U049837 RS- 266000/-

AZAM ALAM STAMP VENDER
Licence # 59, G-7, Spanis Homes, Phase-1,D.H.A Karachi
S.NO. ..... DATE .....
Issued To With Address .....
Through With Address .....
Purpose .....
Value Rs ..... Attested .....
Stamp Vendor's Signature .....
Not For Use Free Will & Divorce Deed
Vendor Not Responsible Any Fake Documentation

191332 Rupees

Muhammad Waris Khan Ajmeri
Advocate Leger-16113

01 APR 2021

FORM OF CONTRACT AGREEMENT

THIS CONTRACT AGREEMENT (hereinafter called the "Agreement") is made on the 15 day of 5 2021 by and between **Institute of Business Administration IBA Karachi,** an educational institute incorporated under the laws of Pakistan and having its registered address located at IBA Main Campus at Karachi University Enclave (Karachi) (hereafter called the "Employer") of the one part and **Solis Energy Solutions (Private) Limited,** a company incorporated under the laws of Pakistan and having its registered address located at D-180, Block 5, Clifton, Karachi, Pakistan (hereafter called the "Contractor") of the other part.

WHEREAS the Employer is desirous that certain Works, viz as stated under Annexures (g), (h) and (i) of this Agreement, should be executed by the Contractor and that the Employer has accepted a Bid by the Contractor for the execution and completion of such Works and the remedying of any defects therein.

NOW this Agreement witnesseth as follows:

1. In this Agreement words and expressions shall have the same meanings are respectively assigned to them in the Conditions of Contract hereinafter referred to.

2. The following documents after incorporating addenda, if any except those parts relating to Instructions to Bidders shall be deemed to from and be read and constructed as part of this Agreement, viz:

a) The Contract Agreement
b) The Letter of Acceptance
c) The completed Form of Bid
d) The Preamble to Conditions of Contract

Dr Mohammad Asad Ilyas
Registrar
Former Chairperson Accounting & Law Department
Institute of Business Administration (IBA)
Karachi, Pakistan

SOLIS

OFFICE SUPERINTENDENT
Stamp Office, City Court
Karachi

05 MAY 2021

e) The Particular Conditions of Contract
f) The General Conditions of Contract
g) The priced Schedule of Prices
h) The completed Schedules to Bid
i) The Specifications
j) The Drawings

Inconsideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the Works and remedy defects therein in conformity and in all respects with the provisions of the Contract.

The Employer hereby covenants to pay the Contractor, in consideration of the execution and completion of the Work as per provisions of the Contract, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

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

Signature of the Contractor

Name: Farman Ahmed Khan Lodhi
Designation Chief Executive Officer
(Seal)

Signature of the Employer

Dr Mohammad Asad Ilyas
Registrar
Former Chairperson Accounting & Law Department
Institute of Business Administration (IBA),
Karachi, Pakistan

Name:
Designation
(Seal)

Signed, Sealed and Delivered in the presence of:

Witness:

Name: NOMAN ALI
Address: D-180 BLOCK-5
CLIFTON

Witness:

Name: Rana Atif
Address: D-180 Block-5
Clifton

Witness:

Name: Muhammad Nasimul Hasan Malik
Address:

Witness:

Name: S. Fahad Jawed
Address: IBA, Main Campus

IBA Institute of Business Administration Karachi

Leadership and Ideas for Tomorrow

Ref # IBA-MC/PD/214/0135/2020-21 March 2, 2021

M/s. Solis Energy Solutions (Pvt.) Ltd.
D-180 Block-5 Clifton, Karachi
Phone: 35294301-6
Attn: Syed Sami

Subject: LETTER OF AWARD (LOA) FOR SUPPLY, CONSTRUCTION, INSTALLATION AND COMMISSIONING OF 750 kWp ON-GRID SOLAR POWER SYSTEM ROOF, CAR & BUS PORT MOUNTED AT INSTITUTE OF BUSINESS ADMINISTRATION (IBA) KARACHI

Dear Mr. Sami
This is with reference to your bid submitted and opened on December 20, 2020, by the Procurement Committee - IBA.

We are pleased to inform you that upon Financial & Technical Scrutiny, your bid is found to be the lowest evaluated bid at a cost of PKR 75.952 Million (Rupees Seventy-Five Million Nine Hundred Fifty-Two Thousand only) for a total installed capacity of 806.13 kWp (per watt cost PKR 94.22) and total unit generation yearly minimum 1135 MWH at P90.

This Letter of Award (LOA) comprises of:

1. Tender documents Volume-1 (General & Special Conditions of Contracts)
2. Tender documents Volume-2 (Technical Specification & Drawings)
3. Tender documents Volume-3 (Bill of Quantities)

The work should be executed strictly as per specification and direction and instruction issues by the Site Execution Staff.

The Terms & Conditions shall be as under:

1 Contract Price: PKR 75.952 Million (Rupees Seventy-Five Million Nine Hundred Fifty-Two Thousand only) for 806.13 kWp.

2 Time of Completion: 12 (Twelve) Calendar Months (Nine Months for Execution of work & three months for Commissioning & Testing) from 15 days after the date of issue of LOA.

3 Defects Liability Period: As per Clause 7 (A & B) Special Stipulations Clauses Conditions of Contract Appendix A to Bid Page # 82, Volume-1

4 Liquidated Damages: As per clauses of Appendix A to Bid Page # 83, Volume-1.

5 Payment terms:

a) Mobilization Advance: 10% of the Contract amount as Mobilization Advance subject to the submission of Bank Guarantee from a Scheduled Bank of Pakistan.

IBA Institute of Business Administration Karachi

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This will be recovered from each successive bill at the rate of 10% till up to complete reimbursement of Mobilization advance.

b) Secured Advance: Up to 70% of the Material Cost of the item as per Clause 14 of Appendix A to Bid Page # 83 Volume-1 on materials required at the site supported with pre Dispatch inspection report, Valid Warranty and individual test report. The payment shall be made only upon the material brought at the site and duly verification of the IBA authorized representative that materials are required and are in good working condition. The safe custody shall be the Contractor's responsibility. The reimbursement shall be made from the next submitted bill.

c) Retention Amount: 5% (Five percent) from each bill shall be deducted from each running bill and 50% (Fifty percent) of the retention amount shall be released upon issuance of substantial completion along with the final bill, while the balance 50% (Fifty percent) shall be released upon successful completion of Defects Liability Period. Twelve calendar months from the date of issue of Substantial Completion of the Project.

6 Variation: No variation or Extra Substitute items shall be executed without the written approval of the IBA Competent Authority.

7 Work Program: Contractor is required to submit work Program & cash flow within seven (7) days of issuance of Letter of Award (LOA) based on CPM / Bar Chart.

8 Performance Guarantee: M/s. Solis Energy Solution (Pvt.) Ltd is required to submit the Performance Guarantee as per Clause-I of Appendix-A to Bid Volume-1 equivalent to 5% (Five percent) of the Contract amount, as mentioned in LOA in form of a Bank Guarantee from a Scheduled Bank of Pakistan or Pay Order in the name of *IBA, Karachi*

All technical and contractual matters are as per Tender Terms & Conditions (General & Particular) of Contract Volume-1. It is requested to please return the copy of this letter of award duly signed with an official stamp as an acknowledgment of its receipt as well as unconditional acceptance of the same. It is also requested to sign the agreement as per the prescribed Performa given in the contractor document on Judicial Paper equivalent to 0.35% of the Contract amount as mentioned on LOA as per rules.

Thanking you

2/3/21

Head of Procurement
Institute of Business
Administration (IBA) Karachi

Manager Contracts
(Projects) IBA

2/3/21

Received & Accepted on behalf of
M/s. Solis Energy Solution (Pvt.) Ltd

To,

Sr. Manager Contract

IBA, Karachi

SUB: SUPPLY, CONSTRUCTION, INSTALLATION AND COMMISSIONING OF 750 KWp OM-GRID SOLAR POWER SYSTEM PROOF MOUNTED, CAR & BUS PORT MOUNTED AT INSTITUTE OF BUSINESS ADMINISTRATION KARACHI (MAIN CAMPUS)

Dear Sir,

1. Having examined the bidding documents including instructions to Bidders, Bidding Data, and Conditions of Contract, Specifications, drawings and Bill of quantities and Addenda Nos. for the Execution of above named work, we/I, the undersigned, offer to execute and complete the work and remedy any defects therein in conformity with the conditions of contract, Specifications, Drawings, Bill of Quantities and Addenda for the sum of Rs. (FP) Or such other sum as may be ascertained in accordance with the said conditions.

2. We/I understand that all the Appendices attached hereto form part of this bid.

3. As security for due performance of the undertakings and obligations of this bid, we/I submit herewith a bid security in the amount of Rs. 1,000,000 Drawing in favor or made payable to procuring agency and valid for a period of 90 days beginning from the date, bid is opened.

4. We/I undertake, if our bid accepted, to commence the works and to complete the whole of the works comprised in the contract within the time stated in Appendix-A to Bid.

5. We/I agree to abide by this bid for the period of 90 days from the date fixes for opening the same and it shall remain binding upon us and maybe accepted at any time before the expiration of that period.

6. Unless and until a formal Agreement is prepared and executed, this bid, together with your written acceptance thereof, shall constitute a binding contract between us.

7. We do hereby declare that the bid is made without any collusion, comparison of figures or arrangement with any other bidder for the works.

8. We understand that you are not bound to accept the lowest or any bid you may receive.

9. We undertake, if our/my bid is accepted, to execute the performance security referred to in Clause 10 of Conditions of Contract for the due performance of the contract.

10. We confirm, if our bid is accepted, that all partners of the joint venture shall be liable jointly and severally for the executin of the contract and the composition or the constitution of the joint venture shall not be altered without the prior consent of the procuring agency.

In the capacity of **Syed Sami** duly authorized to sign Bids for and on behalf of

SOLIS ENERGY SOLUTIONS PVT. LTD.

Dated this 19-Nov-2020

Signature _____

Address: D-180, Block-5, Clifton, Karachi

Witness: _____

Signature: _____

Name: Ahmed Salman

Address: D-180 Block 5 Clifton

Occupation: Design Engineer

Solis energy Solutions Pvt. Ltd.
D-180, Block-5, Clifton,
Karachi-Pakistan

T +92(21)3529 4301-6
F +92(21)3529 4311

www.solis-energy.com

PREAMBLE TO CONDITIONS OF CONTRACT

Date Of Commencement Sub-Clause 1.1.1 (i)

The date for commencement of the Works is the date *"Fifteen days after issuance of Letter of Acceptance (LOA)"*

Defect Liability Period Sub-Clause 1.1.11

The Defect Liability Period is 365 days after issuance of Completion Certificate

The Employer Sub-Clause 1.1.12.

"INSTITUTE OF BUSINESS ADMINISTRATION IBA KARACHI" Tele : 111-422-422

www.iba.edu.pk

The Engineer Sub-Clause 1.1.15.

M/S HI-Tech Engineering Company Al Fath Chamber CC Area KCHS Block 7/8 Near Old Duty Free Shop Shahrah-e- Faisal Karachi www.hec-eng.com

Project Manager : Project Department IBA Shall be the Project Manager www.iba.edu.pk

Time for Completion Sub-Clause 1.1.35.

12 (Twelve) Months days from the Commencement Date.

Warranty Period Sub-Clause 1.1.40.

(i)	For PV Module	25 Years Performance Warranty
(ii)	For Grid- Tied Inverter	5 Years Performance Warranty
(iii)	For MMS (Module Mounting Structure)	25 Years Performance Warranty

Engineer's Duties & Authorities Sub-Clause 2.1

Amount of Variation Order in emergency is (+/-) 2% of the Contract Price

Confirmation in Writing Sub-Clause 2.6

If the Contractor shall require the confirmation it shall be notified to the Engineer within 14 Days.

(i) Engineer shall confirm the decision/instruction within 14 days.

Ruling Language Sub-Clause 5.1.

The version in English language (ruling language) shall prevail

Day to Day Communications	English	Sub-Clause 5.2.
As-Built Drawings	As-Built drawings shall be provided to the Engineer within 28 days from the date of issue of Taking Over Certificate.	Sub-Clause 6.10
General Obligations	Detail of Erection and Testing Equipment and Maintenance Tools is given herein below:	Sub-Clause 8.1
Programme to be Furnished	The Programme must be submitted in the form of Bar Chart Prima Vera	Sub-Clause 12.1.
Electricity Water, Gas and Other Services	Supplies on the Site are: a. Electricity: To be Provided on charge b. Water : To be Provided on charge c. Gas : Not Provided d. Other : Not Provided	Sub-Clause 14.3.
Employer's Equipment	The following Employer"s equipment is available for use by the Contractor under the Employer"s operation: None	Sub-Clause 14.4.
Working Hours	The normal working hours are as per labour laws of Pakistan	Sub-Clause 18.3.
Time for Completion	12 (Twelve) Months from commencement date.	Sub-Clause 25.1
Place of the Project :	(i) IBA Main Campus Karachi University	
Earlier Completion		Sub-Clause 26.3
(i) Amount of Bonus per day	Nil	
(ii) Max. Amount of Bonus	Nil	
Delay in Completion		Sub-Clause 27.1.

Failure to meet the Time for Completion entitles the Employer to reduction in Contract Price as follows:

Percentage per day 0.10 % Per Day x No. of days Maximum 10 % of the Project Tender Cost

Prolonged Delay Sub-Clause

27.2.

Maximum amount recoverable from the Contractor by the Employer 20 %

Terms of Payment Sub-Clause 33.1.

In addition to the provisions under Clause 33, the terms of payment shall be as stated in Particular Conditions of Contract.

Min Amount of Interim Payment Certificate Sub-Clause 33.2

Total amount of Contract As per LOA /Total Period of Contract in Months /2

Payment Period Sub Clause 33.5

(I) Period of Payment by Employer to Contractor 20 Days after joint verified by employer and Contractor and submission of Duly verified bill to Finance office

(ii) Period of Final Certificate of Payment : 56 Days after issuance of the Completion Certificate and final payment certificate jointly verified.

Payment in Foreign Currencies Sub Clause 35.1

Payment in Foreign Currencies **Not Applicable**

Insurance of Works Sub-Clause 43.1.

The deductible limits in the insurance cover of the Works shall not exceed Full replacement value of such works and temporary works+15 % additional to cover additional expenses.

Sub-Clause 43.1.(a)

The additional risks to be insured are:

As per PCC

Third Party Liability Sub-Clause 43.3.

The amount of insurance against third party liability taken out by the Contractor shall not be less than: 500,000 for Property damage and Rs 500000 for personnel injury/death per occurrence with number of occurrence with number of occurrence un- limited.

Payment on Termination for Employer's Default Sub-Clause 46.3.

The additional amount payable by the Employer on termination shall not exceed:

The actual work executed.

Labour, Materials and Transport	Sub-Clause 47.1. The method of calculating adjustments for changes in costs shall be: (The user may extract the formula from Clause 70.1 PCC of the PEC Civil Works documents and with reference to PEC documents "Standard Guidelines and Formula for Price Adjustment")
Notices to Employer and Engineer	Sub-Clause 49.2. The address of the Employer for notices is: **Institute of Business Administration (IBA) Karachi** The address of the Engineer for notices is: HI- Tech Engineering Co. Al Fateh Chamber CC Area, KCH Block 7/8 Near Old Duty Free Shop Shahrah-e- Faisal Karachi Ph. 021-37361355
Disputes & Arbitration	Sub-Clause 50.4 Venue of Arbitration _Karachi Pakistan.
Applicable Law	Sub-Clause 51.1. The applicable law is Arbitration Act 1940 and the rules made thereunder and /or any statuary modification thereof
Procedural Law for Arbitration	Sub-Clause 51.2. The procedural law for arbitration is Arbitration Act 1940
Language and Place of Arbitration	Sub-Clause 51.3. The language of arbitration is English language. The place of arbitration is Karachi

GENERAL CONDITIONS OF CONTRACT

[Notes on the Conditions of Contract

The Conditions of Contract comprise two parts:

(a) General Conditions of Contract

(b) Particular Conditions of Contract

Over the years, a number of "model" General Conditions of Contract have evolved. The one used in these Standard Bidding Documents was prepared by the International Federation of Consulting Engineers (Federation Internationale des Ingenieurs-Conseils, or FIDIC), and is commonly known as the FIDIC Conditions of Contract. (The used version is the 1987 edition, reprinted in 1988 with editorial amendments.)

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

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

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

The FIDIC Conditions of Contract are copyrighted and may not be copied, faxed, or reproduced. Without taking any responsibility of its being accurate, Pakistan Engineering Council with prior consent of FIDIC Secretariat, has reproduced herein the FIDIC General Conditions of Contract for reference purpose only which cannot be used by the users for preparing their bidding documents. The bidding document may include a purchased copy, the cost of which can be retrieved as part of the selling price of the bidding document. Alternatively, the FIDIC Conditions of Contract can be referred to in the bidding documents, and the bidders are advised to obtain copies directly from FIDIC.*

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

"Copies of the FIDIC Conditions of Contract can be obtained from:

FIDIC Secretariat

P.O. Box 86

1000 Lausanne 12

Switzerland

fidic.pub@fidic.org – FIDIC.org/bookshop]

PART-II: PARTICULAR CONDITIONS OF CONTRACT

(Mandatory Provisions- not to be amended/substituted except where indicated by PEC)

PART-II: PARTICULAR CONDITIONS OF CONTRACT

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PART-II: PARTICULAR CONDITIONS OF CONTRACT

1.1 Definitions

The text of Sub-Clause 1.1.1 is deleted and substituted by the following:

"***Commencement Date***" means the date specified in the Preamble to Conditions of Contract.

The text of Sub-Clause 1.1.2 is deleted and substituted by the following:

"***Conditions***" means the Preamble to Conditions of Contract, General Conditions of Contract and Particular Conditions of Contract.

Sub-Clause 1.1.3

At the end of Sub-Clause the following is added:

"Any subsequent document mutually agreed and signed by the Employer and the Contractor, shall be the part of the Contract."

The text of Sub-Clause 1.1.5 is deleted and substituted by the following:

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

Sub-Clause 1.1.11

The Defects Liability Period is the period mentioned in the Preamble to Conditions of Contract.

Sub-Clause 1.1.15

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

"or any other competent person appointed by the Employer as his replacement."

Sub-Clause 1.1.23

The following paragraph is added:

The word "Goods" is synonymous with "Plant."

The text of Sub-Clause 1.1.27 is deleted and substituted by the following:

"Schedule of Prices" means the completed and priced Schedule of Prices, or any part or individual schedule thereof, submitted by the Contractor with his Bid or revised and mutually agreed and forming a part of the Contract documents.

Sub-Clause 1.1.33 (148)

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

The following Sub-Clauses are added:

"1.1.38 "Month" means calendar month according to Gregorian calendar.

1.1.39 *"Operation and Maintenance Manuals" has the meaning described in Sub-Clause 6.6.*

1.1.40 *"Warranty Certificate" means the certificate against specified goods/equipment, for the period mentioned in the Preamble to Conditions of Contract, to be issued by the Contractor that the goods/equipment supplied under the Contract are new, unused and incorporate all recent improvements in design and materials unless provided otherwise in the Contract and that the Contractor will be responsible for making good or replacing any defective goods/equipment during the Warranty Period specified in the Preamble to Conditions of Contract which should commence after expiry of Defect Liability Period.*

Sub-Clause 1.1.41

The word "Part II" stated in FIDIC Conditions of Contract is synonymous with the word *"Particular Conditions of Contract".*

Sub-Clause 1.6 Cost, Overhead Charges and Profit

The last sentence "Any profit _____ stated in the Preamble" is deleted and substituted by the following:

"Any profit entitlement shall be added to cost at the percentage stated in the Bid and agreed in the Contract Agreement."

Sub-Clause 2.1 Engineer"s Duties

The text of Sub-Clause 2.1 is deleted and substituted by the following:

"The Engineer shall carry out the duties specified in the Contract.

The Engineer may exercise the authority attributable to the Engineer as specified in or necessarily to be implied from the Contract. The Engineer is required to obtain the specific approval of the Employer before carrying out his duties in accordance with the following Clauses of General Conditions of Contract:

(a) approval of Subcontractor under Sub-Clause 4.1,

(b) certifying additional sums under Sub-Clause 5.4,

(c) certifying additional costs under Sub-Clauses 11.3 & 12.3,

(d) certifying any cost under Sub-Clause 14.6,

(e) approval of extension of time under Clause 26,

(f) issuing a Taking–Over Certificate under Sub-Clause 29,

(g) issuing a Defects Liability Certificate under Sub-Clause 30.11,

(h) issuing a Variation Order under Clause 31,

(i) fixing rates or prices under Clauses 31 and 34,

(j) certifying additional costs under Sub-Clause 44.5 and

(k) certifying additional costs under Sub-Clause 47.2;

Except for such variations pursuant to Sub-Clause 31.1 of the GCC which may be necessary in an emergency affecting safety of life, the works or of adjoining property."

Except as expressly stated in the Contract the Engineer shall have no authority to relieve the Contractor of any of his obligations under this Contract." (149)

Sub-Clause 2.6 Confirmation in Writing

(i) In line 3 after the words "undue delay" the following is added: "but not after the number of days mentioned in the Preamble to Conditions of Contract from the instruction or decision."

(ii) At the end of Sub-Clause 2.6, the following is added.

"The Engineer shall confirm or otherwise within the period mentioned in the Preamble to Conditions of Contract from the receipt of requirement(s) from the Contractor."

Sub-Clause 2.7 Disputing Engineer"s Decisions and Instructions

The following text is deleted:

"If either party ..... in accordance with the Contract."

Sub-Clause 2.8 Replacement of Engineer

The text of Sub-Clause 2.8 is deleted and substituted by the following:

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

Sub-Clause 2.9 Engineer Not Liable

Sub-Clause 2.9 is added as follows:

"Approval, reviews and inspection by the Engineer of any part of the Works does not relieve the Contractor from his sole responsibility and liability for the supply of remaining materials and equipment for the Works and parts thereof and complete the remaining erection works and testing and commissioning in accordance with the Contract and neither the Engineer's authority to act nor any decision made by him in good faith as provided for under this Contract whether to exercise or not to exercise such authority shall give rise to any duty or responsibility of the Engineer to the Contractor, any Subcontractor, any of their representatives or employees or any other person performing any of the works. However the Contractor shall be compensated if any loss/damage is occurred due to the decision of the Engineer."

Sub-Clause 4.2 No Contractual Relation between Subcontractor and the Employer

Sub-Clause 4.2 is added as follows:

Nothing contained in the Contract Documents shall create any contractual relation between any Subcontractor and the Employer.

Sub-Clause 5.3 Priority of Contract Documents (150)

Sub-Clause 5.3 is deleted and substituted by the following:

"Unless otherwise provided in the Contract the priority of the Contract Documents shall be as follows:

1. *The Contract Agreement (if completed)*
2. *The Letter of Acceptance*
3. *The completed Form of Bid*
4. *Preamble to Conditions of Contract*
5. *The Particular Conditions of Contract*
6. *The General Conditions of Contract*
7. *The priced Schedule of Prices*
8. *The completed Schedules to Bid*
9. *The Specifications*
10. *The Drawings*
11. *.....(Any other document)*

In case of discrepancies between drawings, those of larger scale shall govern unless they are superseded by drawing(s) of a later date regardless of scale. All drawings and specifications shall be interpreted in conformity with the Contract Agreement and these conditions."

Sub-Clause 5.4 Documents Mutually Explanatory

The text appearing in the last line after the words "the Contract Price" is deleted.

Sub-Clause 6.2 Consequences of Disapproval of Contractor's Drawings

Full stop is deleted and the following words are added at the end of Sub-Clause:

"for the approval of the Engineer. However, the Contractor shall not be entitled for time extension on this account."

Sub-Clause 6.6. Operation and Maintenance Manuals

Paras 2&3 are deleted and the following text is added at the end of Para 1 of Sub-Clause:

"The Operation and Maintenance Manuals shall include full instructions for the operation, servicing and maintenance of the Plant, not only during the period of the Contractor's liability but more particularly during its operating life.

The directions shall be set out simply, clearly and systematically. This may be divided into two volumes if desirable, one for operation and the second for servicing and maintenance (in sub-volumes for major items of Plant).

The operational data shall include a complete physical and functional description of the Plant (in sub-volumes for major items of Plant) and step-by-step procedures for inspection, checking and adjustments for proper operation of the Plant.

The maintenance data shall include complete instructions for routine checks, servicing, maintenance and repair of all parts and for dismantling, handling and re-assembly of all

equipment, sub–assemblies and all separate components. The (151) maintenance data shall also include where possible parts catalogues The lists shall provide all necessary information for identifying the parts and for re–ordering the parts including name of part, part number and catalogue references where applicable, name of manufacturer, size, capacity and other characteristics .

General arrangements, single line diagrams and detailed drawings shall be provided for ready reference in the operation and maintenance instructions.

The manuals shall be printed on ISO paper size A4 (210x297 mm) with offset or equivalent printing strongly bound in a durable stiff cover bearing the title in approved legend. Drawings shall be folded or reduced to 297 mm height. All volumes shall bear on the spine an approved shortened version of the title.

The Contractor shall submit three draft copies for approval of the Engineer prior to producing finished volumes.

The Contractor shall provide ten (10) copies of the approved Operation and Maintenance Manuals prior to Taking Over by the Employer. Supplementary Operation and Maintenance Manual shall be provided by the Contractor, if required, to incorporate changes resulting from experience during the operation and maintenance period. The work shall not be considered to be completed for the purpose of taking over until such manual and drawings have been supplied to the Employer."

Sub-Clause 6.9 Manufacturing Drawings

The words "Unless otherwise specified in Part-II" are deleted and the following is added at the end of Sub-Clause:

"However, the Contractor is required to disclose to the Engineer or the Employer any confidential information necessary to justify the reliability, the efficiency and the operation and maintenance of the Plant supplied by him."

Sub-Clause 6.10 "As–Built" Drawings

The following new Sub-Clause is added:

The Contractor shall furnish to the Engineer six (6) copies and one (1) reproducible of approved quality of all "As–Built" drawings within the period mentioned in the Preamble to Conditions of Contract.

Sub-Clause 8.1 General Obligations

The text of Sub-Clause 8.1 is deleted and substituted by the following:

"(a) The Contractor shall commence the work on the date specified in the Preamble to Conditions of Contract and shall proceed with the same with due expedition and without delay.

(b) *The Contractor shall, in accordance with the Contract, with due care and diligence, complete the Works and test and commission the Plant and carry out the Works within the*

Time for Completion. The Contractor shall also provide all necessary Contractor's Equipment, superintendence, labour and except as stated hereinbelow, all necessary facilities therefor. (152) The Employer will permit use of the Erection, Testing Equipment and Maintenance Tools as stated in the Preamble to Conditions of Contract.

The above facilities shall be provided at no cost to the Contractor but he shall procure at his cost all required consumable materials and any other items necessary for the proper execution of the Works. These shall be properly used and maintained by the Contractor and returned to the Employer upon handing over of the Works in good condition, fair wear and tear excepted. In case of any damage, loss or theft, the items shall be replaced by the Contractor at his own cost."

Sub-Clause 10.1 Performance Security

Sub-Clause 10.1 is deleted and substituted by the following:

"The Contractor shall provide a Performance Security in the prescribed Form annexed to these Documents. The said Security shall be furnished by the Contractor within 28 days after the receipt of Letter of Acceptance. The Performance Security shall be of an amount equal to 5 percent of the Contract Price in the currency (ies) of the Contract at the option of the bidder, in the form of Bank Guarantee from any Scheduled Bank in Pakistan or from a bank located outside Pakistan duly counter-guaranteed by a Scheduled Bank in Pakistan."

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

Sub-Clause 10.3 Claims under Performance Security

Sub-Clause 10.3 is deleted in its entirety.

The following Sub Clause is added:

Sub-Clause 10.4 Performance Security Binding on Variations and Changes

"The Performance Security shall be binding irrespective of variations and changes in the quantities of the Works or extensions in completion time of the Works, which are granted or agreed upon under the provisions of the Contract."

Sub-Clause 12.1 Programme to be Furnished

Sub-Clause 12.1(a) is deleted and substituted by the following:

"(a) the order in which the Contractor proposes to carry out the Works (including preliminaries, required material ordering, delivery to Site, erection and rectifications work, testing, commissioning and taking-over by the Employer). The programme shall also include the following:

(i) Employment of local and expatriate labour of various categories,

(ii) Local material procurement,

(iii) Material imports, if any."

(153) In Sub-Clause 12.1(c)(iv) the words "any import licenses" are deleted.

Sub-Clause 12.4 Monthly Progress Report

The following Sub-Clause 12.4 is added:

"During the period of the Contract, the Contractor shall submit six sets of report to the Engineer not later than the 8th day of each month, including:

(i) a construction schedule indicating the progress achieved during the preceding month;

(ii) description of all work carried out since the last report;

(iii) description of the work planned for the next forty two days sufficiently detailed to enable the Engineer to determine his programme of inspection and testing;

(iv) summary of daily job record for the preceding month; and

(v) colour photographs to illustrate progress.

Sub-Clause 12.5 Daily Job Record

The following Sub Clause 12.5 is added:

"During the period of the Contract, the Contractor shall keep a daily record of the work progress, which shall be made available to the Engineer as and when requested.

The daily record shall include particulars of weather conditions, number of men working, in different categories, deliveries of materials, quantity, location and assignment of equipment."

Sub-Clause 13.1 Contractor's Representative

At the end of the Sub-Clause the following is added:

"The Contractor's Representative shall be a competent and skilled person approved by the Engineer (which approval may at any time be withdrawn) and who shall be present on the Site during all working hours. He shall be fluent in the English language. He shall not be transferred from the Site without the consent of the Engineer. The Contractor's Representative shall be a Registered/Professional engineer as defined in the Pakistan Engineering Council Act 1975 (V of 1976)."

Sub-Clause 13.3 Language Ability of Superintending Staff of Contractor

The following Sub-Clause 13.3 is added: (154) "A reasonable proportion of the Contractor's superintending staff shall have a working knowledge of the English language."

Sub-Clause 13.4 Employment of Local Personnel

The following Sub-Clause 13.4 is added:

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

Sub-Clause 14.1 Contractor's Equipment

Replace the word "or" at the end of Sub-paragraph (a) by the word "and" and insert the following at the end of Sub-paragraph(b):

"which shall not be unreasonably withheld."

Sub-Clause 14.2 Safety Precautions

At the end of the Sub-Clause the following is added:

"In order to provide for the safety, health and welfare of persons, and for prevention of damage of any kind, all operations for the purposes of or in connection with the Contract shall be carried out in compliance with the safety requirements of the Government of Pakistan with such modifications thereto as the Engineer may authorise or direct and the Contractor shall take or cause to be taken such further measures and comply with such further requirements as the Engineer may determine to be reasonably necessary for such purpose.

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

Sub-Clause 14.3 Electricity Water and Gas

The text of Sub-Clause 14.3 is deleted and substituted by the following:

"The Contractor shall be responsible for making his own arrangements for the adequate supply of electricity, water and gas required for the effective performance of his obligations under the Contract. Subject to the aforesaid, the Contractor shall be entitled to use for the purposes of the Works such supplies and services as may be available on the Site. The Contractor shall, before the commencement of the work at Site, seek the approval of the Engineer as to his detailed requirements of electricity, water and gas for the entire Contract period. The Contractor shall pay the Employer at the rates/cost incurred by the Employer. The Contractor shall at his own cost provide any apparatus necessary for such use."

Sub-Clause 14.4 Employer"s Equipment

The text of Sub-Clause 14.4 is deleted and substituted by the following: (155) *"The Employer shall, if the Contractor so requests for the execution of the works, operate any available equipment of which details are given in the Preamble to Conditions of Contract. The Contractor shall pay the Employer a mutually agreed price for such use.*

The Employer shall during such operation retain control of and be responsible for the safe working of the equipment.

Sub-Clause 14.8 Information for Import Permits & Licences

The text of Sub-Clause 14.8 is deleted and substituted by the following:

"The Contractor shall submit to the Employer in good time such details of all Plant and Contractor's Equipment as is to be imported into Pakistan and identify as to what assistance of the Employer is required for obtaining by the Contractor of all necessary import permits or licences."

Sub-Clause 15.2 Compliance with Laws

The Sub-Clause 15.2 is deleted and substituted by the following:

"The Contractor shall comply with the Laws of country of manufacture and the Laws of Pakistan where the Plant is to be erected."

Sub-Clause 16.4 Photographs of Works and Advertisement Prohibited

Sub-Clause 16.4 is added:

"Except with the prior written authorisation of the Employer the Contractor shall not exhibit or permit to be exhibited any photographs or advertisement on the Works. Any authorized exhibition shall be immediately removed if the Employer so requires."

Sub-Clause 16.5 Training of Employer's Staff

Sub-Clause 16.5 is added:

"The Contractor shall provide such facilities for the training of such numbers of Pakistani engineers, engineering students, apprentices and trade apprentices on such sections of the Works at the Site or on the Contractor's premises or Contractor selected plant manufacturer's premises and factories, or wherever else work is in hand, as specified or directed by the Engineer. The Employer shall direct what sums by way of wages and allowances are to be paid by the Contractor to such persons and shall reimburse the Contractor for such sums as are so directed to be paid and are paid. The Contractor shall also provide medical expenses or medical insurance and travelling expenses for trainees if required by the Employer which shall be reimbursed by the Employer.

The language of training at the above stated premises shall be English and Urdu."

Sub-Clause 17.4 Consents and Way Leaves (156) The Sub-Clause 17.4 is deleted and substituted by the following:

The Employer shall issue permissions, letters, certificates and provide such other assistance to the Contractor for his obtaining permits-to-work, way leaves and approvals from any other department/authority and right of way from private owners, if required. The Contractor will bear the cost of logistics, fees, etc. for such activities. The Employer, will reimburse the Contractor only the payments made by him in respect of any land compensation for obtaining such way leaves, required for the Works.

Sub-Clause 17.5 – Import Permits and Licences

The word "Employer" is deleted and substituted by the word "Contractor" and the following is added at the end of Sub-Clause 17.5:

"the Employer will provide assistance for this purpose."

Sub-Clause 18.1 – Engagement of Labour

At the end of the Clause the following is added:

"in accordance with the regulations, orders and requirements of the Govt. of Pakistan."

Sub-Clauses 18.5 to 18.12 are added:

"Sub-Clause 18.5 Employment of Persons in the Service of Others

The Contractor shall not recruit or attempt to recruit staff and labour from amongst the persons in the service of the Employer or the Engineer and vice-versa, unless mutually agreed between the Employer/Engineer and the Contractor

Sub-Clause 18.6 Alcoholic Liquor or Drugs

The Contractor shall not, otherwise than in accordance with the Statutes, Ordinances and Government Regulations or Orders for the time being in force, import, sell, give, barter or otherwise dispose of any alcoholic liquor or drugs, or permit or suffer any such importation, sale, gift, barter or disposal by his Subcontractors, agents, employees or labour. (157)

Sub-Clause 18.7 Arms and Ammunition

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

Sub-Clause 18.8 Festivals and Religious Customs

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

Sub-Clause 18.9 Disorderly Conduct

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

Sub-Clause 18.10 Records of Safety and Health

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

Sub-Clause 18.11 Reporting of Accidents

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

Sub-Clause 18.12 Compliance by Subcontractors

The Contractor shall be responsible for compliance by his Subcontractors of the foregoing provisions."

Sub-Clause 19.1 Manner of Execution

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

"The Contractor shall submit for approval of the Engineer, his detailed method statement(s) for the execution of such items of work as may be desired by the Engineer. Approval of such method statement(s) shall neither relieve the Contractor of his responsibilities under the Contract nor form any basis for claiming additional costs."

Sub-Clause 19.3 Uncovering Work

The following is added at the end of second paragraph of Sub-Clause 19.3:

"In any other case, all costs shall be borne by the Contractor." (158)

Sub-Clause 19.4 Use of Pakistani Materials

The following Sub-Clause 19.4 is added:

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

Sub-Clause 24.1 Cost of Suspension

At the end of the second paragraph after the word "Contractor" the following is added:

"or for the proper execution or for the safety of the Works or Plant unless such necessity results from any act or default of the Engineer or the Employer or in consequence of any of the Employer's Risks under Sub-Clause 37.2."

Sub-Clause 24.4 Resumption of Work

First paragraph of Sub-Clause 24.4 is deleted and substituted by the following:

"If the Contractor chooses not to treat prolonged suspension as an omission or termination under Sub-Clause 24.3, the Employer shall, upon the request of the Contractor, take over the responsibility for protection, storage, security and insurance of the suspended Works and of the Plant which has been delivered to the Site and which is affected by suspension and the risk of loss or damage thereto shall thereupon pass to the Employer."

Sub-Clause 25.1 Time for Completion

The text of Sub-Clause 25.1 is deleted and substituted by the following:

"The Works at the place of the project mentioned in the Preamble to Conditions of Contract shall be completed tested and commissioned within the period mentioned in the Preamble to Conditions of Contract."

Sub-Clause 26.1 Extension of Time for Completion

Sub-Clause 26.1(h) is deleted.

Sub-Clause 26.3 Earlier Completion

(i) At the end of Sub-Clause 26.3(a) the following text is added and Clause is re-designated as 26.3.

"The extra sum to be paid to the Contractor for Completion of Works prior to the date of Completion established under Sub-Clause 25.1 shall be computed (159)on the basis of the sums mentioned in the Preamble to Conditions of Contract."

(ii) Sub-Clause 26.3 (b) is deleted.

"Sub-Clause 26.4 Rate of Progress

Sub-Clause 26.4 is added:

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

Sub-Clause 27.1 Delay in Completion

Sub-Clause 27.1 is deleted and substituted by the following:

"If the Contractor fails to deliver the Works, or any part thereof, within the time stated in Sub-Clause 25.1, or fails to complete the whole of the Work, or, if applicable, any Section within the relevant time prescribed by Sub-Clause 25.1, then the Contractor shall pay to the Employer the relevant sum stated herein below as liquidated damages for such default (which sum shall be the only moneys due from the Contractor for such default) for every day or part of a day which shall elapse between the relevant time for Delivery or Time for Completion and the actual date of delivery at site or the date stated in a Taking-Over Certificate of the whole of the Works or the relevant Section, as the case may be, subject to the applicable limit stated herein below. The Employer may deduct the amount of such damages from any monies due or to become due to the Contractor. The payment or deduction of such damages shall not relieve the

Contractor from his obligation to complete the Works, or from any other of his obligations & liabilities under the Contract."

The liquidated damages for each day of delay and the maximum amount of liquidated damages shall be the amounts mentioned in the Preamble to Conditions of Contract. (160)

Amount of Liquidity Damages/Delay Damages/Penalties	8.7	Liquidated Damages are two Type a) Delay in Commissioning b) Deviation in Guaranteed Energy Generation (GEG)
Delay in Commissioning		1.20 x Avg No. of units generated for no. of days delayed (calculated on pro rate basis as per Clause of tender) X Rs. / kWh (As per KE)
Liquidated Damages (LD) for deviation in Guaranteed Energy Generation.		The Contractor shall guarantee the energy generation from the project as per the generation table of this document. In case the contractor is not able to meet the guaranteed energy generation per the generation table of contract document, then the contractor shall be liable to pay the Liquidated Damages (LD) as per below mentioned formula: **Penalty**: 1.20 x No. of kWh shortfall in a year (calculated on pro rata basis as per generation table) X Rs./kWh (As per KE) for average life of 25 Years

Sub-Clause 28.7 Consequences of Failure to Pass Tests on Completion

The words "by arbitration" appearing at the end of the Sub-Clause 28.7(c) are deleted and substituted by the words "by the Engineer".

Sub-Clause 30.4 Extension of Defects Liability Period

At the end of 4th paragraph of Sub-Clause the following is added:

"or a mutually agreed period."

Sub-Clause 30.5 Failure to Remedy Defects

In first line after the words "reasonable time" the following is added:

"fixed by the Engineer".

Sub-Clause 30.13 Unfulfilled Obligations

New Sub-Clause 30.13 is added as herein below:

"After the Defects Liability Certificate has been issued, the Contractor and the Employer shall remain liable for the fulfillment of any obligation which remains unperformed at that time. For the purposes of determining the nature and extent of any such obligation, the Contract shall be deemed to remain in force."

Sub-Clause 31.1 Engineer's Right to Vary

The following is added at the end of second paragraph:

"No such variation shall in any way vitiate or invalidate the Contract, but the effect, if any, of all such variations shall be valued in accordance with Clause 31. Provided that where the issue of an instruction to vary the Works is necessitated by some default of or breach of Contract by the Contractor or for which he is responsible, any additional cost attributable to such default shall be borne by the Contractor."

Sub-Clause 31.5 Record of Costs

The word "Engineer" in 4th line of Sub-Clause is deleted and substituted by "Engineer/Employer".

Sub-Clause 31.6 Daywork under Variation Order

New Sub-Clause 31.6 is added as given below:

"A Variation Order may provide that work done pursuant thereto shall be executed as Daywork. In such case the Contractor shall be paid for such work under the conditions and the rates and prices set out in the Day Work Schedule."

Sub-Clause 31.7 Value Engineering

New Sub-Clause 31.7 is added as given below:

The Contractor may, at any time, submit to the Engineer a written proposal which in the Contractor"s opinion will reduce the cost of constructing, maintaining or operating the works, or improve the efficiency or value to the Employer of the completed Works or otherwise be of benefit to the Employer. Any such proposal shall be prepared at the cost of the Contractor. However Employer is not bound to accept such proposal.

Sub-Clause 33.1 Terms of Payment

(Employer may vary this Sub-Clause)

The following Sub-Clauses are added:

Sub-Clause 33.1.1 Retention of Payment

If at any time any payment would fall due for Works or part of Works and, if there shall be any defect in part of such Works in respect of which such payment is proposed, the Employer may retain the whole or any part of such payment. Any sum retained by the Employer pursuant to the provisions of this Clause shall be paid to the Contractor after the said defect is removed.

Sub-Clause 33.1.2 Payment Where Taking-Over Certificate Issued for Section or part of Works

If any section or part of the Works shall be taken-over separately under Clause 29 (Taking-Over) hereof, the payments herein provided for on or after Taking-Over shall be made in respect of the section or part taken-over and reference to the price shall mean such part of the price as shall, in the absence of agreement, be apportioned thereto by the Engineer.

Sub-Clause 33.2 Method of Application

(Employer may vary this Sub-Clause)

Sub-Clause 33.5 Payment

Sub-Clause 33.5 is deleted and substituted by the following:

The amount due to the Contractor under any Interim Payment Certificate issued by the Engineer pursuant to this Clause, or to any other term of the Contract, shall, subject to Clause 27, be paid by the Employer to the Contractor within 30 days after such Interim Payment Certificate has been jointly verified by Employer and Contractor, or, in the case of the Final Certificate referred to in Sub-Clause 33.10 within 60 days after such Final Payment Certificate has been jointly verified by Employer and Contractor; Provided that the Interim Payment shall be caused in 42 days and Final Payment in 60 days in case of foreign funded project. Deduction shall be made from the net amounts payable to the Contractor of any sum(s) in accordance with the prevalent Federal and/or Provincial laws, provided that no such deduction shall be made from those payments in respect of which the Contractor has obtained exemption under the Law."

Sub-Clause 33.6 Delayed Payment

The text of Sub-Clause 33.6 is deleted and substituted by the following:

"In the event of the failure of the Employer to make payment within the times stated in Sub-Clause 33.5, the Employer shall pay to the Contractor compensation at the rate of KIBOR+2% for local currency and LIBOR+1% for foreign currency per annum, upon all local currency sums unpaid from the date by which the same should have been paid. The provisions of this Sub-Clause are without prejudice to Contractor's entitlement under Sub-Clause 46.1."

Sub-Clause 33.8 Payment by Measurement

The work shall be measured for the units mentioned in the Schedule of Prices according to the Contract as determined by the Engineer from approved drawings, Specifications and Contract Documents.

Sub-Clause 33.12 Withholding of Payment

New Sub-Clause 33.12 is added as given below:

If the Works or any part thereof are not being carried out to the Engineer's satisfaction and in order to protect the Employer from loss on account of:

(a) defective work not rectified

(b) guarantees not met

(c) claims filed against the Contractor

(d) failure of the Contractor to make payments due for Plant procured or labour employed by him.

(e) damage to any other contractor employed by the Employer.

(f) Contractor's non–compliance with the Contract

(g) any Government dues recoverable from the Contractor if notified by the Government

The Engineer may notify withholding of such payments or part thereof as may, in his opinion, be related to the aforesaid reasons/grounds. When the reasons/grounds for withholding the payment are removed by the Contractor, the Engineer shall upon being satisfied to that effect issue Certificate of Payment in respect of withheld amounts.

Sub-Clause 35.1 Payment in Foreign Currencies

(Employer may vary this Sub-Clause) (163)

Sub-Clause 35.2 Currency Restrictions

The text of Sub-Clause 35.2 is deleted and substituted by the following:

"Any required foreign currency transactions shall be met by the Employer/Contractor at his cost from his own resources."

Sub-Clause 35.3 Rates of Exchange

The words "as stated in the Preamble" appearing in 3rd line of Sub-Clause are deleted and substituted by the words "as published or authorized by State Bank of Pakistan".

Sub-Clause 36.4 Payment against Provisional Sums

Sub-Clause 36.4 is deleted and substituted by the following:

"Provisional Sum if any will be expended on the direction of the Engineer through Variation Orders which would be valued in accordance with the provisions of Clause 31 Conditions of Contract."

Sub-Clause 37.2 Employer's Risks

The text of Sub-Clause 37.2 is deleted and substituted by the following:

"The Employer's Risks are:

(a) (Insofar as they relate to Pakistan) war and hostilities (whether war be declared or not), invasion, act of foreign enemies

(b) (Insofar as they relate to Pakistan) rebellion, revolution, insurrection, military or usurped power or civil war

(c) ionizing radiation or contamination by radioactivity from any nuclear fuel, radio-active toxic explosives or other hazardous properties of any explosive nuclear assembly or nuclear components thereof

(d) pressure waves caused by aircraft travelling at sonic or supersonic speed

(e) (Insofar as they relate to Pakistan) riot, commotion or disorder, unless solely restricted to the employees of the Contractor or of his Subcontractors

(f) use or occupation of the Work or any part thereof by the Employer

(g) fault, error, defect or omission in the design of any part of the Works by the Engineer, Employer or those for whom the Employer is responsible for which the Contractor has disclaimed responsibility in writing within a reasonable time after the receipt of such design

(h) the use or occupation of the Site by the Works or any part thereof, or for the purposes of the Contract: or interference, whether temporary or permanent with any right of way, light, air or water or with any easement, way leaves or right of a similar nature which is the inevitable result of the construction of the Works in accordance with the Contract

(i) the right of the Employer to construct the Works or any part thereof on, over, under, in or through any land

(j) damage (other than that resulting from the Contractor's method of construction) which is the inevitable result of the construction of the Works in accordance with the Contract

(k) the act, neglect or omission or breach of contract or of statutory duty of the Engineer, the Employer or other contractors engaged by the Employer or of their respective employees or agents."

Sub-Clause 39.2 Loss or Damage Before Risk Transfer Date

The words "by arbitration under Clause 50" are deleted and substituted by the words "by the Engineer".

Sub-Clause 39.4 Duty to Minimize Delay

New Sub-Clause 39.4 is added as given below:

Each Party shall at all times use all reasonable endeavours to minimize any delay in the Performance of the Contract as a result of Risks.

The Contractor shall give notice to the Employer and vice versa the Employer shall give notice to the Contractor in case of foreseeable delay by the Risks.

Sub-Clause 40.2 Employer's Liability

The text of Sub-Clause 40.2 from the words "or of death or personal injury" to the end of the Sub-Clause, is deleted and substituted by the following:

"..... (other than the Works) or of death or personal injury to the extent caused by any of the Employer's Risks listed in paragraphs (f), (g), (h), (i), (j), and (k) of Sub-Clause 37.2 but not otherwise."

Sub-Clause 42.2 Maximum Liability

the words "the sum stated in the Preamble to Conditions of Contract or if no such sum is stated" appearing in 2nd line of Sub-Clause are deleted.

Sub-Clause 42.6 Foreseen Damage

Sub-Clause 42.6 is deleted in its entirety.

Sub-Clause 43.1 The Works (Insurance)

(Employer may vary this Sub-Clause)

Sub-Clause 43.2 Contractor's Equipment

Sub-Clause 43.2 is deleted and substituted by the following:

"The Contractor shall insure the Contractor's Equipment for its full replacement value while on the Site against all loss or damage caused by any of the Contractor's Risks."

Sub-Clause 43.3 Third Party Liability (Insurance)

(Employer may vary this Sub-Clause)

Sub-Clause 43.7 Remedies on the Contractor"s Failure to Insure

In 3rd line after the word, "purpose", the expressions- "and reasonable costs including the man-hours costs of Employer"s Personnel" are added.

Sub-Clause 43.9 Currency of Insurance

New Sub-Clause 43.9 is added as given below:

"All policies of Insurance of the Plant shall provide for payment of indemnity to be made in such amounts as will allow making good of loss of or damage to the whole or any part of the Works."

Sub-Clause 43.10 Contractor to Notify

New Sub-Clause 43.10 is added as given below:

"It shall be the responsibility of the Contractor to notify the insurance company of any changes in nature and extent of the Works and to ensure the adequacy of the insurance coverage at all times in accordance with the provisions of the Contract."

Sub-Clause 43.11 Procurement of Insurance Policies

New Sub-Clause 43.11 is added as given below:

"The Contractor shall procure and submit the insurance cover under this Clause within a period of 28 days from the date of receipt of Letter of Acceptance from the Employer."

Sub-Clause 44.6 Damage Caused by Force Majeure

At the end of the Sub-Clause 44.6 the following is added: "However the Contractor shall put up his claim to the Employer / Engineer with full details and justification."

Sub-Clause 44.8 Payment on Termination for Force Majeure

Text in sub-para (c) is deleted and para (d) and (e) are re-numbered as (c) and (d).

Sub-Clause 44.10 Force Majeure Affecting Engineer"s Duties

Sub-Clause 44.10 is deleted in its entirety.

Sub-Clause 45.2 Contractor's Default

The following paragraph is added at the end of Sub-Clause 45.2.

"The Employer or such other contractor may use for such completion any Contractor's Equipment which is upon the Site as he or they may think proper, and the Employer shall pay the Contractor a reasonable compensation for such use".

Sub-Clause 45.6 is added as follows:

Sub-Clause 45.6 Integrity Pact

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

(a) recover from the Contractor an amount equivalent to ten times the sum of any commission, gratification, bribe, finder"s fee or kickback given by the Contractor or any of his Subcontractors, agents or servants;

(b) terminate the Contract; and

(c) recover from the Contractor any loss or damage to the Employer as a result of such termination or of any other corrupt business practices of the Contractor or any of his Subcontractors, agents or servants.

The termination under Sub-Para (b) of this Sub-Clause shall proceed in the manner prescribed under Sub-Clauses 45.2 to 45.5 and the payment under Sub-Clause 45.4 shall be made after having deducted the amounts due to the Employer under Sub-Para (a) and (c) of this Sub-Clause.

Sub-Clause 46.1 Employer's Default

The comma and the word "or" at the end of paragraph (d) of Sub-Clause 46.1 are deleted and substituted by period (.) Paragraph (e) of Sub-Clause 46.1 is deleted.

Sub-Clause 46.3 Payment on Termination for Employer's Default

The words "including loss of profit" in the second paragraph of Sub-Clause 46.3 are deleted.

Sub-Clause 47.1 Labour, Materials and Transport

(Employer to modify this Sub-Clause as provided under Clause 70.1 of PCC of PEC Civil Documents and following PEC Procedure and Formula for Price Adjustment)

Sub-Clause 48.1 Customs and Import Duties

(Employer may vary this Sub-Clause)

The Sub-Clause 48.3 is added:

Sub-Clause 48.3 Port Charges and Port Congestion

The Contractor shall be deemed to have obtained all the information regarding facilities and charges, in respect of port clearance, loading and unloading, storage, transportation, congestion and confirmed the requirements thereof at his own responsibility and all such costs and charges are deemed to be included in the rates and prices of the Schedule of Prices.

Sub-Clause 49.1 Notice to Contractor

The following is added at the end of Sub-Clause 49.1:

"For the purposes of Sub-Clause 49.1 the Contractor shall, immediately after receipt of Letter of Acceptance, intimate in writing to the Employer and the Engineer by registered post, the address of his principal place of business or any change in such address during the period of the Contract."

Sub-Clause 50 Disputes & Arbitration

Clause 50 is deleted and in its place the following Sub-Clauses 50.1 to 50.5 are inserted:

"50.1 If a dispute of any kind whatsoever arises between the Employer and the Contractor in connection with, or arising out of, the Contract or the execution of the Works, whether during the execution of the Works or after their completion and whether before or after repudiation or other termination of the Contract, including any dispute as to any opinion, instruction, determination, certificate or valuation of the Engineer, the matter in dispute shall, in the first place, be referred in writing to the Engineer, with a copy to the other party. Such reference shall state that it is made pursuant to this Clause. No later than the fifty sixth (56) day after the day on which he received such reference, the Engineer shall give notice of his decision to the Employer and the Contractor. Such decision shall state that it is made pursuant to this Clause. Unless the Contract has already been repudiated or terminated, the Contractor shall, in every case, continue to proceed with the Work with all due diligence, and the Contractor and the Employer shall give effect forthwith to every such decision of the Engineer unless and until the same shall be revised, as hereinafter provided in an amicable settlement or in an arbitral award. In any case where the Conditions of Contract provide that the decision of the Engineer is to be

final and conclusive, such decision shall not be referable to arbitration under this Clause nor shall the same be questioned in any other form of proceedings whatsoever.

50.2 If either the Employer or the Contractor be dissatisfied with a decision of the Engineer or if the Engineer fails to give notice of his decision on or before the fifty sixth (56) day after the day on which he received the reference, then either the Employer or the Contractor may, on or before the twenty eighth (28) day after the day on which the said period of fifty six (56) days expired, as the case may be, give notice to the other party to commence arbitration, as hereinafter provided, as to the matter in dispute. Such notice shall establish the entitlement of the party giving the same to commence arbitration, as hereinafter provided, as to such dispute and, subject to Sub-Clause 50.5, no arbitration in respect thereof may be commenced unless such notice is given.

If the Engineer has given notice of his decision as to a matter in dispute to the Employer and the Contractor and no notification of intention to commence arbitration as to such dispute has been given by either the Employer or the Contractor on or before the twenty eighth (28) day after the day on which the parties received notice as to such decision from the Engineer the said decision shall become final and binding upon the Employer and the Contractor.

50.3 Where notice of intention to commence arbitration as to a dispute has been given in accordance with Sub-Clause 50.2, arbitration of such dispute shall not be commenced unless an attempt has first been made by the parties to settle such dispute amicably through mutual negotiation within ninety (90) days from the date of notification of Engineer"s decision.

50.4 **Any dispute in respect of which:**

(a) the decision, if any, of the Engineer has not become final and binding pursuant to Sub-Clause 50.1 and

(b) amicable settlement has not been started/reached within the period stated in Sub-Clause 50.3

shall be finally settled, unless otherwise specified in the Contract, under the Pakistan Arbitration Act, 1940 (Act No. X of 1940) and Rules made thereunder as amended, by one or more arbitrators appointed under such Rules.

The said arbitrator(s) shall have full power to open up, review and revise any decision, opinion, instruction, determination, certificate or valuation of the Engineer for the purpose of obtaining said decision pursuant to Sub-Clause 50.1. No such decision shall disqualify the Engineer from being called as a witness and giving evidence before the arbitrator(s) on any matter whatsoever relevant to the dispute. The venue of arbitration proceedings shall be the place in Pakistan as mentioned in the Preamble to Conditions of Contract.

50.5 Where neither the Employer nor the Contractor has given notice of intention to commence arbitration of a dispute within the period stated in Sub-Clause 50.1 or 50.2 and the related

decision has become final and binding, either party may, if the other party fails to comply with such decision, and without prejudice to any other rights it may have, refer the failure to arbitration in accordance with Sub-Clause 50.4. The provisions of Sub-Clauses 50.1 to 50.2 shall not apply to any such reference."

SCHEDULE OF PRICES

SUMMARY OF BID PRICES

Item no.	Description	TOTAL INSTALLED CAPACITY KWp	AMOUNT	TOTAL UNIT GENERATION YEARLY (Minimum)
2(A)	Design, Procurement, Supply, Installation, Testing and Commissioning of On Grid Solar Power System . (BUS PORT)	252.81 ~~219.4~~	23,894,269/-	356,103 Kwh ~~320,400~~
2(B)	Design, Procurement, Supply, Installation, Testing and Commissioning of On Grid Solar Power System . (CAR PORT)	381.60 ~~400.68~~	33,443,272/-	537,515 kwh ~~574,800~~
2(C)	Design, Procurement, Supply, Installation, Testing and Commissioning of On Grid Solar Power System(ADAMJEE CAR PORT)	171.72	16,232,198/-	241,851 Kwh ~~247,200~~
2(D)	Design & Construction of Control Room Civil Work : a) Control Room 12'-0"x16'-0" 1 No	—	868,979/-	—
2(E)	Design, Supply, Install, Testing & Commission of Fuel Control System.	—	738,504/-	—
2(F)	Design, Supply, Install, Remote Monitoring Unit	—	121,691/-	—
2(G)	Design, Supply, Install, Weather Station	—	160,514/-	—
2(H)	Grid Study & Net Metering including all relevant accessories as per KE requirement.	—	492,366/-	—
	TOTAL AMOUNT OF THE PROJECT COST	~~791.78~~ 806.13	75,951,793/-	~~1142400~~ 1,135,469 Kwh

Per watt rate (PKR) = 94.22/-
Inclusive of taxes

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PROJECT TITILE : Designing, supply, Erection Testing, Commissioning of Bus Port, Car Port, & Roof Mounted Grid Tied Utility Interactive Photo Voltaic Solar Power System at IBA Main Campus Karachi

BUS PORT CLEARANCE HEIGHT FROM ROAD LEVEL 20'-0" MINIMUM

BILL OF QUANTITY

ABSTRACT OF COST

Sr No	Product	Capacity	Unit	Quantity	Price (PKR)
	Photovoltaic Solar System works				
	General: The system is designed to cover the Essential loads in **IBA Karachi Main Campus**				
1	The system will be grid interactive connected which will allow many power sources options. The system will import from the grid when loads are being more than the generated from PV and supply surplus electricity to the grid when PV generates more than the loads.				
2	Contractor shall submit shop drawings for all civil, electrical and a complete photovoltaic solar system works, including a single line diagram showing all the components of the PV system, DC and AC distribution boards, PV Arrays lay out , connections and cables, wires cross section for all the system to be approved by the Engineer before executing the work.				
3	Contractor shall submit the catalogs of each component showing the requested specifications stated at thebill of quantity.				
4	The contractor shall submit the Manufacture testing certificate, country of origin, certified characteristics, test performance curves, spare parts regular (as recommended by manufacturer , maintenance manuals and manufacturers warranty for each components of the system.				
5	As-built drawings shall be submitted after handing over the work.				
6	All junction boxes and DBs will be lockable type.				
7	Upon completion of the installation, the contractor shall organize an on site training program involving nominated employer's staff. Such a program shall be carried out during the commissioning phase. The cost of the training shall be deemed to have been included in the tendered rates.				
8	The price includes all builders' works, making good and reinstatement including necessary materials and workmanship as well as removal of unwanted materials to dump sites approved by the engineer to complete the job successfully.				
9	All the following items include supply, install, commission and operate of the complete PV solar system.				
10	Contractor must provide Bank Maintenance Guarantee for period One years for all components of the solar system				

Sr No	BOQ of BUSPORT with 5 Degree Tilt Estimated Capacity = ~~219.4~~ 252.81 KWp	Unit	Qty	Unit Price	AMOUNT
1	MODULE MOUNTING STRUCTURE (MMS)				
	Designing, Supplying, Fabrication & Installation of PV Mounting structure (MMS) for Bus Port Minimum height 20'-0" from FFL /Road Level. The Module Mounted Structure (MMS) shall Comprising of Corrosion resistant anodized aluminum Section or hot dipped galvanized Steel Profile. The mounting structures and the foundations must be designed structurally to be suitable to withstand all static loads (weight of modules, wind loads etc) min. wind pressure 150 KM /hour in harsh environment. The design submission must be as per ASTM-A36, ASTM-123 and ASCE 7-10, for anodized aluminum AL6005/6063 The mounting structure components are bonded together to guaranty potential equalization. The tilt angle shall be not less than 5^0 for self-cleaning purposes and not more than 8^0 and for optimal exposure to direct solar irradiation. The work is to be carried out strictly as per approved drawing, design and specification and the rate quoted is inclusive of the following:	Kwp.	~~219.4~~ 252.81	28,053/-	7,092,079/-
a	Designing of the structure as per design specification approved				
b	Lay out at Site				
c	Footing & Foundation work as per approved drawing and specification.				
d	Placing of Anchor Bolts & Base Plate as per design & length & Details.				
e	Supply, Fabrication & Erection of Column, Beams, purlins & braces as per approved design				
f	Tilt angle is to be maintained as per Site Condition.				
g	RCC Drain with RCC grating Cover is to be provided to drain out rain/ cleaning water.				
h	Re do the Pavement work to its original condition after completion of the work.				
i	The Contractor shall remove all the debris and clear the site as per direction				
j	The contractor shall submit the detail technical shop drawing before execution of work.				
k	After completion of the work the contractor shall submit the as built drawing.				

Sr No	Product	Unit	Qty	RATE	AMOUNT
2.	PV Modules – 219.4 Kwp:				
	Supply, install, Testing & Commissioning (SITC) Mono Crystalline 144 Cells Photovoltaic Solar Modules Tier - 1 Type anti-reflective high transparency low iron tempered glass, with earthing provision. The modules STC parameters must be as under (a). Min. Power Pmax 530 or above Wp rated power (b), open circuit voltage (Voc) +/- 5 % 49.05V–49.65V (c) MPP Voltage Vmpp 41.2 V – 41.8 V (d) MPP Current Impp 12.75 A – 13.04 A (e) Short Circuit Current Isc +/-5 % 13.65A--13.92 A. (f) Module Efficiency 20.0 – 20.5 % (g) Operating Temp. Degree Centigrade - 40 ~ +85 (h) Maximum System Voltage 1500 V UL 1000 V IEC (i) Maximum Series Fuse Rating 25 A (j) Junction Box Protection Degree , IP 68 (k) connection box, 4.0 mm2 conductor cross section, (m) cable with , MC4 male and female connectors, (o) Anodized Aluminum Frame and Support Bars (p) PVC duct, Clamps & Accessories ,support and labels to be stalled under PV Array. The Contractor Shall provide manufacturer warranty for solar panel for a period not less than 25 years. Contractor must submit all the required certificates for each PV solar panel from manufacturer as per specification. All works and materials must be according to the drawings, specifications and supervisor engineer instruction's and approval.	Kwp.	~~219.4~~ 252.81	46,646/-	11,792,449/-
3.	GRID -TIED INVERTER (PCU)				
	Supply, install, testing & commissioning (SITC) DC/AC grid tie 3-phase inverter with data communication unit with Ethernet connection .The inverter with must be suited to any PV module configuration, and depending on the system design and installation proposed and for the future extended also. (Leading Market brand, having annual production greater than 1GW). The DC max power input rating should be at-least 1.2 times of AC power at standard test condition (STC). The inverter unit shall be suitable for indoor and outdoor installations with IP65. The inverter must include the safety concepts such as (triple protection with opti protect, electronic strings fuses, self-learning string failure detection, DC surge arrestor type (2) to ensure max availability. All works and materials must be according to the drawings, specifications and supervisor engineer instruction's and approval. Make:Sungrow/Huawei/SMA Power Rating: 100 KW & above	EACH	2	815,375/-	1,630,750/-

	Brief specification is as under :				
a	MPPT Voltage Range : 550V-850V,				
b	MPPT Operating Voltage Range : 200V ~ 1000V,				
c	Min 09 Independent MPP Trackers ,				
d	Minimum Efficiency 98.0 % ,				
e	Warranty : 5 Years				
f	Certification Required : CE, IEC 61727, IEC 62109-1/2				
4	**BREAKER BOXES**				
a	**DC BOX**				
	Supply , installation, testing & commissioning (SITC) of DC Box/ Array Junction Box with all accessories for out-door usage with water proof enclosure . Each Junction Box Shall be provided with suitable Metal Oxide Varistors (Mov's),Surge Arrestors, one fuse, one SPD (Surge Protection device) and one DC Protection per string. DC Protection 16A, 1200VDC Qty : 09 nos DC SPD's Type 2 Qty : 09 nos (Refer Single Line Diagram Sheet E-09)	EACH	2	119,252/-	238,504/-
b	**AC BREAKER BOXES**				
i)	Supply, installation, testing & commissioning (SITC) of of AC Breakers Box with all related accessories for outdoor usage with water proof enclosure. AC Breaker 200A, 4P, MCCB , 600V , Qty : 02 Main AC Breaker 400A, 4P, MCCB, 600V, Qty: 01 (Refer Single Line Diagram Sheet E-09)	EACH	1	282,599/-	282,599/-
ii)	Supply, installation, testing & commissioning (SITC) of of LV Panel with all related accessories including termination of cables in existing panel. AC Breaker adj 400A, 4P, MCCB , 600V , Qty : 01 AC Breaker adj 800A, 4P, MCCB , 600V , Qty : 01 Main AC Breaker adj 1000A, 4P, MCCB, 600V, Qty: 01 (Refer Single Line Diagram Sheet E-09)	EACH	1	N/A (Hook up with exp port)	N/A
5	**CABLES**				
a	**DC Cables**				
	Supply, Installation & Testing of DC Cable, 1 Core 4mm2 Cu/XLPE/XLPE cable complete in all respect with accessories to connect the PV solar cells together and to the inverter directly to have a complete operational circuit, clamps , trays and cable end terminations which shall be DC plug and socket connectors . The allowable voltage drop for DC cables between PV Arrays and inverter less than 1%. Minimum voltage capacity 1500VDC, Highest permissible voltage conductor/conductor should be 1.8kV DC, Standard Double insulated : Cross link polyolefin, Tinned copper conductor : Certified from DIN VDE 0295 CL.5, Fine-wire, IEC 60228 CL.5. Cable should be Certified from TUV Approved. Standard: EN50618	Meter	3520	104/-	366,080/-
b	**AC Cables**				
	supplying, connecting, and termination of the XLPE CU cables with all required works, in different sizes of ducts or pipes for internal cables . , clamps and				

	all needed fittings to connect cables terminals from source to destination. According to drawings, specifications, instructions, and demands of the supervising engineer. as follow:				
i)	4C x 70mm², Cu 0.6/1kV XLPE/PVC Pure Copper	Meter	20	5073/-	101,860/-
ii)	4C x 240 mm², Cu 0.6/1kV XLPE/PVC Pure Copper	Meter	30	19,325/-	579,750/-
c	**Earthing Cables**				
	Supply, Installation & Testing of Earthing Cable, Including PVC Pipe with related accessories. Brand : Pakistan Cable or Equivalent as Engineer approved.				
i)	Single Core 4 sqmm, CU/PVC/FLEX(Green)	Meter	140	50/-	7000/-
ii)	1 core, 10 sqmm, Bare Conductor	Meter	150	181/-	27150/-
iii)	1 core, 35 sqmm, CU/PVC/FLEX(Green).	Meter	20	749/-	14,980/-
iv)	1 core, 120 sqmm, CU/PVC/STD(Green)	Meter	30	2,074/-	62,220/-
6	**EARTHING SYSTEM**				
	Earthing System. Supply, installation, testing and commissioning of Earth Electrodes (Rod Type) for Earthing System with 25mm dia 3 meters (10 feet) long driven copper rod, complete with clamps lugs, washers/bolts, connected with 2x70mmsq bare copper earth conductors to Earth connecting point including 50mm dia G.I pipe/UPVC pipe class 'D/E' up to Earth Chamber, job includes cad-welding of copper conductor to earth electrode rod at one end and provision/ fixing of cable lugs at other end, including all accessories and RCC inspection chamber, heavy duty G.I. Cover having earth symbol, etc., as per the Specifications and Drawings and to the entire satisfaction and approval of the Engineer. Earthing result should be less than 5 Ohm for AC combiner, less than 1 Ohm for DC combiner and less than 10 ohm for Structure/lighting protection system.	Each	6	53,855/-	323,130/-
7	**LIGHTINING PROTECTION SYSTEM**				
i)	Supply, Installation ,Testing & Commissioning of Air rod with Base, rod length 500 mm high from PV panels, rod diameter 15mm, thread size M16, conductor material copper With all related accessories as per drawing & specification	Each	10	4,308/-	43,080/-
ii)	Supply, Installation ,Testing & Commissioning of lighting protection pole 20 ft long with RCC foundation with all related accessories as per drawing & specification	Each	10	8,616/-	86,160/-
iii)	Supply, Installation ,Testing & Commissioning of test clamp. Test Clamp shall be made of copper	Each	6	1,847/-	11,082/-
iv)	Supply, Installation & Testing of 1 core, 70 sqmm, CU/PVC/STD(Green) Earthing Cable, Including PVC Pipe with related accessories.	Meter	400	1,105/-	442,000/-
8	**CABLE TRAY**				
	Supply and installation of following sizes 16 SWG heavy duty G.I Perforated Cable Tray 150mm x 75mm with 16 SWG G.I. Covers as per details given in the drawings and specifications. Complete with all installation material such as angle iron support of size,MS round bar, elbows, Tee , nuts, bolts, washer, Hiltidrop-in anchour, etc,	Meter	10	1,231/-	12,310/-

	complete in all respect, as per the Specification and Drawings.				
9	MISC. CIVIL WORK				
a	Providing , Laying in Position, RCC rain water disposal Channel size 3'-0"x2'-0" (average) with slope with RCC Perforated Cover 2" thick as per design & direction to collect & dispose rain water to a sump out side the station .Concrete min . Class B and M/S steel Grade 60 Deformed.	Job	1	95,101/-	95,101/-
b	Supply and installation of 150 mm dia RCC Pipe for DC/AC cable, including excavation, sand bedding, back-filling, manholes etc., complete in all respects, in the following sizes:	Meter	80	1,784/-	142,720/-
c	Construction of concrete manholes / cable chambers (900 mm x 900 mm x 900 mm deep) with heavy duty RCC covers with anti-rust paint , including all required sleeves for pulling under ground power cables laid in pipes.	Each	2	23,776/-	47,552/-
d	Construction of concrete manholes / cable chambers (600 mm x 600 mm x 900 mm deep) with heavy duty RCC covers with anti-rust paint , including all required sleeves for pulling under ground power cables laid in pipes.	Each	1	20,209/-	20,209/-
e	Re-fixing Paver as in Position including providing sand etc required & Removal /Cutting of trees etc	Job	1	475,504/-	475,504/-
	TOTAL AMOUNT FOR BUS PORT				

BOQ of CARPORT with 5 Degree Tilt Estimated Capacity = ~~400.68~~ 381.60 KWp. MIN. HT. 12'-0"

Sr No	Product	Unit	Qty	Unit Price	AMOUNT
1	MODULE MOUNTING STRUCTURE (MMS)				
	Designing, Supplying, Fabrication & Installation of PV Mounting structure (MMS) for Car Port Minimum height 10'-0" from FFL /Road Level. The Module Mounted Structure (MMS) shall Comprising of Corrosion resistant anodized aluminum Section or hot dipped galvanized Steel Profile. The mounting structures and the foundations must be designed structurally to be suitable to withstand all static loads (weight of modules, wind loads etc) min. wind pressure 150 KM /hour in harsh environment. The design submission must be as per ASTM-A36, ASTM-123 and ASCE 7-10, for anodized aluminum AL6005/6063.The mounting structure components are bonded together to guaranty potential equalization. The tilt angle shall be not less than 5° for self-cleaning purposes and not more than 8° and for optimal exposure to direct solar irradiation. The work is to be carried out strictly as per approved drawing, design and specification and the rate quoted is inclusive of the following:	Kwp.	~~400.68~~ 381.60	20,535/-	7,836,156/-
a	Designing of the structure as per design specification approved				
b	Lay out at Site				
c	Footing & Foundation work as per drawing and specification .				
d	Placing of Anchor Bolts & Base Plate as per design & length & Details.				
e	Supply, Fabrication & Erection of Column, Beams , purlins & braces as per design				
f	Tilt angle is to be maintained as per Site Condition.				
g	RCC Drain with RCC grating Cover is to be provided to drain out rain/ cleaning water.				
h	Re do the Pavement work to its original condition after completion of the work.				
i	The Contractor shall remove all the debris and clear the site as per direction				
j	The contractor shall submit the detail technical shop drawing before execution of work.				
k	After completion of the work the contractor shall submit the as built drawing.				

Sr No	Product	Unit	Qty	RATE	AMOUNT
2	PV Modules – 400.68 Kwp:				
	Supply, install, Testing & Commissioning (SITC) Mono Crystalline 144 Cells Photovoltaic Solar Modules Tier -1 Type anti-reflective high transparency low iron tempered glass, with earthing provision. The modules STC parameters must be as under (a).Min. Power Pmax 530 or above Wp rated power (b), open circuit voltage (Voc) +/- 5 % 49.05V–49.65V (c) MPP Voltage Vmpp 41.2 V – 41.8 V (d) MPP Current Impp 12.75 A – 13.04 A (e) Short Circuit Current Isc +/-5 % 13.65A–13.92A. (f) Module Efficiency 20.0 – 20.5 % (g) Operating Temp. Degree Centigrade - 40 ~ +85 (h) Maximum System Voltage 1500 V UL 1000 V IEC (i) Maximum Series Fuse Rating 20 A (j) Junction Box Protection Degree , IP 68 (k) connection box, 4.0 mm2 conductor cross section, (m) cable with, MC4 male and female connectors, (o) Anodized Aluminum Frame and Support Bars (p) PVC duct, Clamps & Accessories, support and labels to be stalled under PV Array. 3 bypass diodes per module, and 1 bypass diode per each string of modules and 1 bypass diode for each array of modules, Modules must have in built blocking diodes, The Contractor Shall provide manufacturer warranty for solar panel for a period not less than 25 years. Contractor must submit all the required certificates for each PV solar panel from manufacturer as per specification. All works and materials must be according to the drawings, specifications and supervisor engineer instruction's and approval.	Kwp.	~~400.68~~ 381.60	46,646/-	17,799,923/-
3	GRID -TIED INVERTER (PCU)				
	Supply, install, testing & commissioning (SITC) DC/AC grid tie 3-phase inverter with data communication unit with Ethernet connection .The inverter with must be suited to any PV module configuration, and depending on the system design and installation proposed and for the future extended also. (Leading Market brand, having annual production greater than 1GW). The DC max power input rating should be at-least 1.2 times of AC power at standard test condition (STC). The inverter unit shall be suitable for indoor and outdoor installations with IP65. The inverter must include the safety concepts such as (triple protection with opti protect, electronic strings fuses, self-learning string failure detection, DC surge arrestor type (2) to ensure max availability. All works and materials must be according to the drawings, specifications and supervisor engineer instruction's and approval. Make: Sungrow /Huawei/SMA	EACH	3	815,375/-	2,446,125/-

	Power Rating: 100 KW or above.				
	Brief specification is as under :				
a	MPPT Voltage Range : 550V-850V,				
b	MPPT Operating Voltage Range : 200V ~ 1000V,				
c	Min 06 Independent MPP Trackers ,				
d	Minimum Efficiency 98.0 % ,				
e	Warranty : 5 Years				
f	Certification Required : CE, IEC 61727, IEC 62109-1/2				
4	**BREAKER BOXES**				
a	**DC BOX**				
	Supply, Installation, testing & commissioning (SITC) of DC Box/ Array Junction Box with all accessories for out door usage with water proof enclosure. Each Junction Box Shall be provided with suitable Metal Oxide Varistors (Mov's),Surge Arrestors, one fuse, one SPD (Surge Protection device) and one DC Protection per string. DC Protection 16A, 1200V Qty : 10 nos DC SPD's Type 2 Qty : 10 nos (Refer Single Line Diagram Sheet E-09)	EACH	~~4~~ 3	122,252/-	366,756/-
b	**AC BREAKER BOXES**				
	Supply, Installation, testing & commissioning (SITC) of of AC Breakers Box with all related accessories for out door usage with water proof enclosure. AC Breaker 200A, 4P, MCCB , 600V , Qty : 04 Main AC Breaker 800A, 4P, MCCB, 600V, Qty: 01 (Refer Single Line Diagram Sheet E-09)	EACH	1	423,878/-	423,878/-
5	**CABLES**				
a	**DC Cables**				
	Supply , Installation,& Testing of DC Cable, 1 Core 4mm2 including XLPE/XLPE Pipe complete in all respect with accessories to connect the PV solar cells together and to the inverter directly to have a complete operational circuit, clamps , trays and cable end terminations which shall be DC plug and socket connectors . The allowable voltage drop for DC cables between PV Arrays and inverter less than 1%. Minimum voltage capacity 1500VDC, Highest permissible voltage conductor/conductor should be 1.8kV DC, Standard. Double insulated : Cross link polyolefin. Tinned copper conductor : Certified from DIN VDE 0295 CL.5, Fine-wire, IEC 60228 CL.5. Cable should be Certified from TUV Approved. Standard: EN50618	Meter	8000	104/-	832,000/-
b	**AC Cables**				
	supplying, connecting, and termination of the XLPE CU cables with all required works, in different sizes of ducts or pipes for internal cables , , clamps and all needed fittings to connect cables terminals from source to destination. According to drawings, specifications, instructions, and demands of the supervising engineer, as follow:				

i)	4C x 70mm², Cu 0.6/1kV XLPE/PVC Pure Copper	Meter	50	5,093/-	254,650/-
ii)	2 x 4C x 240 mm², Cu 0.6/1kV XLPE/PVC Pure Copper	Meter	30	19,325/-	579,750/-
c	**Earthing Cables**				
	Supply, Installation & Testing of Earthing Cable, Including PVC Pipe with related accessories. Brand : Pakistan Cable or Equivalent as Engineer approved				
i)	Single Core 2.5/4 sqmm, CU/PVC/FLEX(Green)	Meter	260	50/-	13,000/-
ii)	1 core, 10sqmm, Bare Conductor	Meter	250	181/-	45,250/-
iii)	1 core, 35 sqmm, CU/PVC/FLEX(Green).	Meter	50	749/-	37,450/-
iv)	1 core, 120 sqmm, CU/PVC/STD(Green)	Meter	240	2,074/-	497,760/-
6	**EARTHING SYSTEM**				
	Earthing System. Supply, installation, testing and commissioning of Earth Electrodes (Rod Type) for Earthing System with 25mm dia 3 meters (10 feet) long driven copper rod, complete with clamps lugs, washers/bolts, connected with 2x70mmsq bare copper earth conductors to Earth connecting point including 50mm dia G.I pipe/UPVC pipe class 'D/E' up to Earth Chamber, job includes cad-welding of copper conductor to earth electrode rod at one end and provision/ fixing of cable lugs at other end, including all accessories and RCC inspection chamber, heavy duty G.I. Cover having earth symbol, etc., as per the Specifications and Drawings and to the entire satisfaction and approval of the Engineer. Earthing result should be less than 5 Ohm for AC combiner, less than 1 Ohm for DC combiner and less than 10 ohm for Structure/lighting protection system.	Job	6	53,855/-	323,130/-
7	**LIGHTINING PROTECTION SYSTEM**				
i	Supply, Installation ,Testing & Commissioning of Air rod with Base, rod length 500 mm high from PV panels, rod diameter 15mm, thread size M16, conductor material copper With all related accessories as per drawing & specification	Each	23	4,309/-	99,084/-
ii	Supply, Installation ,Testing & Commissioning of lighting protection pole 12 ft long with RCC foundation with all related accessories as per drawing & specification	Each	23	8,616/-	198,168/-
iii	Supply, Installation ,Testing & Commissioning of test clamp. Test Clamp shall be made of copper	Each	6	1,847/-	11,082/-
iv	Supply, Installation & Testing of 1 core, 70 sqmm CU/PVC/STD(Green) Earthing Cable, Including PVC Pipe with related accessories.	Meter	650	1,105/-	718,250/-
8	**CABLE TRAY**				
i)	Supply and installation of following sizes 16 SWG heavy duty G.I Perforated Cable Tray 150mm x 75mm with 16 SWG G.I. Covers as per details given in the drawings and specifications. Complete with all installation material such as angle iron support of size,MS round bar, elbows, Tee , nuts, bolts, washer, Hiltidrop-in anchour, etc, complete in all respect, as per the Specification and Drawings	Meter	30	1,231/-	36,930/-

ii)	Supply and installation of following sizes 16 SWG heavy duty G.I Perforated Cable Tray 300mm x 75mm with 16 SWG G.I. Covers as per details given in the drawings and specifications. Complete with all installation material such as angle iron support of size,MS round bar, elbows, Tee , nuts, bolts, washer, Hiltidrop-in anchour, etc, complete in all respect, as per the Specification and Drawings	Meter	30	2,462/-	73,860/-
9	**MISC. CIVIL WORK**				
a	Providing , Laying in Position, RCC rain water disposal Channel size 3'-0"x2'-0" (average) with slope with RCC Perforated Cover 2" thick as per design & direction to collect & dispose rain water to a sump out side the station .Concrete min . Class B and MS steel Grade 60 Deformed.	Job	1	95,101/-	95,101/-
b	Supply and installation of 150 mm dia RCC Pipe for DC/AC cable, including excavation, sand bedding back-filling, manholes etc., complete in all respects, in the following sizes:	Meter	100	1,784/-	178,400/-
c	Construction of concrete manholes / cable chambers (600 mm x 600 mm x 900 mm deep) with heavy duty RCC covers with anti-rust paint , including all required sleeves for pulling under ground power cables laid in pipes.	Each	5	20,209/-	101,045/-
d	Re-fixing Paver as in Position including providing sand etc required & Removal /Cutting of trees etc	Job	1	475,504/-	475,504/-
	TOTAL AMOUNT FOR CAR PORT (4 Nos)				

BOQ of ADAMJEE CARPORT with 5 Degree Tilt Estimated Capacity = 171.72KWp. MIN. HT. 12'-0"					
Sr No.	Product	Unit	Qty	Unit Price	AMOUNT
1	MODULE MOUNTING STRUCTURE (MMS)				
	Designing, Supplying, Fabrication & Installation of PV Mounting structure (MMS) for Car Port Minimum height 10'-0" from FFL /Road Level. The Module Mounted Structure (MMS) shall Comprising of Corrosion resistant anodized aluminum Section or hot dipped galvanized Steel Profile. The mounting structures and the foundations must be designed structurally to be suitable to withstand all static loads (weight of modules, wind loads etc) min. wind pressure 150 KM /hour in harsh environment. The design submission must be as per ASTM-A36, ASTM-123 and ASCE 7-10, for anodized aluminum AL6005/6063.The mounting structure components are bonded together to guaranty potential equalization. The tilt angle shall be not less than 5° for self-cleaning purposes and not more than 8° and for optimal exposure to direct solar irradiation. The work is to be carried out strictly as per approved drawing, design and specification and the rate quoted is inclusive of the following:	Kwp.	171.72	20,208/-	3,470,032/-
a	Designing of the structure as per design specification approved				
b	Lay out at Site				
c	Footing & Foundation work as per drawing and specification				
d	Placing of Achor Bolts & Base Plate as per design & length & Details.				
e	Supply, Fabrication & Erection of Column, Beams , purlins & braces as per design				
f	Tilt angle is to be maintained as per Site Condition.				
g	RCC Drain with RCC grating Cover is to be provided to drain out rain/ cleaning water.				
h	Re do the Pavement work to its original condition after completion of the work.				
i	The Contractor shall remove all the debris and clear the site as per direction				
j	The contractor shall submit the detail technical shop drawing before execution of work.				
k	After completion of the work the contractor shall submit the as built drawing.				

Sr No	Product	Unit	Qty	RATE	AMOUNT
2	PV Modules – 171.7 Kwp:				
	Supply, install, Testing & Commissioning (SITC) Mono Crystalline 144 Cells Photovoltaic Solar Modules Tier -1 Type anti-reflective high transparency low iron tempered glass, with earthing provision. The modules STC parameters must be as under (a).Min. Power Pmax 530 or above Wp rated power (b), open circuit voltage (Voc) +/- 5 % 49.05V–49.65V (c) MPP Voltage Vmpp 41.2 V – 41.8 V (d) MPP Current Impp 12.75 A – 13.04 A (e) Short Circuit Current Isc +/-5 % 13.65A–13.82A. (f) Module Efficiency 20.0 – 20.5 % (g) Operating Temp. Degree Centigrade - 40 ~ +85 (h) Maximum System Voltage 1500 V UL 1000 V IEC (i) Maximum Series Fuse Rating 20 A (j) Junction Box Protection Degree , IP 68 (k) connection box, 4.0 mm2 conductor cross section, (m) cable with, MC4 male and female connectors, (o) Anodized Aluminum Frame and Support Bars (p) PVC duct, Clamps & Accessories, support and labels to be stalled under PV Array. 3 bypass diodes per module, and 1 bypass diode per each string of modules and 1 bypass diode for each array of modules. Modules must have in built blocking diodes, The Contractor Shall provide manufacturer warranty for solar panel for a period not less than 25 years. Contractor must submit all the required certificates for each PV solar panel from manufacturer as per specification. All works and materials must be according to the drawings, specifications and supervisor engineer instruction's and approval.	Kwp.	171.72	46,646/-	8,009,965/-
3	GRID -TIED INVERTER (PCU)				
	Supply, install, testing & commissioning (SITC) DC/AC grid tie 3-phase inverter with data communication unit with Ethernet connection .The inverter with must be suited to any PV module configuration, and depending on the system design and installation proposed and for the future extended also. (Leading Market brand, having annual production greater than 1GW). The DC max power input rating should be at-least 1.2 times of AC power at standard test condition (STC). The inverter unit shall be suitable for indoor and outdoor installations with IP65. The inverter must include the safety concepts such as (triple protection with opti protect, electronic strings fuses, self-learning string failure detection, DC surge arrestor type (2) to ensure max availability. All works and materials must be according to the drawings, specifications and supervisor engineer instruction s and approval.	EACH	~~2~~ 2	659,063/- + 815,375/-	1,474,438/-

	Make: Sungrow/Huawei/SMA Power Rating: 60KW × 1 : 100kw x 1				
	Brief specification is as under :				
a	MPPT Voltage Range : 550V-850V,				
b	MPPT Operating Voltage Range : 200V ~ 1000V,				
c	Min 06 Independent MPP Trackers ,				
d	Minimum Efficiency 98.0 % ,				
e	Warranty : 5 Years				
f	Certification Required : CE, IEC 61727, IEC 62109-1/2				
4	**BREAKER BOXES**				
a	**DC BOX**				
i	Supply, installation, testing & commissioning (SITC) of DC Box/ Array Junction Box with all accessories for out door usage with water proof enclosure . Each Junction Box Shall be provided with suitable Metal Oxide Varistors (Mov's),Surge Arrestors, one fuse, one SPD (Surge Protection device) and one DC Protection per string. DC Protection 16A, 1200V Qty : 07 nos DC SPD's Type 2 Qty : 07 nos (Refer Single Line Diagram Sheet E-09)	EACH	~~3~~ 2	110,253/-	220,506/-
b	**AC BREAKER BOXES**				
i	Supply, installation, testing & commissioning (SITC) of of AC Breakers Box with all related accessories for out door usage with water proof enclosure. AC Breaker 120A, 4P, MCCB , 600V , Qty : 03 Main AC Breaker 400A, 4P, MCCB, 600V, Qty: 01 (Refer Single Line Diagram Sheet E-09)	EACH	1	327,977/-	327,977/-
ii	Supply, installation, testing & commissioning (SITC) of of LV Panel with all related accessories including termination of cables in existing panel Main AC Breaker 400A, 4P, adj MCCB, 600V, Qty: 01 (Refer Single Line Diagram Sheet E-09)	EACH	1	245,117/-	245,117/-
5	**CABLES**				
a	**DC Cables**				
	Supply , Installation,& Testing of DC Cable, 1 Core 4mm2 including XLPE/PVC Pipe complete in all respect with accessories to connect the PV solar cells together and to the inverter directly to have a complete operational circuit, clamps , trays and cable end terminations which shall be DC plug and socket connectors . The allowable voltage drop for DC cables between PV Arrays and inverter less than 1%. Minimum voltage capacity 1500VDC, Highest permissible voltage conductor/conductor should be 1.8kV DC, Standard. Double insulated : Cross link polyolefin, Tinned copper conductor : Certified from DIN VDE 0295 CL.5, Fine-wire, IEC 60228 CL.5. Cable should be Certified from TUV Approved, Standard: EN50618.	Meter	2530	104/-	263,120/-
b	**AC Cables**				
	supplying, connecting, and termination of the XLPE CU cables with all required works, in				

	different sizes of ducts or pipes for internal cables , , clamps and all needed fittings to connect cables terminals from source to destination. Accorcing to drawings, specifications , instructions, and demands of the supervising engineer. as follow:				
i)	4C x 35mm², Cu 0.6/1kV XLPE/PVC Pure Copper	Meter	25	1941/-	48,525/-
ii)	4C x 185 mm², Cu 0.6/1kV XLPE/PVC Pure Copper Armoured Cable 4C x 95mm² x 2	Meter	70	7,488/-	1,048,320/-
c	**Earthing Cables**				
	Supply, Installation & Testing of Earthing Cable, Including PVC Pipe with related accessories. Brand : Pakistan Cable or Equivalent as Engineer approved.				
i)	Single Core 2.5/4 sqmm, CU/PVC/FLEX(Green)	Meter	110	50/-	5,500/-
ii)	1 core, 10sqmm Bare Conductor	Meter	120	181/-	21,720/-
iii)	1 core, 16 sqmm, CU/PVC/FLEX(Green).	Meter	25	350/-	8,750/-
iv)	1 core, 95 sqmm, CU/PVC/STD(Green) 50 sq.mm x 2	Meter	140	996/-	139,440/-
6	**EARTHING SYSTEM**				
	Earthing System. Supply, installation, testing and commissioning of Earth Electrodes (Rod Type) for Earthing System with 25mm dia 3 meters (10 feet) long driven copper rod, complete with clamps lugs, washers/bolts, connected with 2x70mmsq bare copper earth conductors to Earth connecting point including 50mm dia G.I pipe/UPVC pipe class 'D/E' up to Earth Chamber, job includes cad-welding of copper conductor to earth electrode rod at one end and provision/ fixing of cable lugs at other end, including all accessories and RCC inspection chamber, heavy duty G.I. Cover having earth symbol, etc., as per the Specifications and Drawings and to the entire satisfaction and approval of the Engineer. Earthing result should be less than 5 Ohm for AC combiner, less than 1 Ohm for DC combiner and less than 10 ohm for Structure/lighting protection system.	Job	6	53,855/-	323,130/-
7	**LIGHTINING PROTECTION SYSTEM**				
	Supply, Installation ,Testing & Commissioning of Air rod with Base, rod length 500 mm high from PV panels, rod diameter 15mm, thread size M16, conductor material copper With all related accessories as per drawing & specification	Each	10	4,308/-	43,080/-
ii	Supply, Installation ,Testing & Commissioning of lighting protection pole 12 ft long with RCC foundation with all related accessories as per drawing & specification	Each	10	8,616/-	86,160/-
iii	Supply, Installation ,Testing & Commissioning of test clamp. Test Clamp shall be made of copper	Each	6	1847/-	11,082/-
iv	Supply, Installation & Testing of 1 core, 70 sqmm, CU/PVC/STD(Green) Earthing Cable, Including PVC Pipe with related accessories.	Meter	200	1,105/-	221,000/-
8	**CABLE TRAY**				
	Supply and installation of following sizes 16 SWG heavy duty G.I Perforated Cable Tray 150mm x 75mm with 16 SWG G.I. Covers as per details given in the	Meter	10	1,231/-	12,310/-

	drawings and specifications. Complete with all installation material such as angle iron support of size,MS round bar, elbows. Tee , nuts, bolts, washer, Hiltidrop-in anchour, etc, complete in all respect, as per the Specification and Drawings				
9	**MISC. CIVIL WORK**				
a	Providing , Laying in Position, RCC rain water disposal Channel size 3'-0"x2'-0" (average) with slope with RCC Perforated Cover 2" thick as per design & direction to collect & dispose rain water to a sump out side the station .Concrete min . Class B and MS steel Grade 60 Deformed.	Job	1	95,101/-	95,101/-
b	Supply and installation of 150 mm dia RCC Pipe for DC/AC cable, including excavation, sand bedding, back-filling, manholes etc., complete in all respects, in the following sizes:	Meter	10	1,754/-	17,540/-
c	Construction of concrete manholes / cable chambers (600 mm x 600 mm x 900 mm deep) with heavy duty RCC covers with anti-rust paint , including all required sleeves for pulling under ground power cables laid in pipes.	Each	1	20,209/-	20,209/-
d	Dismantling & Re-fixing Existing Steel Shade at some designated place as in Position including providing Footing, foundation , CC flooring etc Complete as required & Removal /Cutting of trees etc	Job	1	115,876/-	115,876/-
	TOTAL AMOUNT FOR ADAMJEE CAR PORT				

CIVIL WORKS FOR CONTROL ROOMS & INVERTOR /PCU STATIONS

Sr No	Product	Unit	Qty	RATE	AMOUNT
1	CONTROL ROOM	Reference Specification			
	Design, Provide & Construct RCC Frame Structure Control Room Size 12'-0" x16'-0" for installation of Weather Station & Fuel Control System including all type of Masonry work with Aluminum Doors & windows & 12000 BTU AC ,The rate include, all type of labour & material required. Max ht. of the Building 10'-0" from FFL. Non Skid Tiled floor and Plastic Emulsion on walls internal & Weather Shield on External walls as per direction of Engineer Incharge & approved design & drawing	Sq M	~~17.84~~	N/A	N/A
2	INVERTOR ROOM				
	Design, Provide & Construct RCC Frame Structure Invertor Room Size 10'-0" x12'-0"ht. 10'-0" for installation of Grid Tied Invertors at a) Bus Port & Car Port b) Adam jee Car Port ~~c) Auditorium Roof Port~~ (N/A) The rate including all type of Masonry work with Aluminum Doors & windows & 12000 BTU AC ,The rate include, all type of labour & material required. Max ht. of the Building 10'-0" from FFL. Non Skid Tiled floor and Plastic Emulsion on walls internal & Weather Shield on External walls as per direction of Engineer Incharge & approved design & drawing	Sq M	~~33.54~~ 22.36	31,707/-	708,969/-
3	Providing & supply of adjustable & moveable trolley type ladder with working Plate form for cleaning of SPV maximum working height 20'-0"	Each	1	160,009/-	160,009/-

★ Control room to be considered as Inverter room.

FUEL SAVER CONTROLLER

Sr. No	Product	Unit	Qty	RATE	AMOUNT
	Fuel Saver Controller				
	Design, Supply, installation, testing and commission of SMA Or Equivalent Fuel Save Controller System Solution for the Integration of PV Power Plant into Electrical Net Work based on Gen Sets. Fuel Save Controller should performs the following tasks: ➢ Monitoring of the gensets' power and operating status ➢ Monitoring of the load and grid status ➢ Calculation of suitable values for the maximum power output of the PV inverters according to defined parameter settings and the current status of gensets and load ➢ Control and communication interface to PV inverters ➢ Internal logging of all relevant system data ➢ Provision of relevant system data for local and remote monitoring ➢ Emergency shutdown of the PV inverters in case of a system malfunction The bidder shall provide the complete technical details of the system .	Each	1	738,504/-	738,504/-

WEATHER STATION

Sr No	Product	Unit	Qty	RATE	AMOUNT
	WEATHER MONITORING STATION				
	Design, Supply, installation, testing and commission of Weather monitoring System along with all necessary equipment and software which should I be capable of monitoring the solar radiance, wind velocity, module cell temperature, ambient temperature, humidity, wind direction and rain fall level. All sensors must be of class-A. The performance monitoring system shall use the present weather information and compare the solar power generated with the typical power to be produced with respect to the present available solar irradiance. The deviation of power generation shall be embedded in the automatic report generation documents, any degradation or performance deviation shall be alerted to the user through email. Based on this, the users initiate the maintenance/cleaning of solar panel, trouble shooting of the solar power system, etc. The weather information shall be recordec in the database continuously 24-hour basis and the same shall be viewed through the internet browser. The weather data stored in the database server shall be retrieved and displayed in the user intranet browser in user friendly tabular and graphical format. The user shall select the date range to view the history of weather data with date and time stamping. The automatic report generation feature in the server shall automatically generate the report based on the events or time duration and convert the same report in to PDF, word, excel, html and other formats and shall send to the specified e-mail ids as an attachment. The row, column, content, user email-id, shall be specified during the configuration setting by the user. The automatic report generation shall monitor the various user defined events continuously. For generating automatic reports and emailing process shall not require any human intervention.	Each	1	160,514/-	160,514/-

REMOTE MONITORING SYSTEM

Sr No	Product	Unit	Qty	RATE	AMOUNT
	DATA MANGER with REMOTE MONITORING SYSTEM				
	Design, Supply, installation, testing and commission of Data Manger with Remote Monitoring System consists of the following parameter: • Total energy generation of PV Plant • Instantaneous Power been generated by solar PV Plant • Performance ratio of PV plant. • Current load of client • Load profile v/s energy generation. Data should be store on server for not more than 10 min time interval. Data must be access through internet via user friendly GUI.	Each	1	121,691/-	121,691/-

NET METERING

Sr No	Product	Unit	Qty	RATE	AMOUNT
	NET METERING				
	Service of Grid Study & Net metering application process as per K.E approved criteria complete in all respects or directed by Engineer. This also include the services charges & fee for assessment of Grid Load service charges for Load Inspector etc. Only the cost of Challan shall be paid by IBA.	Each	1	492,336/-	492,336/-

* Fees for NEPRA & KE will be borne by IBA as the fees chalan's will be on IBA's name.

SCHEDULE A

SPECIFIC WORKS DATA

SUPPLY, CONSTRUCTION, INSTALLATION AND COMMISSIONING OF 750 KWp ON-GRID SOLAR POWER SYSTEM ROOF MOUNTED, CAR & BUS PORT MOUNTED AT INSTITUTE OF BUSINESS ADMINISTRATION KARACHI (MAIN CAMPUS)

→ Not Applicable

Solis energy Solutions Pvt. Ltd.
D-180, Block-5, Clifton,
Karachi-Pakistan

T +92(21)3529 4301-6
F +92(21)3529 4311

www.solis-energy.com

SOLIS

SCHEDULE B

WORK TO BE PERFORMED BY SUB-CONTRACTOR

Item of works to be sub contracted	Name & Address of the sub-contractor	Statement of similar work previously executed (Attached Evidences)
N/A	N/A	N/A

Solis energy Solutions Pvt. Ltd.
D-180, Block-5, Clifton,
Karachi-Pakistan

T +92(21)3529 4301-6
F +92(21)3529 4311

www.solis-energy.com

SOLIS

SCHEDULE C

PROPOSED PROGRAMME OF WORKS

→ Attached

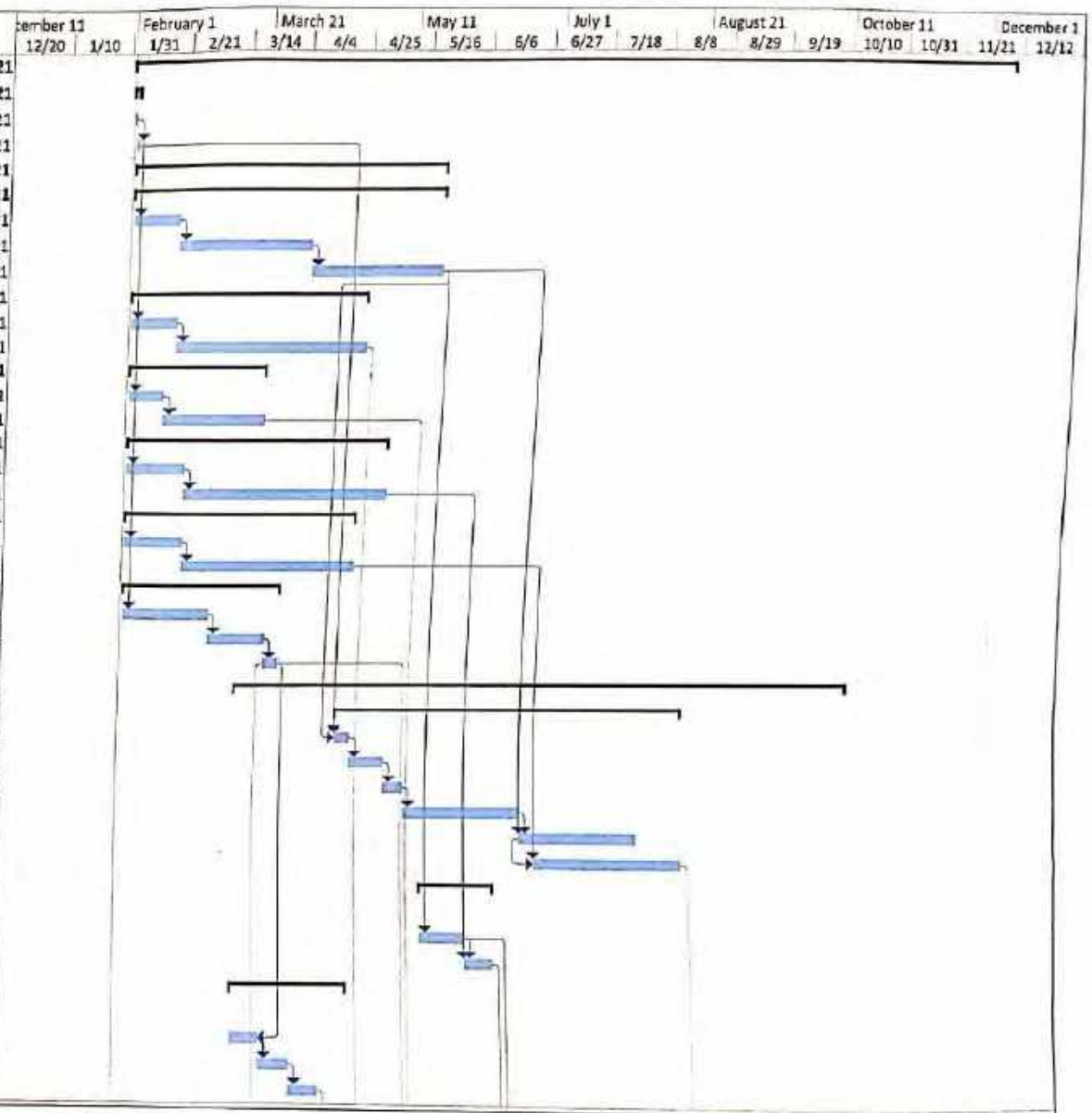
Solis energy Solutions Pvt. Ltd.
D-180, Block-5, Clifton,
Karachi-Pakistan

T +92(21)3529 4301-6
F +92(21)3529 4311

solis-energy.com

SCHEDULE C : GANTT CHART

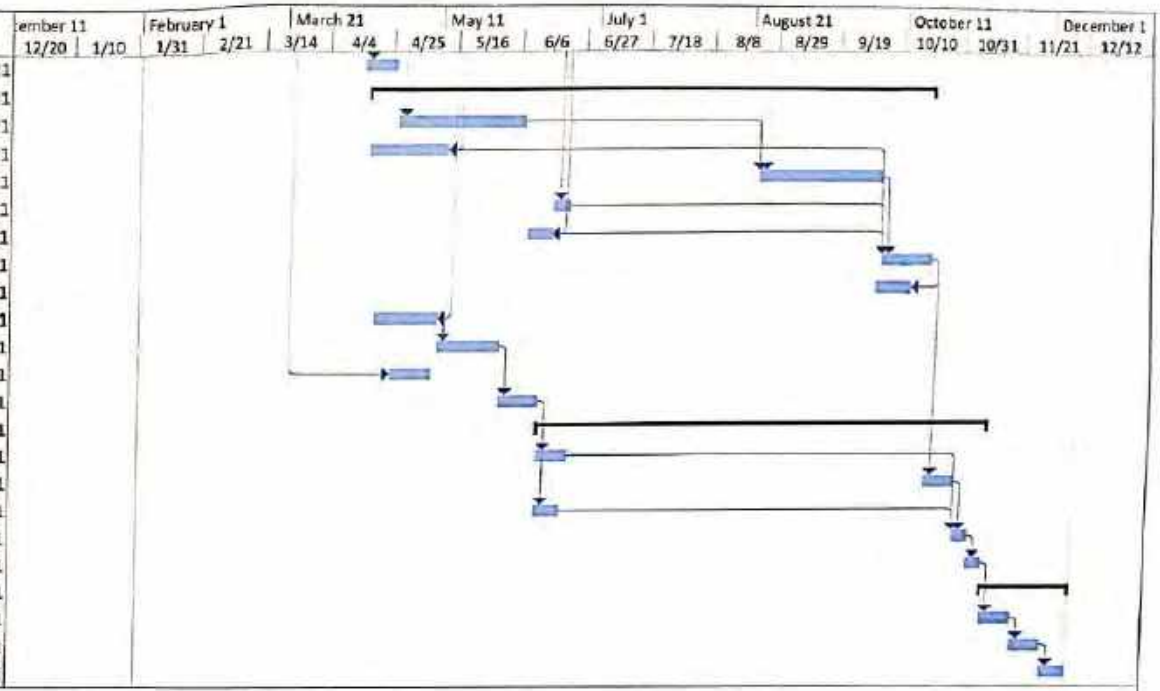
ID	Task Name	Duration	Start	Finish
1	**IBA**	**300 days**	**Mon 2/1/21**	**Wed 12/8/21**
2	**finalization & Lending**	**2 days**	**Mon 2/1/21**	**Tue 2/2/21**
3	signing	1 day	Mon 2/1/21	Mon 2/1/21
4	Kickoff Meeting	1 day	Tue 2/2/21	Tue 2/2/21
5	**Procurement**	**106 days**	**Tue 2/2/21**	**Sat 5/22/21**
6	**Procurement of Mechanical + Civil**	**106 days**	**Tue 2/2/21**	**Sat 5/22/21**
7	Issuance of PO	16 days	Tue 2/2/21	Thu 2/18/21
8	**Carport and busport manufacturing**	**45 days**	Thu 2/18/21	Tue 4/6/21
9	Delivery of Car port and busport	45 days	Tue 4/6/21	Sat 5/22/21
10	**Procurement of DC cables**	**81 days**	Tue 2/2/21	Mon 4/26/21
11	Issuance of PO	16 days	Tue 2/2/21	Thu 2/18/21
12	Delivery of Cables	65 days	Thu 2/18/21	Mon 4/26/21
13	**Procurement of AC Cables**	**47 days**	**Tue 2/2/21**	**Mon 3/22/21**
14	Issuance of PO	12 days	Tue 2/2/21	Sun 2/14/21
15	Delivery of Cables	35 days	Sun 2/14/21	Mon 3/22/21
16	**Procurement of Inverters**	**90 days**	**Tue 2/2/21**	**Thu 5/6/21**
17	Issuance of PO for Inverters	20 days	Tue 2/2/21	Mon 2/22/21
18	Delivery of Inverters & DC Combiner	70 days	Mon 2/22/21	Thu 5/6/21
19	**Procurement of Solar Panels**	**80 days**	**Tue 2/2/21**	**Sun 4/25/21**
20	Issuance of PO for PV Panels	20 days	Tue 2/2/21	Mon 2/22/21
21	Delivery of Solar Panels	60 days	Mon 2/22/21	Sun 4/25/21
22	**Procurement of Consumables**	**55 days**	**Tue 2/2/21**	**Tue 3/30/21**
23	Issuance of PO	30 days	Tue 2/2/21	Thu 3/4/21
24	Estimated Production timelines	20 days	Fri 3/5/21	Thu 3/25/21
25	Delivery of goods at site	5 days	Thu 3/25/21	Tue 3/30/21
26	**On-Site Installation**	**211 days**	**Mon 3/15/21**	**Wed 10/20/21**
27	**Mechanical and Civil works**	**119 days**	**Wed 4/21/21**	**Mon 8/23/21**
28	Demarcation of Site	5 days	Wed 4/21/21	Mon 4/26/21
29	Bushes cutting (if any)	12 days	Tue 4/27/21	Sun 5/9/21
30	land cleaning	7 days	Sun 5/9/21	Sun 5/16/21
31	Civil foundation for Car port and bus po	40 days	Sun 5/16/21	Sun 6/27/21
32	Fixing of Mounting Frames	40 days	Sun 6/27/21	Sat 8/7/21
33	Installation of Solar Modules	50 days	Fri 7/2/21	Mon 8/23/21
34	**Installation of inverter & combiner box mounting structure**	**25 days**	**Sat 5/22/21**	**Thu 6/17/21**
35	piles / column installation	15 days	Sat 5/22/21	Mon 6/7/21
36	Inverter and combiner box installation	10 days	Mon 6/7/21	Thu 6/17/21
37	**Construction of Civil Foundations for Lightning Rods**	**40 days**	**Mon 3/15/21**	**Sun 4/25/21**
38	Demarcation	10 days	Mon 3/15/21	Thu 3/25/21
39	Excavation	10 days	Thu 3/25/21	Mon 4/5/21
40	Steel Structure Fixing	10 days	Mon 4/5/21	Thu 4/15/21



Project: IBA timeline
Date: Thu 11/19/20

Task
Split
Milestone
Summary
Project Summary
External Tasks
External Milestone
Inactive Task
Inactive Milestone
Inactive Summary
Manual Task
Duration-only
Manual Summary Rollup
Manual Summary
Start-only
Finish-only
Deadline
Progress
Manual Progress

ID	Task Name	Duration	Start	Finish
41	Concrete Pouring and Curing	10 days	Thu 4/15/21	Sun 4/25/21
42	**Electrical Works**	**179 days**	**Sat 4/17/21**	**Wed 10/20/21**
43	DC Cable Laying	40 days	Tue 4/27/21	Mon 6/7/21
44	AC Cable Laying	25 days	Sat 4/17/21	Thu 5/13/21
45	Stringing of Solar Modules	40 days	Mon 8/23/21	Sun 10/3/21
46	Inverter Installation	5 days	Thu 6/17/21	Tue 6/22/21
47	Combiner box Installation	8 days	Wed 6/9/21	Thu 6/17/21
48	AC & DC Cable terminations	16 days	Sun 10/3/21	Wed 10/20/21
49	Installation of monitoring system	12 days	Fri 10/1/21	Wed 10/13/21
50	preparation of Earth pits	20 days	Tue 4/20/21	Tue 5/11/21
51	Laying of grounding conductors	20 days	Tue 5/11/21	Tue 6/1/21
52	Erection of lightning pole	13 days	Mon 4/26/21	Sun 5/9/21
53	Termination of Grounding conductor	13 days	Tue 6/1/21	Mon 6/14/21
54	**Commissioning/Start up**	**143 days**	**Mon 6/14/21**	**Tue 11/9/21**
55	Meggering & Continuity Tests of Cables	10 days	Mon 6/14/21	Thu 6/24/21
56	Open Circuit Voltage Tests	10 days	Wed 10/20/21	Sat 10/30/21
57	Earth Tests	8 days	Mon 6/14/21	Tue 6/22/21
58	Plant Start up	5 days	Sat 10/30/21	Thu 11/4/21
59	Energizing of Plant	5 days	Thu 11/4/21	Tue 11/9/21
60	**Post Commissioning Tests**	**28 days**	**Wed 11/10/21**	**Wed 12/8/21**
61	Closed Circuit Voltage & Current Tests	10 days	Wed 11/10/21	Sat 11/20/21
62	Thermal Imaging of Equipment's	10 days	Sat 11/20/21	Tue 11/30/21
63	Functional Test	8 days	Tue 11/30/21	Wed 12/8/21



Project: IBA timeline
Date: Thu 11/19/20

Task	Project Summary	Inactive Milestone	Manual Summary Rollup	Deadline
Split	External Tasks	Inactive Summary	Manual Summary	Progress
Milestone	External Milestone	Manual Task	Start-only	Manual Progress
Summary	Inactive Task	Duration-only	Finish-only

SCHEDULE D

DEVIATION FROM TECHNICAL PROVISION

It is presumed that the bidder shall not take any deviation. However, if he intends to take deviations to the specified terms, those must be listed in the space provided below:

Sr. No.	Clause No/ Section No	Deviation/Clarification
	None	None

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SCHEDULE E

DEVIATION FROM CONTRACTUAL CONDITION

It is presumed that the bidder shall not take any deviation. However, if he intends to take deviations to the specified contractual/commercial conditions, those must be listed in the space provided below:

Sr. No.	Clause No/ Section No	Deviation/Clarification
	None	
		None

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SOLIS

ENERGY SOLUTIONS

Schedule – F

Working Methodology

Client:

IBA Karachi

Contractor:

SOLIS Energy Solutions Pvt. Ltd.

Nov, 2020

Contents:

1. Purpose
2. Sequence of Activities
3. Tools, Equipment & Safety
4. Mobilization in Project Area
5. Complaint Management

1. Purpose:

The purpose of this work document is to define the procedure for Project execution/O&M activities and complaint management.

- **Health, Safety & Environment (HSE) Policy**
  - All work activities will be carried out as per SOLIS HSE policy and established safety procedures of execution.
- **Scope**
  - The Scope of every work shall be according to the design approved by the client.
- **Responsibility**
  - It is overall responsibility of SOLIS to organize resources to perform all works as per project specifications, in compliance with quality, schedule & requirements.

2. Sequence of Activities:

Solar Power Plant at IBA, Karachi will be comprised of the Roof top area.

Following set of activities will be performed.

1. Designing of Mechanical structure.
2. Designing of Civil works.
3. Designing of Electrical works.
4. Approval of Design Documents from Client.
5. Energy Simulation.
6. Procurement.
7. Establishing of storage area.
8. On-Site Activities.

On site activities will comprise of following activities:

- Mechanical Work
  a. Supply of material
  b. Lifting Equipment from ground to roof via Crane
  c. Structure installation (as per approved design)
  d. Mounting of Panels

- Civil Work for Structure Fixing:

a. Construction of civil foundations for mounting structure
b. Earth pits

- Electrical Work
  a. Installation of PV Modules
  b. Formation of strings
  c. Connection of string to inverter via DC Cable.
  d. Combining of AC cable outputs from inverters to 400V LV panel
  e. Tie- in of main AC cable from LV panel with 400V bus bar
  f. DC Cable Laying
  g. Earthing & Lightning Protection
  h. Inverter Mounting
  i. DC and AC Connections & Terminations
  j. Installation of EMS
  k. Installation of Web boxes and laying of LAN cables for remote monitoring of inverter, EMS

- Commissioning & Start-Up
  a. It will include complete commissioning tests of the project and start-up of the plant.

3. Tools, Equipment & Safety

- **Equipment:**
  - Crane (lift equipment E.g PV & Inverter from ground to Roof).
  - Meggar.
  - Digital Multi-meter.
  - Earthing Resistance tester.
  - Electrical Tool Box.
  - Instruments and Meters.
- **Safety:**
  - PPE (personal protective equipment).
    - Safety helmet.
    - Safety goggles.
    - Safety gloves.
    - Safety shoes.
    - Ear Plugs (if required).

- **Safety Instructions:**
  - All work items will be executed will be as per SOLIS HSE Policy.
  - Safety and hazards sign boards will be displayed at appropriate locations.
  - Contractor and on-site staff safety will be enhanced by conducting safety talks.

4. Mobilization at the Project Area

Upon Close of Contract SOLIS will establish a Mobilization Team led by the Project Manager to develop and coordinate all contract mobilization tasks. This Team will prepare a fully developed and detailed Mobilization Plan .The Mobilization Plan will indicate how the contract will move from Close of Contract to Service Commencement Date.

- **ACTIVITIES WITHIN THE MOBILISATION PLAN**

  - **Delegation/Enlistment of Employees**
    All Employees to work at IBA facility will be appointed for well-defined tasks.
  - **Provision of storage**
    IBA is responsible for providing storage space for equipment to be installed at site.
  - **Personnel Accommodation**
    SOLIS shall provide accommodation for its technical staff at site
  - **Communications**
    Project Coordinator

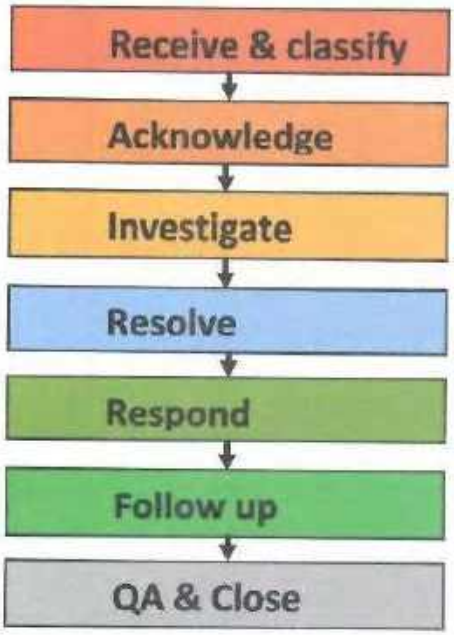
5. Complaint Management

These procedures apply to all technical employees of SOLIS ENERGY SOLUTION who receive a complaint from client. They are to be used in conjunction with the Client complaint management policy and any relevant departmental guidelines.

These Client complaint management procedures outline the process for managing **complaints about a SOLIS product, service, procedure, practice or policy.**

Process Overview:-

The following key steps must be followed for complaints received from the client:



Roles and Responsibilities:

Receiving Officer (Project Manager/ Project Coordinator)

- Receives and assesses complexity of complaint
- Resolves simple complaints
- Advises complainant of the complaint process, including review options
- Refers complaints not resolved at the frontline to the management
- Refers complaints to other areas as required.

Managing Officer

- Assesses complaints to decide if they can be actioned by the business area
- Assigns complaints to complaint officers for action
- Liaises with senior management on complex issues
- Grants extensions
- Analyses and reports on complaints

Complaint Officer (Technical Staff)

- Records, Evaluates, investigates and resolves complaints
- Liaises with the client on a regular basis to provide progress updates and to seek and clarify information
- Advises client of outcome and options for review if they are not satisfied.

SCHEDULE G

PROPOSED ORGANIZATION

S/N	Position	Name	Nationality	Qualification	Experience (number of years)
1	Project Manager	Fahad Ali Daudpota	Pakistani	B.E Electrical	15+
2	Project Manager	Saleem Ahmed		MEM Energy Management & B.E Industrial Electronics	10+
3	Project Engineer	Rana Atif		B.E Electrical & DAE Electrical	10+
4	Site Supervisor	Mubariz Mushtaq		B.S Electrical	10+
5	Site Supervisor	Hussnain Tahir		B.Tech. & DAE (Mechanical	10+
6	Site Surveyor	Abdul Manan		(B.E Electrical)	10+

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1. Proposed Position Head of Technical & Design

2. Name of the Expert Fahad Ali Daudpota

3. Name of the Firm Solis Energy Solutions (Pvt.) Ltd.

4. Present Residential Address Flat # 209 Block-B Wonder Tower, Gulshan-e-Iqbal, Karachi

- Telephone No. 0334-3520147
- Email Address Fahad.ali@solis-energy.com

5. Date of Birth Apr 19th 1983 Citizenship Pakistani

6. Qualification B.E Electrics

7. Work Experience: Summarize professional experience in reverse chronological order

From	To	Company / Project / Position / Relevant technical and management experience
2019	Present	**Solis Energy Solutions** /Director Technical
Aug 2014	2019	**Nizam Energy**/ General Manager Sales & Head of Operations
Aug-2005	Sep 2014	**Jubilee Corporation**/Manager Industrial Sales & Support
Mar 2005	Aug-2005	**Indus Steel Pipes**/ Trainee Engineer

SOLIS

A-V: CURRICULUM VITAE (CV) FOR PROPOSED EXPERTS

1. Proposed Position Project Manager

2. Name of the Expert **Saleem Ahmed**

3. Name of the Firm Solis Energy Solutions (Pvt.) Ltd.

4. Present Residential Address House # R 457 Sector 15-A/2 Buffer zone, North Nazimabad, Karachi

   - Telephone No. 0345-3107903
   - Email Address saleem.ahmed@solis-energy.com

5. Date of Birth May 16th 1990 Citizenship Pakistani

6. Qualification (MEM Energy Management & B.E Industrial Electronics)

7. Work Experience: Summarize professional experience in reverse chronological order

From	To	Company / Project / Position / Relevant technical and management experience
Aug 2015	Present	**Solis Energy Solutions/ Head Technical**
Oct 2012	Aug 2015	**Nizam Energy Pvt. Ltd./** **Senior** Solar Systems Engineer
Jul 2012	Oct 2012	**Limitless Solutions/** Junior Solar Systems Engineer

1. Proposed Position Site Supervisor

2. Name of the Expert Rana Atif

3. Name of the Firm Solis Energy Solutions (Pvt.) Ltd.

4. Present Residential Address Karachi

- Telephone No. 0307-7772960
- Email Address rana.atif@solis-energy.com

5. Date of Birth Apr 18th 1989 Citizenship Pakistani

6. Qualification B.Tech. Electrical & DAE Electrical

7. Work Experience: Summarize professional experience in reverse chronological order

From	To	Company / Project / Position / Relevant technical and management experience
2018	Present	**Solis Energy Solutions** /Head of Operations-South Region
2013	2018	**Reon Energy**/Senior Execution Officer
2009	2013	**Ghandhara Nissan Limited**/ Sr. Tech Power house and maintenance

1. Proposed Position Site Supervisor

2. Name of the Expert Mubariz Mushtaq

3. Name of the Firm Solis Energy Solutions (Pvt,) Ltd.

4. Present Residential Address 454-B, Street #10, Askari 10, Lahore

- Telephone No. 0333-1266567
- Email Address Mubariz.mushtaq@solis-energy.com

5. Date of Birth Jan 15th 1989 Citizenship Pakistani

6. Qualification B.Tech. Electrical & DAE Electrical

7. Work Experience: Summarize professional experience in reverse chronological order

From	To	Company / Project / Position / Relevant technical and management experience
2019	Present	**Solis Energy Solutions** /Head of Operations-North Region
Mar-2018	2019	**ZED Solar**/Assistant Manager - PV, ZED Solar Ltd.
Aug 2014	**Feb 2018**	**Nizam Energy**/Assistant Manager - Engineering
May 2014	**Aug 2014**	**TDCCIA** /Management Trainee
Jun 2012	**Jul 2012**	**Pakistan Steel Mills** /Intern Officer

1. Proposed Position Site Supervisor

2. Name of the Expert Hussnain Tahir

3. Name of the Firm Solis Energy Solutions (Pvt,) Ltd.

4. Present Residential Address House # 02, Saba Street, Taj Bagh Housing Scheme, Lahore

- Telephone No. 0304-0322311
- Email Address husnain.tahir@solis-energy.com

5. Date of Birth Mar 1st 1989 Citizenship Pakistani

6. Qualification (B.Tech. & DAE (Mechanical)

7. Work Experience: Summarize professional experience in reverse chronological order

From	To	Company / Project / Position / Relevant technical and management experience
2019	Present	**Solis Energy Solutions** /Cluster Head-North Region
Mar-2008	May 2014	**JGC, SAIPEM, GSE & C, TECNICAS RUENDAS, FERTIL/ QA & QC Inspector**

SOLIS

SCHEDULE H

NAME OF MANUFACTURER/SUPPLIERS OF EQUIPMENT/ MATERIAL/ RELEVANT TECHNICAL DATA ON WHICH THE TENDER IS BASED

S.NO.	Equipment Description	Make, Model, Manufacturer's Name, Country of Origin	Address, Contact E-mail
1.	PV modules	Longi - 530Wp	China
2.	Inverter	Huawei - 100KTL / 60KTL	China
3.	DC cables	Imported, Jucca/FK	China
4.	AC cables	Pakistan Cables / Fast	Pakistan
5.	Structure	Imported (China)	China
6.	Breakers	Schnieder / Togsaki	Italy / Japan
7.	Weather Station	Ingenieurbüro (Class A)	Germany

SCHEDULE J

SPARE PARTS AND WEAR & TEAR PARTS

PV modules : 10 Nos.

Inverter : 1 NOS.

Breaker = 2Nos. each

Consumables : 1 Nos. each

MC4 connectors : 10 Pair

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SCHEDULE K

SPECIAL TOOLS

→ Attached

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SCHEDULE K

EQUIPMENT CAPABILITIES (OWNED BY THE CONTRACTOR / FIRM / JOINT VENTURE)

S.No.	Name of Equipment	Name of Manufacturer	Model & Power Rating	Capacity	Year of Manufacturer	Current Location
1	Site Assessment Tools					
i)	Solar Path Finder	Fluke/Solar edge/Huawei	N/A	N/A	2017/2018	Karachi
ii)	PV analyzer with software					
iii)	PV Power Meter					
iv)	PV optimizer					
2	Conc. Mixer Min. ½ Bag Capacity	Bosch				
3	Section Cutting Machine	Caterpillar				
4	Crane 2 Ton lifting Capacity with 20 ft boom	Caterpillar				
5	Pick up	Suzuki		600 Kg	2016	

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EQUIPMENT CAPABILITIES (LEASED / RENTED BY THE CONTRACTOR / FIRM / JOINT VENTURE)

Sr. No.	Name of Equipment	Mention whether Leased or rented	Name of Owner	Address of Owner	Contact Name, Title Telephone, Fax & Email Address	Agreement details of rental
1	Site Assessment Tools					
i)	Solar Path Finder	Rented	Fazal Impex	Plot# 58 Sector 12-D, North Karachi Industrial Area	Hunaid Samiwala, Director 0345-2191910 021-36992352 021-36953329	Attached
ii)	PV analyzer with software					
iii)	PV Power Meter					
iv)	PV optimizer					
2	Conc. Mixer Min. ½ Bag Capacity					
3	Section Cutting Machine					
4	Crane 2 Ton lifting Capacity with 20 ft boom					
5	Pick up					

SCHEDULE L :INTEGRITY PACT

Contract No._____ Dated
Contract Value
Contract Title

_____herby declares that it has not obtained or induced the procurement of any contract, right, interest, privilege or other obligation or benefit from government of Sindh (GoS) or any administrative subdivision or agency thereof or any other entity owned or controlled by it GoS through any corrupt business practice.

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

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

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

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

Procuring Agency **Contractor**

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1. SOLAR POWER GENERATION SYSTEM

The system shall be designed and sized as per the site requirements and shall consist of mainly the following:

- Solar photovoltaic panels
- Grid Tied Inverters
- Module mounting structure
- Junction boxes
- AC Distribution board
- Surge Arrester AC & DC
- Earthing protection system
- Cables and other accessories
- Lighting Protection System

The PV array converts the light energy of the sun to DC power. The module mounting structure shall be used to hold the module in position. The DC power generated shall be converted to 3 phase, AC, 415V, 50 Hz. solar panels shall be integrated with the premises power supply from electricity authority.

a) SOLAR PV MODULES:

Since the light intensity in the region and the temperature parameters have been taken into consideration, we strongly recommend to go for PV Crystalline modules. The photovoltaic modules shall be designed, manufactured, and tested in accordance with the applicable standards as follows

b) TESTING, CERTIFICATION & QUALITY ASSURANCE

IEC 61215 / IEC 61730: VDE / MCS / CE / SII / CEC AU / INMETRO
UL 1703: CSA / IEC 61701 ED2: VDE / IEC 62716: VDE / IEC 60068-2-68: SGS Take-eway/UNI 9177 Reaction to Fire: Class 2

c) CERTIFICATION – MANUFACTURER

- The PV module should be AAA or AA rated PV manufacture.
- The Manufacturer should have 10 Years of manufacturing experience.
- The manufacturer should have Authorized Distributor in Pakistan.
- The manufacturer should be Vertically Integrated Company.
- The Product to be listed in PVEL top Performers.

d) SPECIFICAITONS & CERTIFICATIONS

- Cell Type: 144 or above Half cell, Mono PERC, Minifacial.
- Minimum power should be 530W or above at STC: air mass AM 1.5, irradiance 1000 W/m², temperature 25°C
- Minimum Module efficiency ≥20%
- Operating Temperature: -40°C to 90°C
- Solar module must be minimum 20% efficient at low irradiance of 200W/m²:
- Nominal Module Operating Temperature 44.6°C (±2°C)
- Temperature coefficient of PMPP -0.36%/°C or better
- Temperature coefficient of VOC -0.32 %/°C or better
- Connectors: MC4 or comparable
- Maximum series fuse rating: 25A

- PID free (certificate should attached)
- Anti-soiling Coatings.
- Relevant ISO and IEC Certifications should be attached and mentioned (IEC 61215, IEC 61730 & UL 1703, IEC 62804 (PID Free), IEC 60068-2-68, IEC 61701 (Salt Mist Level 6), IEC 62716 (Ammonia Resistance), ISO 11925-2 (Ignitability Class E), UNI 8457/9174 (Class A), comply SRO 604(1) 2019 module batch to be EL flash tested sample size to be selected on S2500/ISO 2859, Waste Electrical and Electronic Equipment (WEEE) COMPLIANT RECYCLING MEMBERSHIP. Mandatory
- Module product warranty 10/12 years and performance warranty 25 years.
- Unique Serial number, Name/Logo of manufacturer and separate date of manufacturing (DD/MM/YY) should be laminated Inside the module so as to be clearly visible from the front side.
- A properly laminated sticker containing the following details should be available at the back side of the module
    - Name of the manufacturer/distinctive log.
    - Model Name and Type of Cell 'Technology.
    - Peak Watt Ratting (Wp) and Power Tolerance Range.
    - Voltage (Vmp) and Current (Imp) at STC.
    - Open Circuit Voltage (Voc) and Short Circuit Current (Isc).
    - Module Voltage RaHg 1500V.
    - Dimensions of PV Module
    - Test Standard(s) to which the module has been tested and certified.
- following essential technical parameters of solar panel/modules should be provided with each
  pane/ supplied as well as in the technical proposal.
    - I-V curve for the solar photovoltaic module/panel.
    - Date and year of obtaining IEC PV module standardization qualification certificate.
    - Electrical Data (i.e: Pmax, Voc/Vmp, Isc/Imp at nominal Cell Operating Temperature (NOCT).
    - PV Module efficiency at STC.
    - Working temperature range of PV Module.
- Each panel should have factory equipped weather proof terminal junction box having at least IP67 protection with provision of opening for replacement of DC cables, blocking diodes and easy debugging if necessary.
- The PV modules offered should not be more than 12 months old from date of issue of work order.
- The Solar Module should be free from visual and cosmetics defects.
- FAT for consultant and client should arranged by supplier/contractor at its own cost.
  with serial numbers from manufacturer for each panel (at the time of supply).
- All information regarding solar panel with above mentioned featured data should be accessible and verifiable online on the manufacturer website.
- IEC accredited lab test for solar panels is mandatory.

2 **PV INVERTERS:**

- Make: SMA/Sungrow/Hawaii
- On-Grid string Inverter Pure Sine Wave MPPT ≥ 6
- Nominal AC Voltage: 3ϕ, 230/400 VAC 50Hz ± 5Hz
- Inverter rated Output Power @ 400 V 3ϕ 50Hz should be ≥ 25000W
- Efficiency ≥ 97.5%
- MPPT Voltage Range: 550V to 850V
- Maximum DC input voltage: 1000V
- Power Factor @ Rated power should be 1
- Operating Temperature Range –25°C to +60°C (–13°F to +140°F)
- Maximum relative humidity 100%"
- Protection Class: IP66 or above
- Maximum Operating Altitude ≥ 2900m

- Transformer less Topology
- Self-consumption at night ≤ 0.01%
- Total Harmonic distortion < 3%
- Must meet I EC62109-1 /2, EN50530. IEC 62116, IEC 61727, IEC60068, IEC 61683 certifications
- EMC IEC 61000 family or equivalent
- Inverter must have following functionalities:
- String/Sub array monitoring
- Matching grid voltage and frequency at point-of-coupling
- Anti-islanding protection
- Ground fault monitorin
- Grid monitoring
- Residual-current monitoring unit
- Frequency regulation
- Limitation of voltage fluctuation due to switching operations and long-term flicker
- DC Reverse Polarity protection
- Limitation of short-circuit current
- Over Voltage Protection
- Communication Interface: Ethernet / WLAN / RS485
- Inverter must meet following standards:
- IEC 60068-2, IEC 61727, IEC 62109-1/2, IEC 62116, IEC 60721-3-4, AS 4777, G59/3, VDE 0126-1-1, VDE-ARN 4105"
- Warranty 5 years
- Advanced communication, with intelligent alerts/warnings and another relevant operational parameter, either with Built-in remote monitoring system or Separate remote monitoring system connected to communication ports of the inverter

3. MODULE MOUNTING STRUCTURE:

- Structure should be fixed tilt
- The selection of the optimum tilt angle for the module installation. The angle between the modules and the horizontal plane shall be the optimum for the region.
- "The height of the module above ground shall also be carefully chosen, considering factors such as, damage from sand driven by wind and clearance from the ground to allow for cooling air to circulate at the back of the module and any condensation of moisture to dissipate."
- Mounting structure material should be of anodized aluminum & Hot Dip Galvanized Iron and must be resistant to corrosion.
- The mounting structure must be able to withstand basic wind speed of 150Km/Hr.
- The Bidder shall provide detailed drawings civil foundations it plans to use.
- The applicable construction codes for each structural element should be quoted.
- The mounting structures must be earthed for maximum short-circuit current and lightning protection.
- The stability of the supporting structure after installation shall be certified and guaranteed by the Contractor.
- Fittings like washer, screws etc. V2A steel quality or proved high quality coating not interacting with Aluminum.
- All nuts and bolts should be made of good quality Stainless Steel.
- The structure should be designed to allow easy replacement of any module.
- Structure to comply with ASTM-A36, ASTM-123, AL 6005/6063 and ASCE-7-10.
- Detail Calculation required considering wind speed.
- Detail drawings of structure is required.

4. DC CABLE FOR SOLAR:

- The main design requirement is to reduce ohmic losses of DC cabling, without adversely affecting the cost trade-off, to < 1 % at full power under STC conditions
- Design calculations through cable loss simulation have to be provided by the bidder for review & approval.
- String cable shall be selected as per EN50618 standard (1500 VDC).
- DC cables shall be suitable for the environmental conditions at the Project site, including UV protection and rodents
- All cables shall be UV resistant PVC double insulated with each core individually insulated. Insulation rating of cables shall be as per IEC standards.
- All cables shall have annealed copper stranded conductors
- All above ground cables shall be routed in rigid galvanized steel cable trays or metallic galvanized steel conduits.
- All underground cables shall have mechanical protection in the form of galvanized steel wire, steel tape or steel interlocked armor. If unarmored cables will be used then the same will be routed in rigid galvanized steel conduits
- All cable connections with industrial cable connectors. (MC4 or equivalent) Used connectors have to be compatible with connectors of panel supplier.
- Submit type test reports of DC Cable.

5. DC Breaker:

DC Breaker Box/ Array Junction Box with all accessories for out door usage with water proof enclosure. Each Junction Box Shall be provided with suitable Metal Oxide Varistors (Mov's),Surge Arrestors, one fuse, one SPD (Surge Protection device) and one DC Breaker per string. AC Breakers Box with all related accessories for outdoor usage with water proof enclosure.

6. LOW VOLTAGE PANELS & SWITCHGEARS

This Specification covers the minimum requirements for the selection, application, procurement, testing and installation of low-voltage switchgear and associated bus.

a) MAIN / SUB-MAIN LOW VOLTAGE PANELS

The main and sub-main Switchboard shall be of wall / floor mounted construction system, incorporating MCCB(s) bus-bars, fuses, measuring equipment etc. all as required and complying to the latest editions of BS EN 60439-1. The switchboard shall be from a reputed manufacturer as per the schedule.

All circuit breakers and busbar ratings shall be as per the load schedules and drawings. All circuit breakers and busbars should be rated for 45 °C ambient temperature. All auxiliary power supplies shall be provided as per the manufacturer's requirement. The fault-current calculation guidelines stated in IEC shall be adhered to when selecting circuit breaker ratings.

The short-circuit current rating of the low-voltage switchgear shall, as a minimum, be 10 percent greater than the calculated available short-circuit current. It is recommended that the rating be 20 percent above the calculated value.

The ambient temperature rating of the switchgear shall be selected in accordance with the maximum ambient temperature of the equipment and shall be 45°C as a minimum.

Low-voltage switchgear shall be, as a minimum, capable of withstanding a current equal to the short-time current capacity of the main circuit breaker for two periods of 0.5 seconds separated by a 15 second interval of zero current. This current shall be maintained without danger to operating personnel and without electrical, thermal or mechanical damage or permanent deformation to the bus, structure or enclosure.

b) DESIGN & CONSTRUCTION

Enclosures shall be made of sheet steel. The basic framework should be roll-formed from 1.6 to 2 mm electro-galvanized steel coated with high-solid enamel, polyester electrostatic spray and oven baked. The doors and panels shall be iron-phosphate steel, coated like the framework but also with primer. The color shall be RAL 7035 or equal. The base frame shall be of minimum 3mm thick Electro galvanized steel.

Compartments shall be easily accessible for maintenance purposes. Barriers shall be included between each compartment to contain an internal fault as defined in BS / IEC standards to ensure safe maintenance on any outgoing circuit when the remainder of the board is alive. Each compartment shall be provided with a separately fixed compartment thermostat controlled heater at the bottom of each compartment.
The maximum height of the enclosure shall be 1800 mm. All meters, lamps, operating handles shall be within a maximum height of 1500 mm. All dimensions shall be of uniform appearance. All live conductors shall be shielded in such a manner that they cannot be accidentally touched when the doors are open. All doors and plates shall be interchangeable and may be hinged left, right, top and bottom as standard. Doors shall be provided with an integral gasket and earth stud and a range of locks to meet all regulations.

All internal separations shall be from standard pre-fabricated plates. The usage of Bakelite, fiber sheets or any other material to provide internal separation will not be acceptable. The internal separation between compartments and sections shall be at least IP 40.

Suitable cableways shall be provided for each functional unit section. There shall be front access for cabling purposes. It shall be possible to safely terminate or work on the outgoing cables of any functional unit without having to switch off the main breaker or adjacent functional units. Switchboards shall be suitable for bottom or top cable entry as specified. All openings and entries shall be vermin proof. Switchboards shall be arranged such that safe access (front, rear, side) may be readily obtained. Adjustable gland plates, adequate channel frames and cable clamps for cable supports shall be provided.

c) BUS-BARS

Bus-bars shall be of rectangular cross section HDHC tinned copper and suitably rated for continuous operation. The main bus-bar rating shall be the same throughout the entire length of the switchboard. The bus-bars and primary connections shall comply with BS 159. The surface temperature of the bus-bar should not exceed 85 °C over an ambient of 45 °C. Connections to incoming circuit breakers shall be of the same rating.

Bus-bars shall be installed in a separate charnber and shall run along the whole length of the switchboard, which allows for easy extension in the future. Vertical droppers if any, shall run behind each functional unit section. Busbars shall be rigidly supported along their entire length. The busbar supports shall be of a high-grade polymer. The mechanical and dielectric strength of the

busbars and supports shall be capable of withstanding the worst fault conditions and as per ASTA testing requirements.

The main busbar system shall be of a parallel 2 bar per phase arrangement, which eliminates the need for drilling or bending of busbars at joints. All switchboards shall be complete with a neutral and earth bar running along the full length of the panel. The cross section of the neutral bar shall be same as that of the phase conductor and that of the earth bar is at least half the size as that of the phase bar.

Busbars and connections shall be color coded for phase identification and shall conform to the phase sequence R-Y-B, counting from left to right, upper to lower and from near to remote when viewed from the operating side of the switchboard.

Under no circumstances will common earth / neutral bar be accepted. Earth bars, neutral bars and wiring of the switchboard and so that all outgoing neutral and earth conductors can be readily and safely connected and disconnected without moving other cables or disconnecting the incoming supply to the switchboard.

d) **DRAWINGS AND INFORMATION:**

A drawing pouch / pocket shall be provided in each panel and laminated load schedules and approved schematic drawings (Framed) shall be providing.

The vendor shall furnish following submittal after placement of order:

General Arrangement drawing showing front view, plan, foundation plan, floor cutouts and trenches for external cables, elevations, transport sections and weights.

Sectional drawings of various types of feeders, panels showing general constructional features, mounting details of various devices, busbars, current transformers, cable boxes, terminal boxes for control cables etc. Schematic and control wiring diagrams for each type of feeder and protection including indicating devices, metering instruments, alarms, space heaters etc.

7. AC CABLES:

- AC cables shall be made of copper. Datasheets, Make, Certifications, and warranties should be provided with proposal.
- Rated voltage, nominal voltage between phase and neutral and nominal voltage between phases have to be specified by the Bidder.
- AC cables shall be suitable for the environmental conditions at the Project site, including UV protection and rodents.
- The main design requirement is to reduce ohmic losses of AC cabling, without adversely affecting the cost trade-off, to below 2% under STC conditions. (Design calculations through cable loss simulation to be provided by the Bidder for review & commenting).
- All cables shall have annealed copper stranded conductors
- All underground cables shall have mechanical protection in the form of galvanized steel wire, steel tape or steel interlocked armor.
- All cables should be XLPE.

8/ CABLE TRAYS

a) GENERAL

Under this section of the Contract cable trough (cable tray) shall be installed to support distribution cables, communication cables and all wiring cables not generally installed in conduit and or trunking. The cable trough shall be installed in such a manner to enable easy access for cable installation.

The cable trough shall vary in type, i.e. where large armored cables are installed, ladder rack type cable trough shall be permitted. Where smaller type communication cables are installed, ventilated type cable trough shall be permitted. Cable trough shall be galvanized finished.

b) QUALITY ASSURANCE

Subject to compliance with the requirements of the Contract Documents, acceptable manufacturers are to be firms regularly engaged in manufacturer of all materials specified in this section of types and sizes required, whose products have been in satisfactory use under similar service conditions for not less than ten years.

c) SUBMITTALS

Submit the standards to which the cable trough is manufactured to. Submit shop drawings and data in accordance with the general requirements of the contract. Indicate the various types of cable trough with terminology used. Show actual cable trough installation details, size and suspension system.

d) PRODUCTS

The cable trough system shall be of one manufacturer and shall include factory made trays, tray fittings, connections, complete with accessories and supports to from a complete tray support system. The cable trough system shall include the factory-made tray elements. Straight trays and ladders, fittings and horizontal and vertical bends of various angles crosses, tees, wyes, reducers, vertical riser elements, connectors, joint plates and all necessary fixing accessories including supports. No local or site fabrication of any cable trough system including ceiling and wall supports are acceptable. Threaded rods for ceiling supports are not acceptable.

The whole of the tray work, fittings, supports shall be of mild steel hot dipped galvanized after manufacture / imported GI Sheet. The thickness of the protective sheath on any element shall not be less than 60 microns.

Cable trays shall be constructed from mild steel of minimum thickness 16 gauge (1.5mm). Height shall be 75/100mm. Trays in excess of 300mm width shall be of minimum thickness 14 gauge (2.0mm). Flange height shall be 100mm. Insert elements, bolts, screws, pins etc., shall be mild steel cadmium plated/hot dip galvanized. Tray work shall have oval perforations. Ladder type trays shall be used as required and/or approved by the Employer. All trays (straight and fittings) to be heavy duty returned flanged type unless specified otherwise.
Tray component are to be accurately rolled or formed to close tolerance and all edges rounded. Flanges are to have full round smooth edges. Ladder racks for widths up to and including 300mm

shall be constructed from rolled steel sections of minimum thickness 16 gauge (1.5mm). Height shall be 75/100mm. Ladders in excess of 300mm width shall be C Section construction with a minimum thickness of 14 gauge (2.0mm). Height shall be 100mm. The rungs shall be spaced at a maximum 300mm.

Unless indicated otherwise on drawings, cable trays shall be used in the range and 150mm to 750mm wide, in five preferred standard sizes: 150, 300, 450, 600 and 750mm. Other sizes shall be used where specified or previously agreed with the Employer. Return flanges shall be a minimum of 10mm deep, unless otherwise specified. Minimum radii at side rails, horizontal, and vertical tees and crosses shall be in accordance with the Manufacturer's standard.

e) INSTALLATION

Install all cable trays and ladder racks strictly in accordance with IEE and local authorities requirements. Drilling, machining or cutting shall not be carried out after application of protective coat, unless previously agreed by the Employer. If cutting or drilling is necessary, edges shall be cleaned up and painted with zinc-based paint before erection. Provision shall be made when installing all cables and cable trays for the expansion and settlement of the building. Cables shall be fixed to the trays/ladders by means of PVC cleats and flame-retardant cleats for flame/fireproof cables with galvanized bolts, nuts and washers. Use galvanized metal trefoil cleats with rubber pad for single core cables 5 Control cables run and clipped in groups shall not exceed twelve in number and shall be not more than double banked. Power cables shall be laid in a single layer except with the prior approval of the Employer. Power cables should be spaced 2D between centres of cables throughout the run of cables. Submit calculations for voltage drop for cables and increase the size if necessary.

Vertical distances between trays mounted horizontally shall be minimum of 250mm. Local reduction of distances between trays will be allowed to a minimum of 150mm with approval from the Employer. Trays shall be adequately supported to prevent sagging by more than 3 Deg. between fixed points. All supporting steelwork shall be fixed at not more than 1-meter centers unless otherwise specified.

Where cable tray pass through floor arrange for 100mm concrete curb around opening and fire sealants shall be provided. The Contractor shall submit calculations relating to tray / ladder work and tray / ladder supports demonstrating acceptable mechanical stresses and sag.

Cable trays shall be constructed from mild steel of minimum thickness 16 gauge (1.5mm). Height shall be 75/100mm. Trays in excess of 300mm width shall be of minimum thickness 14 gauge (2.0mm). Flange height shall be 100mm.Where cable tray is intended to cross a series of beams the tray shall be supported from each beam it crosses by metal supports suspended from below the underside of the beam - the space between the tray and the beam underside surface shall not exceed three times the diameter of the largest cable to be carried on the tray. Cable tray covers are only required on roofs or outdoor where cables are installed exposed to weather conditions or as specified in the BOQ.

f) EARTHING

The entire cable tray and ladder system shall be bonded and 12mm x 1.5mm tinned copper shall be bolted across each joint in the system by means of galvanized nuts and bolts, complete with flat and spring washers. Tray systems shall be bonded to the main building earthing system as required or directed by the Employer.

9. GROUNDING SYSTEM

a) GENERAL

This section described the grounding and bonding system components for active green earth system. Each and every electrical / mechanical equipment computers, panels, mechanical equipment, ventilation fans, metal structures etc. should be connected to earthing system. The earthing system should be made by connecting all the earthing electrodes by copper conductor of specified size as shown on drawing, in such a way to from a ring. Contractor has to ensure a minimum earth resistance of 5.0 OHM. If difficulty is faced in getting this value additional earth electrodes be added into the ring system.

b) WORK DESCRIPTION

This section specifies the engineering, supply, installation, testing, commission and setting to work of the complete earthing network for individual earthing systems, circuit protective conductors and bonding conductors. A complete earthing network comprising cables, copper tapes, electrodes and earth bonding of all relevant necessary non-current carrying metal shall be supplied, erected and connected as required.

The system shall be a common earthing system as described in the specification and as shown on the drawings. Individual earthing systems shall be provided as follows prior to any according to drawing.

- Structure Earthing
- LV Electrical Earthing
- DC Earthing
- Lighting Protection

Sufficient numbers of electrodes interconnect so that the overall earth resistance shall be less than 1 ohm for each individual earthing.

The number of earth electrodes of the earthing system are indicated on the drawings as minimum. The contractor shall test the resistivity of soil at site. Exact number of earth electrodes shall be determined by the contractor to achieve the earth resistance value subject to Engineer approval.

The contractor shall inform the Engineer or his representative before driving earthing rod into ground so that he may supervise the operation. Driving shall be carried out only in the presence of the Engineer or the representative and all rods shall be submitted for the examination before use.

c) SUBMISSION

All technical submission shall be approved by the Engineer prior to the respective stages of construction.

As minimum requirement, the submission shall include the following:

- Equipment schedule, including all manufacturer's data.
- Shop Drawings and sample submission.
- Builder's work requirements.
- Testing procedures and report format for testing of the earth electrodes and/or earth strips.
- Soil resisting test report with calculation report for the details of the earthing system detail including quantity and layout of earth electrodes and/or earth strips to achieve the required

earth resistance. The report shall be endorsed by the contractor's installation Engineer who supervise and endorse the installation upon completion.

- Proposed details of earthing system including quantity and layout of the earth electrodes and earth strips according to the calculation.

d) PRODUCT

- Common earth mats of resistivity of less than one (1) ohms, shall be constructed below the lowest floor structure prior to any ground work construction. The stainless-steel earth mats shall comprise the complete earth electrodes, earth strip/grid, earth inspection chambers, earth leads, main earth terminals, earth test link boxes at ground level etc. Under these circumstances, each individual earthing system shall have earth leads connecting its main earth terminal directly to an earth electrode underground as specified.

- In the case where drilling is required to take the earth rods below ground level, a specified to take the earth resistance enhancement shall be added into bored holes and a mixture at 60% bentonite and 40% of gypsum to 125% of water mixed to give a thick slurry. It shall be grouted into the holes prior to inserting of rods and be allowed to solidify. The hiring of machine drilling equipment and the grouting as described above shall be provided by the contractor.

- All holdfast, claps, earth rod clamps, etc. shall be supplied by the same manufacturer of the rods.

- All earthing products/accessories shall be UL Listed.

e) EARTH ELECTRODE

The earthing electrodes shall be comprising of

- 3m length 25mm dia copper rod 99.99% purity/UL Listed
- Earth electrodes rod shall be 25mm diameter with internal screw and socket joints, driving head and connection clamp.
- Coupling for each section of the rod shall be of same material of the rod, threaded to fit the rod sections. Driving studs shall be used whn driving the electrode into the ground. Earth values shall be measured and recorded before coupling and driving in the next section. Additional earth rod shall be driven in if necessary, to attain the required effective earth values.
- Clamping if the earth leads to the earth rod shall be made by earth clamp. The clamps shall be capable of providing a high pressure contact between the earth rod and the earth leads to achieve a low contact resistance.
- When two or more electrodes are driven to form a group, the heads of the electrodes in the group shall be bonded to each other by means of a 25mm x 3mm copper, laid at a depth of at least 600m in soil.

f) GROUNDING CONDUCTORS OR EARTH LEADS

The earth leads shall be provided from the earth electrodes to the earth test point in external area and shall be of tin plated bare copper conductor type. The termination of earth leads at the electrode end shall be though exothermic cad weld jointing method. A PVC insulated earth continuity conductor of specified size as given in drawing and BOQ shall be laid and connected to the grounding bus bars and from the grounding bus bars to each equipment as shown in the

drawings.

g) EARTH TEST POINTS

These points are for testing of earthing systems. At these points hot work can be separated and can be tested for continuity and resistance. Earth Test Point shall be made of copper bar and enclosed in powder coated box as per the sizes shown in the drawings and BOQs.

h) EARTH INSPECTION CHAMBERS

These should be made of pre cast concrete with a cover lid and should be placed over the electrode in level with the finished ground level. The cover lid should have marking showing its number and written "Earth Electrode" in Urdu & English.

i) EARTH CONNECTING POINT / MAIN / SUB MAIN GROUNDING BUS BARS

The Earth Connecting Point / Grounding Main & Sub Main Bus Bars shall be part of the building grounding electrode system for the electrical infrastructure.

The ECP copper bar shall be electro-tin plated to ensure low resistance corrosion free contact between the lugs and busbars.

j) CODES AND STANDARDS

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

BS 951 - Earthing clamps
CP 1013 - Earthing
BS 2873 - Copper and copper alloys
BS 2874 - Copper and copper alloys - Rods and section (other than forging stock)
BS 1433 - Hard drawn bare copper conductor for earthing
BS 6346 - PVC insulated cables.

10. LIGHTNING PROTECTIONS

a) GENERAL

- The Air Rod Lightning Protection System, comprising of Lightening Arrestor shall be provided at top of each Structure/Tower/Building/Rooftop. The Arrestor at least 1 meters from the top of the building/Structure.
- The down conductors shall be 70 sq-mm copper conductor or as mentioned in the BOQ shall be installed as shown in drawings welded with the Earth Connecting Point. Continuity shall be checked and recorded for each pit.
- Contractor should also include in his scope inspection by manufacturers authorized representative to ensure correct installation.
- All metal work on or around the building must be bonded to the lightning protection network to avoid side flashing.
- All materials used throughout the installation shall be either copper or copper-based components

which are corrosion resistant and compatible with the application.

- The Contractor shall submit fully detailed shop drawing for the arrestors, down conductors, earth termination network and bonding and shall be responsible to provide all the necessary accessories to integrate the system with the architectural finish of the building.

b) Electronic System Surge Protection

- Electronic system surge protection shall be used for the, Incoming Main Power Supply:
- A suitable protection should be installed in the main LV Panels.
- The ESP shall be connected in parallel with the supply. ESP should be installed within the LV Panel by the panel assembler.
- HRC Fuses shall be provided in the connecting leads as required by the Specialist.
- ESP to have neutral earth warning light, to detect if there is excessive voltage present between neutral and earth.
- Protection shall be tested in accordance with the requirement of:
- BS6651: 1999 'Protection of Structures against lightning' (Appendix C).
- BS2914:1972 'Specification for surge diverters for alternating current power circuits.
- IEEE C62 41 - 1991 'Recommended practice on surge voltage in low voltage AC Power circuits.'
- The protector must not interfere with or restrict the system normal operation. It should not:
- Corrupt the normal mains power supply.
- Break or shutdown the power supply during operation.
- Have an excessive earth leakage current.
- The protector shall be rated for a peak discharge current of no less than 10 KA (8 / 20 microsecond waveform) between any two conductors (phase to neutral, phase to earth, neutral to earth).
- The protector shall limit the transient voltage to below equipment susceptibility levels. Unless otherwise stated, the peak transient let-through voltage shall not exceed 600 volts. For protectors with a nominal working voltage of 230 or 240 volts, when tested in accordance with BS 6651 :1999 Category B - High (6 kV 1.2 / 50mircorsecond open circuit voltage, 3kA 8/20 microsecond short circuit current).
- This peak transient let through voltage shall not exceed for all combinations of conductors:
- Phase to neutral
- Phase to earth
- Neutral to earth.
- Mains protectors (installed in shunt / parallel) should have continuous indication of its protection status and the presence of power. Status indication should clearly show per phase.
- Full protection present.
- Reduced protection - replacement required.
- No protection - failure of protector.
- The status indication should warn of protection failure between all combinations of conductors, including neutral to earth. (Otherwise a potentially dangerous short circuit between neutral and earth could go undetected for some time). This should include early warning of excessive neutral to earth voltage.

11. JUNCTION BOXES

- The junction boxes shall have suitable cable entry points via PV Connectors and outgoing cables shall be through cable glands of appropriate sizes.
-
- Suitable markings are provided on the bus bar for easy identification & cable ferrules shall be fitted at the cable termination points for identification.
-

- Suitable surge protection shall be used at the terminals of array junction boxes for external over voltage protection and also for lightning protections.
-
- The array junction boxes should be Weather-proof 3 in 2 out Array Junction Box.
- The Positive Input of AJB should be through Fuse & Negative Input through Terminal Block.

12. SIMULATION REPORT

The technical bid submission should include an energy generation simulation report with all inputs assumption clearly mentioned in a separate table. This energy generation report can be generated with any commercially available solar PV simulation software, however PVsyst is preferred. The bidder will use this submitted simulation report to commit an annual Performance Ratio (PR) or Energy Generation (KWh) against a specified Irradiance (Kwh/m2/year) and temperature (C°). The bidder is to provide year on year expected solar PV generation table which will called as the "Performance Commitment Table" from year 1 to year 25 against a specified irradiance/temperature with year 1 and year 2 numbers which will be taken as commitment numbers. Provided employer intends to extend O&M period for following years after the second year the performance commitment for that year will be based on the "Performance Commitment Table".
The "Performance Commitment Table" provided by the bidder will be considered to technically qualify bidders for the commercial bid.

13. WEATHER STATION

The bidder will be expected to share a safety and quality control plan along with the detailed design submission

S.no	Parameters	Class	Sensor Type	Notes
1	In place Irradiance (POA)	Class A	PV reference or Thermopile	Sensor recalibration to be carried out once a year.
2	Global Horizontal Irradiance	Class A	Pyranometer	Sensor cleaning every week required
3	Air Module temperature	Class A	Transducer type	Recalibration needed after every 2 years.
4	Ambient Air Temperature	Class A		Recalibration needed after every 2 years.
5	Wind Speed/Direction	Class A	Anemometer and tail Vane	Per manufacturer's recommendations

14. HSE PLAN AT SITE

The bidder will be expected to share a safety and quality control plan along with the detailed design submission. The plan shall include all steps taken to maintain quality and the resources that will be engaged at site for quality control. Similarly, safety for all resources and safety of project equipment is an important consideration at site and a safety plan will be shared by the bidder to highlight all consideration, resources that will be engaged for maintaining safety at site. The safety plan to also include special consideration to tackle CoVID-19 and implement best practices and SOP's at SITE. Implementation of these SOP's will also be required as a compulsion at the project site.

15. O&M PLAN

One year of operations and maintenance is an integral activity after the completion of this EPC project. It is intended that the project performs as per design "Performance Commitment Table" while also maintaining the project to ensure reliability and longevity for 25 years. Industry best practices to be used to operate and maintain the solar PV Project.

List of Approved Manufacturers/Suppliers

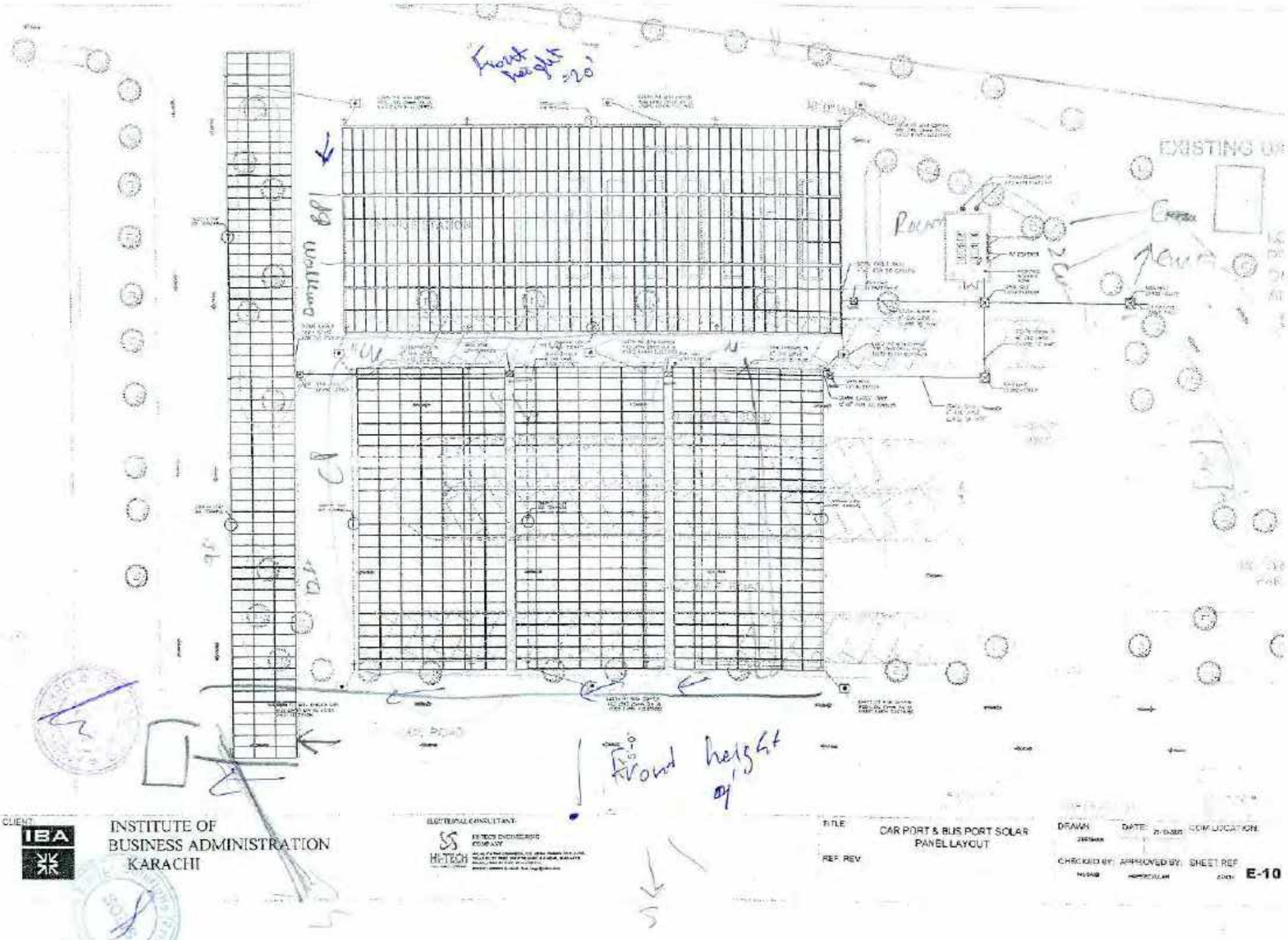
All equipment and materials provided under this contract shall be procured from the following manufacturers/suppliers only. Alternatives may be approved from the Engineer before the bid is submitted.

1.	Solar Panels	AAA or AA Rated Manufacture
2.	Solar Inverters	SMA
		Hawaii
		ABB
		Schneider
		Sungrow
3.	AC Cables	Pakistan Cables Ltd., Karachi
		Fast Cables Ltd., Karachi
		Newage Cables (Pvt) Ltd.
4.	DC Cables (EN 50618-1500 VDC)	Helukabel
		JOCA
		FR Cables
5.	Cable Lugs and Ferrules	Cembre,
		Raychem
		3 M (USA)
6.	Contactors / Relays	ABB
		Telemecanique
		National
		Finder
7.	AC Circuit Breaker	Teraski
		Schneider
		ABB
8.	DC Circuit Breaker	ABB
		Schneider
9.	Surge Protector Device	Dehn
		Schneider
		Citel
10.	Voltmeters / Ammeters	Saci, Spain
		GEC, UK
		Hobut, UK
		Revalco, Italy
11.	PVC Conduit & Accessories	Jeddah Polymer
		Galaxy (GALCO), Karachi.

		Civic, Karachi
		Dadex, Karachi
12.	Steel Conduit & Accessories	IIL, Karachi
13.	RCC Pipe	Pakistan Pipes & Construction Company Ltd, Karachi
14.	Earthing & Lighting Protection System	Errico
		Furse
		Dehn

BOQ

DRAWINGS



CLIENT

IBA

INSTITUTE OF
BUSINESS ADMINISTRATION
KARACHI

ELECTRICAL CONSULTANT

HI-TECH

TITLE

CAR PORT & BUS PORT SOLAR
PANEL LAYOUT

REF REV

DRAWN

DATE

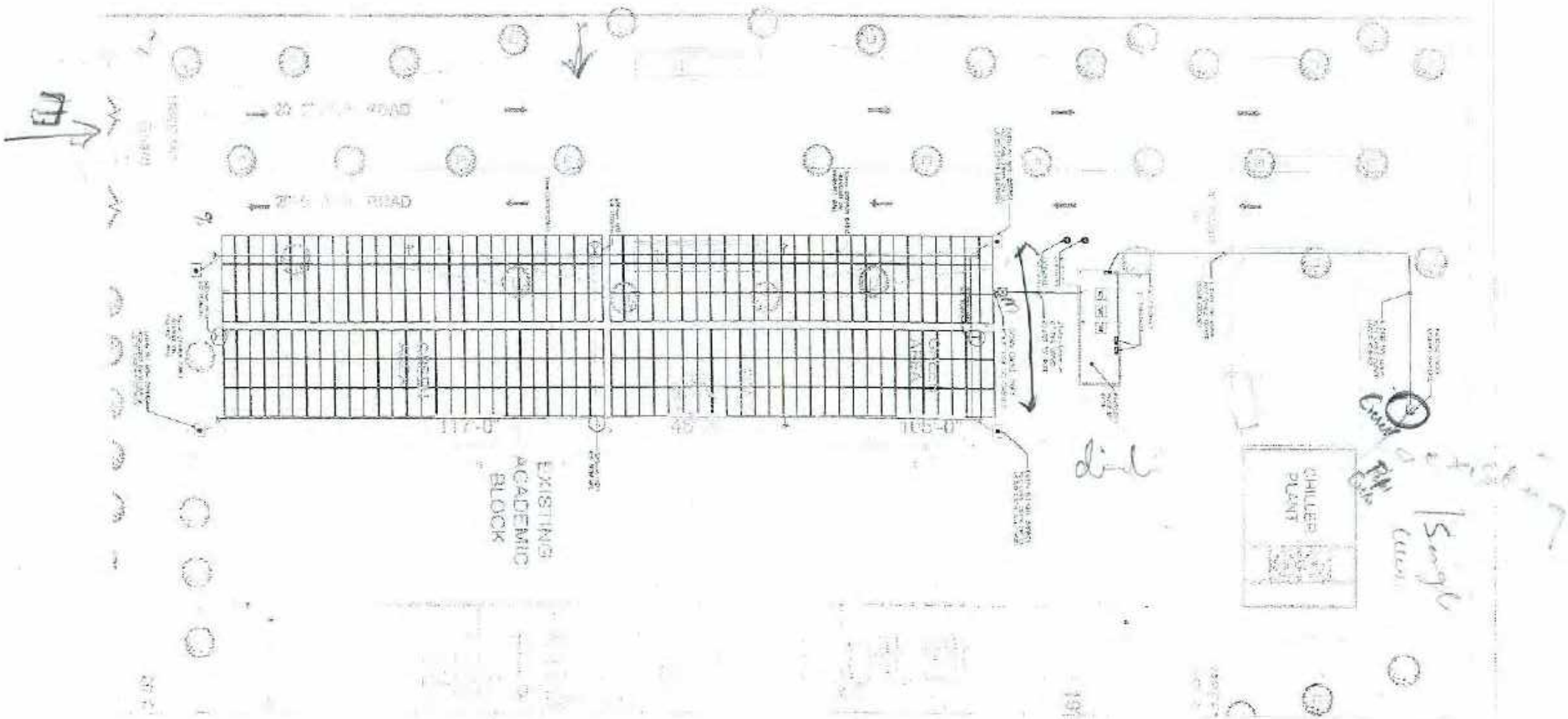
COM LOCATION

CHECKED BY

APPROVED BY

SHEET REF

E-10



CLIENT

INSTITUTE OF BUSINESS ADMINISTRATION KARACHI

ELECTRICAL CONSULTANT

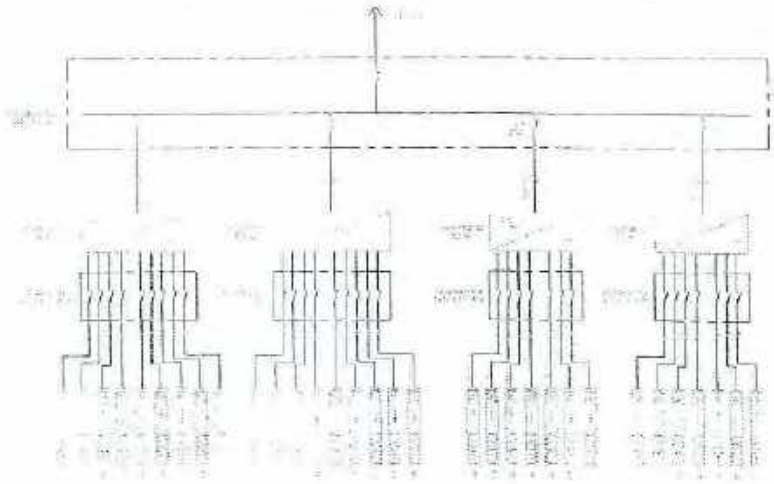
TITLE: CARPORT NEAR ADAMJEE BLOCK SOLAR PANEL LAYOUT

REF. REV.

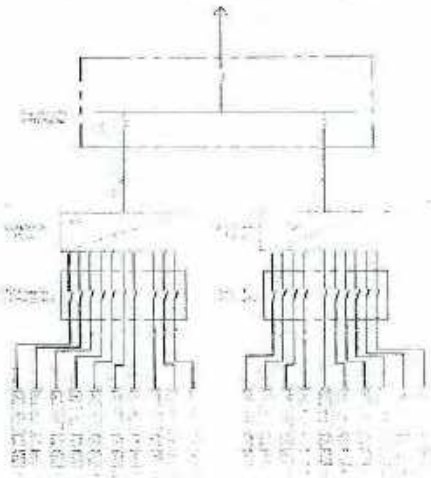
DRAWN | DATE | CONFIGURATION

CHECKED BY | APPROVED BY | SHEET REF: E-11

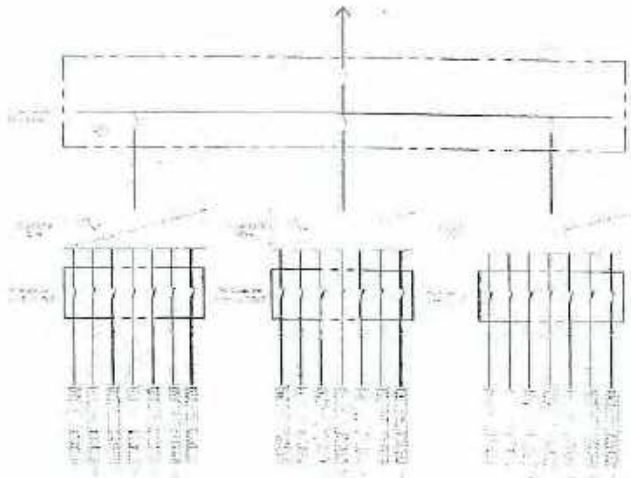
IBA Karachi Carport SLD



IBA Karachi Busport SLD



IBA Karachi Adamjee Carport SLD



CLIENT

INSTITUTE OF BUSINESS ADMINISTRATION KARACHI

ELECTRICAL CONSULTANT

TITLE

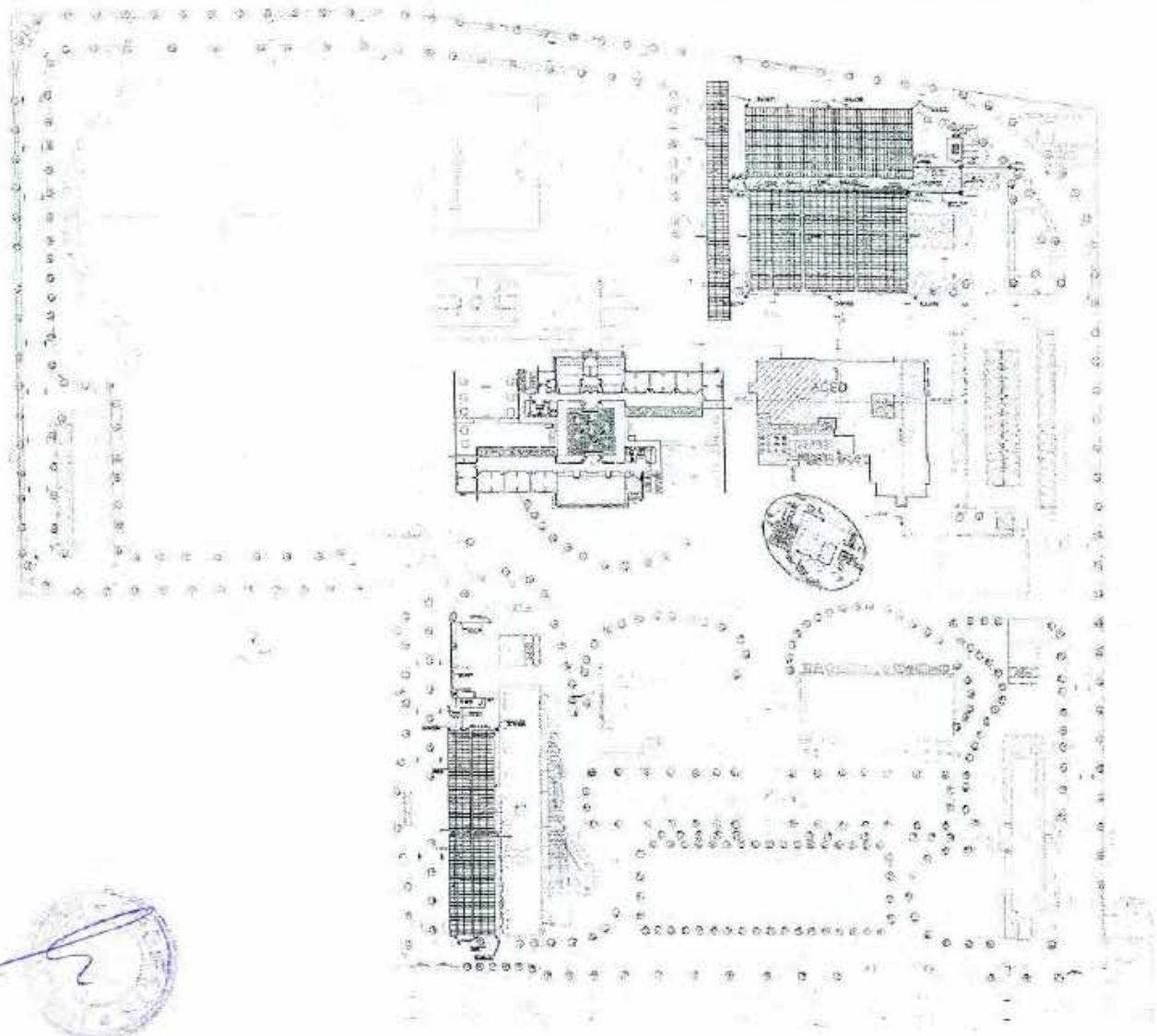
SINGLE LINE DIAGRAM

REF. REV

DRAWN | DATE | CONFIGURATION

CHECKED BY | APPROVED BY | SHEET REF.

E-09



CLIENT

IBA

INSTITUTE OF
BUSINESS ADMINISTRATION
KARACHI

ELECTRICAL CONSULTANT

HUTCH

TITLE

MASTER PLAN SOLAR POWER, ELECTRICAL
ROOM & MAIN CABLES ROUTE

DRAWN

CHECKED BY

APPROVED BY

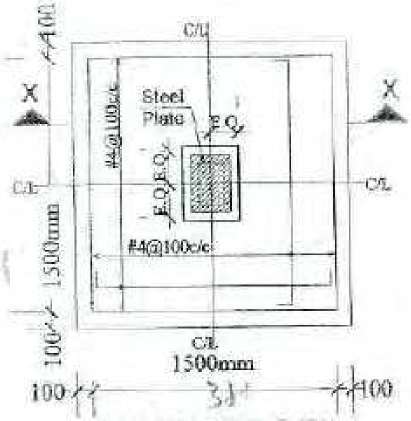
DATE

CONT LOCATION

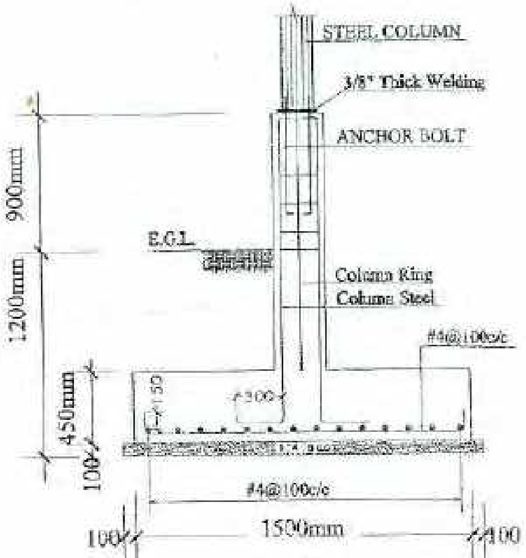
SHEET REF

E-04

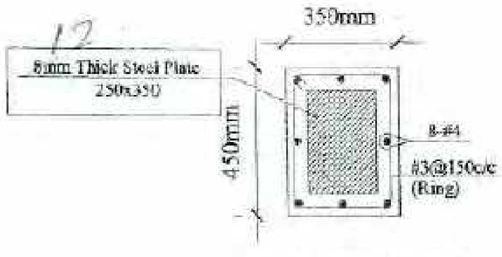
SET REV



PLAN OF FOOTING (F1)
(1500x1500)



Sec. X - X

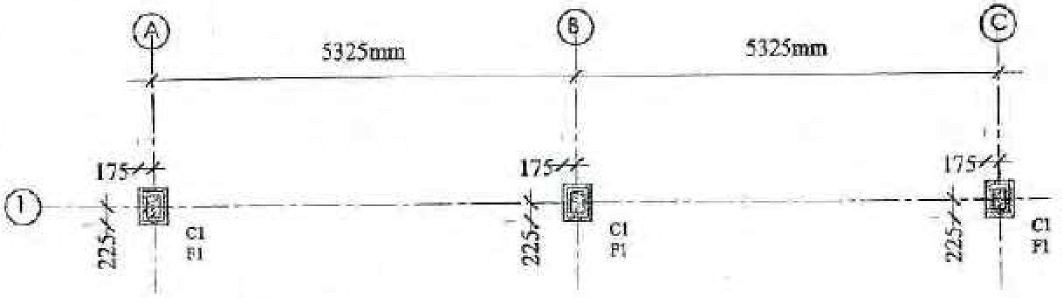


SEC. OF COLUMN (C1)
(350x450)
(14"x18")

NOTES.

1. ALL STRUCTURAL DRG. SHOULD BE READ IN CONJUCTION WITH ARCH. DRG.
2. ALL LEVELS AND DIMENSIONS SHOULD BE VERIFY BY THE CLIENT.
3. SULPHATE RESISTANCE CEMENT SHOULD BE USED IN UPTO PLINTH LEVEL.
4. FOUNDATION HAS BEEN DESIGNED (Ground Floor) Only.
5. ALL RIBBED STEEL SHOULD BE USED FY=60000 AT 0.2 % STRAIN.
6. B.C OF SOIL 1.50 T/ft. @ 4'-0" DEPTH FROM E.G.L. (ASSUMED)
7. APPROVED WATER PROOFING CHEMICAL SHOULD BE USE IN ALL STRUCTURAL WORK UP TO PLINTH LEVEL.
8. CONCRETE COVER.
   - a- FOUNDATION = 75
   - b- COLUMN = 37.5
   - c- BEAM = 50
   - d- SLAB = 25
9. CONCRETE STRENGTH OF STRUCTURAL MEMBERS:
   A:- COLUMNS & FOUNDATION CONCRETE RATIO = **1:1:2c.c**

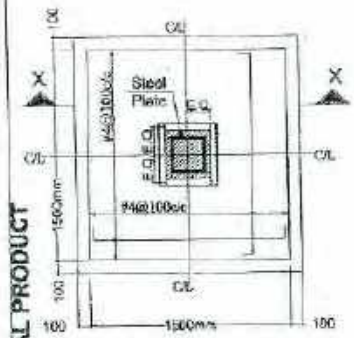
11. **CONTRACTOR SHOULD MAKE ALL SAFETY MAJOR FOR THE ADJACENT BUNGALOW WHILE EXCAVATION WORK WILL CARRIED OUT.**



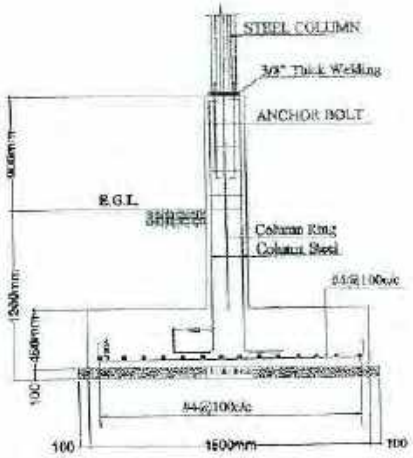
Foundation Plan

PROJECT:-	STRUCTURAL CONSULTANT :-	FOUNDATION PLAN	SCALE :-
Shed -01	HAMEEDY CONSULTANTS CONSULTING ENGINEERS	TENDER DRAWING 19-11-2019	DRG. NO:- T5-01

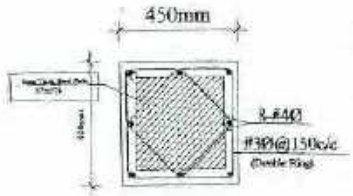
PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT



PLAN OF FOOTING (F1)
(1500x1500)



Sec. X - X



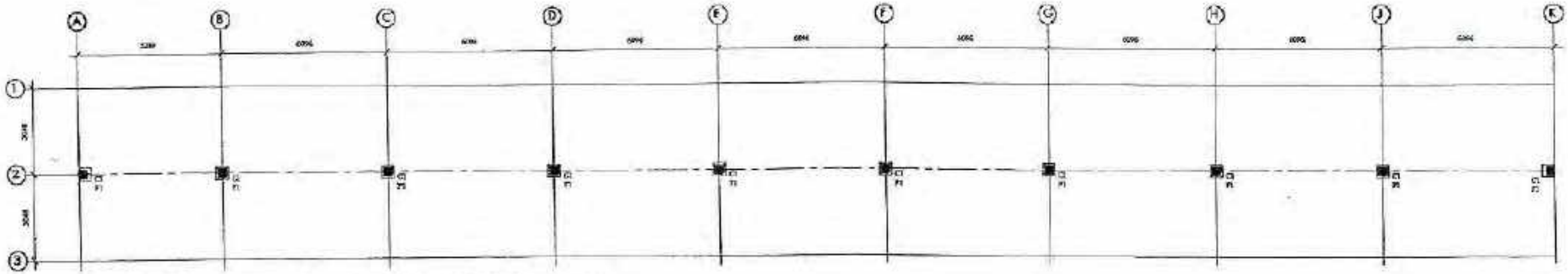
SEC. OF COLUMN (C1)
(450x450)

NOTES.

1. ALL STRUCTURAL DRG. SHOULD BE READ IN CONJUCTION WITH ARCH. DRG.
2. ALL LEVELS AND DIMENSIONS SHOULD BE VERIFY BY THE CLIENT.
3. SULPHATE RESISTANCE CEMENT SHOULD BE USED IN UPTO PLINTH LEVEL.
4. FOUNDATION HAS BEEN DESIGNED (Ground Floor) Only.
5. ALL RIBBED STEEL SHOULD BE USED FY=60000 AT 0.2 % STRAIN.
6. B.C OF SOIL 1.50 T/ft. @ 4'-0" DEPTH FROM E.G.L (ASSUMED)
7. APPROVED WATER PROOFING CHEMICAL SHOULD BE USE IN ALL STRUCTURAL WORK UP TO PLINTH LEVEL.
8. CONCRETE COVER.
   - a- FOUNDATION = 75
   - b- COLUMN = 37.5
   - c- BEAM = 50
   - d- SLAB = 25
9. CONCRETE STRENGTH OF STRUCTURAL MEMBERS:

   A:- COLUMNS & FOUNDATION CONCRETE RATIO = 1:1:2c.c

11. **CONTRACTOR SHOULD MAKE ALL SAFETY MAJOR FOR THE ADJACENT BUNGALOW WHILE EXCAVATION WORK WILL CARRIED OUT.**



COLUMN LAYOUT & FOUNDATION PLAN
SHED -01

PROJECT:- Shed -02	STRUCTURAL CONSULTANT :- HAMEEDY CONSULTANTS CONSULTING ENGINEERS	FOUNDATION PLAN TENDER DRAWING 19-11-2019	SCALE :- DRG. NO:- S-01

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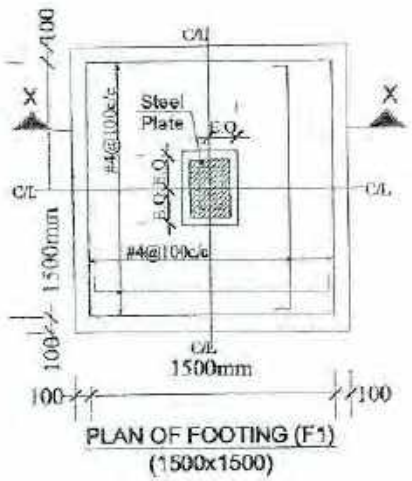
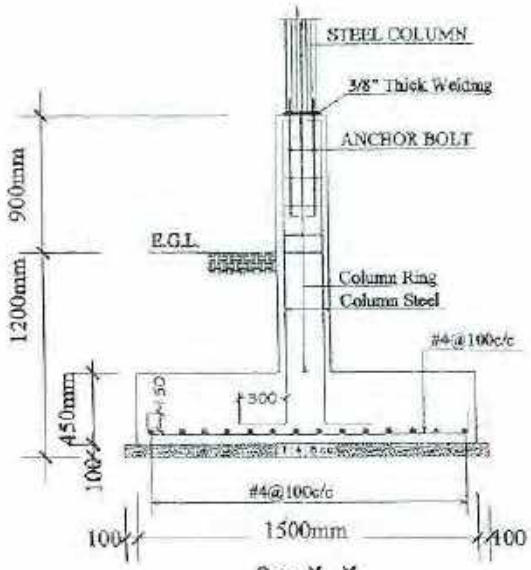
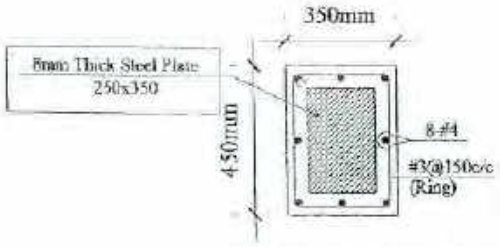


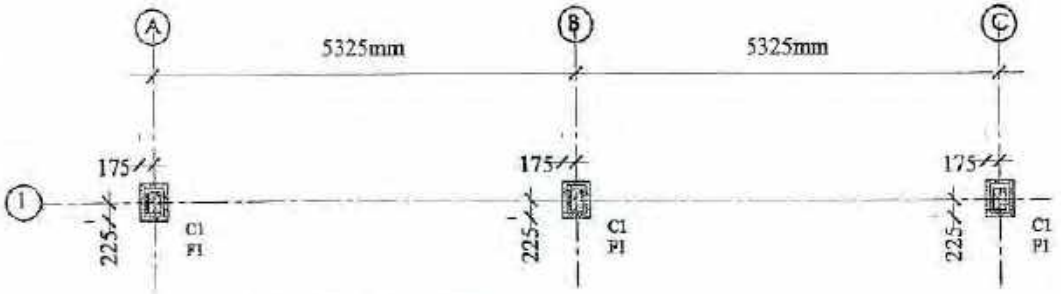
PLAN OF FOOTING (F1)
(1500x1500)



Sec. X - X



SEC. OF COLUMN (C1)
(350x450)
(14"x18")



Foundation Plan

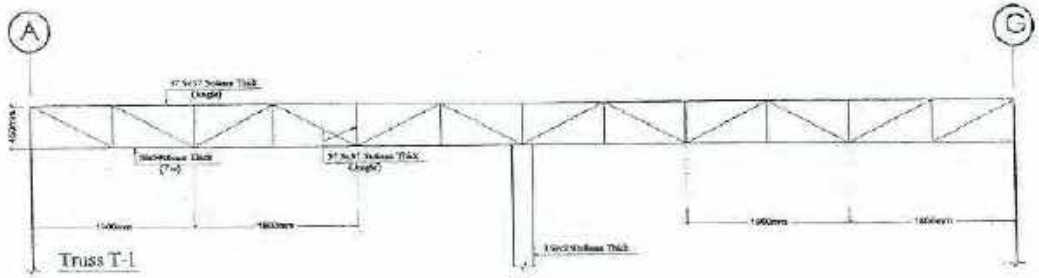
NOTES.

1. ALL STRUCTURAL DRG. SHOULD BE READ IN CONJUCTION WITH ARCH. DRG.
2. ALL LEVELS AND DIMENSIONS SHOULD BE VERIFY BY THE CLIENT.
3. SULPHATE RESISTANCE CEMENT SHOULD BE USED IN UPTO PLINTH LEVEL.
4. FOUNDATION HAS BEEN DESIGNED (Ground Floor) Only.
5. ALL RIBBED STEEL SHOULD BE USED FY=60000 AT 0.2 % STRAIN.
6. B.C OF SOIL 1.50 T/ft. @ 4'-0" DEPTH FROM E.G.L. (ASSUMED)
7. APPROVED WATER PROOFING CHEMICAL SHOULD BE USE IN ALL STRUCTURAL WORK UP TO PLINTH LEVEL.
8. CONCRETE COVER.
   - a- FOUNDATION = 75
   - b- COLUMN = 37.5
   - c- BEAM = 50
   - d- SLAB = 25
9. CONCRETE STRENGTH OF STRUCTURAL MEMBERS:

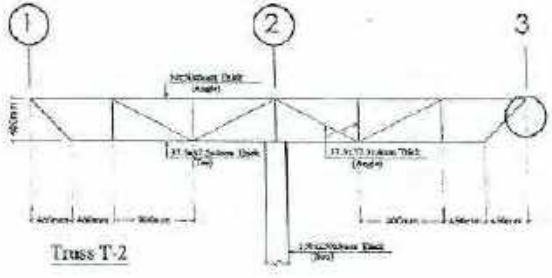
   A:- COLUMNS & FOUNDATION CONCRETE RATIO = **1:1:2c.c**

11. **CONTRACTOR SHOULD MAKE ALL SAFETY MAJOR FOR THE ADJACENT BUNGALOW WHILE EXCAVATION WORK WILL CARRIED OUT.**

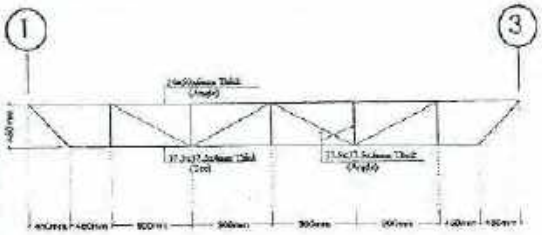
PROJECT:-	STRUCTURAL CONSULTANT :-		
Shed -03	HAMEEDY CONSULTANTS CONSULTING ENGINEERS	FOUNDATION PLAN TENDER DRAWING 19-11-2019	SCALE :- DRG. NO:- SS-01



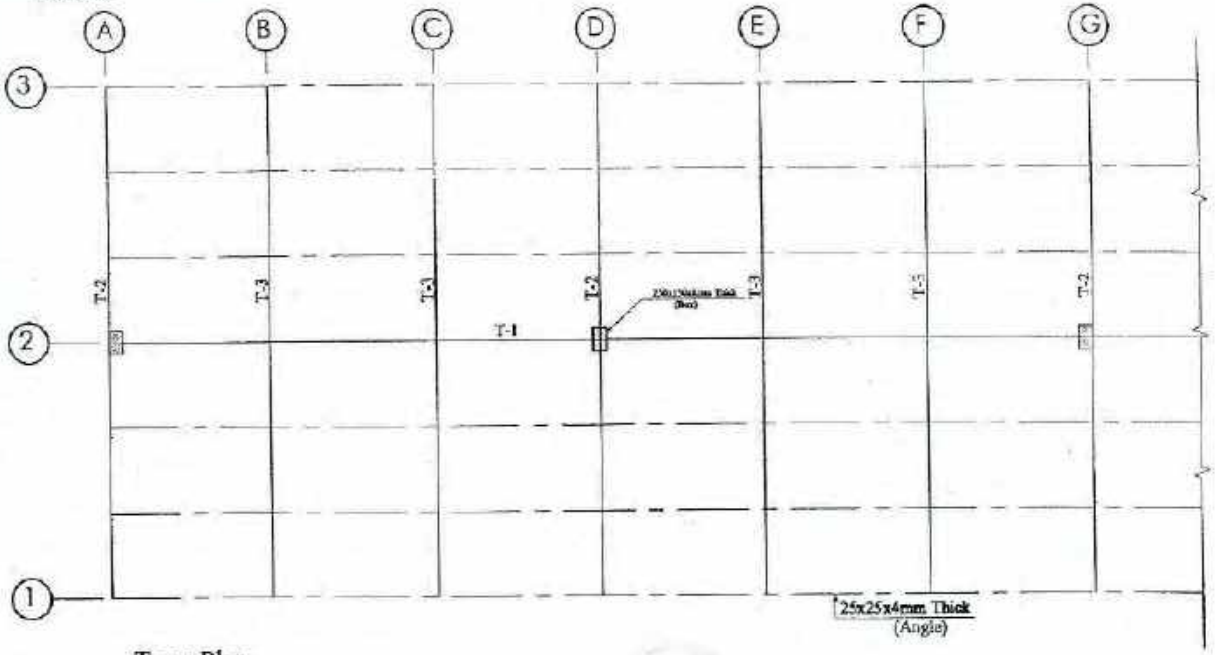
Truss T-1



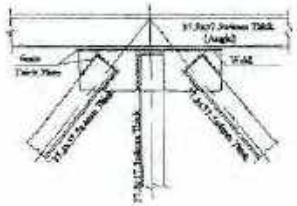
Truss T-2



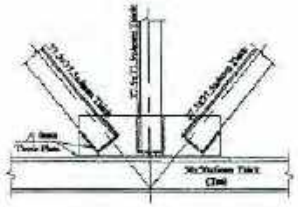
Truss T-3



Truss Plan



DETAIL - A (TYP.)



DETAIL - B (TYP.)

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PROJECT:- Shed -01	STRUCTURAL CONSULTANT :- HAMEEDY CONSULTANTS CONSULTING ENGINEERS	TRUSS PLAN	SCALE :-
		TENDER DRAWING 19-11-2019	DRG. NO:- TS-02

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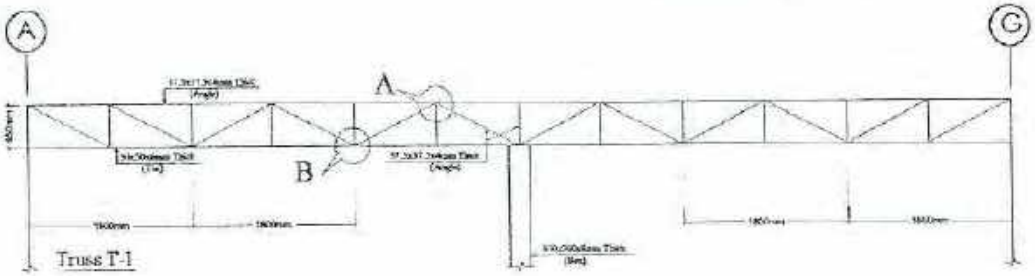
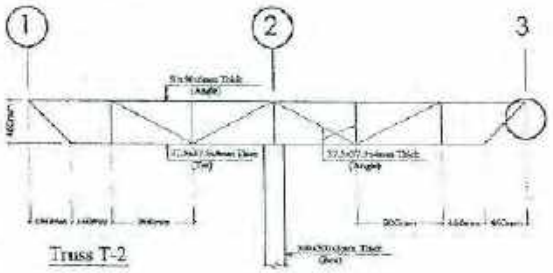
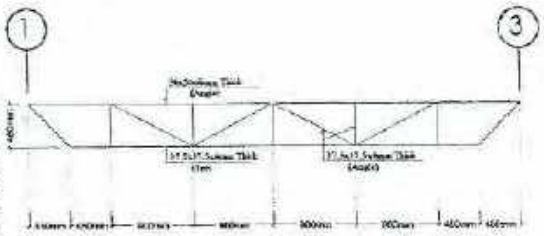


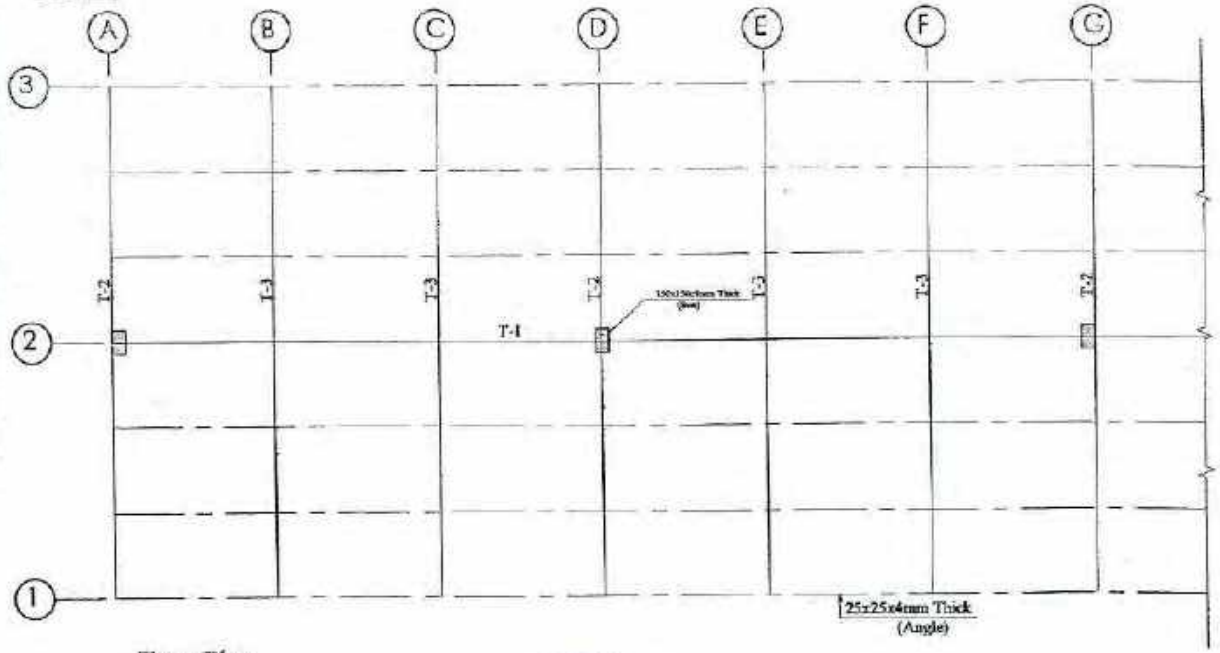
Truss T-1



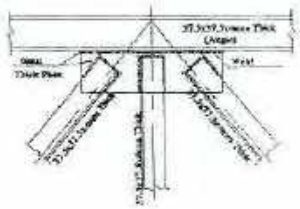
Truss T-2



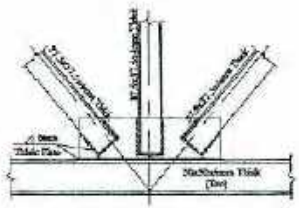
Truss T-3



Truss Plan



DETAIL - A (TYP.)



DETAIL - B (TYP.)

PROJECT :- Shed -02	STRUCTURAL CONSULTANT :- HAMEEDY CONSULTANTS CONSULTING ENGINEERS	TRUSS PLAN / TENDER DRAWING 19-11-2019	SCALE :- / DRG. NO:- S-02

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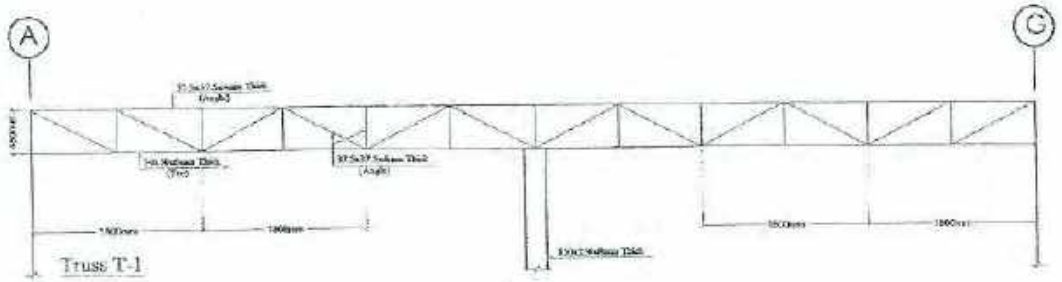
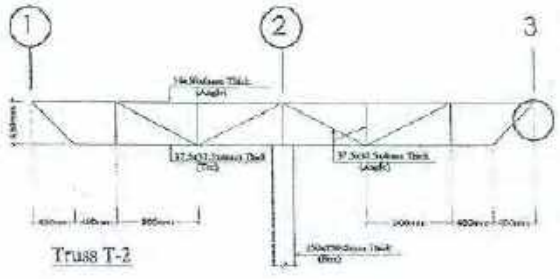
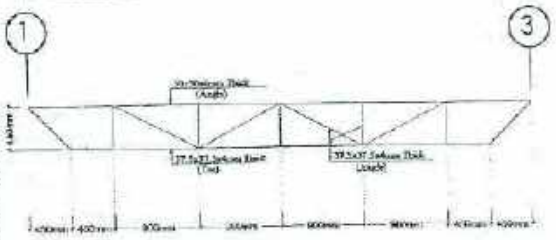


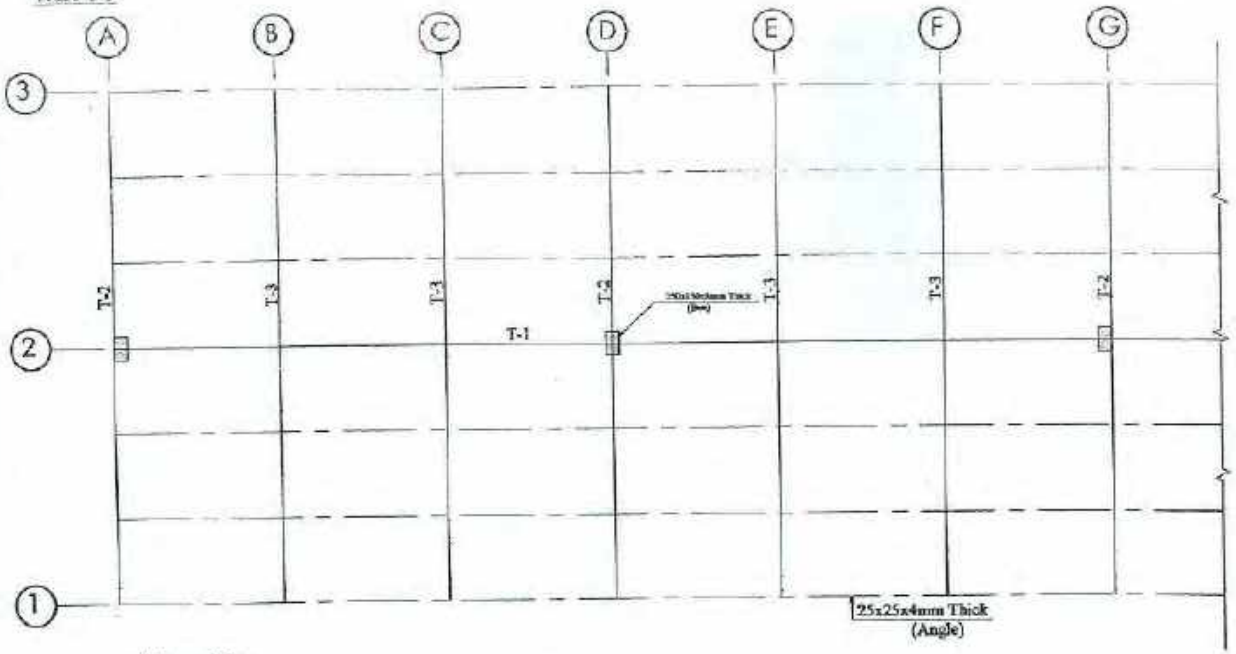
Truss T-1



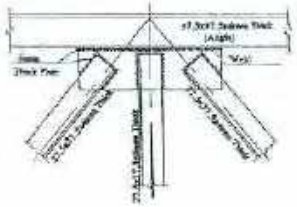
Truss T-2



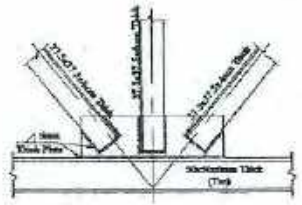
Truss T-3



Truss Plan



DETAIL - A (TYP.)



DETAIL - B (TYP.)

PROJECT:-

Shed -03

STRUCTURAL CONSULTANT :-

HAMEEDY CONSULTANTS

CONSULTING ENGINEERS

TRUSS PLAN

TENDER DRAWING
19-11-2019

SCALE :-

DRG. NO:-

SS-02

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