, and any specified tests, shall be prepared and this shall be incorporated in the contract programme following approval by the Project Manager / Consultant. All commissioning engineers/specialists shall be qualified to undertake such work and then competence shall be demonstrated to the satisfaction of the Project Manager/Consultant.
2. Commissioning shall mean, the advancement of all the building services systems, from the state of static completion to full working order, adjusted to the design requirements which are given.
3. The cost of providing all instruments and associated equipment whether of a temporary and / or permanent nature, attendance of any specialists, and for the provision of test points required for the commissioning and testing, shall be included in the tender. A recent calibration certificate for each instrument shall be available for inspection.
4. A schedule of the instruments to be used shall be submitted to the Project Manager for approval, prior to the commencement of commissioning and testing.
5. A comprehensive report shall be prepared for each system which shall record all the parameters which affect the performance of the system at the time of commissioning. A similar report shall be prepared for any specified test. The report shall be vetted/ scrutinized by the consultant before the approval is accorded by the Project Manager. Project Managers approval must be gained before the services are handed over to the owner.
6. Three copies of each of the reports shall be handed over to the Project Manager.
7. Unless otherwise stated in this specification, the Project Manager shall be given seven days clear notice of all tests.

18.3 Test Runs:

1. After the works have been commissioned and all required performance tests carried out the Contractor shall be required to carry out test run(s) as specified in the memorandum of the tender after the issue of the certificate of substantial completion for the complete works by the Project Manager. The period for the test run(s) would be designated in writing by the Project Manager. The test run observations shall be recorded in duplicate by the Contractor on appropriate log sheets as specified and approved by the Project Manager. The site engineering staff for taking and recording test run observations. The normal plant operation shall be carried out by the Owner's operators.
2. The Owner shall only provide without charge to the Contractor, water, electricity, and fuel for the test run (s) and the Contractor shall be responsible for the supply of all tools and instruments etc. required to take and record the test run observations.
3. The log sheets shall be jointly signed by the Project Manager or his representative and Contractor's Site Project Manager. The Contractor shall hand over one set of log sheets to the Project Manager every day.
4. The Contractor shall check and prepare a summary of observations at the end of each test week. One set each shall be supplied to the Project Manager, Project Manager and Owner's representative within one week of the conclusion of the corresponding test run week.
5. The Contractor shall be responsible for making all necessary adjustments to the plant which may be required after the observations recorded are reviewed.

19. RECORD DRAWINGS

19.1 General:

1. During construction, the Contractor shall keep an accurate record of all deviations, between the work as shown on the drawings and that which is actually installed.

2. After completion of the installation work, the Contractor is to provide one set of properly edge landed and soft copy of as-installed drawings showing runs and location of all the plant equipment, raceways, electric wiring etc., giving all necessary details of the works as actually installed. All records shall be drawn on AUTOCAD version 2000.
3. In case of any question regarding the Contractor's responsibility for preparation and supply of any detail shop drawings, data, etc., the Engineer's decision shall be final and binding as to the requirements of the shop drawings, technical manuals, etc., for any particular part of the work.
4. The approval by the Engineer / Consultants of any submitted data, shop drawing, performance curves, test certificates for any item, arrangement and / or layout shall not relieve the Contractor from any responsibility regarding the performance of the Contract. Such approval shall not also relieve the Contractor from responsibility of error of any sort in the submitted data and shop drawing.
5. The cost of furnishing above prints and preparing these record drawings shall be borne by the Contractor and shall be included in the Contract Price. When all revisions showing the work as finally installed are made, the corrected sets shall be submitted for review by the Engineer, and delivered to the Consultants before final payment for the completed work will be made.

20. PROTOCOL FOR QUALITY ASSURANCE20.1 Scope:

The check list presented in the following shall be strictly followed by Contractor for quality assurance of Works under the contract. The Contractor shall afford all assistance to the respective personnel in discharging their duties.

20.2 Check List:

S. NO.	DESCRIPTION	STATUS		REMARKS
		YES	NO	
A.	GENERAL			
1.	Minimum conduit size: 25mm Φ .			
2.	Check for wall thickness			
3.	Any defective pipe conduit and accessories.			
4.	Maximum allowable fill for 2 conductors 30%.			
5.	Maximum allowable fill for 3 or more conductors 40%.			
6.	Joints are water tight with proper PVC adhesive.			
7.	Manufactured smooth bends are used.			
8.	Empty pipes/conduits plugged in.			
9.	Conduits edges are smooth, free from burrs.			
10.	Minimum bending not less than 8 times the conduit Φ .			
11.	Outlet to outlet bends are not more than 4.			
12.	90-degree sharp bend and tees are not used.			
13.	Any cross over of conduits.			
B.	UNDERGROUND DUCT BANK			
1.	All pipes/conduits are below 2'-6" from finish			
2.	level/grade.			
3.	Minimum distance of 6" from one service to other			
4.	service.			

S. NO.	DESCRIPTION	STATUS		REMARKS
		YES	NO	
5.	At least 3" concrete envelope between conduits.			
6.	Pipe/conduits are plugged in manhole. Sleeves provided in concrete walls, slabs and beams Fish wire 18 SWG G.I or nylon laid in all conduits.			
C.	CONDUITS IN CONCRETE FLOOR SLAB / ROOF SLAB			
1.	Minimum of 32mm cover of concrete maintained from the top of the conduit to finished surface.			
2.	All conduit work completed prior to pouring.			
3.	Pull boxes are made of 16 SWG G.I. sheet steel minimum.			
4.	Maximum distance of conduit between two pull boxes.			
	a. Straight conduit - 100 ft			
	b. With one bend - 65 ft			
	c. With two bend - 50 ft			
5.	Sleeves provided in concrete walls, slabs and beams. Fish wire 18 SWG G.I or nylon laid in all conduits.			
D.	CONDUITS IN OPEN SURFACE			
1.	Saddles used not less than 6mm thickness			
2.	Factory made Clamps of 16 SWG G.I. sheet steel used.			
3.	Maximum distance of support (saddles and clamps) to support shall be:			
	¾" to 1 Φ 3 ft			
	1 ½ Φ 5 ft			
	2" Φ 6 ft			
	3" to 4" Φ 7 ft			
E.	CONDUITS IN FALSE CEILING			
1.	Use of approved saddle or clamps on walls and ceiling.			

S. NO.	DESCRIPTION	STATUS		REMARKS
		YES	NO	
2.	Any loose wiring or conduiting.			
3.	Conduits properly tied on channels or hanging support.			
4.	Pull Boxes / Junction Boxes individually supported.			
5.	Independent supports used (not to be supported from Duct or pipe hangers).			
F.	LABELING			
1.	All electrical conduits marked for Fire Alarm, Control power etc.			
2.	All JB's, P.B. labeled for type of Services.			
G.	WIRING AND ACCESSORIES			
1.	Wiring pulled after completion of surface of walls, ceiling and flooring wet works.			
2.	Switches, sockets, JB's and PB's are installed as per drawing.			
3.	Circuit continuity maintained.			
4.	Color-coding used as per standard.			
5.	Connection made as per polarity condition.			
6.	Switches make break on live wire only.			
7.	Earth wire run in all conduits for each circuit separately.			
8.	All steel box are of galvanized steel with earth log.			
9.	Any JB/PB installed without approval (not shown in drawing).			
10.	Wiring tagged as per design.			
11.	Earth continuity conductor (ECC) is PVC insulated copper cable.			
12.	Earth wire is green or yellow striped on green.			

S. NO.	DESCRIPTION	STATUS		REMARKS
		YES	NO	
H.	EARTHING AND GROUNDING			
1.	All equipment, switch sockets earthed properly with green earth wire.			
2.	Earth pits are made as per standard.			
3.	Inspection chamber provided in the pits.			
4.	Earthing leads and earth continuity conductors are of proper size.			
5.	Earth resistance is not more than 10 ohms.			
6.	Main grounding cable is hard drawn bare copper conductor.			
7.	Earth continuity conductor (ECC) is PVC insulated copper cable.			
8.	Earth wire is green or yellow striped on green.			
I.	ELECTRICAL TESTING			
1.	Meggering of all the circuits done for insulation test - as per meggering test sheets enclosed.			
2.	Earth resistance measured test sheets enclosed.			
3.	Continuity of the circuits.			
4.	Continuity of the earth.			
5.	Correctness of polarity.			
	TEMPORARY CONNECTION (T.C)			
1.	Appropriate extra power available in existing DB			
2.	Power connection made from normal DB			
3.	Temporary wires connected to outgoing spare breaker			
4.	Approval of TC taken from maintenance department.			
5.	KWH meter installed for billing.			
6.	Cable run through proper conduit from top, bottom or sides of DB			

S. NO.	DESCRIPTION	STATUS		REMARKS
		YES	NO	
7.	The inside cover and door of DB closed after connection.			
8.	All power distribution through temporary board.			
9.	Equipment used with proper switch socket and top plugs.			
10.				
11.	Temporary board switch sockets properly earthed.			
12.	A notice of "Temporary connection for construction use" placed on DB.			
13.	Drawings are approved as per site condition before manufacturing.			
14.	Sheet thickness as per specification.			
15.	Painted with electrostatic powder paint as per approved shade.			
16.	Bus bars are braced for rupturing capacity mentioned in specification.			
17.	DB's are totally enclosed, rubber gasketed, dust tight, vermin & damp proof			
18.	All live parts are covered with protection sheets (M.S. or bakelite).			
19.	Channels are provided for support of incoming/outgoing cables.			
20.	Proper size of ground bus bar provided.			
21.	All doors are double earthed with flexible copper braid.			
22.	Bus bars and cables are color-coded.			
23.	All components are rated for voltage and short circuits level mentioned in specs.			
24.	Components are labeled for identification.			
25.	Control wiring is ferruled with numbers marked on drawing.			
26.				
27.	Components rating are as per BOQ.			

S. NO.	DESCRIPTION	STATUS		REMARKS
		YES	NO	
28.	Connections are tight and wires are properly dressed.			
29.	Phase barriers are provided in single phase circuits.			
30.	Pre-punched knockouts provided for mounting of glands.			
31.	Current carrying capacity of bus bar is 1.5 Amps per sqmm minimum.			
32.	Bus bar is made of 99% pure electrolytic copper.			
33.	Size of neutral and ground bus is 50% of main bus.			
34.	Control wiring is protected through breaker/fuse.			
35.	All factory related test performed.			
36.	Components functional test performed.			
37.	High. voltage test 2kV for 1 minute, done.			
38.	Meggering test done, test sheet provided.			
39.	Calibration done on all measuring instruments			
40.	As-built drawing and Circuit Directory put in the pocket.			
41.	PFI Plant is suitable for auto and manual operation.			
42.	Power factor relay provided with built in digital PF meter.			
43.	The capacitor banks have discharge resistors and internal fuse.			
44.	The banks have enough space for cooling.			
45.	Wiring is curled for harmonic suppression.			
	The setting of CT ratio is checked.			
	The breakers or fuses are of high rupturing capacity.			

AIR CONDITIONERS Work

01. Air cooled electrically operated DC-Inverter, Refrigerant-**R410A** split cassette type room air conditioners of minimum capacities as specified in the Schedule of Equipment OR on the drawings. The air conditioner to for T3 operating conditions.

02. The air conditioners shall comprise weather proof outdoor condensing unit and ceiling suspended cassette type indoor evaporator unit provided with rubber-in-shear type vibration isolators for installation.

The condensing unit to be complete with compressor, air cooled condenser, fan, fan motor, automatic and safety controls and all accessories.

The evaporator unit to be complete with cooling coil, fan, fan motor, cleanable air filter, drain pan, condensate drain lift up mechanism with overflow prevention, automatic and safety controls, and all accessories. The unit shall be suspended above false ceiling and have a decorative access door cum supply/return air grille, with 4-way supply air throw and powder coated finish for exposed installation in the room.

The unit to have cooling or cooling-heating systems; heating cycle to be either reverse cycle type or with electric heater, as specified in the Schedule of Equipment.

The unit to have wall mounted microprocessor Controller with on-off switch, multi speed fan control and cooling (or cooling-heating) thermostat with settings to cover full comfort range.

03. The Contractor to complete refrigerant piping and electric wiring and earthing from the electric supply point between the indoor and outdoor units and charge the unit with refrigerant and oil. The refrigerant circuit to include liquid line sight glass-moisture indicator, filter drier, line valve, etc. The refrigerant piping to be correctly sized as recommended by the unit manufacturer to suit the total distance and height between the indoor and outdoor units. The piping to be hard drawn copper tubing with silver soldered joints, type L/K for low/high pressure sides. The low temperature piping to be insulated with 1/2" thick flexible foamed plastic insulation protected with specified jacketting.

04. The units to be of Toshiba/LG/SAMSUNG/Hitachi/Daikin/Mitsubishi manufacture or approved equal.

05. The tenderer to submit following information for the units offered by him:

(a) Net cooling-heating capacities under specified conditions.

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- (b) The salient technical features of the units including control panel.
- (c) Manufacturer's complete technical literature.

MOTOR CONTROL CENTRES/DBs & ELECTRIC WIRING

01. The Contractor will be responsible for complete electric wiring and earthing of the plant, equipment and controls. The Employer shall only provide 3 phase and neutral, 4 wire electric supply point(s) with two earthing points, and 1 phase, neutral and earth, 3 wire electric supply point(s) at locations shown in the drawings and detailed elsewhere in the documents.

02. The electrical work shall be carried out by licensed workmen authorised to undertake such works under the provisions of the Electricity Act 1910 and Pakistan Electricity Rules 1937.

03. The installation in general shall be carried out in conformity with the latest relevant British Standard Specifications and Codes, VDE, IEC and IEE Recommendations and latest edition of Regulations for the Electrical Equipment of Buildings by The Institution of Electrical Engineers, UK as adopted in Pakistan by Pakistan Standards Institution. Any special requirements of Electric Supply Co. and The Electric Inspector shall be complied with. The Contractor shall be responsible for making the required applications, submitting the Test Certificates and for getting the installation passed by The Electric Inspector of the Government.

04. The climatic conditions shall be temperatures between 2°C (min) and 45°C (max) with max. relative humidity 90%, unless lower min. and higher max. temperatures are specified elsewhere in the documents.

05. The electric wiring shall be carried out in MS or G.I. conduits as specified, 18g G.I. sheet metal trunking or cable trays, or G.I. (medium weight) piping as specified and/or shown in drawings. All wiring buried in floor or exposed to weather to be in G.I. piping (mw). MS conduit to be of 16g, given anti rust coating and then painted with black enamel paint.

Conduits buried in slabs or walls may be PVC conduits or PVC Class D pipes as specified in the drawings.

Sheet metal trunking or cable trays installed indoor shall have ventilation slots; those installed in Building shafts shall have removable covers and installed outside shall be of weather proof construction with removable covers.

The wire sizes shall be selected for satisfactory operation at atleast 45°C ambient temperature derated according to installation method and grouping as envisaged.

06. The terminal connections for motors and where required for starters, shall be made in flexible conduit. The terminal wiring for 230 volt, 1 phase below 0.5 HP

Benazir Bhutto Shaheed Institute of Management & Sciences, Dadu motors (such as for fan-coil units, small ventilation-exhaust fans) and their starter control switches can be exposed PVC insulated and sheathed wiring, connections protected within the terminal box so that no live lead is exposed.

07. The wiring for electric/electronic automatic controls shall preferably be with single conductor wire which may be PVC insulated within metal conduits, exposed shielded or exposed PVC insulated and sheathed wiring in accordance with the recommendations of the control manufacturer. The live connections shall be protected by the cover plates to avoid any hazard. The wiring outside the plant rooms or fan-coil unit enclosures must be in conduit to avoid any mechanical damage.

08. All Motor Control Centres (MCCs) or Control Boards shall be Factory fabricated of an approved listed manufacturer.

09. On each Motor Control Centre (MCC), the incoming supply shall have a circuit breaker for 20 amps and above rating and circuit breaker or disconnect switch with fuses for lower rating.

The circuit breaker shall be of high rupture capacity, heavy continuous duty, moulded case type (MCCB) for 1000amps and below rating and air-breaker (ACB) type for rating above 1000 amps. The circuit breaker shall have adjustable magnetic short circuit trip and adjustable thermal overload trip. In MCCs with multi circuit outgoing, the incoming MCCB of 100amp and above or ACB shall have high and low voltage release, rated 415 volt $\pm 20\%$ adjustable range. The MCCB or ACB to be manually reset after trip.

The minimum rupture capacities (IEC 157-1 P-1 rating or IEC 947-2 Icu rating) at 415 volt of MCCBs shall be as follows:

Upto 30 amp rating		10 KA
40 to 225	"	25 "
250 to 400	"	30 "
500 to 600	"	35 "
800	"	50 "
1000	"	65 "

Miniature Circuit Breakers (MCB) shall have minimum rupture capacity of 5KA (1-phase) and 10KA (3-phase) and to have off-on-reset switch with handle. The 3-phase MCB shall make or break all 3 circuits simultaneously. MCB may be used for single phase circuits upto 30amp rating. 3-phase MCB may be used for motors 4HP and below or for general power supply circuit 20amp and below.

The disconnect switch shall be rotary type. The fuses shall be HRC time lag link type according to BS 88:1952 and ASTA-20 certified. Two sets of replacement HRC fuses shall be supplied as spare for each disconnect switch.

Each outgoing individual circuit shall have a ACB or MCCB or MCB or disconnect switch with fuses according to rating limits specified above. The outgoing for each motor circuit shall be provided with:

1-phase MCB for single phase motors upto 1HP.

3-phase MCB for 3-phase motors 4HP and below.

MCCB for " " above 4HP.

10. Single phasing preventer relay shall be provided for each 3 phase circuit of 1 HP and above rating as part of motor starter.

11. The Contractor shall supply and install necessary Motor Control Centres (MCCs), Control Boards, circuit breakers, disconnect switches, fuses, MCBs, earthing, etc. to complete the work. It is required, where possible, to mount all circuit breakers, disconnect switches, fuses, starters, contactors and relays, etc. in one machine room on one MCC for ease of operation.

12. The MCCs shall be of design and construction to provide easy access to all internal components for servicing and replacement. The large size MCCs to have multi panel type construction. The MCC shall have hinged access doors at the front, swing not exceeding 450 mm, and of design that all work of servicing, maintenance, replacement, additions and alterations can be carried out from the front without requiring access from the back. The back panels shall be bolted and easily removable. The MCC to have protected bus bars and indicator name plates for all items. A pocket shall be provided for keeping electric wiring diagrams.

All circuits shall be numbered and tags fixed with the wires for identification.

The MCCs to be installed outside shall be of weather proof construction.

The motor starters shall comply with the requirements specified elsewhere in the documents.

The main MCC in the central plant room shall have one 30amp 3 phase service outlet with MCB and 4 pole quick disconnect coupling, and two 15 amp 3 pin single phase service outlets with MCB and on-off switch.

Reproducible transparencies and 3 sets of complete detail wiring diagrams for each MCC shall be supplied to the Employer and one plastic coated set to be kept in a pocket in the respective MCC.

13. The Contractor shall submit schematic electric wiring diagrams, manufacturer's construction drawings, component selection lists with manufacturers' technical literature for all components proposed to be used to the Consultant for checking and approval before the fabrication of MCCs and Control Boards is commenced. The work will be carried out only in accordance with the approved drawings and components.

14. All components and wires shall be selected/sized with required derating for site ambient and altitude as specified and close grouping within the enclosed space of a MCC or Control Board.

15. Each Motor Control Centre shall have three phase indicating lights, incoming supply voltmeter with 7 position phase selector switch, three ammeters one for each phase if more than one outgoing and total load 30 KW (40 HP) and above, an incoming ACB or MCCB according to load, a MCCB or MCB for each outgoing according to circuit rating, motor starters, ammeters, indicator lights, etc.

All starters/contactors for motors and equipment operation control shall have rotary type hand/off/auto switch. With HOA switch in "auto" position the motor/equipment shall be remote operated from the MCC so designated or Building DDC System as specified, "hand" position would permit local operation and testing, while the "off" position would ensure that all circuits are de energized for servicing and checking.

16. Wires and Cables shall be of Pakistan Cables Ltd./ Pioneer Cables Ltd./AGE Industries Ltd./Newage Cables Ltd. manufacture or approved equal.

The steel conduits shall be of Hilal or IIL, PVC conduits of Shavyl or Galco and PVC Class D pipes of Dadex-Eternit or Shavyl, manufacture or approved equal.

MCCBs & ACBs of ABB, Fuji, Hitachi, Merlin Gerin or Terasaki, Contactors and Starters of ABB, Fuji, Hitachi, National, Siemens, Square D or Telemecanique, and MCBs of ABB, Emzed-Kopp, Hitachi or Merlin Gerin, manufacture or approved equal. ACBs, MCCBs, MCBs, Contactors and Starters shall be of listed Manufacturers' country of origin and not substitutes.

PIPING

01. All refrigerant piping shall be refrigerant service quality hard drawn copper piping with silver soldered joints, providing flanged where necessary for easy dismantling, particularly flanged joints shall be provided for equipment, strainer-driers and other specialities. In tight locations and for connections with equipment, the Consultant may allow soft copper tubing with flare or compression joints for sizes upto 16mm OD.

02. The refrigerant pipes shall be properly sized and graded to secure easy circulation of refrigerant without excessive pressure drop, to permit return of oil to the compressor and to prevent slugging of liquid refrigerant to the compressor. The distance, bends and height difference between the compressor and the evaporator shall be taken into account when sizing the pipes.

03. The Contractor shall provide all stop valves, checks valves, expansion valves, filter-driers, sight glasses and other specialities as are required for proper operation and control of the refrigerant system.

04. All pipe work shall be so arranged and assembled as to prevent undue strain or leaks caused by expansion and contraction. Vibration isolators shall be provided at the compressor suction and discharge connections to prevent strain or leaks due to transmission of compressor vibrations to the piping.

05. All pipes shall be properly supported on clamps, hangers etc. of approved design. Supports shall be designed to permit free expansion and contraction to minimise vibrations. All hangers, clamps etc. for piping shall be provided with rubber in shear or equivalent anti vibration supports to prevent transmission of vibrations to the building structure. No pipe shall be suspended from other pipes. MS or GI hangers or sleeves shall not come in contact with the copper pipes.

06. The horizontal pipe hangers shall be supported from building steel framing or concrete inserts of sufficient strength. All vertical pipes shall be supported by heavy clamps resting on the building structure.

07. In general horizontal copper pipes, 25mm OD and below shall be supported at not more than 2m centres and above 25mm OD at maximum 2.5m centres. MS or GI pipes 25mm and smaller shall be supported at centres not more than 2m apart and at 3m centres for pipes between 25 to 80mm. Supports shall be provided as near as possible to the valves, strainers, tees, elbows, other special fittings and equipment connections. The pipes shall not be supported by the equipment.

08. Hangers for insulated piping shall have broad contact area so as not to damage insulation by load concentration. The hangers shall also support insulated pipes without piercing the insulation.

09. During installation, adequate temporary supports shall be provided so that the piping is not strained or supported by the equipment.

10. The low temperature (suction and LP liquid) pipes shall be insulated with 25mm thick flexible foamed plastic insulation average minimum density 80 Kg/cum. The insulation shall be fixed with adhesive recommended by the manufacturer and all joints sealed with adhesive and covered with 40mm wide self-adhesive PVC waterproof tape of approved quality, and protected by a jacket of 8oz canvas fixed with approved adhesive and joints lapped at least 40mm. External and weather exposed piping shall be further protected with a jacket of 28g GI sheet.

11. The condensate drain piping shall be insulated by 6mm thick felt protected with are 8oz canvas jacket.

12. All pipes passing through floors or walls shall have 20 gauge G.I.sleeves for the full depth of the finished floor construction or thickness of the finished wall and extending 6mm beyond the finished face of the structure on both sides. The sleeves shall allow at least 6mm clearance to finished (insulated) pipe size. The Contractor shall fill the gap with soft material to prevent contact between the piping and the sleeve but allow free movement of piping. The Contractor shall be responsible for supplying, locating and setting of all necessary pipe sleeves.

13. The pipe ends shall be kept tightly closed during installation to prevent entry of dirt and moisture into the piping system.

14. On completion of the piping installation, the same shall be pressure and leak tested as specified elsewhere in the specifications.

15. The schedule of piping shall be as follows:

(a) Refrigerant pipes.

Hard drawn seamless copper piping according to ASTM B-88, Type L for working pressure below 10bar and Type K for higher working pressures.

The soft annealed seamless copper tubing according to ASTM B-280 suitable for refrigeration service.

PIPE INSULATION

01. No insulation shall be applied to any system of piping or to any surface until all foreign matter has been removed from the surface to be insulated and until the piping has been tested, made tight, cleaned out and made operable. All insulation shall be applied in a manner consistent with good practice and methods. Sectional covering shall be applied with all end joints broken. All longitudinal joints shall be top and bottom but staggered between sections. Insulation shall be continuous through floors, walls, partitions, etc. except where otherwise indicated or specified. Where the application of insulation will cover nameplates attached to equipment, the insulation shall be recessed so as to expose the name or rating plate. Where space will not permit application of sectional insulation on pipes in a wall or slab chase, the chase shall be packed full of 85% magnesia, specified density mineral wool or fiberglass and protected with cover plates on both sides as approved by the Engineer/Consultant.

02. Piping shall be insulated with preformed/premoulded/foamed sections of type and thickness as specified in the Schedule of Insulation.

03. The insulation shall be of inorganic material bonded together by non-water soluble fire retardant resin, chemically neutral and not to cause or accelerate corrosion of steel, stainless steel, copper or aluminium, compatible with normal building materials, biologically inert not to breed or sustain molds, fungus, bacteria or rodents, water repellent and not to absorb moisture from ambient air, non-hygroscopic and non-capillary, not to crack or shrink while permitting expansion and contraction of piping.

Insulation may be of following types:

Type	Material	Density Kg/m³	Temp. Range °C	Thermal Conductivity (K) W/mK
-----	-----	-----	-----	-----

I-1	Rockwool	100 or 120	(-) 150-750	50°C-0.041
I-2	Cellular Glass	128	0-480	50°C-0.052
I-3	Fiberglass	64 or 96	(-) 50-450	50°C-0.035
I-4	Flexible elastomeric foamed plastic	60	(-) 50-125	32°C-0.040
I-5	Foamed Polyurethane	45	(-) 30-100	25°C-0.025

Types I-1, 2 & 3 shall be non-combustible as per ASTM E136-82.

Type I-4 to have flame spread rating of 25 or less and smoke developed rating of 50 or less as per ASTM E84-91.

Type I-5 shall be fire retardant self extinguishing type.

04. The chilled water piping insulation shall have 2 ply vapour barrier of .0007" aluminium foil and 44 lbs. natural kraft with fiberglass yarn reinforcement and flame retardant adhesive (Type ASJ). Type I-1, 2, 3 & 5 shall have factory applied vapour barrier forming a hinge along one side and an overlap along the other. The field applied vapour barrier shall be fixed fully with the insulation with approved quality adhesive recommended by the manufacturer and both longitudinal and circumferential joints shall be lapped atleast 40mm. Great care will be exercised that the vapour barrier is not damaged/pierced during installation and any damage shall the repaired with the same quality vapour barrier.

05. The insulation shall be fully fixed to the piping with approved adhesive compound recommended by the manufacturer and approved by the Engineer/Consultant. Resin based adhesive compounds shall be used and mineral oil based adhesive shall not be used. Adhesive to be Zahabiya Excel Bond ZGPA Special 7/223, Foster 30-45, or approved equal.

06. Each pipe shall be insulated separately with specified pipe insulation and gaps, if any, shall be filled with the same insulation material. All circumferential and longitudinal joints shall be sealed with atleast 50mm wide self-adhesive tape of approved quality. In case of chilled water piping, PVC impregnated canvas vapour seal tape or Polyethylene coated cloth high moisture resistant tape or Aluminium foil pressure sensitive tape shall be used. The tape shall be pressed down firmly to ensure an efficient seal and smoothed out to avoid any gaps and wrinkles.

07. The flexible foamed plastic insulation shall be thoroughly sealed with adhesive and all joints covered with 40mm wide self-adhesive PVC water proof tape of approved quality.

08. Where specified, the piping shall be insulated with 85% magnesia in layers not thicker than 25mm till the required thickness is achieved. 18g MS 20mm mesh wire netting shall be stretched over the piping, securely wired in place and then the first layer of insulation shall be applied. Each layer shall have wire netting. 15mm thick finish coat shall be mixed 50% by weight with Portland cement and troweled into wire netting to form smooth and hard finish. After full drying of the insulation a coating of hard setting compound shall be applied. It shall then be painted.

09. All specialities (valves, fittings, flanges, etc.) shall be insulated with thickness not less than adjoining straight pipe insulation thickness. In case of chilled/hot water piping, equal/ oversized sections of preformed insulation shall be used duly mitred and trimmed to tailor-fit the specialities. In case of rockwool or fiberglass pipe insulation, semi-rigid blanket of same material may be used instead of mitred sections for insulating the specialities. Loose scrap blanket insulation shall not be used for this purpose.

The insulation shall be fully covered with self adhesive tape specified above to form a complete seal. In case of chilled water piping, a thick coating of liquid vapour seal Foster 60-25 or approved equal shall then be applied.

The valves and strainers shall be insulated separately from the adjoining straight pipe insulation and openable insulation boxes shall be formed with 28g. G.I. or aluminium sheet cladding so that the valves and strainers can be easily serviced.

10. All insulated piping within the Building shall have a jacket of 8 oz canvas fixed with the insulation with water & vapour proof, washable, anti fungus type Zahabiya Sealing Adhesive Coat ZSAC-10/55 and joints lapped atleast 40mm and sealed. The jacketing shall be immediately given two coats of same compound ZSAC-10/55 which is not to be diluted, except when essential with upto 5% demineralised water only.

11. The insulation and 8 oz. canvas jacket shall be further mechanically secured with the piping with 20mm wide soft aluminium bands, generally spaced at 450mm and on either side of elbows, tees, branch-offs, valves and specialities.

12. The insulated piping in the plant rooms and near the equipment at levels 2m and below shall be further protected with a jacket of 28g G.I. or aluminium sheet.

13. External and weather exposed insulated piping shall be further protected with an external jacket as specified in the Schedule of Materials. The external jacket may be of 28g G.I. or aluminium sheet.

14. Insulated piping buried in ground shall be protected as specified in the Schedule of Materials.

15. The hangers, guides, rollers, clamps, etc. shall not pierce the insulation. The insulation on steam and condensate return piping shall be protected by wooden saddles and on all other piping it shall be protected by metal shields. For piping above 50mm NB size insulated with fiberglass, etc. or foamed polyurethane insulation, full section of premoulded cork insulation or minimum 96Kg/cum. density fiberglass preformed insulation of thickness equal to the main insulation shall be used at the supports, hangers, etc.

16. The cellular glass insulation shall be of Pittsburgh Corning Foamglass, fiberglass insulation of ACI/Arabian Fiberglass/Izocam/Johns-Manville/Kimco manufacture or approved equal. The foamed polyurethane insulation and rockwool insulation of Pakistan Insulations Ltd. manufacture or approved equal. The flexible foamed plastic insulation to be of Aerofoam/Aeroflex/Foamflex/Insulflex or approved equal.

17. The tenderer shall confirm the type and thickness of insulation offered and give complete technical details of insulation, vapour barrier, covering jacket, finishing and adhesive, and supply manufacturers' technical bulletins.

INSTALLATION

01. The Contractor shall be responsible for the supply, manufacture, fabrication, assembly and installation of all the above items and all other items, accessories and materials required to complete the installation and make the plant ready for operation in all respects.

02. The installation work shall include all rigging, setting, assembling, aligning and grouting necessary to prepare each of equipment and its integral parts for normal continuous operation in locations shown on drawings and special attention shall be paid to all installation notes on the drawings and instructions in the manufacturers' technical bulletins.

03. The Contractor shall arrange for progressive shipment of equipment/materials with emphasis on early delivery for the items to be installed in the occupied areas. The shipments should commence and be completed within the periods specified in the Memorandum.

04. The Contractor shall be required to complete the work in all respects on floorwise basis. All work in an occupied floor will be completed and tested in all respects and then the Contractor will not be allowed to do any other work in that floor or interfere with the building finishing work of the Main Contractor except for the final testing and adjustment when the complete plant is commissioned and operated.

05. The Contractor shall be required to complete the installation in the occupied areas progressively and the entire installation within the times stipulated in the Memorandum.

06. The Contractor shall follow the procedures outlined in manufacturers' instruction books for handling, setting, assembling, installing, aligning, grouting etc. of equipment. For equipment not supplied with instruction books, the Contractor shall follow standard practices that are acceptable to the Engineer/ manufacturer taking all precautions to prevent damage to the equipment. The Contractor shall advise the Engineer of the installation procedure to be followed for each equipment and shall keep the Engineer informed as to the progress of the installation.

07. Equipment which is not weather proofed or which may be designated by the Engineer as subject to damage if exposed to the elements shall be covered and protected with tarpaulins or other approved means.

08. All equipment such as pumps, motors, refrigeration machines, air compressors, etc. shall be set carefully to the proper line and elevation and aligned, then bolted down and grouted in place.

09. After the piping has been installed, the coupling halves connecting driving and driven portions of equipment shall be checked for alignment. Wherever misalignment is found, the coupling halves shall be disconnected and the equipment shall be realigned. Piping or duct work which is connected to any equipment shall be supported by adequate hangers or other supports and shall be entirely free of any supporting assistance by the equipment. When the alignment is correct, the equipment shall be drilled and dowelled to the base plate. Accurate records shall be kept for the aligning of all rotating equipment.

10. Coupling bolts shall not be installed permanently until the correct direction of rotation has been established for the equipment. Wherever the manufacturer has not provided a directional arrow or marker, the Contractor shall provide the same.

11. Equipment subject to expansion or contraction due to heat or handling hot or cold fluids shall be rechecked after operation under design service conditions for a minimum of 24 hours and if necessary shall be realigned.

12. All uncrating, unpacking, cleaning, degreasing, removal of skids, protective covering and inspection prior to installation shall be performed by the Contractor. Due diligence and extreme care shall be exercised to prevent distortion and damage when unloading and moving equipment to its proper location. Ropes or slings shall be attached to the equipment as recommended by the manufacturer and in such a manner that the weight is properly distributed without abnormal strain on the equipment.

13. All equipment shall be inspected prior to start-up by the Contractor. All work required to satisfy the inspection at the time of start-up such as but not limited to unbolting of covers, access doors, special scaffolding for inspection, removal of foreign matter, removal of belt guards, tightening of hold down bolts and flanges, etc. shall be performed by the Contractor.

14. All required protection of shafts, flanges and similar parts of the equipment by grease coating or otherwise shall be provided.

15. The Contractor shall furnish and install extension handles, extension oil cups or such similar fittings or appliances for lubrication, etc. of all equipment where same is not easily accessible, unless otherwise specified or shown on the drawings.

16. Interferences. The Contractor shall coordinate the work of the different trades in order that interference between mechanical, electrical, architectural and structural work will be avoided. Piping, ducts, etc. shall be kept as close as possible to

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ceilings, walls, columns etc. in order to take up minimum space and all off-sets, fittings
etc. required shall be furnished and installed by the Contractor without additional
expense to the Employer. In case interference develops, the Engineer will decide which
equipment, piping, etc. shall be relocated, regardless of which was first installed.

PAINING

01. The Contractor shall paint all equipment, ducting, piping, hangers, bracing and other surfaces exposed to air as specified and he shall also be responsible for all finish painting. The minimum number of coats are specified hereinunder but sufficient coats shall be given to achieve desired finish.

02. To the extent possible the Contractor will carry out the painting alongwith completion of installation particularly in the occupied areas to avoid interference later on with other contractors or Building completion schedule.

03. Material for painting shall be high grade products of well known approved manufacturers and when approved shall be delivered on the site in original unbroken packages bearing the maker's name and brand. Paints of approved colour only shall be used for each application.

04. Unplatted steel and iron and primed hardware shall match the work to which it is attached, unless otherwise directed.

05. Stainless steel devices shall not be painted.

06. All surfaces shall be clean, dry and free from dust at the time any coating is applied. Base coats provided by others shall be in good condition and the surfaces well covered by touching any bare or abraded spots. Base coats on works subject to close inspection shall be rubbed smooth.

07. Interior painting shall not be done when temperature is below 0°C. Enamel shall not be applied when temperature is below 20°C. Exterior painting shall not be done in frosty, foggy or damp weather or when temperature is below 10°C.

08. All cloth and cotton waste that might constitute fire hazards shall be placed in closed metal containers or destroyed each day. Upon completion of work, all containers shall be removed from the site and destroyed in an approved manner. Paint spots, oil or stains upon adjacent surfaces shall be removed.

09. All equipment and motors shall be painted with three coats of enamel paint in the factory and shall be carefully cleaned and oiled after installation. In case the original paint has been damaged, fresh coats of enamel paint to match the original paint shall be given.

10. All duct, pipe and equipment MS hangers and supports shall be thoroughly wire brushed and given one coat of Buxly Corroless-S primer or approved equal and one coat of synthetic enamel paint before installation. MS hangers and supports visible in the occupied areas, plant rooms and other locations shall be given finish coat of synthetic enamel paint on completion of installation.

11. The interior of all ducts and outlet boxes at the back of air grilles, registers and diffusers shall be painted with two coats of dull black paint.

12. All MS ducting, piping and surfaces and unpainted equipment required to be insulated shall be thoroughly wire brushed and applied one coat of black asphalt paint before insulation is fixed.

13. All uninsulated MS piping, MS ducting and surfaces, MS manufacture and unpainted fan casings, chambers and equipment shall be thoroughly wire brushed, given one coat of Buxly Corroless-S primer or approved equal and finished with two coats of synthetic enamel paint.

14. All uninsulated GI ducting and piping concealed or in plant rooms shall not be painted. The visible G.I. ducting and piping in the occupied areas shall be given two coats of synthetic enamel paint.

15. All 8 oz weight canvas jacketed insulated ducting and piping shall be given two coats of anti fungus water & vapour proof washable type Zahabiya Sealing Adhesive Coat ZSAC-10/55 or approved equal.

In locations where the insulated ducting and piping is exposed and visible within the Building, such as plant rooms, working spaces, basements, attics, passages and occupied areas, these shall then be given two finishing coats of synthetic enamel paint.

16. All ducting and piping with Venture Clad 1577CW jacket-cladding shall not be painted.

17. The ducting and piping shall be painted according to a colour code approved by the Consultant for identification. Where full painting is not specified, colour code strips shall be painted at intervals. Symbols and flow directional arrows shall also be stencilled according to a Schedule approved by the Consultant.

18. All wood surfaces coming in contact with the Building structure shall be given a heavy coat of solignum anti termite wood preservative paint. All other concealed wood surfaces shall be given one coat of anti fungus water repellent primer. All boards made of wood chips, etc. shall be given one coat of anti fungus water repellent black paint on the inner surfaces. All visible surfaces shall be given dull mat finish with synthetic enamel paint.

CHARTS AND TAGS

01. The Contractor shall supply reproducible transparencies and four copies each of charts or diagrams showing outline plans of the structure and describing essential features of all the components of the installed systems for the purpose of identifying location of all control points, valves, etc. for easy operation, maintenance and servicing.

02. The Contractor shall provide identifying brass tags for all valves, controls etc. with numbers corresponding to those given in the charts or diagrams specified above. The 20g brass tags shall be atleast 30mm dia, the numbering shall be stamped and tags fastened to the controls and valves with brass chains and hooks.

03. The Contractor shall supply reproducible transparencies and four copies each of charts indicating Schedules of daily start-up and shut down, emergency shut down, Schedules of servicing and maintenance, lubrication points and schedule, and a Chart listing equipment model and serial Nos., conditions of operation, normal settings of automatic and safety controls, data of accessories and motors, manufacturer's name and address and reference Nos. of technical and spare parts catalogues supplied to the Employer.

04. One set of charts and diagrams shall be mounted in glass frame and permanently fixed according to the Engineer's directions.

05. The Contractor shall submit to the Consultant for approval the list of charts, diagrams etc. which he proposes to supply. The quality of reproducible transparency sheets shall be as approved by the Consultant.

CLEANING, TESTING AND ADJUSTING

01. The Contractor shall during construction properly cap all pipe and duct open ends to prevent the entrance of dirt etc. Each piping and ducting circuit shall be flushed/blown through after completion of installation and again immediately before the testing and commissioning of the Systems, for as long a time as necessary to thoroughly clean that circuit.

02. All air ducting sections shall be given a pressure test before fixing insulation and cutting openings for air devices. Any opening made shall be sealed off with air tight metal caps or any other convenient device for giving the pressure test.

The ducts shall be pressurised with a rotary blower or nitrogen cylinder:

- (a) Low pressure ducts upto 50mm wg.
- (b) Medium pressure ducts upto 150mm wg, and
- (c) High pressure ducts upto 250mm wg.

All seams and joints shall be checked and all audible and noticeable leaks repaired in a good workmanlike manner by filling the joint/seam with a sealant, Zahabiya Soft Special ZSP-1191 with a sealing gun or approved equal, corner cavities filled with Zahabiya sealing gum ZSG-12/99. Sealant preferably applied from inside of the joint so that the air pressure tends to force the sealant into the joint.

The Contractor shall follow SMACNA procedure to carry out final measured leakage test for medium or high pressure ducting. A cfm leakage upto 10% of the volume of the duct section under test shall be permissible.

03. All steam and water piping shall be tested with a hydraulic pressure of 1-1/2 time the operating pressure, but not less than 3.5 bar for LP steam and 10 bar for water or at pressures approved by the Consultant, for sufficient time to detect leaks and defects.

Piping for gaseous systems shall be tested with dry air at 1-1/2 time the operating pressure but not less than 3.5 bar.

All leaks and defects shall be made good in a proper workman-like approved manner. If necessary, piping shall be taken down and reerected and any make shift or temporary repair of leaks will not be permitted. In final test the pressure shall be maintained for atleast three hours.

04. All pneumatic piping shall be tested at a pressure of 1-1/2 time the operating pressure but not less than 2 bar on the low side and 6 bar on the high side. Any leaks shall be made good. In final test the pressure shall be maintained for atleast six hours.

05. All refrigerant piping shall be tested with dry nitrogen at a pressure 1-1/2 time the operating pressure or at the test pressure limits fixed by the manufacturer. Refrigerant-22 systems shall be tested at 10/20 bar on the low/high sides respectively but air cooled Refrigerant-22 high side at 27 bar. The pressure shall be maintained for sufficient time to detect leaks and defects. All leaks and defects shall be made good in proper workman like approved manner. If necessary the piping shall be taken down and re-erected and any make shift or temporary repair of leaks will not be permitted. The pressure shall be maintained for atleast 24 hours in the final test. The system shall subsequently be given 975 mbar vacuum test for sufficient time to detect leaks and defects. Final vacuum shall be maintained for atleast 24 hours.

06. The Contractor shall test (including megger tests for insulation values, and continuity of circuits) all electric motors, electric wiring and earthing and furnish test records to the Engineer.

07. After the entire installation has been completed, the Contractor shall operate the equipment under normal working conditions making all necessary adjustments in the equipment, plants, balancing valves, automatic controls, air vents, pressure reducing valves, air dampers, air devices, etc. until all requirements of performance are met.

08. All water circulating systems shall be properly balanced for the specified flow through each circuit/equipment.

09. Air Balancing.

All air systems shall be adjusted and operated for as long a time as necessary to test air flow in all parts of a system and the Contractor shall make all necessary adjustments to obtain proper and uniform air distribution throughout the Building, meeting the specified design requirements. The Contractor shall arrange for this purpose high quality instruments and meters duly calibrated and certified by the manufacturer and having all necessary probes, jets, scoops and collectors for measuring supply, return, fresh and exhaust air velocities and cfm, static pressure and total pressure in the ducts, plenums, fans, airhandling equipment, supply, return, fresh and exhaust air devices (grilles, registers, diffusers and louvers). The suggested instruments are Alnor Series 6000-P Velometer or Alnor Compu Flow Electro Manometer with Micro Printer, Cambridge-Alnor PMS Meter and Dwyer combination Manometer-Air Velocity Meter. The Contractor shall inform the Consultant about the instruments he proposes to use.

Air balancing and testing shall not begin until the system has been completed and is in full working order.

The Contractor shall submit to the Consultant for approval the biodata of his Engineer or the specialist Subcontractor to be deputed for the work.

The Contractor shall follow the following procedure:

- (a) Prior to start of air balancing, the Contractor shall check:

The rotation of all fans.

Verify that all fire dampers are open.

All balancing dampers (including dampers in mains, branches and air devices) are fully open.

Splitter dampers are in normal position.

All automatic dampers adjusted for summer operation.

All filters are clean.

All coils are in normal operation.

- (b) The Contractor shall proceed with the air balancing as follows:

Test and adjust fan rpm to design requirements.

To meet the design specified cfm requirements, after preliminary balancing and damper adjustment, it may be necessary to re-adjust fan speed by adjusting or replacing variable or fixed pitch pulleys.

Check that fan motor is not overloaded.

Make pitot tube traverse of main supply air duct at 150mm centres in straight duct sections and obtain design cfm at fans.

Test, adjust and record system suction and discharge static pressures.

Test and adjust each system for supply air, return air, fresh air and exhaust air cfm.

Adjust all dampers in main and branch supply, return, fresh and exhaust air ducts to obtain design cfm for each system and zone.

Test and adjust each air device regarding fpm and cfm within 10% of design requirements. Each air device shall be identified as to location and area.

- (c) The test data shall be recorded in forms to be approved by the Consultant. After completion of final testing and balancing, complete record of all final readings shall be prepared and submitted to the Consultant in duplicate for approval.

- (d) The Consultant shall spot check finally balanced air systems with the submitted record and if the specified requirements are met, they will issue a Certificate of acceptance to the Contractor.

TEST RUNS

01. The Contractor shall be required to carry out test run(s) as specified in the Memorandum of Tender after the issue of the Certificate of Substantial Completion for the complete works by the Engineer. The period for the test run(s) would be designated in writing by the Engineer. The test run observations shall be recorded in duplicate by the Contractor on printed log sheets approved by the Consultant. The Contractor shall depute an experienced Site Engineer and sufficient skilled labour for taking and recording test run observations. The normal plant operation shall be carried out by the Employer's Operators.

02. The Employer shall only provide without charge to the Contractor water, electricity and fuel for the test run(s) and the Contractor shall be responsible for the supply of all tools and instruments etc. required to take and record the test run observations.

03. The log sheets shall be jointly signed by the Employer's Representative and Contractor's Site Engineer. The Contractor shall hand over one set of log sheets to the Employer's Representative every day.

04. The Contractor's Project Engineer shall check and prepare a summary of observations on printed forms approved by the Consultant in quadruplicate at the end of each test run week. One set each shall be supplied to the Engineer, Consultant and Employer's Representative within one week of the conclusion of the corresponding test run week.

05. The Engineer shall check the performance of the plant(s) during the test run(s). If the plant(s) performance meets the specified requirements, the Engineer shall issue a Certificate of satisfactory completion of test run(s) to the Contractor.

MAINTENANCE

01. The Contractor shall be responsible without additional charge to the Employer for maintenance and servicing of the complete plant during the period of maintenance named in the Memorandum after the issue of the Certificate of Substantial Completion by the Engineer.

02. The Contractor shall be responsible for arranging all tools, instruments and Technical Staff including Specialist Technicians/Engineers required for the work. The Employer shall be responsible to supply all materials and spare parts required for the work excluding parts defective due to manufacturing defect which shall be replaced by the Contractor under the terms of the contract.

03. The Contractor shall service the complete plant regularly according to the Schedule of Servicing and Maintenance as approved or amended by the Consultant but not less than once a month during the operational seasons. The servicing and maintenance shall be carried out by competent skilled labour under supervision of a qualified Engineer.

The Contractor shall take a certificate of satisfactory completion of monthly servicing from the Employer's Representative.

04. The Contractor shall carry out annual servicing, maintenance and overhauling of the complete plant at the end of the operational season and make the plant ready for operation in all respects well before the commencement of the next operational season. On receiving notification from the Contractor that annual servicing, etc. is nearing completion, the Consultant shall check the work carried out and give directions to the Contractor for completion of outstanding work, if any.

05. On satisfactory completion of annual servicing, maintenance and overhauling of the complete plant, the Engineer shall issue a Certificate of satisfactory completion to the Contractor.

SPECIAL TOOLS AND INSTRUMENTS FOR MAINTENANCE

01. The Contractor shall supply to the Employer all necessary special tools and instruments required for proper operation, servicing and maintenance of the complete plant.

02. The tenderer shall give a complete List of special tools and instruments included in his tender.

03. Amongst others, following shall be included without limitation:

- (a) Tong Tester of suitable range with Amp, Volt and ohm scales.
- (b) Phase Tester.
- (c) Sling psychrometer with 140mm long 0-50°C range thermometers.
- (d) Electric motor driven high pressure air blower for cleaning.
- (e) One set each of open end, ring and adjustable spanners.
- (f) One set each of flat and Phillips head screw drivers.
- (g) Set of hammers.
- (h) Two pliers with flat and pointed nose.
- (i) One set of cleaning and washing tanks for air filters.

SPARE PARTS

01. The tenderer shall include the price of complete set of spare parts for all items supplied by him required for two years operation for the specified operating hours. In particular, spares shall be provided for electrical equipment, fuses, controls, instruments, bearings, flexible couplings, belts, gaskets, O-rings, etc. without which the equipment would become non-operative.

02. The tenderer shall give a complete List of all the spare parts included in his tender.

Approved Make for Air Conditioning System

S.No.	Item	Approved Make
1	Split System	1. L.G – Korea 2. General-Thailand 3. Hitachi-Japan 4. Mitsubishi-Japan Approved Equal
2	Refrigerant pipes	1. Mueller (USA) Approved Equal
3	Pipe/Duct Insulation	1. Aeroflex (Thailand) 2. Aerofoam-UAE Approved Equal
4	UPVC Pipe	1. Dadex 2. AGM 3. Steelex Approved Equal
5	Electric Cables & Wires	1. Pakistan Cables Approved Equal
6	Ventilation/Air Curtains Fan	1. GreenHeck 2. S&P Fans Approved Equal
9	Concrete Fasteners & anchors	1. Hilti (UK/Germany) 2. Fischers (Germany) Approved Equal
10	Paints	1. ICI (Pakistan) 2. Berger (Pakistan) Approved Equal
11	Motors	1- Siemens 2- ABB 3. Approved equal
12	M.C.C & CABLE TRAY	1- Karimi Electric 2- Sunbeam 3- Husain & co. 3- Approved equal
13	Refrigerant Isolation Valve	1- Danfoss 2- Mueller 3- Emersion 4- Approved equal
14	Control wire	1- Belden 4- Approved equal
15	Aluminum Tape	1-Abro industries (USA) Approved Equal 2-
16	Vapor Barrier Coating	1. Foster (USA) 1- Approved Equal

NOTE:

Equipment & Material shall be supplied only from the authorized distributor. The Contractor shall submit complete technical details of the equipment, material and obtain Consultants approval prior to delivery on site. In case of "Approved Equivalent", it shall be at the discretion of the Consultant to accept the alternate proposal submitted by the Contractor.

Approved Make for Remaining Electrical Work

S. #	MANUFACTURER	CONTACT NO.	CONTACT PERSON
1	LV Panels & Distribution Boards		
	Hussain & Co.	021-3636-7002 0333-2315658	Mr. Raza Hussain
	Sunbeam Engineers	0333-7272378 021-35061083-752	Mr. Nouman Sheikh
2	Lighting Fixtures		
	Philips	021-35382992 0300-8285975	Mr. Zaheer Sultan
3	Low Voltage Wires and Cables (LSZH)		
	Pakistan Cables	021-3256-1170 ,75 0301-2844690	Mr. Wasim
4	Switches , Sockets & Dimmers		
	Schneider, (Clipsal Pakistan)	021-111-081-081 0301-8201906	Mr. Faraz
	MK, (Leiamra Engineering)	021-34558611-12 0300-2318227	Mr. Shoaib
5	PVC/UPVC Conduits & Accessories		
	Dadex	111-000-789 021-3431-3881	Ms. Samra
	Civic Pipes	0300-3945580	Mr. Mohsin
6	Cable Lugs		
	3M	021-3263-6011 0321-2555010	Mr. Habib ur Rehman
	Cembre	021-3536-0916 0300-2008982	Mr. Moazzam
7	GI/Steel Conduits & Accessories		

	International Industries Limited (IIL)	021-32313508	Mr. Azam
8	Cable Trays / Ladder & Accessories		
	Hussain & Co.	021-3636-7002 0333-2315658	Mr. Raza
	Zain Lighting	021-3666-9967 0321-9200546	Mr. Ejaz
	Electrech	021-34321590 0301-8212020	Mr. Rizwan
9	Linear Aluminum Channels / Wall Trunking		
	Japan Metal Industries	0312-1006233	Mr. Babar
	Zain Lighting	021-3666-9967 0321-9200546	Mr. Ejaz
10	MS Back Boxes / Ceiling Pull Boxes (Local)		
	Hussain & Co.	021-3636-7002 0333-2315658	Mr. Raza
	Falcon Engineering	021-3507-4719 0321-2449043	Mr. Saleem Siddiqui
11	Floor Service Outlet Boxes (Imported)		
	Davis (Clipsal Pakistan)	021-111-081-081 0301-8201906	Mr. Faraz
	MK, (Leimra Engineering)	021-3455 8611-12 0300-2318227	Mr. Shoaib
	Legrand (Mega Plus)	021-34300872~3 0346-2759190	Mr. Abdul Yasir
12	Junction /Pull Boxes Imported		
	S.A Hamid & Co. (Hensel , Germany)	0301-847226442- 3594-9261	Mr. Shahzad Latif
	Zain Lighting	021-3666-9967 0321-9200546	Mr. Ejaz
13	Industrial Sockets and Isolators		

	Gewiss (Overseas Enterprise)	021-35891691-94 0300-8416328	Ms. Mona Zubedi
	Schneider, (Clipsal Pakistan)	021-111-081-081 0301-8201906	Mr. Faraz
	S.A Hamid & Co. (Walther, Germany)	0301-8472264 42-3594-9261	Mr. Shahzad Latif
14	Network Cables / Voice and Data & Equipments		
	3M,USA (3M-Pakistan)	021-3263-6011 0321-2555010	Mr. Habib ur Rehman
15	Communication Racks (Improted Brand)		
	3M,USA (3M-Pakistan)	021-3263-6011 0321-2555010	Mr. Habib ur Rehman
16	Fire Alarm System (Wiring Only)		
	Prysmian, FP Plus (Solution Cloud)	0321-2554234 0334-3086609	Mr. Shahzaib Ahmed
	Cavicel SR 114E (C-XOR)	042-35446195 0300-8477751	Mr. Aamir Kardar
	Ramcro by Secure Vision	021-34830466 0301-8502042	Mr. Ahmed Ali
17	Public Address System (Wiring Only)		
	Pakistan Cables	021-3256-1170 ,75 0301-2844690	Mr. Wasim
18	Fire Alarm System		
	Zeta, UK (Secure Vision)	021-34830466 0301-8502042	Mr. Ahmed Ali
	Bosch, Kingdom International	021-3452-8801 0336-8225515	Mr. Yasir Azam Hashmi
	IAS Morley by Honeywell (UK) by Telecom Engineering	0335-3035765 0345-2778965	Mr. Mirza Atiqullah
	Schrack by HK Shah	021-35670406 021-35671570	Mr. Mujtaba
19	Public Address System		

	TOA (Secure Vision)	021-34830466 0301-8502042	Mr. Ahmed Ali
	Bosch, Kingdom International	021-3452-8801 0336-8225515	Mr. Yasir Azam Hashmi
	Honeywell (USA) by Telecom Engineering	0335-3035765 0345-2778965	Mr. Mirza Atiqullah
20	IP Based CCTV System		
	Honeywell EquiP Series, Telecom Engineering	0335-3035765 0345-2778965	Mr. Mirza Atiqullah
	Bosch, Kingdom International	021-3452-8801 0336-8225515	Mr. Yasir Azam Hashmi
	Axis (Secure Vision)	021-34830466 0301-8502042	Mr. Ahmed Ali
21	Access Control System		
	Virdi (Secure Vision)	021-34830466 0301-8502042	Mr. Ahmed Ali
	HID (USA) by Telecom Engineering	0335-30357650345- 2778965	Mr. Mirza Atiqullah
	Bosch, Kingdom International	021-3452-8801 0336-8225515	Mr. Yasir Azam Hashmi
22	Co-axial Cables		
	Actasi by Schneider (Clipsal Pakistan)	021-111-081-081 0308-2229597	Mr. Jahanzaib Inam
	Commscope by Infracol	0300-8263664 0317-7111020	Mr. Rahim
	Leviton (USA) by HK Shah	021-35670406 021-35671570	Mr. Mujtaba
	3M, USA (3M-Pakistan)	021-3263-6011 0321-2555010	Mr. Habib ur Rehman
23	Lighting Control System		
	Schneider, Australia (Clipsal Pakistan)	021 111 081 081 0308-2228958	Mr. Hamza Shamim Siddiqui
	ABB, Germany (Zain Com)	021-3413-1304-05 0332-2233088	Mr. S.Mudassir Ali Hashmi

24	UPS / Isolation Transformers		
	ABB (S.M Jaffer)	021-111-765-765 0333-3796237	Mr. Mehmood
	APC (CNS Engineering)	21-34326707, 34311940 0322-8440899	Mr. Zubair Ahmed
	Vertiv (Silicon Technologies)	0321-8755328	Mr. Raheel Qamar
	Eaton by Greaves Pakistan	0300-2725094 0322-2937272	Mr. Anis ur Rehman
25	Enclosed Bus Assemblies		
	Schneider Electric (France) by Schneider Electric, Pakistan	021-3637-7259 0333-2384205	Mr. Farhan Malik
	Gersan (Turkey) by Hussain & Co.	021-3636-7002 0333-2315658	Mr. Raza Hussain
	Pogliano (Italy) by Jubilee Corporation	0304-2497344	Mr. Shaikh Hammad
26	Earthing System and Lightning Protection System		
	Vital Power	0300-9292966	Mr. Saleem
	Consumer Electric	021-3536-0916 0300-2008982	Mr. Moazzam
	C-XOR Engineering	042-35446195 0300-8477751	Mr. Amir Kardar
	<p>NOTE: The provided contact names and numbers are only for reference and ease of approach to the suppliers of recommended brands. They are not to be considered short listed by any means. But still the Consultant holds the right to discard any supplier, keeping in view the past record and quality of their product.</p>		

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AIR CONDITIONING WORK , REMAINING ELECTRICAL AND ALLIED WORK

BOQ. Item#	Description	Unit	Quantity	Rate	Amount
A) WIRING / WIRING ACCESSORIES					
1	Providing & wiring of light point controlled through one switch, wired with 3 x 1.5 mm ² , 1 core CU/PVC insulated cable in already existing PVC Conduit concealed in slab / wall or precast slab as required, complete with all accessories such as ceiling rose, pvc junction box, flexible PVC conduit & wire between ceiling rose and light fixture, complete in all respects and ready for use. (Manufactured Pakistan Cables Ltd. / or equivalent as directed by Engineer Incharge.)	No	414.00		
2	Same as item No 01, above but, wiring of Light Point to Point controlled through the same switch.	No	82.00		
3	Providing & wiring of Exit. Sign Lights wired with 3 x 2.5 mm ² , 1 core CU/PVC insulated cable in already existing PVC Conduit concealed in slab / wall as required, complete with all accessories complete in all respects as directed by Engineer Incharge. (Control Direct from P.DB-UPS)	No	30.00		
4	Same as item No 01, above but, wiring of Ceiling Fan point, complete in all respect.	No	131.00		
5	Same as item No 01, above but, wiring of Exhaust fan point, complete with all respect.	No	23.00		
6	Providing, wiring & circuits for light points from distribution board to respective switch boxes & (switch box to switch box) as shown on the drawing wired with 3x2.5mm ² 1 core CU/PVC insulated cable in 25mm dia PVC conduit or pvc channel at slab/wall/column, complete with all conduit & wiring accessories.	No	206.00		

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AIR CONDITIONING WORK , REMAINING ELECTRICAL AND ALLIED WORK

BOQ. Item#	Description	Unit	Quantity	Rate	Amount
6	Providing & wiring of 15 Amps 3 pin power socket outlet wired with 2x4mm ² +1x2.5mm ² CU/PVC insulated cable in 25mm dia PVC conduit recessed in wall/floor, complete will all conduit & wiring accessories Note: Any outlet coming within range of 2m will not be charged separately and its cost must be inclusive in cost of first outlet.	No	33.00		
7	Same as above item but wiring from outlet to outlet.	No	15.00		
8	Providing & wiring of 10 Amps 2/3 pin switch socket outlet wired with 3x2.5mm ² 1 core CU/PVC insulated cable in 25mm dia PVC conduit recessed in wall/floor, complete will all conduit & wiring accessories Note: Any outlet coming within range of 2m will not be charged separately and its cost must be inclusive in cost of first outlet.	No	328.00		
9	Same as above item but wiring from outlet to outlet.	No	210.00		
10	Providing & wiring of 13 Amps 3 pin switch socket outlet wired with 3x2.5mm ² 1 core CU/PVC insulated cable in 25mm dia PVC conduit recessed in wall/floor, complete will all conduit & wiring accessories Note: Any outlet coming within range of 2m will not be charged separately and its cost must be inclusive in cost of first outlet.	No	362.00		
11	Same as above item but wiring from outlet to outlet.	No	180.00		
12	Providing installing & wiring for 250w School Bell with 2x4mm ² + 1x2.5mm ² 1 core PVC cable in 20mm dia conduit, complete with all accessories including termination. As per drawing complete in all respects.	Rft	1832.00		

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BOQ. Item#	Description	Unit	Quantity	Rate	Amount
	Wiring for Air Conditioner unit Providing, installing, terminating, testing and commissioning of following size single or multicore CU/PVC/PVC cable 600/1000 volts grades in suitable PVC conduit/cable tray concealed in floor / wall/ ceiling, Complete in all respects as per drawing, specification and directed by Engineer in charge. Manufacture: Pakistan Cable Note. Payment of pvc conduit or cable Tray will be paid separately through following given items.				
13	3Core 6mm ² CU/PVC/PVC CABLE AS E.C.C From HVAC - DB to respective switches or air conditioner and Outdoor to Indoor	Mtr	2790.00		
14	4Core 6mm ² + 1Core 6mm ² CU. PVC CABLE AS E.C.C From HVAC - DB to respective switches or air conditioner and Outdoor to Indoor	Mtr	618.00		
15	Providing, laying testing and commissioning of 4Pair, CAT-6a cable (27 AWG, 57 ^{0C}) as shown on drawing complete in all respects as directed by Engineer Make: HIKVISION / equivalent	Mtr	3500.00		
B) FEEDER AND SUB- FEEDER					
	Providing, laying, testing and commissioning of following size single or multicore CU/PVC cable 600/1000 volts grades in suitable PVC conduit concealed in floor / wall as shown on drawings, and as directed by Engineer				
1	95mm ² 4core cu/pvc/pvc cable+ 2x50mm ² 1core cu/pvc cable	Mtr	300.00		
2	50mm ² 4core cu/pvc/pvc cable+ 2x25mm ² 1core cu/pvc cable	Mtr	380.00		
3	35mm ² 4core cu/pvc/pvc cable+ 2x16mm ² 1core cu/pvc cable	Mtr	210.00		
4	25mm ² 4core cu/pvc/pvc cable+ 2x16mm ² 1core cu/pvc cable	Mtr	340.00		

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BOQ. Item#	Description	Unit	Quantity	Rate	Amount
5	16mm ² 4core cu/pvc/pvc cable+ 2x10mm ² 1core cu/pvc cable	Mtr	490.00		
6	6mm ² 4core cu/pvc/pvc cable+ 2x4mm ² 1core cu/pvc cable	Mtr	330.00		
C) CABLE CONTAINMENT					
1	Providing & laying of following size PVC conduit buried in ground or concealed in wall/floor, or surface as required including all conduit accessories for Electrical/Tel system complete as per drawing and specification. Dadex/ Pak Arab / or equivalent as directed by Engineer incharge.				
1.1	20mm dia pvc class-E conduit	Mtr	3000.00		
1.2	25mm dia pvc class-E conduit	Mtr	15000.00		
1.3	38mm dia pvc class-d conduit	Mtr	200.00		
1.4	50mm dia pvc class-c conduit	Mtr	500.00		
1.5	100mm dia upvc pipe class-b conduit	Mtr	60.00		
1.6	150mm dia upvc pipe class-b conduit	Mtr	30.00		

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BOQ. Item#	Description	Unit	Quantity	Rate	Amount
2	<p>G.I Cable Tray/Channel/Ladder: Providing, laying, cutting, fitting, fixing & fabricating of following sizes of hot dip galvanized iron, 14 gauge, rectangular, Electrostatic Powder Coated, Solid/Perforated G.I Cable Tray/Channel with 14 gauge cover, heavy duty brackets, hangers, supports, all required accessories for fixing in wall/ hanging under ceiling/ placing on floor (for support in wires and AC conduits), protection to exposed channel with approved paint & cleaning, , Complete in all respects as per drawing, specification and directed by Engineer in charge. Manufacturer: Cable Tray: Hussain & Co/ Ezzi Engineering/ Equivalent Cable Tray accessories : Mungo / Equivalent</p>				
2.1	a) 4" X 3"	Rft	6355.00		
2.2	b) 9" X 4"	Rft	1276.00		
2.3	c) 9" X 24"	Rft	253.00		
3	Providing & installing of SS pull box powder coated size wall mounted 12"x12" and 3" deep with cover	No	20.00		
4	Providing & installing of SS pull box powder coated size wall mounted 18"x18" and 3" deep with cover	No	52.00		
5	<p>Construction of Rectangular 3' X 3' Manholes/Hand Hole (Depth as per site) including excavation, backfilling, removing surplus excavated material, concrete, Brick Masonry , reinforcement with Grade-60 Amreli Steel , waterproofing, Plaster, including fixing of cover complete in all respects as per drawing, specification and as directed by Engineer in charge. Note. Rate of Cover is not included in this Item and will be paid separately.</p>	No	8.00		
6	Providing & fixing and finishing of C.I / R.C.C Heavy duty Cover of Size 24"x24" for Manhole complete in all respect as directed by Engineer.	No	8.00		

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BOQ. Item#	Description	Unit	Quantity	Rate	Amount
D) SWITCHES & SOCKETS					
1	Providing, fixing & connecting of " CLIPSAL" make Gang switches , fixed on already existing steel back boxes recessed in wall or surface , as required, complete in all respect.				
1.01	10 Amps switch one gang	No	21.00		
1.02	10 Amps switch Two gang	No	129.00		
1.03	10 Amps switch Three gang	No	17.00		
1.04	10 Amps switch Four gang	No	30.00		
1.05	10 Amps switch Five gang	No	40.00		
1.06	10 Amps switch Six gang	No	29.00		
1.07	10 Amps switch 2WAY for stair	No	31.00		
1.08	2PIN Shaver Socket	No	18.00		
1.09	10A Ceiling fan dimmer with switch	No	270.00		
1.10	10A Ceiling fan dimmer with switch (DUPLEX)	No	136.00		
2	Providing, fixing & connecting of " CLIPSAL " make 13/15 Amps, 3 pin switch socket outlet in already existing 1.5mm thick sheet steel back box recessed in wall complete in all respects as directed by engineer incharge.	No	33.00		
3	Providing, fixing & connecting of " CLIPSAL " make 13 Amps, 2/3 pin switch socket outlet in already existing 1.5mm thick sheet steel back box recessed in wall complete in all respects as directed by engineer incharge.	No	538.00		

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BOQ. Item#	Description	Unit	Quantity	Rate	Amount
4	Providing, fixing & connecting of " CLIPSAL" make 13 Amps, 3 pin switch socket outlet (duplex) in already existing 1.5mm thick sheet steel back box recessed in wall complete in all respects as directed by engineer incharge.	No	542.00		
5	Providing, fixing 1.5mm thick galvanized steel back boxes of size 3"X3" in wall or surface , as required, complete in all respect.	No	100.00		
6	Providing, fixing 1.5mm thick galvanized steel back boxes of size 3"X6" in wall or surface , as required, complete in all respect.	No	50.00		
7	Providing, Installation, of CLIPSAL make Floor Box with cover, 1.5mm thick sheet steel fabricated floor mounted water tight weather proof suitable for 4No. Outlets complete in all respects.	No	42.00		
8	Installation Face plate with I/o with Tagging for Networking Points Providing, laying testing and commissioning of Installation Outlet Socket/Face plate with Tagging for Computer Networking system complete in all respect as directed by Engineer. Make: Schneider or equivalent	No	584.00		
9	Providing, laying testing and commissioning of Installation Outlet Socket/Face plate with Tagging for Telephone System complete in all respect as directed by Engineer. Make: Schneider or equivalent	No	184.00		

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BOQ. Item#	Description	Unit	Quantity	Rate	Amount
E) FAN, LIGHTS AND OTHER FIXTURES					
1	Providing, Fixing, testing & commissioning of Coper wired 24" X 24" false ceiling fan complete with all fixing accessories, pre-wired & ready for use. (GFC/Pak)	No	211.00		
2	Providing, Fixing, testing & commissioning of 56" Ceiling Fan complete with all fixing accessories, all pre-wired & ready for use. (Pak fans, Millat & Royal)	No	16.00		
4	Providing, Fixing, testing & commissioning of 12" Metalic Body, Coper wired Exhaust fan complete with all fixing accessories, all pre-wired & ready for use. (GFC/Pak fans, Millat & Royal)	No	23.00		
5	Providing, Installation, testing & commissioning of light fixtures & other accessories, complete with all accessories such as, Chain, Rod and Screw, etc. Complete in all respect. Manufacturer: Philps or equivalent				
5.01	36 Wat False ceiling light of size 24" X 24" Life:50000 hours for Class room, Labs and offices	No	318.00		
5.02	Green Up Surface Mounted – LED 17W, Size 8" dia Life:50000 hours for Corridor	No	195.00		
5.03	Green space Surface Mounted Down Light– LED 10W, Size 6" dia Life:50000 hours Washroom	No	77.00		
5.04	Philips - Core Range LED Batten - LED L1200 – 19W – with Mounting Clamp Life:50000 hours Stair two way light, Store, Pantry	No	32.00		
5.05	Philips - Core Range LED Batten - BN188C LED40 NW ACF L1200 BR G2-37W Life:50000 hours for Record, Electrical room	No	8.00		
5.06	Philips - RC100C LED35S/840 PSU W30L120 - 37W for Kitchen and Store	No	13.00		
5.07	Mirror Light L600 8W Wall mounted Life:50000 hours for Mirror	No	27.00		

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BOQ. Item#	Description	Unit	Quantity	Rate	Amount
5.08	High Intensity LEDs Model ECO Light Olympia for Emergency Exit	No	15.00		
5.09	PHILIPS FBS-120 1X18W PLC for Gate House Room	No	18.00		
5.10	BULK HEAD LIGHT FIXTURE for Gate House Outer Side	No	14.00		
5.11	Main Gate Light	No	12.00		
6	Providing, Installation, testing & commissioning of School bell (approved by consultant) As per drawing complete in all respects.	No	10.00		
7	Providing, Installation, testing & commissioning of 20A Bell push (approved by consultant) As per drawing complete in all respects as directed by Engineer.	No	2.00		
8	Providing, Installation, testing & commissioning of Automatic School Bell System, control panel with Amp. and Timer complete in all respect as directed by Engineer.	No	1.00		
9	Providing, laying testing and commissioning of PIR motion sensor, 360 degree complete in all respects as directed by Engineer. Make: Clipsal	No	14.00		
10	Providing, fixing testing and commissioning of latest modal Hand Dryer for Washrooms complete in all respects as directed by Engineer. Make: Philips or equivalent	No	14.00		

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BOQ. Item#	Description	Unit	Quantity	Rate	Amount
F) SWITCHGEAR					

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BOQ. Item#	Description	Unit	Quantity	Rate	Amount
1	Providing, installation, testing and commissioning of New L.T Panel , 2mm thick sheet steel fabricated floor mounted weather proof suitable for 3 phase, 415V, 4 wire, 50 Hz, A/C system as per following configuration. (as per drawings and Specification) INCOMING 1-800Amps to 630Amps 4P, 50 KA, MCCB. (Adj.) 3-Phase indication lamps. With fuse 3-C.TTs 630/5 Amps. 3- Digital Ammeter scaled 0-400 Amps. 3-Digital Voltmeter 0-500 volts 1- Digital Voltmeter 0-500 volts Bus bar (Pure Copper) capacity = 960 amps. at 50°c All S.P MCB 6KA 3-Exhaust fan 1-Emergency Light with 2 Hours dray batteries back up. 1- KWH Meter Neutral bar. Earth bar. OUTGOING : 2- 400Amps, 25 KA, MCCB, 4 Pole. (Adj.) 1- 300Amps, 25 KA, MCCB, 4 Pole. (Adj.) 2-150Amps, 25 KA, MCCB , 4 Pole. (Adj.) 6-125Amps, 15 KA, MCCB , 4 Pole. (Adj.) 2-100Amps, 15 KA, MCCB , 4 Pole. (Adj.) 6-80Amps, 15 KA, MCCB , 4 Pole. (Adj.) 4-60Amps, 15 KA, MCCB , 4 Pole. 1-32Amps TP, 10 KA, MCB. 5-20 Amps S.P, 6 KA, MCBs 3-16 Amps S.P, 6 KA, MCBs Note: Breakers of Panel should be coordinated/Designed through software from breaker manufacturer. Manufacture: Hussain and CO/Libra/HBA switch Gears/	No	1.00		

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BOQ. Item#	Description	Unit	Quantity	Rate	Amount
2	Providing, Installation, testing and commissioning of 250 KVAR 3phase Automatic power factor improvement plants to be installed adjacent to MAIN L.T PANEL (as per drawing) comprising of all necessary sensing and switching relays contractors, banks of capacitors suitable for operation at 400/450v 50Hz Control voltage 230v 50Hz switching in and out the capacitors in 14 steps 14 stage reactive power control relay with digital power factor indication meter selector switch manual/auto/off indication lamps push buttons hrc fuses of suitable rating contactors for capacitors control, fuses auxiliary contactors for capacitors all necessary materials complete in all respects. and as per drawing.	No	1.00		
3	Providing, Installation, testing and commissioning of L.DB-G1 & L.DB-F1 ,2mm thick sheet steel fabricated wall mounted recessed type suitable for 3 phase, 415V, 4 wire, 50 Hz, A/C system as per following configuration. INCOMING 100 Amps, 4P, 15 KA, MCCB (Adj.) 3-Phase indication lamps. With fuse Bus bar capacity = 150 amps. at 50°c Neutral bar. Earth bar. OUTGOING : 2-32 Amps 4P, 6 KA, MCBs 20-10 Amps S.P, 6 KA, MCBs 17-16 Amps S.P, 6 KA, MCBs 2-20 Amps S.P, 6 KA, MCBs Note: Breakers of DB's should be coordinated/Designed through software from breaker manufacturer. Manufacture: Hussain and CO/Libra/HRA switch Gears Circuit Breakers : Schneider/ Terasaki.	No	2.00		

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BOQ. Item#	Description	Unit	Quantity	Rate	Amount
4	Providing, Installation, testing and commissioning of L.DB-G2/1 & L.DB-F2/1 2mm thick sheet steel fabricated wall mounted recessed type suitable for 3 phase, 415V, 4 wire, 50 Hz, A/C system as per following configuration. INCOMING 125 Amps 4P, 15 KA, MCCB. (Adj.) 3-Phase indication lamps. With fuse Bus bar capacity = 220 amps. at 50°C Neutral bar. Earth bar. OUTGOING : 2-40 Amps, 4P, 6 KA, MCBs 18-10 Amps S.P, 6 KA, MCBs 12-16 Amps S.P, 6 KA, MCBs 2-20 Amps S.P, 6 KA, MCBs Note: Breakers of DB's should be coordinated/Designed through software from breaker manufacturer. Manufacture: Hussain and CO/Libra/HRA switch Gears Circuit Breakers : Schneider/ Terasaki.	No	2.00		

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BOQ. Item#	Description	Unit	Quantity	Rate	Amount
5	Providing, Installation, testing and commissioning of L.DB-G2/2 & L.DB-F2/2 2mm thick sheet steel fabricated wall mounted recessed type suitable for 3 phase, 415V, 4 wire, 50 Hz, A/C system as per following configuration. INCOMING 125 Amps 4P, 15 KA, MCCB. (Adj.) 3-Phase indication lamps. With fuse Bus bar capacity = 220 amps. at 50°C Neutral bar. Earth bar. OUTGOING : 2-40 Amps, 4P, 6 KA, MCBs 19-10 Amps S.P, 6 KA, MCBs 21-16 Amps S.P, 6 KA, MCBs 2-20 Amps S.P, 6 KA, MCBs Note: Breakers of DB's should be coordinated/Designed through software from breaker manufacturer. Manufacture: Hussain and CO/Libra/HRA switch Gears Circuit Breakers : Schneider/ Terasaki.	No	2.00		

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BOQ. Item#	Description	Unit	Quantity	Rate	Amount
6	Providing, Installation, testing and commissioning of L.DB-G3 & L.DB-F3 ,2mm thick sheet steel fabricated wall mounted recessed type suitable for 3 phase, 415V, 4 wire, 50 Hz, A/C system as per following configuration. INCOMING 150 Amps 4P, 15 KA, MCCB. (Adj.) 3-Phase indication lamps. With fuse Bus bar capacity = 300 amps. at 50°C Neutral bar. Earth bar. OUTGOING : 3-40 Amps T.P, 6 KA, MCBs 36-10 Amps S.P, 6 KA, MCBs 27-16 Amps S.P, 6 KA, MCBs 4-20 Amps S.P, 6 KA, MCBs Note: Breakers of DB's should be coordinated/Designed through software from breaker manufacturer. Manufacture: Hussain and CO/Libra/HRA switch Gears Circuit Breakers : Schneider/ Terasaki.	No	2.00		

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BOQ. Item#	Description	Unit	Quantity	Rate	Amount
7	Providing, Installation, testing and commissioning of L.DB-B1 ,2mm thick sheet steel fabricated wall mounted recessed type suitable for 3 phase, 415V, 4 wire, 50 Hz, A/C system as per following configuration. INCOMING 80 Amps 4P, 15 KA, MCCB. (Adj.) 3-Phase indication lamps. With fuse Bus bar capacity = 150 amps. at 50°C Neutral bar. Earth bar. OUTGOING : 1-30 Amps T.P, 6 KA, MCBs 12-10 Amps S.P, 6 KA, MCBs 5-16 Amps S.P, 6 KA, MCBs Note: Breakers of DB's should be coordinated/Designed through software from breaker manufacturer. Manufacture: Hussain and CO/Libra/HRA switch Gears Circuit Breakers : Schneider/ Terasaki.	No	1.00		

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BOQ. Item#	Description	Unit	Quantity	Rate	Amount
8	Providing, Installation, testing and commissioning of L.DB-B2 ,2mm thick sheet steel fabricated wall mounted recessed type suitable for 3 phase, 415V, 4 wire, 50 Hz, A/C system as per following configuration. INCOMING 100 Amps 4P, 15 KA, MCCB. (Adj.) 3-Phase indication lamps. With fuse Bus bar capacity = 150 amps. at 50°C Neutral bar. Earth bar. OUTGOING : 1-30 Amps T.P, 6 KA, MCBs 13-10 Amps S.P, 6 KA, MCBs 9-16 Amps S.P, 6 KA, MCBs Note: Breakers of DB's should be coordinated/Designed through software from breaker manufacturer. Manufacture: Hussain and CO/Libra/HRA switch Gears Circuit Breakers : Schneider/ Terasaki.	No	1.00		

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BOQ. Item#	Description	Unit	Quantity	Rate	Amount
9	Providing, Installation, testing and commissioning of P.DB-UPS-G1 & P.DB-UPS-F1 ,2mm thick sheet steel fabricated wall mounted recessed type suitable for 3 phase, 415V, 4 wire, 50 Hz, A/C system as per following configuration. INCOMING 30 Amps TP, 10 KA, MCCB. 30 Amps 4P, C.O.S 3-Phase indication lamps. With fuse 2-30A T.P Line-up Terminal (see drawing) Bus bar Neutral bar. Earth bar. OUTGOING : 15-16 Amps S.P, 6 KA, MCBs Note: Breakers of DB's should be coordinated/Designed through software from breaker manufacturer. Manufacture: Hussain and CO/Libra/HRA switch Gears Circuit Breakers : Schneider/ Terasaki.	No	2.00		

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BOQ. Item#	Description	Unit	Quantity	Rate	Amount
10	Providing, Installation, testing and commissioning of P.DB-UPS-G2/1, P.DB-UPS-G2/2, P.DB-UPS-F2/1 & P.DB-UPS-F2/2 ,2mm thick sheet steel fabricated wall mounted recessed type suitable for 3 phase, 415V, 4 wire, 50 Hz, A/C system as per following configuration. INCOMING 40 Amps TP, 10 KA, MCCB. 40 Amps 4P, C.O.S 3-Phase indication lamps. With fuse 2-40A T.P Line-up Terminal (see drawing) Bus bar Neutral bar. Earth bar. OUTGOING : 18-16 Amps S.P, 6 KA, MCBs Note: Breakers of DB's should be coordinated/Designed through software from breaker manufacturer. Manufacture: Hussain and CO/Libra/HRA switch Gears Circuit Breakers : Schneider/ Terasaki.	No	4.00		

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BOQ. Item#	Description	Unit	Quantity	Rate	Amount
11	Providing, Installation, testing and commissioning of P.DB-UPS-G3 & P.DB-UPS-F3 ,2mm thick sheet steel fabricated wall mounted recessed type suitable for 3 phase, 415V, 4 wire, 50 Hz, A/C system as per following configuration. INCOMING 60 Amps TP, 10 KA, MCCB. 60 Amps 4P, C.O.S 3-Phase indication lamps. With fuse 2-50A T.P Line-up Terminal (see drawing) Bus bar Neutral bar. Earth bar. OUTGOING : 25-16 Amps S.P, 6 KA, MCBs Note: Breakers of DB's should be coordinated/Designed through software from breaker manufacturer. Manufacture: Hussain and CO/Libra/HRA switch Gears Circuit Breakers : Schneider/ Terasaki.	No	2.00		

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BOQ. Item#	Description	Unit	Quantity	Rate	Amount
12	<p>Providing, Installation, testing and commissioning of AC Main DB, 14 gauge sheet steel fabricated powder coated (80-100 micron) IP67 rating wall mounted/Floor stand recessed type suitable for 3 phase, 415V, 4 wire, 50 Hz, A/C system with phase reversal, Imported Bus Bar, phase failure, surge protection & earth leakage protection as per DB requirement as per following configuration:</p> <p>INCOMING: 1-(250-400 Amps) TP, 25 KA, MCCB, 4 Pole. 1-(250-400 Amps) Amps TP, 25 KA, MCCB, 4 Pole. (Extra) 3-Phase indication lamps. With control fuse C.T's 630/5 Amps. Digital Ammeter scaled 0-400 Amps. Digital Voltmeter 0-500 volts Bus bar capacity = 500 amps. at 50°c Neutral bar. Earth bar.</p> <p>OUTGOING : 5-(150-250 Amps) T.P, 25 KA, MCBs, 4 Pole 26-20 Amps T.P, 15 KA, MCBs, 2 Pole 2-16 Amps T.P, 15 KA, MCBs, 2 Pole Complete in all respects as per drawing, specification and directed by Engineer in charge. Note: Breakers of DB's should be coordinated/Designed through software from breaker manufacturer. Manufacture: Hussain and CO/Libra/HRA switch Gears Circuit Breakers : Schneider/ Terasaki.</p>	No	1.00		

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BOQ. Item#	Description	Unit	Quantity	Rate	Amount
13	<p>Providing, Installation, testing and commissioning of AC DB-2, 14 gauge sheet steel fabricated powder coated (80-100 micron) IP67 rating wall mounted/Floor stand recessed type suitable for 3 phase, 415V, 4 wire, 50 Hz, A/C system with phase reversal, Imported Bus Bar, phase failure, surge protection & earth leakage protection as per DB requirement as per following configuration:</p> <p>INCOMING: 1-(150-250) Amps TP, 25 KA, MCCB. 4 Pole 3-Phase indication lamps. With fuse Bus bar capacity = 200 amps. at 50°c Neutral bar. Earth bar.</p> <p>OUTGOING : 26-20 Amps T.P, 15 KA, MCBs, 2 Pole 2-16 Amps T.P, 15 KA, MCBs, 2 Pole Complete in all respects as per drawing, specification and directed by Engineer in charge. Note: Breakers of DB's should be coordinated/Designed through software from breaker manufacturer. Manufacture: Hussain and CO/Libra/HRA switch Gears Circuit Breakers : Schneider/ Terasaki.</p>	No	1.00		

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BOQ. Item#	Description	Unit	Quantity	Rate	Amount
14	<p>Providing, Installation, testing and commissioning of AC DB-3, 14 gauge sheet steel fabricated powder coated (80-100 micron) IP67 rating wall mounted/Floor stand recessed type suitable for 3 phase, 415V, 4 wire, 50 Hz, A/C system with phase reversal, Imported Bus Bar, phase failure, surge protection & earth leakage protection as per DB requirement as per following configuration:</p> <p>INCOMING: 1-(150-250) Amps TP, 25 KA, MCCB. 4 Pole 3-Phase indication lamps. With fuse Bus bar capacity = 200 amps. at 50°C Neutral bar. Earth bar.</p> <p>OUTGOING : 5-32 Amps T.P, 15 KA, MCBs, 3 Pole 25-20 Amps T.P, 15 KA, MCBs, 2 Pole 2-16 Amps T.P, 15 KA, MCBs, 2 Pole Complete in all respects as per drawing, specification and directed by Engineer in charge. Note: Breakers of DB's should be coordinated/Designed through software from breaker manufacturer. Manufacture: Hussain and CO/Libra/HRA switch Gears Circuit Breakers : Schneider/ Terasaki.</p>	No	1.00		

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BOQ. Item#	Description	Unit	Quantity	Rate	Amount
15	<p>Providing, Installation, testing and commissioning of AC DB-4, 14 gauge sheet steel fabricated powder coated (80-100 micron) IP67 rating wall mounted/Floor stand recessed type suitable for 3 phase, 415V, 4 wire, 50 Hz, A/C system with phase reversal, Imported Bus Bar , phase failure , surge protection & earth leakage protection as per DB requirement as per following configuration.</p> <p>INCOMING 1-(150-250) Amps TP, 25 KA, MCCB. 4 Pole 3-Phase indication lamps. With fuse Bus bar capacity = 200 amps. at 50°c Neutral bar. Earth bar.</p> <p>OUTGOING : 14-32 Amps T.P, 15 KA, MCBs, 3 Pole 10-20 Amps T.P, 15 KA, MCBs, 2 Pole 2-16 Amps T.P, 15 KA, MCBs, 2 Pole</p> <p>Complete in all respects as per drawing, specification and directed by Engineer in charge. Note: Breakers of DB's should be coordinated/Designed through software from breaker manufacturer. Manufacture: Hussain and CO/Libra/HRA switch Gears Circuit Breakers : Schneider/ Terasaki.</p>	No	1.00		
16	<p>Providing, Installation, testing and commissioning of 1No 32A 3 Pin & 1No-32A 3phase 5 pin Industrial socket in M.s box for UPS incoming and outgoing cables</p>	Job	14.00		
17	<p>Providing, Installation, testing and commissioning of 20 KVA 3Phase UPS (3phase in, 1phase out) for Computers Complete in all respect. APC / GE</p>	No	6.00		
18	<p>Providing, Installation, testing and commissioning of 10 KVA 3Phase UPS (3phase in 3phase out) for Computers Complete in all respect. APC / GE</p>	No	6.00		

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AIR CONDITIONING WORK , REMAINING ELECTRICAL AND ALLIED WORK

BOQ. Item#	Description	Unit	Quantity	Rate	Amount
19	Providing, Installation, testing and commissioning of 6 KVA 3Phase online UPS (3phase in, 1phase out) for Computers Complete in all respect. APC / GE	No	2.00		
G) FIRE ALARM SYSTEM					
	Note:- The contractor shall provide warranty of parts & service for one year from authorized Distributor/Agent in Pakistan. Supply & Installation of fire Alarm system to B.s. 3116 pt 4 and Bs5836 comprising of following components/equipment				
1	Supply, Installing and Connecting of addressable Manual call stations press glass type with test dey, suitable for surface or flush mounting, complete in all respects and conforming to general specifications. Make: Gent by Honey Well UK / Thorn UK	No	23.00		
2	Supply, Installing and Connecting of Electronic alarm sounders complete in all respects and conforming to general specifications. Make: Gent by Honey Well UK / Thorn UK	No	12.00		
3	Supply, Installing and Connecting of addressable Optical Smoke Detector with Base and operational indicating LED , complete in all respects and conforming to general specifications and to be installed in false ceiling. Make: Gent by Honey Well UK / Thorn UK	No	195.00		
4	Supply, Installing and Connecting of addressable Optical Heat Detector with Base and operational indicating LED, complete in all respects and conforming to general specifications and to be installed in false ceiling. Make: Gent by Honey Well UK / Thorn UK	No	22.00		
5	Supply, Installing and Connecting of addressable fire alarm 2 loop control panel micro processor type. Separate bell alarming in each zone indication of point 2 hours power backup. Short/open circuit indications LED display/power fault, zone isolated test. with dot matrix printer complete in all respects and conforming to general specifications and drawing. Make: BENTEL ITALY / CB200	No	1.00		

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AIR CONDITIONING WORK , REMAINING ELECTRICAL AND ALLIED WORK

BOQ. Item#	Description	Unit	Quantity	Rate	Amount
6	Supply and Wiring of Smoke/Heat detector manual call point and sounder with 2 No. 2.5 mm ² single core fire resistant CU/PVC cable in already existing 1" dia PVC conduit with all installing accessories, complete in all respect as per drawings and specification. Make: Pak. Cable / equivalent	Rft	1100.00		
7	Testing & Commissioning of fire alarm System by approved agent of System supplied.	JOB	1.00		
H) IP PUBLIC ADDRESS SYSTEM					
1	Supply & Wiring of column speakers from amplifier with 2 No. 1.5mm single core wires in already existing 3/4" dia PVC conduits installed recessed in wall/column or ceiling slab as shown in drawing.	Rft	500.00		
J) EARTHING SYSTEM					
1	Providing, installation, testing & commissioning of earth point to achieve an earth resistance of less than one ohm, work includes making earth electrode with 600 x 600 x 5 mm thick copper plate at a depth of water table, complete with construction of CC inspection chamber with heavy duty cast iron cover etc; complete as per specification and drawings.	No	4.00		
2	Providing, laying & connecting of Earth Terminal block size of 2" x 6" x 1/4" Thick fixed to wall with grouting bolts provided with copper nuts to connect incoming & outgoing earthing conductors, complete in all respects.	No	4.00		
3	Providing, laying & connecting of earthing load of 2 x 70 mm ² stranded bare copper conductors in 38 mm dia pvc class-d conduit complete in all respects.	Mtr	215.00		

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AIR CONDITIONING WORK , REMAINING ELECTRICAL AND ALLIED WORK

BOQ. Item#	Description	Unit	Quantity	Rate	Amount
K) CUTTING/DISMANTLING & REPAIRE WORK					
1	Dismantling, Core cutting and removing of existing wall/slab/floor to make openings/trenches for crossing the wire, conduit, refrigerant pipe and cable tray , including the repair of the surface as per existing condition complete in all respects as directed by Engineer in charge. Note. Total dismantling and repair work will be paid as one job so rate must be filled accordingly after site visit.	Job	1.00		
L) AS-BUILT DRAWINGS					
1	Preparation of as-built drawings of all electrical and allied works after final approval from the consultant/client. Note: Submission of as-built drawings 2 sets after work completion of each floor and 3 sets & soft copy of complete electrical works after final commissioning of project. Approval of final bills are subject to completion of as built drawings.	Job	1.00		
TOTAL OF ELECTRICAL AND ALLIED WORK					

Benazir Bhutto Shaheed Institute of Management Sciences Dadu, Sindh, Pakistan

AIR CONDITIONING WORK , REMAINING ELECTRICAL AND ALLIED WORK

BOQ. Item#	Description	Unit	Quantity	Material Cost		Labour Cost		Total Amount
				Rate	Amount	Rate	Amount	
M-AIR CONDITIONING WORK								
1	AC							
	<p>a) Wall mounted Split Air conditioner Supply, Installation, Testing & Commissioning of following Heat and Cool Inverter air conditioner (T-3 type compressor for high ambient application) complete with gas charging 410A or R32, refrigerant piping (up to 10 Rft) with suitable conduit, insulation, electric and control copper wiring (up to 10 Rft) with suitable conduit complete as per following description. T3 Compressor 10 year Warranty Low noise 650 operation for wall mounted Voltage range 187-276 Power supply to outdoor/Indoor Communication cable Motor Insulation Class-E Auto cleaning and Gold fin condenser Display LED With Power control of Indore AC with suitable circuit breaker and Back Box Complete in all respects ready for use as per drawing, specification and as directed by Engineer in charge. (Brands: Mitsubishi -Japan / LG-Korea / Daikin-Japan / Samsung- Korea/ Hitachi-Japan)</p>							
	a-i) 1.5 Ton AC unit	No.	8.00					
	a-ii) 2 Ton AC unit (7500-27300 Btu/Hr)	No.	10.00					

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AIR CONDITIONING WORK , REMAINING ELECTRICAL AND ALLIED WORK

BOQ. Item#	Description	Unit	Quantity	Material Cost		Labour Cost		Total Amount
				Rate	Amount	Rate	Amount	
	<p>b)Cassette Type Air conditioner Supply, Installation, Testing & Commissioning of following Heat and Cool Inverter Cassette air conditioner (T-3 type compressor for high ambient application) complete and ready for use with gas charging 410A or R32, refrigerant piping (up to 10 Rft) with suitable conduit, insulation, electric and control copper wiring (up to 10 Rft) with suitable conduit complete as per following descriptions. (7500-27300 Btu/Hr) T3 Compressor 10 year Warranty Low noise Voltage range 187-276 Power supply to outdoor/Indoor Communication cable Gold fin condenser Display LED With Power control of Indore AC with suitable circuit breaker and Back Box Complete in all respects ready for use as per drawing, specification and as directed by Engineer in charge. (Brands: Mitsubishi -Japan / LG-Korea / Daikin-Japan / Samsung- Korea/ Hitachi-Japan)</p>							
	b-i) 1.5 Ton AC unit	No.	8.00					
	b-ii) 2 Ton AC unit	No.	9.00					

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AIR CONDITIONING WORK , REMAINING ELECTRICAL AND ALLIED WORK

BOQ. Item#	Description	Unit	Quantity	Material Cost		Labour Cost		Total Amount
				Rate	Amount	Rate	Amount	
	<p>c) Floor Standing Air conditioner Supply, Installation, Testing & Commissioning of following Heat and Cool Floor Standing Inverter air conditioner (T-3 type compressor for high ambient application) complete with gas charging 410A or R32, refrigerant piping (up to 10 Rft) with suitable conduit, insulation, electric and control copper wiring (up to 10 Rft) with suitable conduit complete as per following descriptions. T3 Compressor 10 year Warranty Low noise Voltage range 187-276 Power supply to outdoor/Indoor Communication cable Gold fin condenser Display LED With Power control of Indore AC with suitable circuit breaker and Back Box Complete in all respects ready for use as per drawing, specification and as directed by Engineer in charge. (Brands: Mitsubishi -Japan / LG-Korea / Daikin-Japan / Samsung- Korea/ Hitachi-Japan)</p>							
	c-i) 2 Ton AC unit i/c 4D floor	No.	2.00					
	c-ii) 4 Ton AC unit i/c 4D floor	No.	8.00					
2	<p>Angle iron frame / platform Supply & installation of frame / platform for A/C Compressor made with 2x1/4 MS angle iron including 2 coats of anti rust paint & finally Terracotta oil paint, Anti vibration pads to be fixed on exterior wall, complete in all respect as per drawing, specification and as directed by Engineer in charge.</p>	No.	80.00					

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AIR CONDITIONING WORK , REMAINING ELECTRICAL AND ALLIED WORK

BOQ. Item#	Description	Unit	Quantity	Material Cost		Labour Cost		Total Amount
				Rate	Amount	Rate	Amount	
3	REFRIGERANT PIPING (GAS AND LIQUID)							
	Refrigerant Piping. Supply and installation of hard drawn seamless following type and sizes Copper refrigerant piping with 1/2" armaflex foamed insulation, piping kits, oil traps where necessary, including slab hanging or wall mounted accessories complete with fittings and silver soldered joints. (Pipes to be of Mueller USA or KEMBLA Australia or approved equal. Note. This Item is applicable where length of refrigerant piping is more than 10 Rft and Length will be measured as a distance from inner to outer only. Brand : Mueller (USA) / Approved Equal							
	a) For AC 1.5 Ton Wall mounted/ Cassette Type	Rft	1020.00					
	b) For AC 2 Ton Wall mounted / Cassette Type	Rft	517.00					
	c) For Floor Stand AC 2 Ton i/c 4D floor	Rft	80.00					
	d) For Floor Stand AC 4 Ton i/c 4D floor	Rft	320.00					
4	Supply and installation of uPVC Class E condensate drain piping from AC to drain point, concealed in wall, slab or floor including bends, sockets, solution, 1/4" felt insulation & 8 oz, canvas jacketing, painting & finishing and other required accessories -complete in all respects as directed by Engineer in charge. Brands. Dadex or equivalent							
	a) 1" dia	Rft	840.00					
	b) 3/4" dia	Rft	1510.00					
	TOTAL AMOUNT OF AC WORK							0.00
	Grand Total Rs.							0.00

Shaheed Mohtarma Benazir Bhutto

Institute of computer science Dadu

AIR CONDITIONING WORK ,
REMAINING ELECTRICAL AND ALLIED WORK

Tender Drawings

Architect

HABIB FIDA ALI

- ARCHITECTURE ■ INTERIORS
- URBAN DESIGN ■ PROJECT MANAGEMENT

4, CH. KHALIQUZZAMAN ROAD, KARACHI - 75530.

PHONE NO. 5661683, 5661720,

Electrical Consultant

Mr.Fareed-ul-haq Cell # 0321-2250021

Mr.Abdul Fattah Cell # 0332-0219405

Electrical & Mechanical Consultant
Suit No. 404 / B2 4th. floor Haman Center 55 D.A.C.H.S Main Shahrah-e-faisal
Karachi. Tel. 021-4544674 CELL # 0321-2250021
EMAIL engineer_fareed@yahoo.com

ELECTRICAL LEGEND

SYMBOLS	DESCRIPTION	HEIGHT FROM F.F.L
	10A S.P SWITCH (SWITCH BOX)	FROM F.F.L 42"
	Philips - Green Up Surface Mounted - SM293C LED20/840 PSU 20W WH GM - IP20	SURFACE
	DIRECTIONAL LIGHT / SPOT LIGHT	SURFACE
	Philips - Green Up Surface Mounted - SM291C LED10/840 PSU 10W WH GM - IP20	SURFACE
	Philips - RC100C LED35S/840 PSU W30L120 - 37W	RECESSED
	Philips - Core Range LED Batten - BN188C LED20/NW L1200 - 19W - with Mounting Clamp	SURFACE
	Philips - BN010C 1xTLED L600 8W	FROM F.F.L 6'-6"
	PENDENT LIGHT FIXTURE	PENDENT
	FANCY LIGHT FIXTURE WITH 14W PLEC LAMP	FROM F.F.L 8'-0"
	Philips LED Under Water - BCP170 LED160/WW PSU 12V IP68 along with PS60 12V DC, 100 - 240VAC 50/60 Hz	ON FLOOR
	WALL BRACKET FAN 80W	FROM F.F.L 7'-6"
	EXHAUST FAN (12" DIA)	FROM F.F.L 8'-6"
	GATE LIGHT WITH 18W PLEC LAMP	AS PER SITE COND.
	CHANDELIER (500W)	AT CEILING
	BULK HEAD WITH 18W PLEC LAMP	AS PER SITE COND.
	Philips - Core Range LED Batten - BN188C LED20/NW L1200 - 19W - with Mounting Clamp	SURFACE
	EMERGENCY EXIT, MODEL ECO LIGHT OLYMPIA GREECE (E.U HELLAS) HIGH INTENSITY LEDs	SURFACE
	Philips - WT066C NW LED36 L1200 PSU TB - 40W	SURFACE
	LIGHT FIXTURE WITH 14W PLEC LAMP	AS PER SITE COND.
	Philips - Core Range LED Batten - BN188C LED40 NW ACF L1200 BR G2 - 37W	SURFACE
	CEILING FAN 80W (WITH FAN HOOK STEEL BOX)	CEILING
	5A SHAVER SWITCH SOCKET 2PIN	FROM F.F.L 42"
	SPLIT UNIT (INDOOR UNIT)	AS PER SITE COND.
	SPLIT UNIT CONDENSER	AS PER SITE COND.
	T.V CABLE OUTLET	FROM F.F.L 4'-6"
	GATE INTERCOM UNIT	FROM F.F.L 4'-6"
	CONDUIT RUN UNDER CEILING SLAB	---
	CONDUIT RUN UNDER FLOOR	---
	CONDUIT RUN UNDER WALL	---
	ELECTRIC DISTRIBUTION BOARD	FROM F.F.L TO TOP OF L.DB 7'-0"
	COMPUTER DATA OUTLET RJ-45	FROM F.F.L -12"
	13A 3PIN (FLAT PINS) S.P SWITCH SOCKET (UPS POWER)	FROM F.F.L -12"
	P. DB-UPS (POWER DISTRIBUTION BOARD)	FROM F.F.L TO TOP OF L.DB 7'-0"
	T.J.B (TELEPHONE JUNCTION BOX)	FROM F.F.L -12"
	BELL / BELL PUSH	BELL F.F.L TO 7' BELL PUSH F.F.L 42"
	15A POWER SOCKET	FROM F.F.L TO MID POINT OF BOX 1'-0"
	5A 10A LIGHT PLUG	FROM F.F.L TO MID POINT OF BOX 1'-0"
	TELEPHONE OUTLET (RJ-11)	FROM F.F.L TO MID POINT OF BOX 1'-0"
	DATA OUTLET & TELEPHONE OUTLET & 10A S.P SOCKET (NORMAL POWER) & 13A S.P SOCKET (UPS POWER)	FROM F.F.L -12"
	20A D.P MCB IN POWDER COATED M.S BOX WITH NEUTRAL & EARTH BAR	FROM F.F.L -8"
	DATA OUTLET & TELEPHONE OUTLET & 10A S.P SOCKET (NORMAL POWER) & 13A S.P SOCKET (UPS POWER)	UNDER FLOOR
	6" DIA 6W CEILING SPEAKER	UNDER CEILING

LEGEND FOR FIRE ALARM SYSTEM

SYMBOLS	DESCRIPTION	HEIGHT FROM F.F.L OR LOCATION
	SMOKE DETECTOR	CEILING
	HEAT DETECTOR	CEILING
	BELL / SOUNDER	FROM F.F.L -7'
	MANUAL BREAK GLASS STATION	FROM F.F.L -4'
	FIRE ALARM CONTROL PANEL	AS PER SITE

LEGEND FOR CC-TV SYSTEM

SYMBOL	DESCRIPTION	HEIGHT FROM F.F.L
	5A S.P SWITCH SOCKET (UPS POWER)	AS PER SITE
	CC-TV DOME CAMERA WITH POWER	AS PER SITE
	CC-TV MONITOR	AS PER SITE

GENERAL NOTES

- 1 ALL WIRING FOR LIGHTING AND POWER SHALL BE WITH SINGLE CORE PVC INSULATED CABLES LAID IN PVC CONDUITS OF 3/4"Ø OR HIGHER EXCEPT NOTED OTHERWISE
- 2 SIZE OF CABLE SHALL BE AS GIVEN BELOW UNLESS OTHERWISE INDICATED: (FOR DETAIL SEE B.O.Q)

LIGHT POINT / FAN POINT	2x1.5mm ² + 1x1.5mm ²	} For Earth pvc pipe 1" dia
LIGHT CIRCUITS	2x2.5mm ² + 1x2.5mm ²	
10A SOCKET OUTLET	2x2.5mm ² + 1x2.5mm ²	
15AMP SOCKET OUTLET	2x4.0mm ² + 1x2.5mm ²	
SPLIT UNIT 2TON	2x6.0mm ² + 1x6mm ²	
DATA OUTLET	4PAIR CAT-6 CABLE	
TELEPHONE OUTLET	4PAIR CAT-5E CABLE	
T.V CABLE OUTLET	RG-7	
- 3 EACH CIRCUIT TO HAVE ITS INDEPENDENT NEUTRAL AND EARTH FROM DB
- 4 THE CONDUIT SHALL HAVE A MINIMUM COVERING OF 20 mm OF CONCRETE/TILES, ETC.
- 5 INSPECTION BOX, PULL BOX, JUNCTION BOX, ETC. SHALL BE PROVIDED WHERE NECESSARY TO PULL THE WIRE CONVENIENTLY.
- 6 ALL BACK BOXES SHALL BE OF 16 SWG SHEET STEEL EPOXY PAINTED WITH PROVISION FOR EARTH CONNECTION.
- 7 FOR EXACT LOCATION OF LIGHTING FIXTURES REFER TO ARCHITECTURAL DRAWINGS.
- 8 ALL CONDUITS RUN ABOVE FALSE CEILING SHALL BE LABELED / IMPRINTED WITH THE NAMES OF RESPECTIVE SERVICES.
- 9 WIRING FOR TELEPHONES TO BE WITH 4 PAIR CAT-5E CABLE OR AS NOTED OTHERWISE.
- 10 WIRING FOR SPEAKERS AND FIRE ALARM SYSTEM TO BE WITH 2x1.5 SQMM, 1CORE PVC CABLES. EXCLUDING BELL
- 11 WIRING FOR MATV, CCTV AND DVD TO BE WITH COAXIAL COPPER SHIELDED CABLE OR AS NOTED OTHERWISE.
- 12 DIFFERENT SYSTEM WIRING TO RUN IN DIFFERENT CONDUITS.
- 13 CONTRACTOR MUST COORDINATE WITH OTHER TRADE DRAWINGS
- 14 DO NOT SCALE THE DRAWINGS
- 15 THE ELECTRICAL RESISTANCE OF ECC TOGETHER WITH EARTH LEAD AND ELECTRODE SHOULD NOT EXCEED ONE OHM. IF IT EXCEEDS, THE CONTRACTOR SHALL OBTAIN INSTRUCTION FROM CONSULTANT FOR ANY CHANGES.
- 16 THE MAKES STATED IN THE TENDER DRAWINGS/DOCUMENTS ARE FOR REFERENCE TO A PARTICULAR CLASS OF QUALITY OR PERFORMANCE REQUIREMENT. EQUIVALENT OR BETTER MAKES COULD ALSO BE OFFERED. APPROVAL OF EQUIVALENCE OF MAKES SHALL BE THE DISCRETION OF CONSULTANT/OWNER.

**Shaheed Mohtarma Benazir Bhutto
Institute of computer science Dadu**

Architect

HABIB FIDA ALI

■ ARCHITECTURE ■ INTERIORS
 ■ URBAN DESIGN ■ PROJECT MANAGEMENT
 4, CH. KHALIQUZZAMAN ROAD, KARACHI - 75530.
 PHONE NO. 5661683, 5661720.

Electrical Consultant

Mr.Fareed-ul-haq Cell # 0321-2250021

Mr.Abdul Fattah Cell # 0332-0219405

Electrical & Mechanical Consultant
 Suit No. 404 152 4th Floor Habitat Centre 5512 A.C.H.S Main Shaheedra-Road
 Karachi. Tel: 021-4544874 CELL # 0321-2250021
 EMAIL: engineer_fareed@yahoo.com

Project

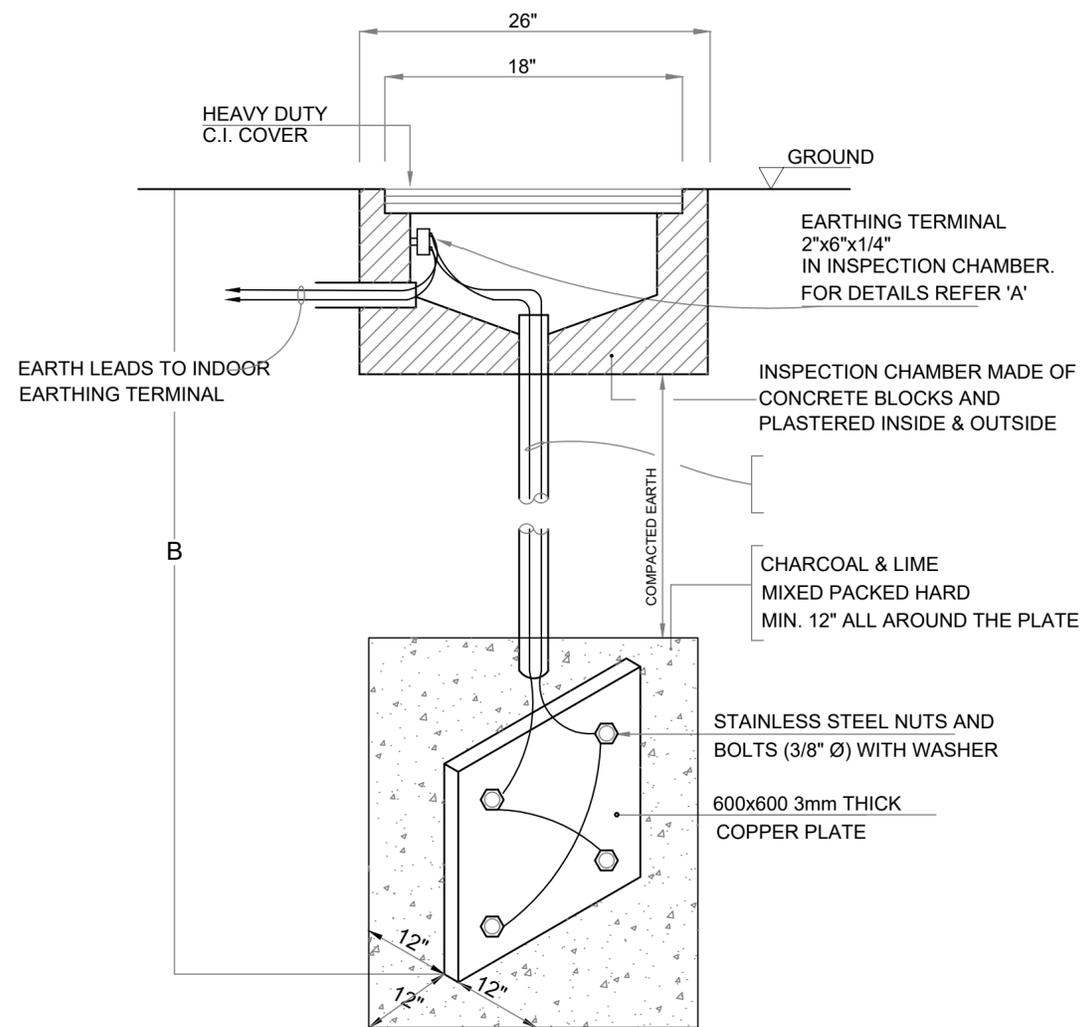
**Electrical, Telephone, Computer Networking, CC-TV,
Public Address, Fire Alarm System Works**

Title:

LEGEND & GENERAL NOTES

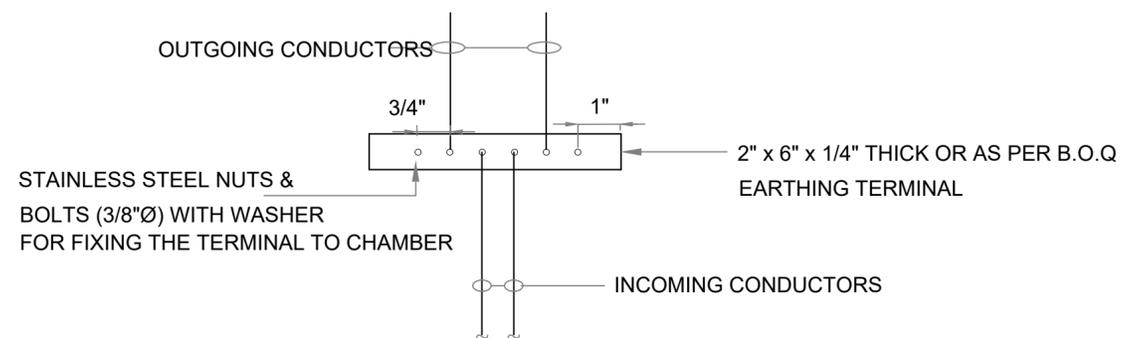
Design Engineer FAREED-UL-HAQ	Scale NTS	Drawing No.
AutoCad Opp. N.K	Date: 04-06-2018	E-01
Checked By. A.F	Job No.	

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B: 15' DEPTH OR
18" BELOW GROUND
WATER LEVEL WHICHEVER
COMES EARLIER

EARTH PIT DETAIL



EARTHING TERMINAL DETAIL 'A'

WIRING SCHEDULE

	DESCRIPTION	CABLE SIZE CU/PVC	CONDUIT SIZE	LOCATION
01	TELEPHONE SYSTEM	4PAIR CAT-5E	25mmØ	FLOOR
02	LIGHT POINT / FAN POINT	3x1.5mm ² 1CORE	25mmØ	CEILING
03	5A LIGHT PLUG	3x2.5mm ² 1CORE	25mmØ	FLOOR
04	SPLIT UNIT 2TON	2x6mm ² +1x4mm ²	25mmØ	CEILING
05	15A POWER SWITCH SOCKET	2x4mm ² +1x2.5mm ²	25mmØ	FLOOR
06	LIGHT CKT D.B TO SWITCH BOX	3x2.5mm ² 1CORE	25mmØ	CEILING
07	SMOKE DETECTOR + MANUAL	1.5mm ² 2CORE PVC/PVC	25mmØ	CEILING
08	DATA OUTLET	4 Pair CAT-7 Cable	25mmØ	FLOOR

Shaheed Mohtarma Benazir Bhutto
Institute of computer science Dadu

Architect

HABIB FIDA ALI

■ ARCHITECTURE ■ INTERIORS
■ URBAN DESIGN ■ PROJECT MANAGEMENT
4, CH. KHALIQUZZAMAN ROAD, KARACHI - 75530.
PHONE NO. 5661683, 5661720.

Electrical Consultant

Mr. Fareed-ul-haq Cell # 0321-2250021

Mr. Abdul Fattah Cell # 0332-0219405

Electrical & Mechanical Consultant
Suit No. 404/152/4th Floor Hassan Center 55/A, C.I.T. III Main Shaheed Benazir
Karachi. Tel: 021-4544674. CELL # 0321-2250021
EMAIL: engineer_fareed@yahoo.com

Project

Electrical, Telephone, Computer Networking, CC-TV,
Public Address, Fire Alarm System Works

Title:

EARTHING DETAIL &
WIRING SCHEDULE

Design Engineer
FAREED-UL-HAQ

Scale
NTS

Drawing No.

AutoCad Opp:

N.K

Date:

04-06-2018

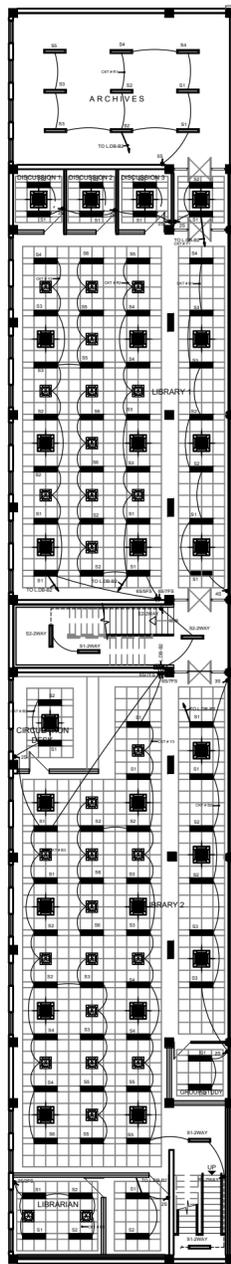
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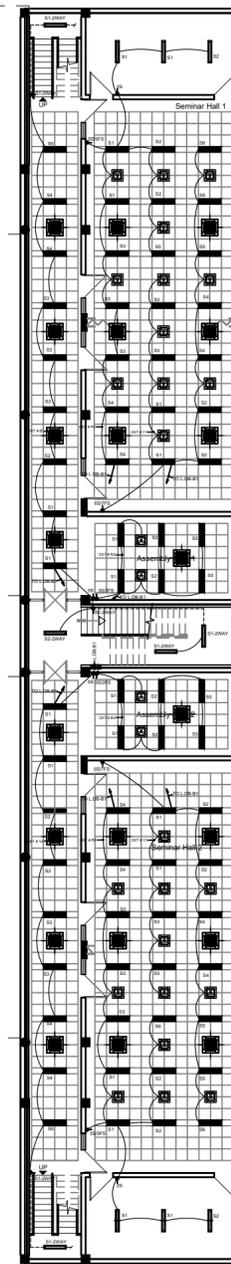
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Job No.

This print supersedes all prints bearing a lower revision letter



BASEMENT PLAN
LEFT WING



BASEMENT PLAN
RIGHT WING

BASEMENT FLOOR LIGHTING LAYOUT

Shaheed Mohtarma Benazir Bhutto
Institute of computer science Dadu

Architect

HABIB FIDA ALI

■ ARCHITECTURE ■ INTERIORS
■ URBAN DESIGN ■ PROJECT MANAGEMENT
4, CH. KHALIQUZZAMAN ROAD, KARACHI - 75530.
PHONE NO. 5661683, 5661720.

Electrical Consultant

Mr. Fareed-ul-haq Cell # 0321-2250021
Mr. Abdul Fattah Cell # 0332-0219405

ELECTRICAL MECHANICAL CONSULTANT
SUIT NO. 404/152/405, BOND HANSEN CENTER 55/3, A.C.T. 13, MAIN SHAHRAH-E-ISLAM
KARACHI. TEL: 021-4544874, CELL # 0321-2250021
EMAIL: engineer_fareed@yahoo.com

Project

Electrical, Telephone, Computer Networking, CC-TV,
Public Address, Fire Alarm System Works

Title:

BASEMENT FLOOR
LIGHTING LAYOUT

Design Engineer
FAREED-UL-HAQ

Scale
1/16" = 1'-0"

Drawing No.

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N.K

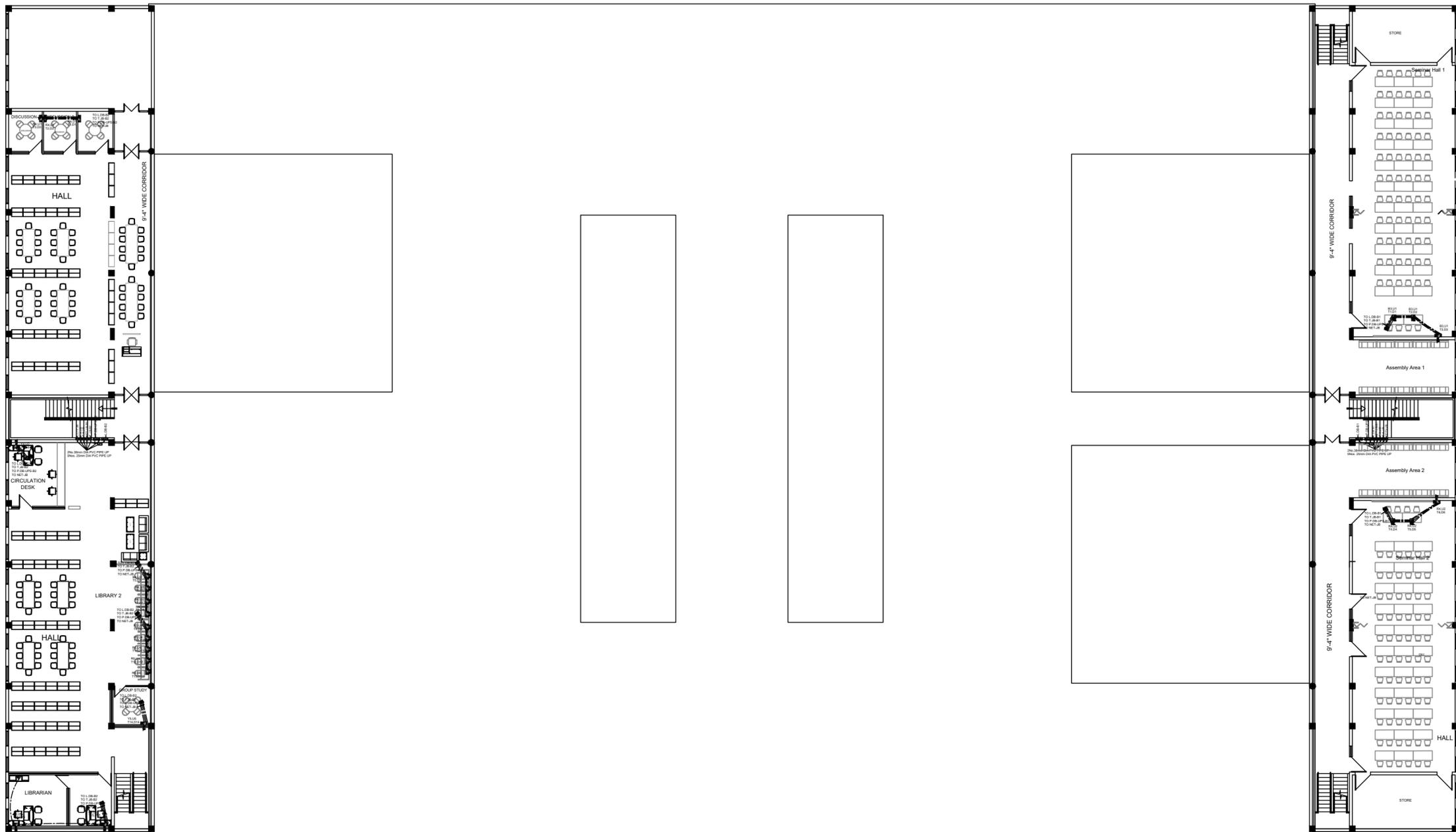
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**BASEMENT FLOOR NORMAL & U.P.S POWER
TELEPHONE & DATA SYSTEM LAYOUT**

Shaheed Mohtarma Benazir Bhutto
Institute of computer science Dadu

Architect

HABIB FIDA ALI

■ ARCHITECTURE ■ INTERIORS
■ URBAN DESIGN ■ PROJECT MANAGEMENT
4, CH. KHALIQUZZAMAN ROAD, KARACHI - 75530.
PHONE NO. 5661683, 5661720.

Electrical Consultant

Mr. Fareed-ul-haq Cell # 0321-2250021
Mr. Abdul Fattah Cell # 0332-0219405

ELECTRICAL & MECHANICAL CONSULTANT
Suit No. 404/152/4th Floor, Hassan Center, 55/A, C-11/5, Main, Shaheedra-Road
Karachi. Tel: 021-4544874, CELL # 0321-2250021
EMAIL: engineer_fareed@yahoo.com

Project

Electrical, Telephone, Computer Networking, CC-TV,
Public Address, Fire Alarm System Works

Title:

BASEMENT FLOOR NORMAL U.P.S POWER
TELEPHONE & DATA SYSTEM LAYOUT

Design Engineer

FAREED-UL-HAQ

Scale

1/16" = 1'-0"

Drawing No.

AutoCad Opp.

N.K

Date:

04-06-2018

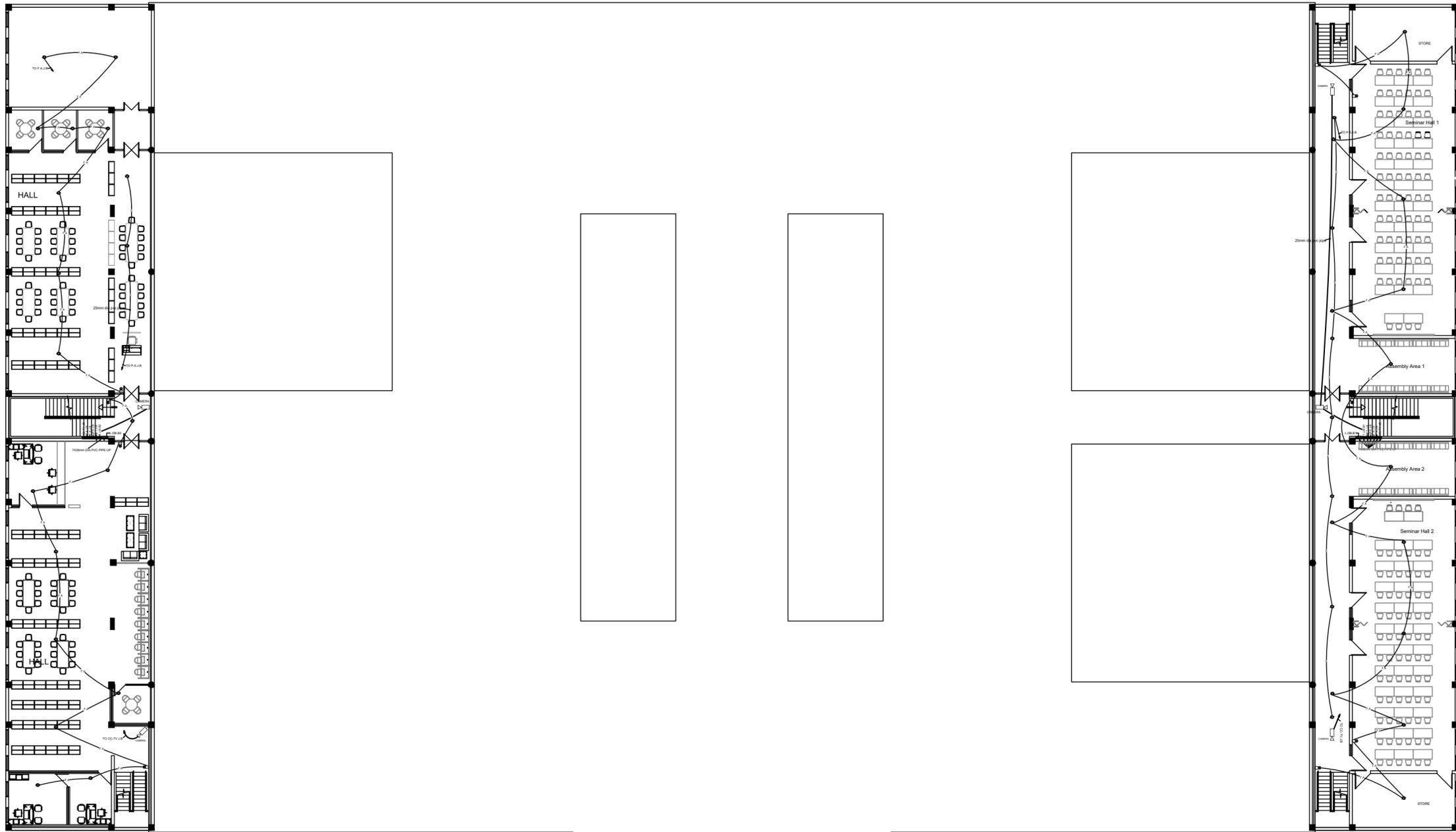
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**BASEMENT FLOOR FIRE ALARM
& CC-TV SYSTEM LAYOUT**

**NOTES.
LOCATION OF CC-TV DVR &
FIRE ALARM CONTROL PANEL
AS PER SITE**

**Shaheed Mohtarma Benazir Bhutto
Institute of computer science Dadu**

Architect
HABIB FIDA ALI
■ ARCHITECTURE ■ INTERIORS
■ URBAN DESIGN ■ PROJECT MANAGEMENT
4, CH. KHALIQUZZAMAN ROAD, KARACHI - 75530.
PHONE NO. 5661683, 5661720.

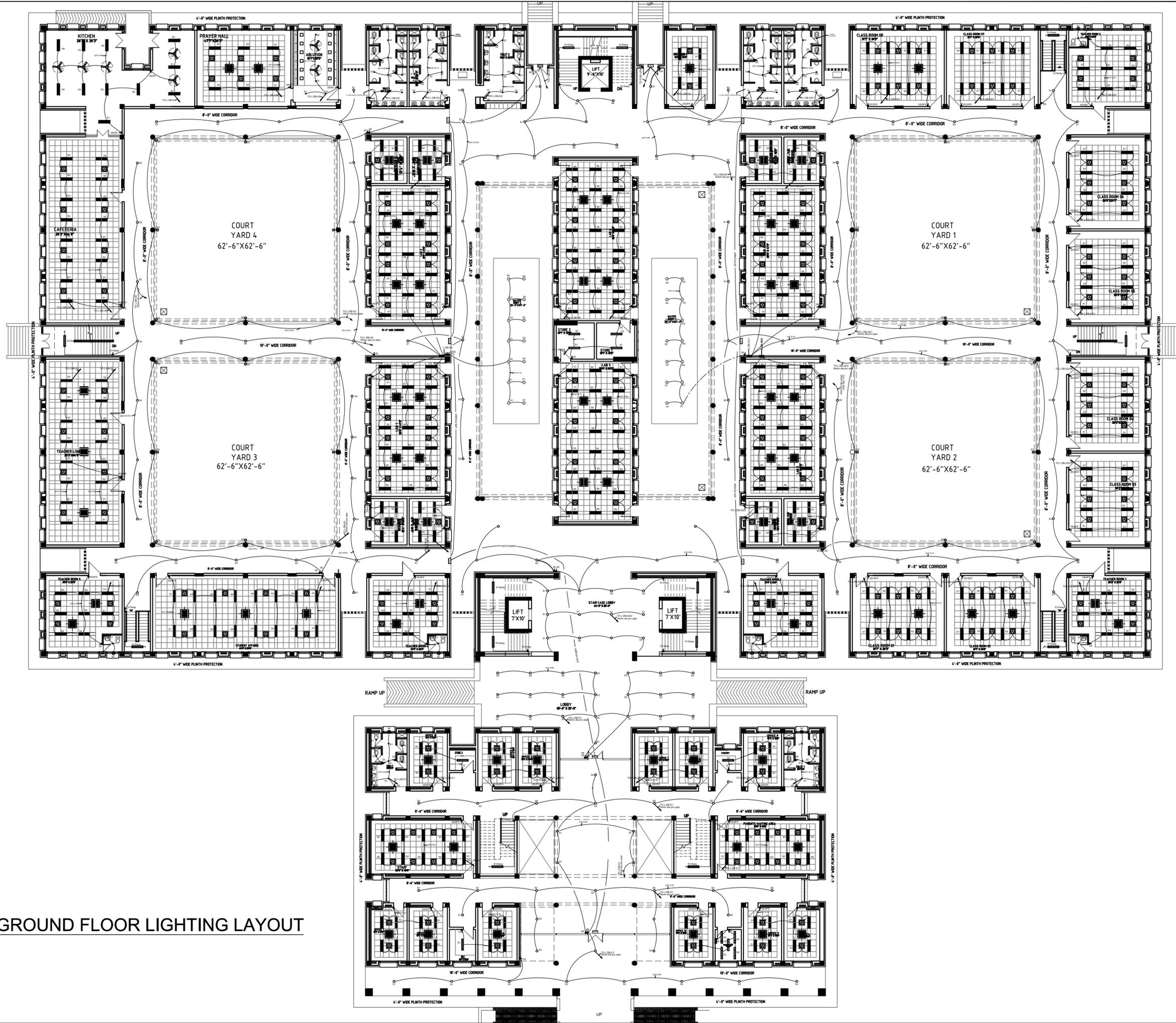
Electrical Consultant
Mr.Fareed-ul-haq Cell # 0321-2250021
Mr.Abdul Fattah Cell # 0332-0219405
ELECTRICAL & MECHANICAL CONSULTANT
SUIT NO. 404 1ST 4TH FLOOR HAZRAT NIZAMUDDIN ROAD CH. KHAN MAHMOOD KHAN
KARACHI. TEL: 021-4544674 CELL: # 0321-2250021
EMAIL: enginner_fareed@yahoo.com

Project
**Electrical, Telephone, Computer Networking, CC-TV,
Public Address, Fire Alarm System Works**

Title:
**BASEMENT FLOOR FIRE ALARM
& CC-TV SYSTEM LAYOUT**

Design Engineer FAREED-UL-HAQ	Scale 1/16" = 1'-0"	Drawing No. E-05
AutoCad Opp. N.K	Date: 04-06-2018	
Checked By. A.F	Job No.	

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GROUND FLOOR LIGHTING LAYOUT

Shaheed Mohtarma Benazir Bhutto
Institute of computer science Dadu

Architect
HABIB FIDA ALI
 ■ ARCHITECTURE ■ INTERIORS
 ■ URBAN DESIGN ■ PROJECT MANAGEMENT
 4, CH. KHALIQUZZAMAN ROAD, KARACHI - 75530.
 PHONE NO. 5661683, 5661720.

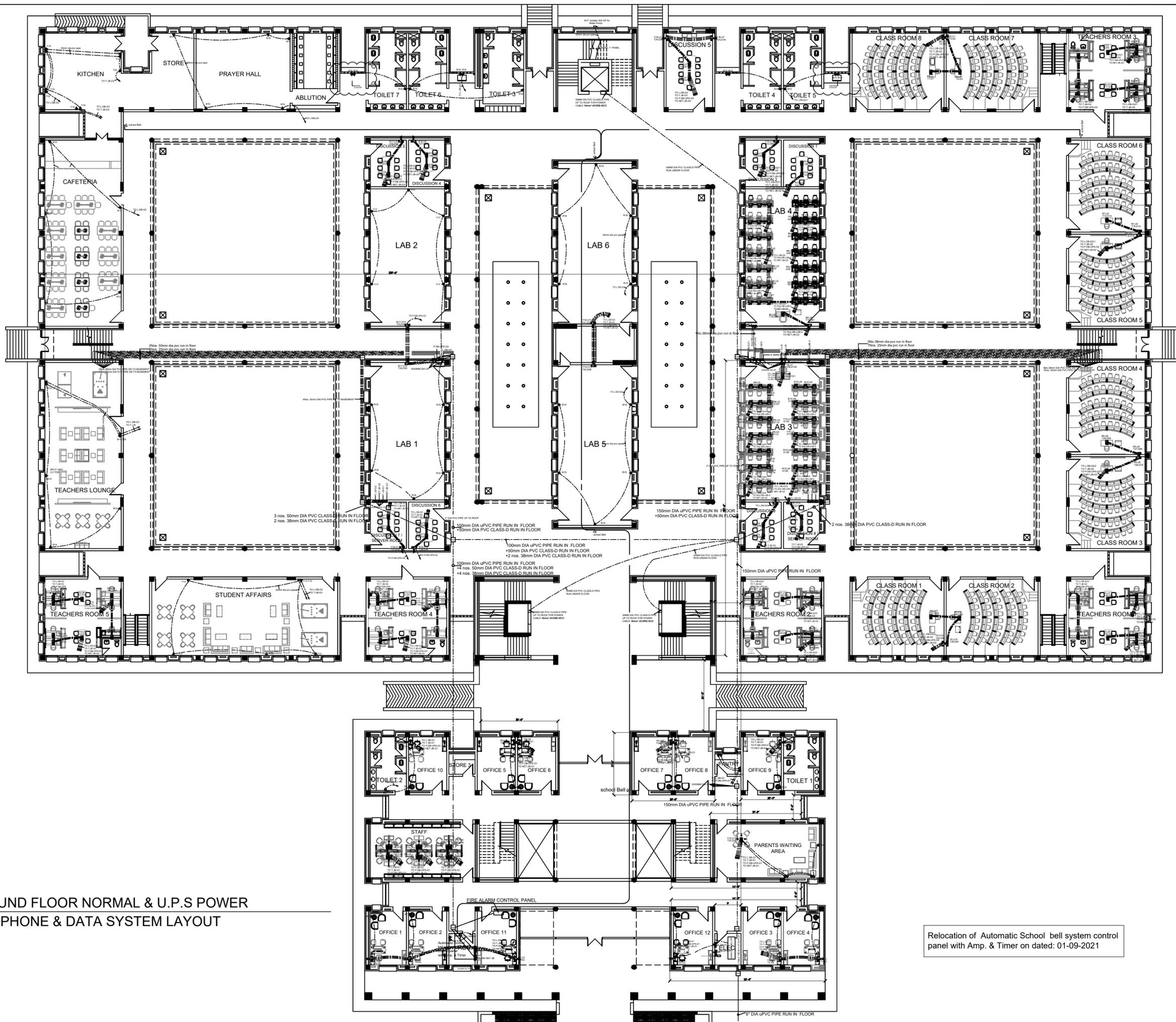
Electrical Consultant
Mr. Fareed-ul-haq Cell # 0321-2250021
Mr. Abdul Fattah Cell # 0332-0219405
 Electrical Mechanical Consultant
 Suit No. 404 152 4th Floor Habitat Centre 55 D.A.C.H. Main Shaheed Benazir
 Karachi. Tel: 021-4544674 CELL # 0321-2250021
 EMAIL: engineer_fareed@yahoo.com

Project
Electrical, Telephone, Computer Networking, CC-TV,
Public Address, Fire Alarm System Works

Title:
GROUND FLOOR
LIGHTING LAYOUT

Design Engineer FAREED-UL-HAQ	Scale 1/16" = 1'-0"	Drawing No.
AutoCad Opp. N.K	Date: 04-06-2018	E-06
Checked By. A.F	Job No.	

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Relocation of Automatic School bell system control panel with Amp. & Timer on dated: 01-09-2021

Shaheed Mohtarma Benazir Bhutto Institute of computer science Dadu

Architect
HABIB FIDA ALI
 ■ ARCHITECTURE ■ INTERIORS
 ■ URBAN DESIGN ■ PROJECT MANAGEMENT
 4, CH. KHALIQUZZAMAN ROAD, KARACHI - 75530.
 PHONE NO. 5661683, 5661720.

Electrical Consultant
Mr. Fareed-ul-haq Cell # 0321-2250021
Mr. Abdul Fattah Cell # 0332-0219405
ELECTRICAL & MECHANICAL CONSULTANT
 Suit No. 404 152 4th Floor Hasmat Center 55 D.A.C.H. 11th Main Street Phase-1/1
 Karachi. Tel: 021-4544674 CELL # 0321-2250021
 EMAIL: engineer_fareed@yahoo.com

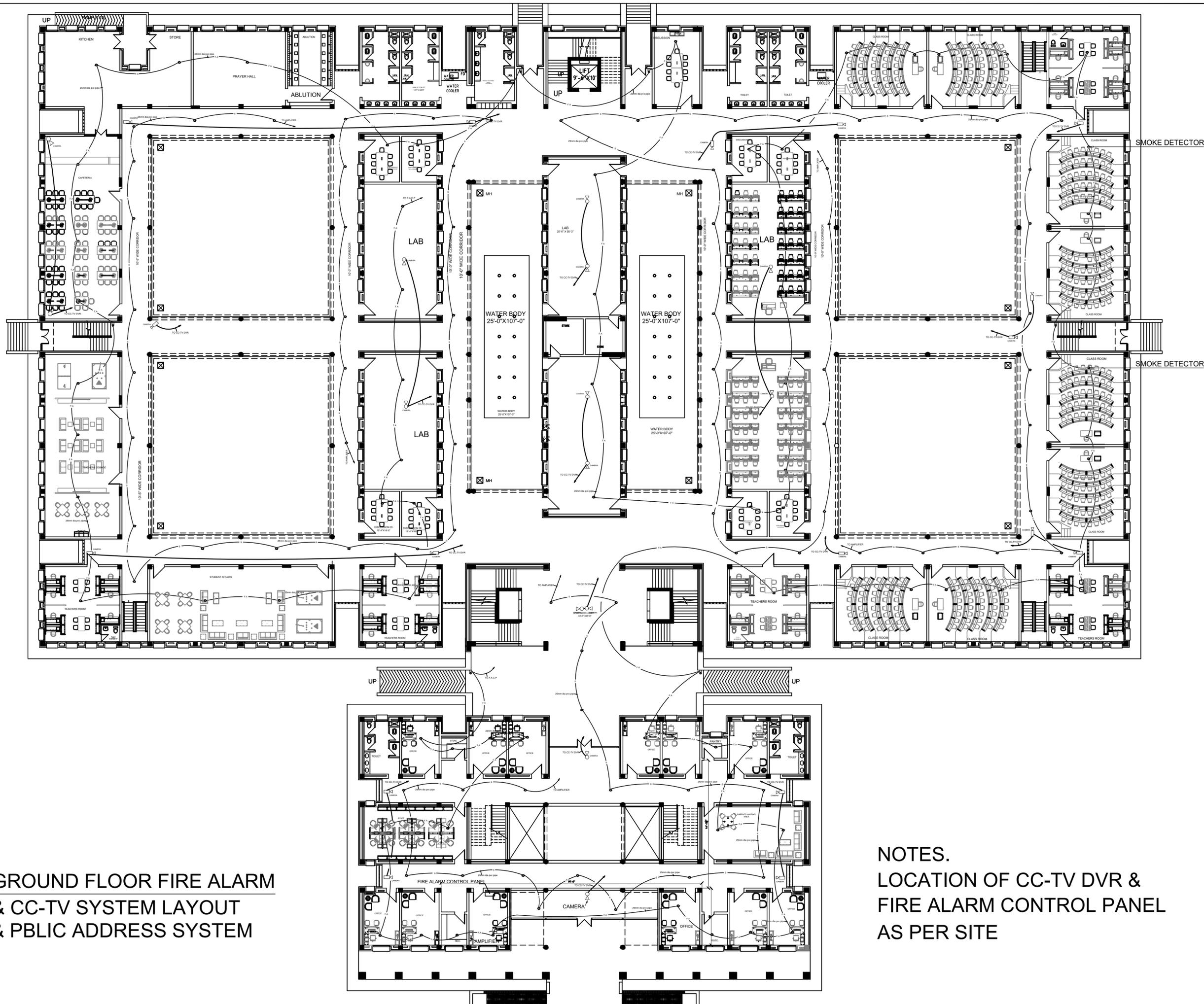
Project
Electrical, Telephone, Computer Networking, CC-TV, Public Address, Fire Alarm System Works

Title:
GROUND FLOOR NORMAL U.P.S POWER TELEPHONE & DATA SYSTEM LAYOUT

Design Engineer FAREED-UL-HAQ	Scale 1/16" = 1'-0"	Drawing No.
AutoCad Opp. N.K	Date: 04-06-2018	E-07
Checked By. A.F	Job No.	

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GROUND FLOOR NORMAL & U.P.S POWER TELEPHONE & DATA SYSTEM LAYOUT



**GROUND FLOOR FIRE ALARM
& CC-TV SYSTEM LAYOUT
& PBLIC ADDRESS SYSTEM**

**NOTES.
LOCATION OF CC-TV DVR &
FIRE ALARM CONTROL PANEL
AS PER SITE**

**Shaheed Mohtarma Benazir Bhutto
Institute of computer science Dadu**

Architect
HABIB FIDA ALI
■ ARCHITECTURE ■ INTERIORS
■ URBAN DESIGN ■ PROJECT MANAGEMENT
4, CH. KHALIQUZZAMAN ROAD, KARACHI - 75530.
PHONE NO. 5661683, 5661720.

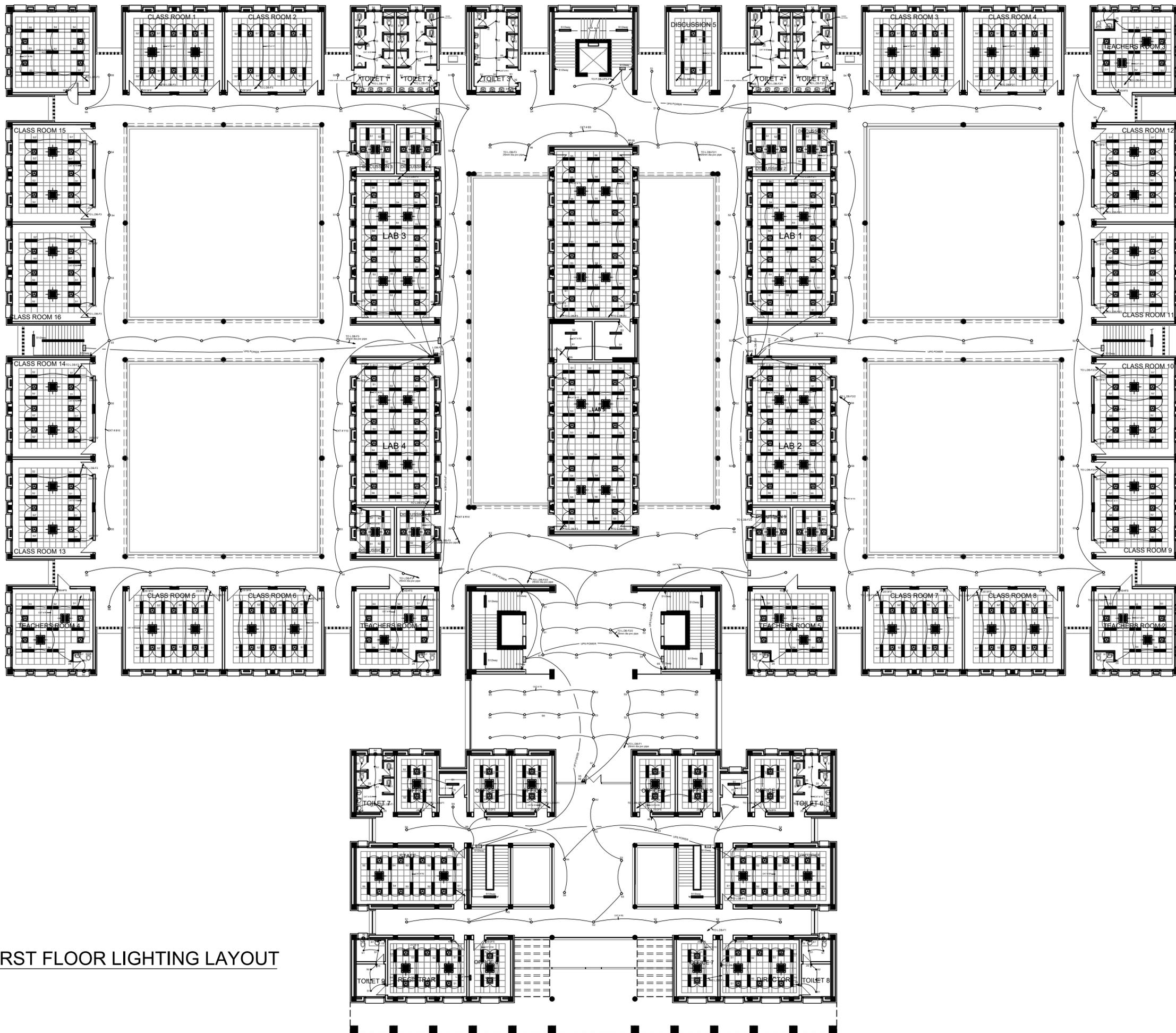
Electrical Consultant
Mr. Fareed-ul-haq Cell # 0321-2250021
Mr. Abdul Fattah Cell # 0332-0219405
ELECTRICAL & MECHANICAL CONSULTANT
SUIT NO. 404 1ST 4TH FLOOR HAZRAT CENTER 55 D.A.C.H. 1ST MAIN SHARAFUDDIN ROAD
KARACHI. TEL: 021-4544674 CELL # 0321-2250021
EMAIL: engineer_fareed@yahoo.com

Project
**Electrical, Telephone, Computer Networking, CC-TV,
Public Address, Fire Alarm System Works**

Title:
**GROUND FLOOR FIRE ALARM
& CC-TV SYSTEM LAYOUT**

Design Engineer FAREED-UL-HAQ	Scale 1/16" = 1'-0"	Drawing No. E-08
AutoCad Opp. N.K	Date: 04-06-2018	
Checked By. A.F	Job No.	

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FIRST FLOOR LIGHTING LAYOUT

Shaheed Mohtarma Benazir Bhutto
Institute of computer science Dadu

Architect
HABIB FIDA ALI
 ■ ARCHITECTURE ■ INTERIORS
 ■ URBAN DESIGN ■ PROJECT MANAGEMENT
 4, CH. KHALIQUZZAMAN ROAD, KARACHI - 75530.
 PHONE NO. 5661683, 5661720.

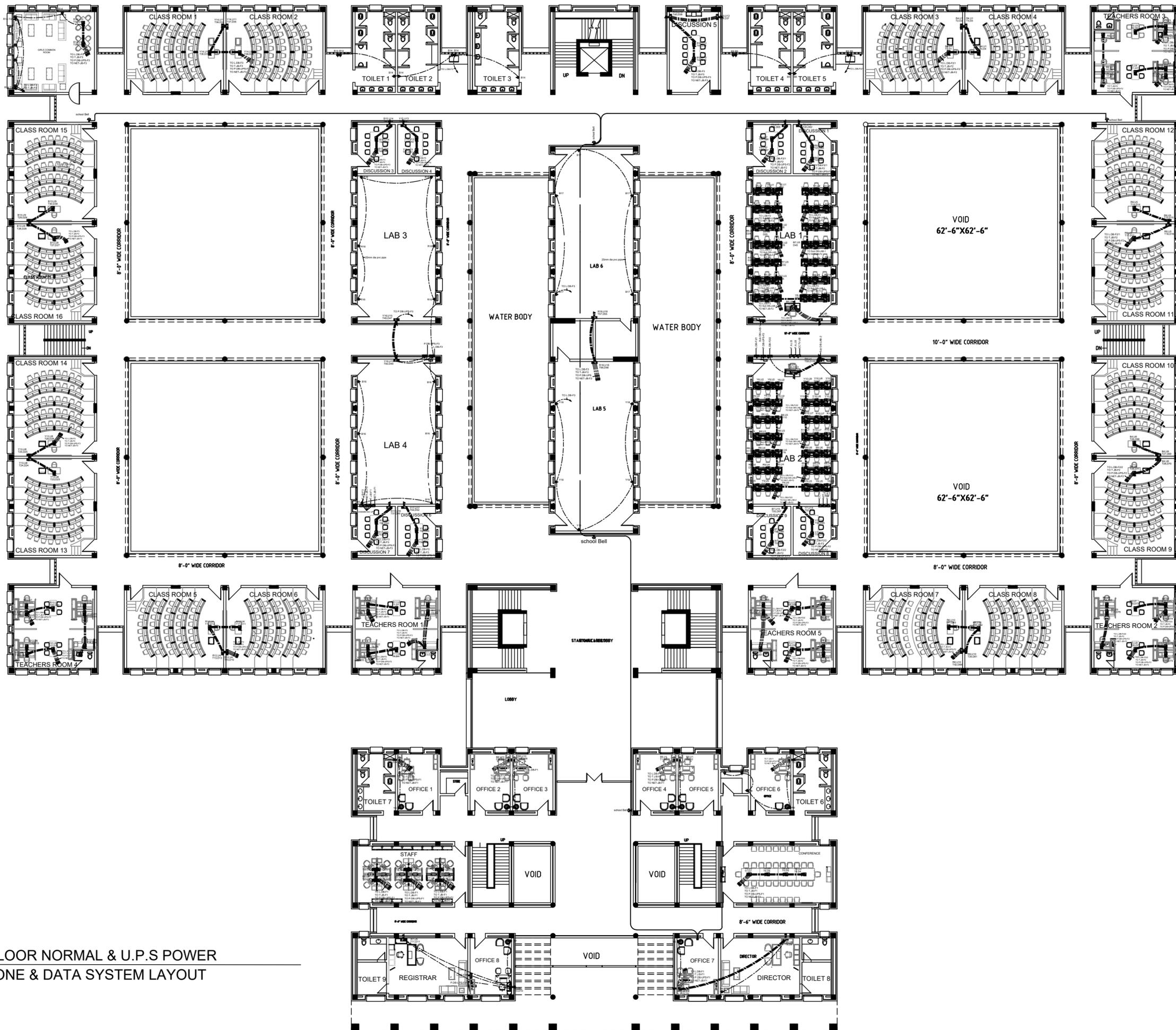
Electrical Consultant
Mr. Fareed-ul-haq Cell # 0321-2250021
Mr. Abdul Fattah Cell # 0332-0219405
ELECTRICAL MECHANICAL CONSULTANT
 Suit No. 404/152/405, River Harbour Centre 55/2, A.C.H.S. Main Shaheed-Benazir
 Karachi. Tel: 021-4544674, CELL # 0321-2250021
 EMAIL: engineer_fareed@yahoo.com

Project
Electrical, Telephone, Computer Networking, CC-TV,
Public Address, Fire Alarm System Works

Title:
FIRST FLOOR
LIGHTING LAYOUT

Design Engineer FAREED-UL-HAQ	Scale 1/16" = 1'-0"	Drawing No.
AutoCad Opp. N.K	Date: 04-06-2018	E-09
Checked By. A.F	Job No.	

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FIRST FLOOR NORMAL & U.P.S POWER TELEPHONE & DATA SYSTEM LAYOUT

Shaheed Mohtarma Benazir Bhutto Institute of computer science Dadu

Architect
HABIB FIDA ALI
 ■ ARCHITECTURE ■ INTERIORS
 ■ URBAN DESIGN ■ PROJECT MANAGEMENT
 4, CH. KHALIQUZZAMAN ROAD, KARACHI - 75530.
 PHONE NO. 5661683, 5661720.

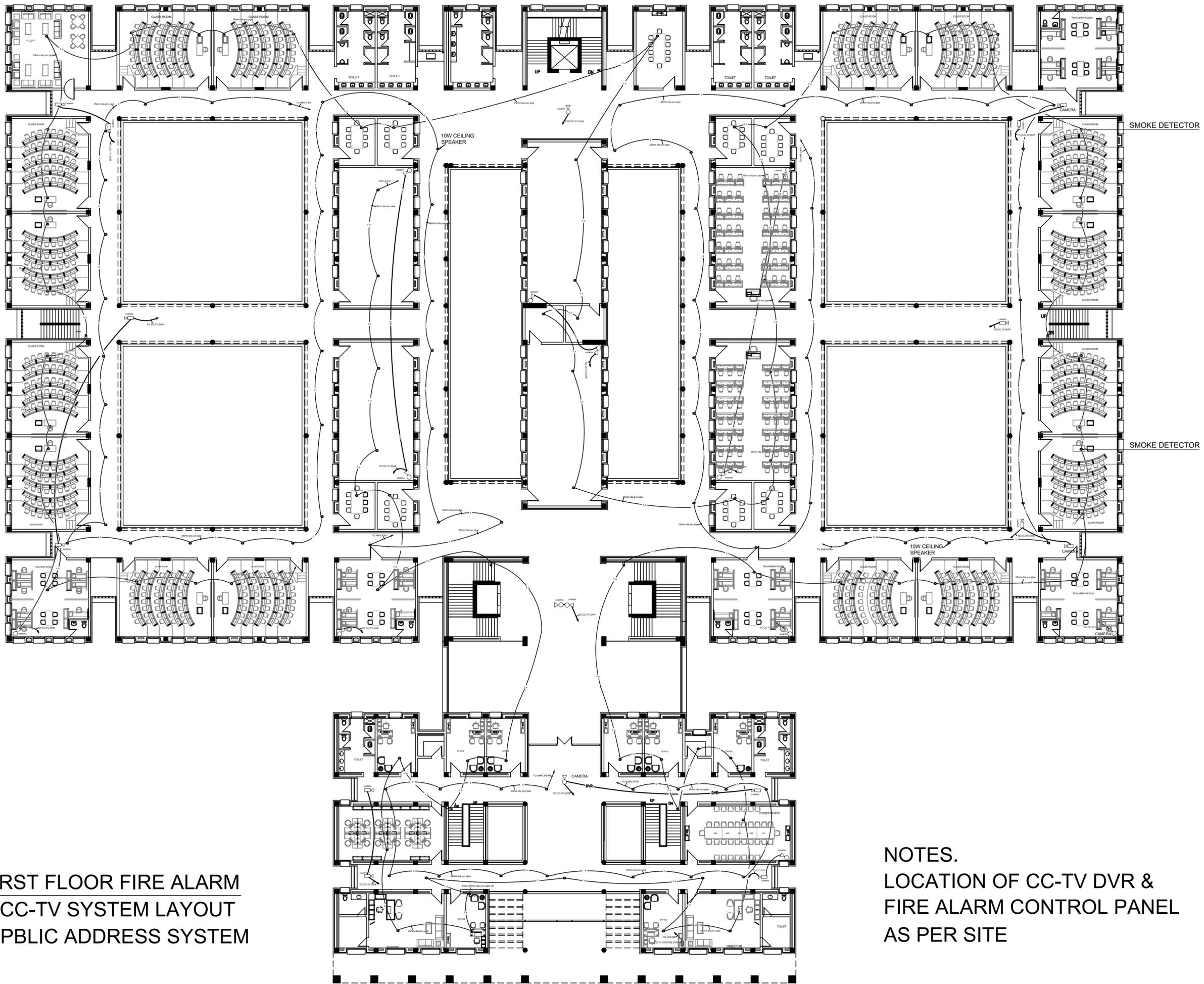
Electrical Consultant
Mr. Fareed-ul-haq Cell # 0321-2250021
Mr. Abdul Fattah Cell # 0332-0219405
ELECTRICAL MECHANICAL CONSULTANT
 Suit No. 404 152 4th Floor Habitat Centre 55 D.A.C.H. Main Shaheed Benazir
 Karachi. Tel: 021-4544674 CELL # 0321-2250021
 EMAIL: engineer_fareed@yahoo.com

Project
Electrical, Telephone, Computer Networking, CC-TV, Public Address, Fire Alarm System Works

Title:
FIRST FLOOR NORMAL U.P.S POWER TELEPHONE & DATA SYSTEM LAYOUT

Design Engineer FAREED-UL-HAQ	Scale 1/16" = 1'-0"	Drawing No. E-10
AutoCad Opp. N.K	Date: 04-06-2018	
Checked By. A.F	Job No.	

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**FIRST FLOOR FIRE ALARM
& CC-TV SYSTEM LAYOUT
& PBLIC ADDRESS SYSTEM**

**NOTES.
LOCATION OF CC-TV DVR &
FIRE ALARM CONTROL PANEL
AS PER SITE**

Shaheed Mohtarma Benazir Bhutto
Institute of computer science Dadu

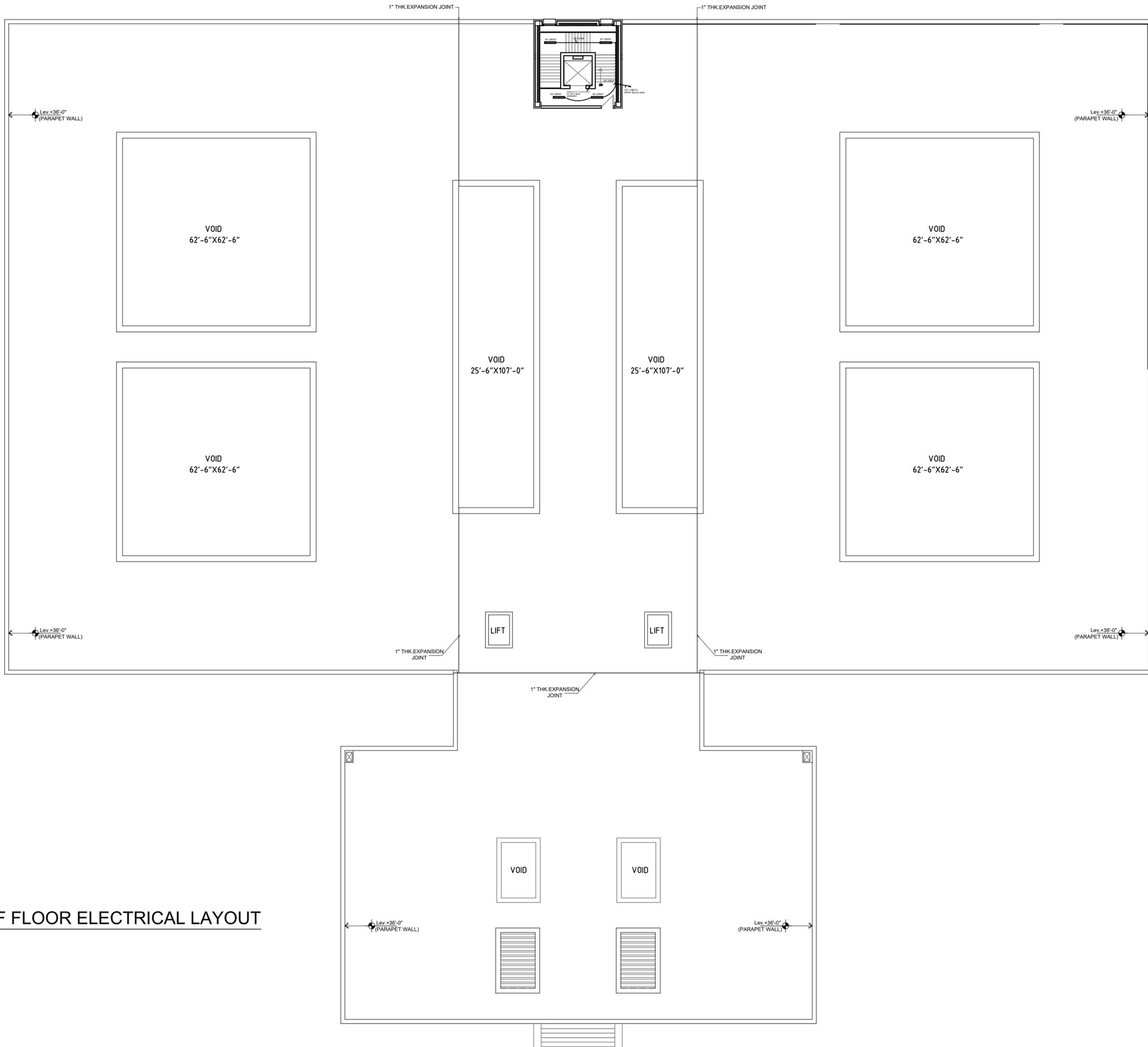
Architect
HABIB FIDA ALI
■ ARCHITECTURE ■ INTERIORS
■ URBAN DESIGN ■ PROJECT MANAGEMENT
4, CH. KHALIQUZZAMAN ROAD, KARACHI - 75530.
PHONE NO. 5661683, 5661720.

Electrical Consultant
Mr.Fareed-ul-haq Cell # 0321-2250021
Mr.Abdul Fattah Cell # 0332-0219405
ELECTRICAL MECHANICAL CONSULTANT
SUIT NO. 404 FID 405, BOND HOSPITAL CENTER, 55 D.A.C.H II SE, MAIN SHARAFUDDIN ROAD
KARACHI. TEL: 021-4544874, CELL: # 0321-2250021
EMAIL: engineer_fareed@yahoo.com

Project
**Electrical, Telephone, Computer Networking, CC-TV,
Public Address, Fire Alarm System Works**

Title:
**FIRST FLOOR FIRE ALARM
& CC-TV SYSTEM LAYOUT**

Design Engineer FAREED-UL-HAQ	Scale 1/16" = 1'-0"	Drawing No. E-11
AutoCad Opp. N.K	Date: 04-06-2018	
Checked By. A.F	Job No.	
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ROOF FLOOR ELECTRICAL LAYOUT

Shaheed Mohtarma Benazir Bhutto Institute of computer science Dadu

Architect
HABIB FIDA ALI
 ■ ARCHITECTURE ■ INTERIORS
 ■ URBAN DESIGN ■ PROJECT MANAGEMENT
 4, CH. KHALIQUZZAMAN ROAD, KARACHI - 75530.
 PHONE NO. 5661683, 5661720.

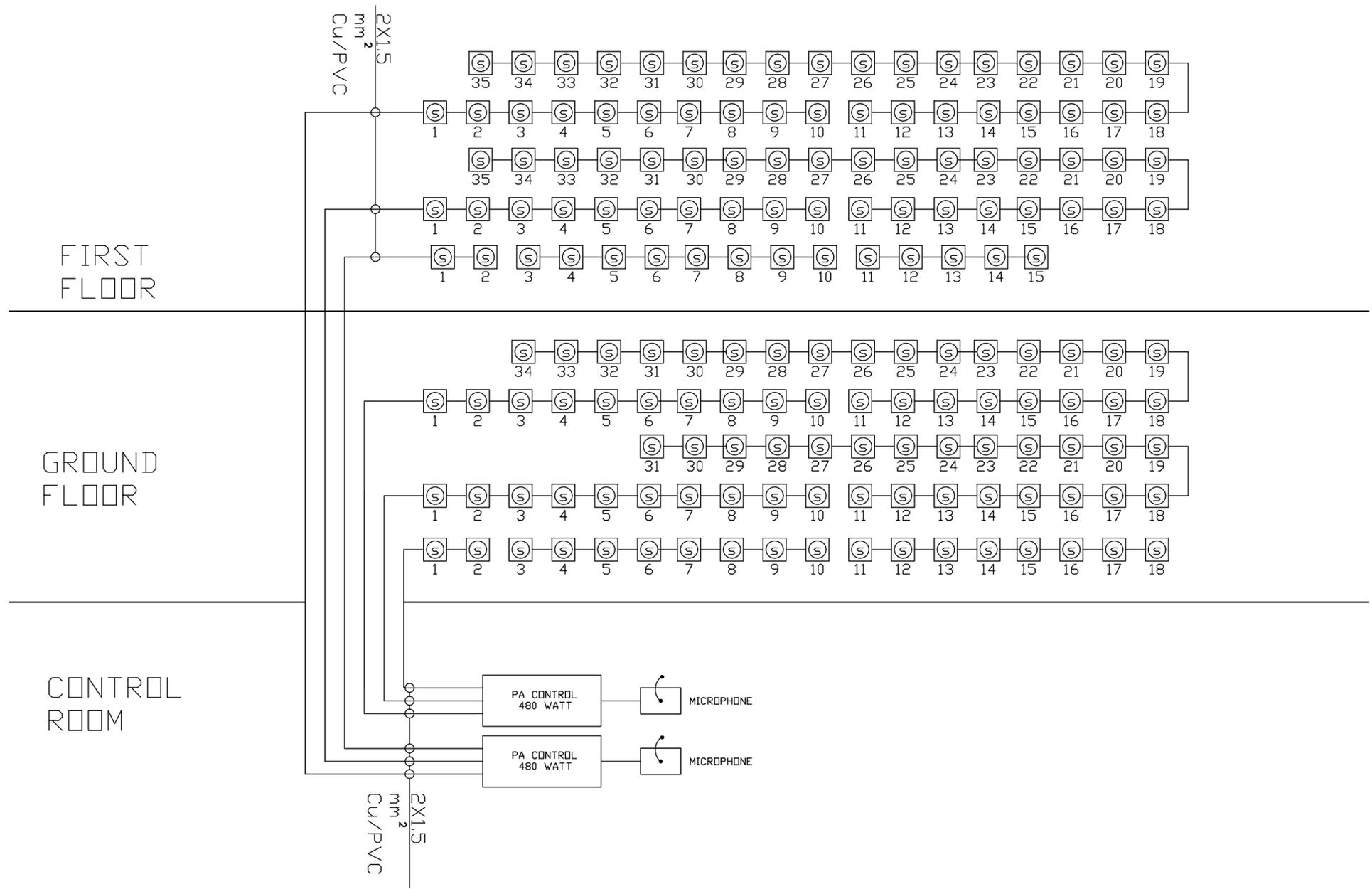
Electrical Consultant
Mr. Fareed-ul-haq Cell # 0321-2250021
Mr. Abdul Fattah Cell # 0332-0219405
 Electrical & Mechanical Consultant
 Suit No. 404/152/4th Floor, Hesperus Center, 55/3, A.C.H.S. Main, Shaheed Benazir Bhutto Institute
 Karachi. Tel: 021-4544674, CELL # 0321-2250021
 EMAIL: engineer_fareed@yahoo.com

Project
Electrical, Telephone, Computer Networking, CC-TV, Public Address, Fire Alarm System Works

Title:
FIRST FLOOR NORMAL U.P.S POWER TELEPHONE & DATA SYSTEM LAYOUT

Design Engineer FAREED-UL-HAQ	Scale 1/16" = 1'-0"	Drawing No.
AutoCad Opp. N.K	Date: 04-06-2018	E-12
Checked By. A.F	Job No.	

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Single line Diagram PA-System

**Shaheed Mohtarma Benazir Bhutto
Institute of computer science Dadu**

Architect
HABIB FIDA ALI
 ■ ARCHITECTURE ■ INTERIORS
 ■ URBAN DESIGN ■ PROJECT MANAGEMENT
 4, CH. KHALIQUZZAMAN ROAD, KARACHI - 75530.
 PHONE NO. 5661683, 5661720.

Electrical Consultant
Mr. Fareed-ul-haq Cell # 0321-2250021
Mr. Abdul Fattah Cell # 0332-0219405
 Electrical & Mechanical Consultant
 Suit No. 404/152/4th Floor, Hassan Center, S.S.I.A.C.T.H. Main, Shaheed Benazir
 Karachi. Tel: 021-4544674, CELL # 0321-2250021
 EMAIL: engineer_fareed@yahoo.com

Project
**Electrical, Telephone, Computer Networking, CC-TV,
Public Address, Fire Alarm System Works**

Title:
Single line Diagram PA-System

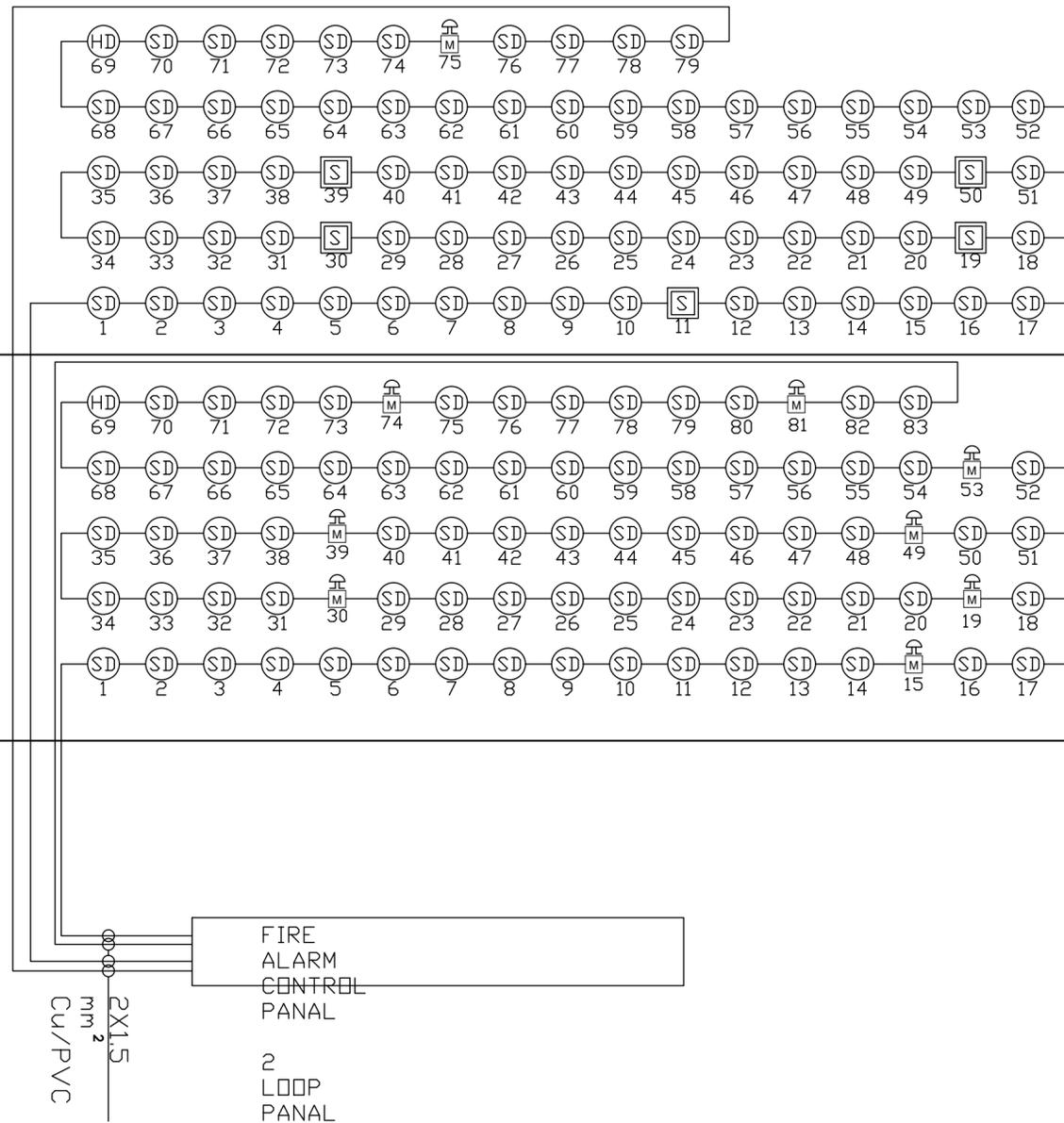
Design Engineer FAREED-UL-HAQ	Scale NTS	Drawing No.
AutoCad Opp. N.K	Date: 04-06-2018	E-13
Checked By. A.F	Job No.	

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FIRST FLOOR

GROUND FLOOR

CONTROL ROOM



Single line Diagram Fire Alarm

Shaheed Mohtarma Benazir Bhutto
Institute of computer science Dadu

Architect

HABIB FIDA ALI

■ ARCHITECTURE ■ INTERIORS
■ URBAN DESIGN ■ PROJECT MANAGEMENT
4, CH. KHALIQUZZAMAN ROAD, KARACHI - 75530.
PHONE NO. 5661683, 5661720.

Electrical Consultant

Mr. Fareed-ul-haq Cell # 0321-2250021
Mr. Abdul Fattah Cell # 0332-0219405

ELECTRICAL & MECHANICAL CONSULTANT
SUIT NO. 404/152/405, BROAD HORIZON CENTER, 55/A, C.I.T. III, MAIN SHARADHA-ROAD
KARACHI. TEL: 021-4544674, CELL: # 0321-2250021
EMAIL: engineer_fareed@yahoo.com

Project

Electrical, Telephone, Computer Networking, CC-TV,
Public Address, Fire Alarm System Works

Title:

Single line Diagram Fire Alarm

Design Engineer
FAREED-UL-HAQ

Scale
NTS

Drawing No.

AutoCad Opp.
N.K

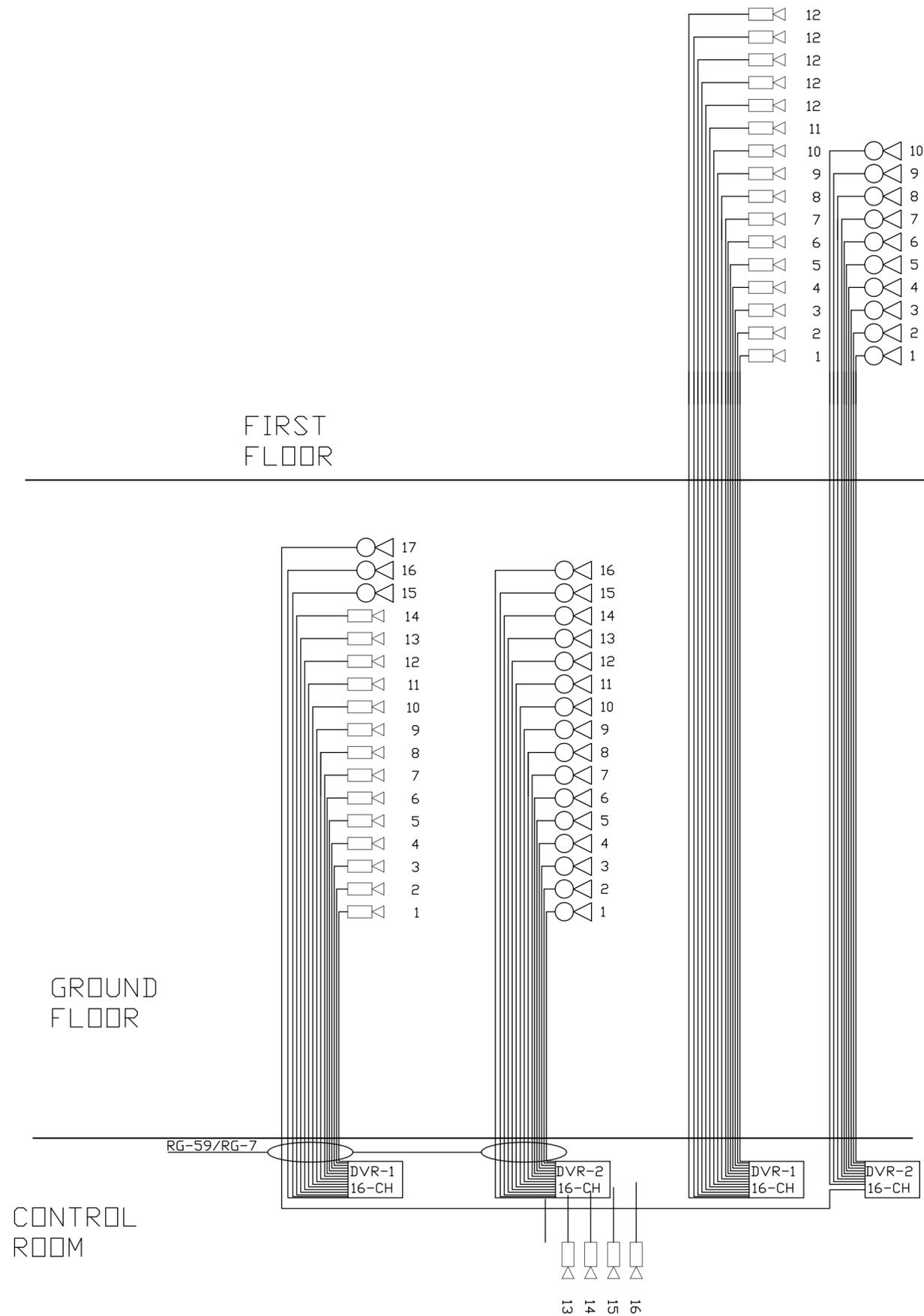
Date:
04-06-2018

E-14

Checked By.
A.F

Job No.

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Single line Diagram CCTV

Shaheed Mohtarma Benazir Bhutto Institute of computer science Dadu

Architect
HABIB FIDA ALI
 ■ ARCHITECTURE ■ INTERIORS
 ■ URBAN DESIGN ■ PROJECT MANAGEMENT
 4, CH. KHALIQUZZAMAN ROAD, KARACHI - 75530.
 PHONE NO. 5661683, 5661720.

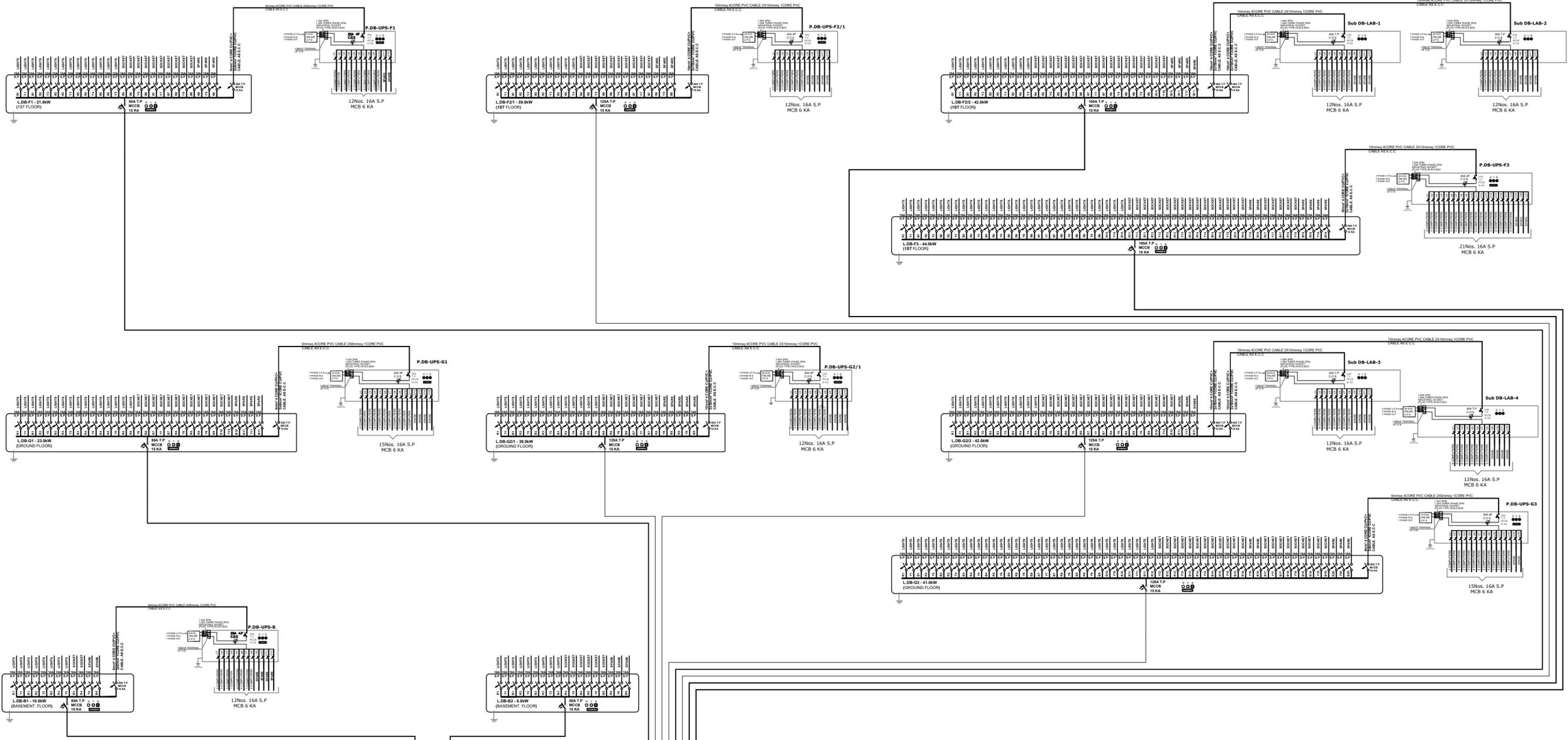
Electrical Consultant
Mr.Fareed-ul-haq Cell # 0321-2250021
Mr.Abdul Fattah Cell # 0332-0219405
ELECTRICAL & MECHANICAL CONSULTANT
 Suit No. 404 152 4th Floor Hameed Center 55 A.C.T-15 Main Shaheed Benazir
 Karachi. Tel: 021-4544874 CELL # 0321-2250021
 EMAIL: engineer_fareed@yahoo.com

Project
Electrical, Telephone, Computer Networking, CC-TV, Public Address, Fire Alarm System Works

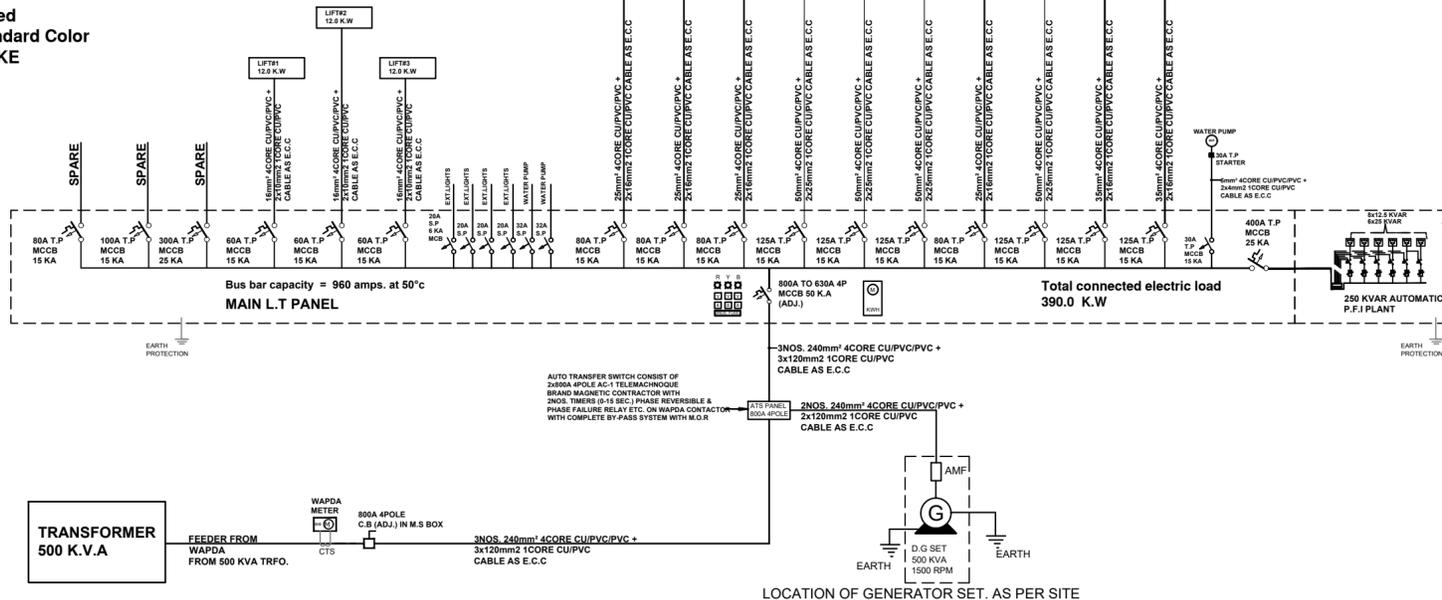
Title:
Single line Diagram CCTV

Design Engineer FAREED-UL-HAQ	Scale NTS	Drawing No.
AutoCad Opp. N.K	Date: 04-06-2018	E-15
Checked By. A.F	Job No.	

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Notes for L.T Panel
 MS Sheet Metal 14 Swg. (approved make)
 Bus bar 99.99 pure copper imported
 Color RAL 7032 Powder Coat-Standard Color
 ALL S.P MCB 6KA TERASAKI MAKE



NOTE:
 250 KVAR 3phase Automatic power factor improvement plant to be installed adjacent to MAIN L.T. PANEL comprising of all necessary sensing and switching relays contactors, banks of capacitors suitable for operation at 400/415v 50Hz Control voltage 230v 50Hz switching in and out the capacitors in 14 steps rective power control relay with digital power factor indication meter selector switch manual/auto/off indication lamps push buttons hrc fuses of suitable rating contactors for capacitors control, fuses auxiliary contactors for capacitors all necessary materials complete in all respects

cable size	imp.cable size
1.5mm ²	= 3/,029 Inch
2.5mm ²	= 7/,029 Inch
4mm ²	= 7/,036 Inch
6mm ²	= 7/,044 Inch
10mm ²	= 7/,052 Inch
16mm ²	= 7/,064 Inch
25mm ²	= 19/,052 Inch
35mm ²	= 19/,064 Inch

**Shaheed Mohtarma Benazir Bhutto
Institute of computer science Dadu**

Architect
HABIB FIDA ALI
 ■ ARCHITECTURE ■ INTERIORS
 ■ URBAN DESIGN ■ PROJECT MANAGEMENT
 4, CH. KHALIQUZZAMAN ROAD, KARACHI - 75530.
 PHONE NO. 5661683, 5661720.

Electrical Consultant
Mr.Fareed-ul-haq Cell # 0321-2250021
Mr.Abdul Fattah Cell # 0332-0219405
E L E C T R I C A L M E C H A N I C A L C O N S U L T A N T
 Suit No. 404 152 4th Floor Habitat Centre 55 C.I.C.H.S Main Shaheed-Benazir
 Karachi. Tel: 021-4544674 CELL# 0321-2250021
 EMAIL: engineer_fareed@yaho.com

Project
**Electrical, Telephone, Computer Networking, CC-TV,
Public Address, Fire Alarm System Works**

Title:
SINGLE LINE DIAGRAM

Design Engineer FAREED-UL-HAQ	Scale NTS	Drawing No. E-16
AutoCad Opp. N.K	Date. 14-09-2021	
Checked By. A.F	Job No.	

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