

ON-GRID SOLAR PLANT DHANLAXMI BANK MATTANCHERRY BRANCH



CLIENT

DhanlaxmiBank 
established 1927

MATTANCHERRY
P B NO 303, VI/368 ANAVATHIL
ERANAKULAM, KERALA, INDIA

VOLUME I
GENERAL CONDITIONS OF CONTRACT

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1. SUMMARY OF TENDER

1. Name and Address of Owner/Client: The Branch Manager
Dhanlaxmi Bank
Mattancherri Branch
Ernakulam
2. Name and Address of Consultant: ESBS TECHNOLOGIES PRIVATE LIMITED
2nd Floor, CP Tower
Naya Bazar, Opp Hajj House
Calicut International Airport
Karipur, Malappuram
3. Scope of works: The scope of works includes the Supply, Design, Storage, installation, testing, commissioning, maintenance and guarantee of the Roof top 17kWp Panels with 15kW Inverter ON-GRID solar systems for Dhanalakhmi Bank, Mattachery Branch, Cochin as described elsewhere in the specification documents and in the tender schedules and drawing.
4. Date of issue of tender: 08-04-2024
5. Venue of issue of tender: Dhanlaxmi Bank Corporate office
6. Date of submission of tender: 24-04-2024
7. Earnest Money Deposit: Rs. 5,000
8. Venue of submission of tender: Dhanlaxmi Bank, Mattancherry
9. Validity period: 30 days from the date of opening of tender.
10. PaymentTerms: 10% advance
60% towards delivery of the material.
25% after commissioning
5% after defects liability period
11. Escalation: No escalation
12. Retention 5 % of contract value for 1 year and shall be released based on satisfactory operation of the plant for one year and duly certified byconsultant.
13. Penalty for delay: For every week of delay, at the rate of 1.5% of the total contract subject to a maximum of 15% of the total contract value after which the contract stands cancelled.

**DHANLAXMI BANK MATTANCHERRY BRANCH
TENDER FOR ROOF TOP SOLAR POWER SYSTEM
VOLUME-I CONDITIONS OF CONTRACT-R01**



14. Defects Liability Period: 5 Years from the date of issue of completion certificate.

2. PRE QUALIFICATION DETAILS:

CONTRACTOR'S GENERAL

1. Contractor's name as it appears on license:

2. Corporation Partnership Sole Proprietor Other

3. If firm is a sole proprietor or partnership: Owner(s) of Company

4. Name of Contractor's Primary Contact (for questions):

5. Address:

6. City/State/Pin Code:

7. Telephone: () Fax: () E-mail address: (pre-qual. results will be sent to this address)

8. GST Number:

9. PAN Number:

2.1 PROJECT CONTACT DETAILS

SI.NO	PROJECT NAME	LOCATION	OWNER'S NAME	OWNER'S PHONE NUMBER	OWNER'S E-MAIL ADDRESS

2.2 FORMAT LIST OF MAJOR WORK DONE
(bidder has to prepare this sheet)

SI.NO	CLIENT NAME	PROJECT LOCATION	KWP	YEAR OF COMPLETION

3 SCOPE OF WORK

- a) Design, Supply, Installation, Testing and Commissioning Of 17KWp Grid Connected Roof top Solar Power System Under Net Metering Policy Including 5 Years Comprehensive Maintenance (from 2ndYear)
- b) Net Metering and Grid synchronization related approvals, Bi- directional meters and CT's to be provided as per KSEB/Kerala Electrical Inspectorate norms are in the scope of L-1 Bidder alongwith clearance/NOC from other statutory authority like Electrical inspector and other related applicable Government authority.
- c) No extra payment shall be made by the Dhanlaxmi Bank for liaisoning works to the vendor. However, statutory fees paid by the vendor to the Government Departments/Electricity Boards for approval of extension of load/NOC etc. shall be reimbursed to the vendor on submission of original payment receipt to the Bank.
- d) Clubbing of existing Meter as per site requirement and Load enhancement as per site conditions at the site and liasoning with the respective KSEB Section for this work is in the scope of the vendor.
- e) Prepare & furnish the following as-built drawings in soft copy (AutoCAD) and hardcopy to obtain approvals and all operating manuals, user manuals, system manuals, etc., as required.

- Shadow analysis of the roof
- General arrangement and dimensional layout
- Schematic drawing showing the SPV panels, Power conditioning Unit(s)/ inverter, Junction Boxes, AC and DC Distribution Boards, meters etc.
- Layout of solar PV Array and Single line diagram with specification of all components
- Design document for mounting structure including certificate showing wind speed withstanding capacity of the structure (STAAD Pro / Equivalent).
- Mounting structure drawing
- Structural drawing along with foundation details for the structure.
- Cable layout (indicating details of cable route for power & communication cables)
- Itemized bill of material for complete SPV plant covering all the components and associated accessories.
- Sizes and specification of cables between array interconnections, array to junction boxes, junction boxes to Inverter etc. shall be furnished.

- f) Remote Monitoring system shall be provided to monitor the Solar Power Generation such that all (i.e. AC & DC) electrical parameters (cumulative & instant) in graphical presentation from string level, next inverter and so on as desired by Bank/ owner.

3.1 GOVERNING STANDARDS

The installation shall comply with all relevant statutory instruments and regulations and in particular with the following:

MNRE : Ministry of New and Renewable Energy

ALMM	:	Approved List of Materials and Manufactures
DCR	:	Domestic Content Requirement
BIS	:	Bureau of Indian Standards
BS	:	British Standards Institution
IEE	:	Institution of Electrical Engineers.
IEC	:	International Electro -Technical Commission.
ISO	:	International Organisation of Standardization.
UL	:	Under writers Laboratory.
EN	:	Euro norms
NBC	:	National Building Code of India

The tender shall be based on regulations and standards current on the date of return of tenders.

If these regulations are amended or new regulations are enacted after that date, the Consultant shall be notified immediately. The materials, equipment and installations detailed in this specification are based on the standards and codes of practice indicated in the Contract Documents

3.2 LICENSE AND PERMITS

Contractor must be an experienced, registered firm and authorised to execute installation of particular branded product.

4 RELATED WORKS AND SCOPES

4.1 CIVIL WORKS

All necessary major civil works like equipment foundations, slab cut outs, shafts, etc. are in the scope of civil agency. Solar contractor shall provide the necessary details, drawings and marking at site well in advance with exact size / type, etc.

Other civil works required like making openings in walls, making good, closing of left out openings, surrounding the pipes and conduits, chipping works, grouting works, etc. are in the scope of the Solar contractor.

The complete coordination with civil agency for the required civil works is the responsibility of the Solar contractor.

Civil Works shall be performed with respect to the following but not limited to:

- Trimming of tress and removing the unwanted materials in rooftop.
- Design and construction of foundation for module mounting Structures having modules, all electrical equipment and allied equipment foundations.
- GI structural supports to mount PV panel as per Bank approved design and drawings given alongwith tender document.
- Providing concrete pedestal as per drawing and laying M20, 6inch length anchor bolts at the time of casting.
- Providing and laying cement plaster and doing waterproof treatment around the pedestals to

Prevent leakage of water.

- All GI structural steel section should be 'CE' quality certified.
- Damaged existing water proofing sheet should be re-laid with new one and also around the civil pedestals, to ensure no rain water will leak inside the building after completion of the total erectionworks.
- The structural design should be for 150KM / hours wind speed.
- Providing, fabricating and laying galvanized structural steel section, plates, nuts washer and bolts, and cable tray as per drawing with thickness of galvanizing of minimum 90 microns

4.2 ELECTRICAL WORKS

- a) Power cables, communication cables & control cables of armoured and Solar grade type.
- b) Synchronizing / Paralleling equipment's to achieve flaw less synchronizing with electricity board grid as desired / required by Bank i.e. 100% utilization solar power.
- c) Lighting arresters, earthing, cable trays, cable trenches, terminations and etc.
- d) Armoured copper cables for power should be laid up to AC junction box.
- e) From AC junction box to main junction box, armoured aluminium power cable should be considered.
- f) Checking the feasibility of existing Control Panel/Switch Gear. Modification of existing outgoing feeder protection, which may include extension of bus bars in the Bus and outgoing section, metering and control circuits and energy meter to suite for receiving solar power for both grid connections (i.e. DG & EB).
- g) The Bidder shall provide the display board of size 3ft x 3ft that gives detailed information of system along with the contact details of manufacturer. This will help the beneficiary during 5 years CMC period.
- h) Suitable earthing withCopper strips/Insulated Copper Wires for following items provided at each plant
 - Civil supporting structure
 - Modules
 - Inverters
 - DC junction, Distribution & combiner boxes
 - AC junction & combiner boxes
- i) Solar PV Power Plants with associated system (Typical) shall include but not be limited to the Supply, Erection, and Testing & commissioning of Solar PV modules, PV array, fixed PV array support structure, String/Array combiner boxes, DC cabling, DC distribution box, Inverter, AC cabling, AC distribution box, plant AC energy meter, Surge Arrestors, Lighting arrestor, CT/PT net meter load energy meter and data acquisition system etc.

4.3 LICENCE

Electrical work done under this contract shall be executed under licensed electrical supervision as per requirements of the Indian Electricity Act. Contractor shall obtain the approval of all electrical installation done under this contract from the appropriate competent authority before the installation is commissioned.

4.4 ELECTRICITY & WATER

The Solar contractor shall make his own arrangements for making available electricity and

water for construction purposes.

4.5 PROTECTION AND STORAGE

Protect the buildings and structures from damage due to carrying out of this work. Protect all works from damage. Keep all equipment dry and clean at all times. Cover all openings in equipment and materials. Cover all temporary openings in pipes and sleeves with polyethylene sheets or caps until final connection is made. The quality of such cover must be determined with due regard to how long it may be until final connection. Be responsible for and make good any damages caused directly or indirectly to any walls, floors, ceilings, woodwork, brickwork, finishes, services, roads, gardens, etc.

4.6 SHIFTING AND LIFTING OF EQUIPMENT / MATERIAL

The contractor shall submit the method statement well in advance to lift and shift the Solar Panels, Inverter, Structure Materials, etc., to the consultant and take his approval before executing the work. The contractor shall be responsible for any damage to the building or facade while lifting / shifting / installation works and replace / repair at his cost. The contractor shall be responsible for any damage to equipment, men and material while lifting and shifting of equipment / material.

4.7 CLEANING

Each day as the work proceeds and on completion, clean up and remove from the premises all rubbish, surplus material, equipment, machinery, tools, scaffolds, and other items used in the performance of the work. Clean out dirt and debris and leave the buildings broom clean with no stains and in a condition acceptable to the Consultant. Where items form part of the visible finish in the rooms, protect from over-painting, etc. and give all items a final cleaning before handing over of the project.

4.8 SUPERVISION

The contractor shall maintain at site, as necessary for the performance of the Contract, qualified personnel and supporting staff, with proven experience in erecting, testing, and adjusting projects of comparable nature and complexity. Before commencing work, the Contractor will submit details of the proposed Engineers and Supervisors, including copies of their Certificates.

5 GUARANTEES

The Contractor will guarantee all material and workmanship for at least five years after the issue of final completion certificate and take over by the Owner. All warranties from equipment suppliers will be vested in the Owner, regardless of whether the Contractor who supplied the equipment is still associated with the project or not.

Guarantees will be full guarantees and will include all overhead, profit, incidental charges and sundries. Where damage is caused to any other item by any failure of the item guaranteed, then the guarantee shall also include the costs incurred in rectifying that damage.

5.1 RATES

The rates quoted by the Contractor shall include for supplying materials and labour necessary for completing the work in the best and most workman like manner to the satisfaction of the Engineer-in-Charge and which in the option of the Engineer-in-Charge cannot be made better, and for maintaining the same. The rates shall be complete in all respects and shall include cost of materials, erection, fabrication, labour, supervision, tools and plant, transport, sales and other taxes, royalties, duties on material contingencies, breakage, wastage, sundries, scaffoldings, etc. Contractor should indicate separately the custom duties, excise duties, for each of the items, wherever applicable.

5.2 MAINTENANCE IN WARRANTY PERIOD

Maintenance is defined as the Contractual Liability to maintain the equipment in working condition, PLUS the regular checks and servicing of equipment during the maintenance period to keep the equipment in best working order. Regular maintenance shall be as necessary, but in any event not less frequently than monthly. In the event that the Owner has his own staff, the Contractor is still to check monthly and advice on any problems and is still to assume responsibility.

The CONTRACTOR shall furnish warranty for the entire system for a defect liability period (DLP) of twelve (60) months after the final official hand over date of the installation duly approved by the consultants and project managers. This period shall include maintenance replacement of parts, regular periodic visit by qualified personnel of the CONTRACTOR and attending to emergency call at short notice.

5.3 INSPECTION OF THE WORK

The representatives of the Owner and the Consultant will make periodic visits to the site during construction to ascertain that the work is being executed in reasonable conformity with all plans and specifications, but will not execute quality control at all times. The Contractor must maintain the quality control as intended in the contract documents. Correct all deficiencies immediately as noted during field inspections. Request in writing that a final inspection of all services. Do not issue this written request until:

- All deficiencies noted during job inspections have been corrected.
- All systems have been balanced and tested and are ready for operation.
- All balancing reports have been submitted and reviewed.
- All instruction manuals have been submitted and reviewed.
- The cleaning up is finished in all respects.
- All spare parts and replacement parts specified have been provided and receipt of the same acknowledged.

5.4 EXAMINATION OF SITE AND DRAWINGS

Visit the site of the proposed works and obtain all information as to existing conditions and limitations and all proposed works on adjacent sites and in adjacent areas which might affect the works on this site, whether by Private Individuals or by Government Authorities or others. Examine the documents including the Specifications and Drawings before bidding and again before commencing any portion of the works. Neither the Owner nor the Consultant will be responsible for any claim for extra work or expense resulting from the failure of the Contractor to be fully aware of Site Conditions, Drawing implications, etc.

6 OPERATION AND MAINTENANCE MANUAL AND TRAINING OF PERSONNEL

Instruct the Owner's staff on how to make minor adjustments, carry out necessary maintenance and how to operate each system. For new equipment, provide the Consultant with three copies of complete operating and maintenance instructions for equipment at the time of delivery of the equipment. Equipment will be rejected unless accompanied by instructions. Such documents must be received at least one month prior to the completion date of the relative section of the works.

Instructions shall be bound in a suitable loose-leaf booklet or binder, and shall include:

- Prints of the following drawings:
 - List of all equipment installed
 - General layout

- Dimensional layout
- Wiring diagram of control panels
- Operation instructions include start-up and shutdown procedure
- Maintenance instructions, including preventative maintenance instructions for components of the equipment
- Lubricating instruction and recommended cycle of lubrication
- Complete parts list, showing manufacturer's name and catalogue number
- Complete list of recommended spare parts with price list for each item of equipment

The contractor is to prepare a draft for discussion with the Consultant prior to finalizing the documents. Portable tools and spare parts shall be correctly labelled and handed over to the Consultant.

The section dealing with complete systems shall be subdivided into each service with a ready means of reference and detailed index. The function and manner of operation of each system shall be clearly described together with illustrations and line diagrams in schematic form showing the location and function of control valves, items of equipment and spaces or areas which are served by these items. The colour coding and identification systems employed shall be explained.

O&M manuals shall be prepared in accordance to BSRIA application guide 1/87.1 "Operating and maintenance manuals for building services installations" and shall include, but not be limited to, the following categories.

- Contractual and legal guides
- The purpose of the installation
- Installation records
- Description of the installation
- Equipment schedule
- Parts identification and recommended spares
- Commissioning data;
- Operation and how installation is to be used and keep operational
- Maintenance schedules
- How installation may be modified or changed
- Disposal of installation
- Names and addresses of manufacturers
- Set of "as built drawings"
- Emergency operating procedures
- Manufacturers literature

The services of a factory trained, field service representative shall be provided to supervise the final testing, charging, and initial start-up and conduct concurrent operator instruction where applicable.

Upon completion and acceptance of Installation, properly acquaint Representative of the Client with details and sufficient training to enable them to obtain maximum efficiency in the system operation.

7 INSPECTION AND TESTS ON COMPLETION AND COMMISSIONING

All the works provided as part of this Contract shall be inspected and commissioned in

accordance with all relevant Indian Standards specifications and Specifications and Codes of Practice and to the entire satisfaction of the Consultant. A senior experienced Commissioning Engineer with minimum dedicated experience of 5 years shall be responsible for supervising and directing the activities for the testing and commissioning team.

Carry out all tests specified. Carry out all tests required by Authorities having jurisdiction. Testing of equipment to the requirements of and where necessary, in the presence of the Manufacturer. Provide all equipment, labour, instruments, loading devices, incidentals, and pay for all fuel, power and sundries required carrying out the tests.

8 SYSTEM ACCEPTANCE

The ultimate condition for system acceptance is that the Owner and Consultant have inspected the system and found it to be acceptable, and indicated this in writing. Issuance of the final payment certificate does not necessarily indicate system acceptance; neither does release of final payment holdback in whole or in part. The Consultant's acceptance may be contingent on any or all of the following if applicable:

- Submit original copies of letters from manufacturers of all systems indicating that their technical representatives have inspected and tested the respective systems and are satisfied with the methods of installation, connections and operation.
- Submit "as built" drawings and operation and maintenance manuals.
- Train owner's maintenance staff.

8.1 PROTECTION OF THE PUBLIC

The installation shall incorporate every reasonable precaution and provision for the safety of all those concerned in the operation and maintenance of the Works and of associated works.

8.2 PROTECTION OF UNFINISHED WORK

All unfinished work shall be left in a safe condition and any temporary supports necessary to give adequate protection from unauthorised interference shall be provided. When it is necessary to store any heavy equipment on the site, the most suitable position shall be ascertained by the Contractor and the equipment shall be stored in such a manner as to prevent it from falling or slipping.

8.3 CUTTING AND PATCHING

Inform, time concerning required openings. Obtain the approval of the Consultant before doing any cutting. Supporting members of any floor, wall or the building structure shall only be cut and in such a manner as approved by the Consultant. All reinstatement work must be done to the same standard as the original work.

9 DELIVERY, STORAGE AND HANDLING

Deliver all equipment with factory-installed (wooden) skids and suitable lifting lugs, or deliver equipment, components, and accessories in factory-fabricated protective containers. Protect all delivered equipment and materials from foreign matter, weather (rain, wind, and dirt/debris) and other damage at all times. Inspect all equipment and materials for damage prior to installation. Remove from the construction site all damaged or corroded materials and equipment. Where applicable, comply with manufacturer's rigging instructions for unloading and moving equipment to installation location(s). In addition to the above outline requirements, all piping shall be clear of foreign matter, having temporary end cap enclosures of sufficient tightness to prevent foreign matter entry during shipment, storage, and handling prior to installation.

10 SCOPE OF WORK UNDER COMPREHENSIVE MAINTENANCE CONTRACT

The scope of work under Scheduled Preventive Maintenance Contract for 'Ongrid Solar Power System ' shall cover the following:

- Attending to break-down calls as and when the same arise. All break-down calls will be responded within 4 hours of lodging of complaint. Break-down calls will be resolved within the following time frames: -
- Minor Complaints such as repairs/replacement of electrical or structural shall be resolved within 12 hours of lodging of complaint.
- Carrying out at least 4 Routine Preventive Maintenance Service, spread out evenly over a period of one year.
- All materials required for the maintenance during the CMC period shall be included.

VOLUME II
TECHNICAL SPECIFICATIONS

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1. SOLAR PV MODULES

- PV modules shall be Mono PERC, PID complaint, robust and with certified life not less than 25 years must have,
- ALMM Certified
- 17kWp- Panels shall be considered (20% more than Inverter capacity)
- 15kWp-Online Inverter
- RF identification tag (RFID).
- Front face -minimum 3mm tempered glass.
- IP67 degree of protection.
- Bypass diodes and MC4 connectors in UV rated boxes.
- IEC/NABL test certification.
- Wattage 500W and Above
- STANDARDS IS 14286, IEC 61215 / IEC 61646, IEC 61730-1, IEC 61730-2, IEC 61701 , IEC 62716, IS14286, MNRE

2. POWER CONDITIONING UNIT (PCU)/ INVERTER

The Power Conditioning Unit shall be String Inverter with power exporting facility to the Grid. Specifications for the ON-Grid Inverters are detailed below:

- 15kW- with 25% overloading capacity
- Input Amper rating-20A and above
- MPPT 2 Nos-2 Strings
- 230/415V, 50Hz,
- Marking Label & Warning Label as per IS 16221 Part II, clause 5
- Outdoor type, IP65
- Islanding
- RS435/RS232/Wifi
- IEEE 519 relevant CEA (Regulations 2013 and subsequent amendments for Harmonic current
- Lagging power factor of 0.9 shall be maintained above 50% loads.
- Data logging facility for temperature, Irradiance, Voltages, Currents, Power, kWh, PR

STANDARDS

- IEC 61683, IEC 61727, IEC/EN 62109-1, IEC/EN 62109-2, IEC/EN 61000-3-3/31-11/3-5/IEC/EN 61000-3-2/-3-12/-3-4/IEC/EN 61000-6-1/6-2/IEC/EN 61000-6-3/6-4, IEC 62116, IEC 60068-2-1, 2, 14, 30

3. SOLAR METER and NET METER

- A separate tested unidirectional Energy Meter called Solar Meter shall be provided at the output of PCU to record the energy generation from the Solar System.
- Net meter means the bidirectional energy meter to be installed at the interconnection point of the consumer with the network of distribution licensee
- As per Kerala State Electricity Regulatory Commission (Renewable Energy and Net Metering) Regulations 2020, net metering system is to be provided to the solar consumer (Latest amendments shall be followed).
- STANDARDS IEC 60687/IEC 6205211/IEC 62053-22/IS 14697, IEC 62056-21.

4. EARTHING

- The Solar PV Plant should have a dedicated earthing system.
- The earthing conductor should be rated for 1.56 times the maximum short circuit current of the PV array
- The cross-section area of the earthing conductor for PV equipment should not be less than 6 mm² copper.
- Earthing of lightning arrestor, cross-section of the earthing conductor should not be less than 16 mm² of copper or 70 mm² if hot-dipped galvanized iron. The complete Earthing system shall be mechanically & electrically connected to provide independent return to earth.
- Masonry enclosure with the earth pit of size not less than 400mm X 400 mm (depth) complete with cemented brick work (1:6) of minimum 150mm width duly plastered with cement mortar (inside) shall be provided. Hinged inspection covers of size not less than 300mm X 300mm with locking arrangement shall be provided.
- Minimum four (04) numbers of interconnected earth pit need to be provided in each location.

IS:3043-2018 "Code of practice for earthing (Second Revision),"

IS 732:2019 "Code of practice for electrical wiring installations (Fourth Revision)

5. ARRAY JUNCTION BOX (AJB)/STRING COMBINER BOX (SCB)

- AJB comprises of an outdoor type enclosure, copper busbars, Fuses, Surge Protection Device (SPD) and Isolator.
- AJB should be equipped with an adequate capacity indoor DC circuit breaker along with control circuit, protection relays, fuses, etc.
- The JB's shall be such that input & output termination can be made through suitable cable glands.
- Suitable markings shall be provided on the bus bar for easy identification and the cable ferrules must be fitted at the cable termination points for identification

- Fuse for both positive and negative inputs of each strings, Isolator of MCB, SPD of type 2 shall be provided.
- Not more than two strings can be connected in parallel to a single input of SCB/AJB. One spare input terminal along with connector shall be provided for each SCB/AJB.
- Every SCB/AJB input shall be provided with fuses on both positive and negative side.

6. AC DISTRIBUTION BOARD

- An ACDB panel shall be provided in between PCU and Utility grid. It shall have MCB/MCCB or circuit breaker of suitable rating for connection and disconnection of PCU from grid.
- The incomer shall be selected at required rating. The ACDB enclosure shall be of good protection and suitable for mounting on the trenches / on wall.
- All the 415 V AC or 230 V AC devices/equipment like bus support insulators, circuit breakers, SPD, etc. mounted inside the switch gear shall be suitable for continuous operation
- Switches/ circuit breakers/ connectors meeting general requirements and safety measurements as per IS 60947 Part I, II, III and IEC 60947 part I, II and III.
- Junction boxes, enclosures, panels for inverters/ Controllers shall meet IP 54 (for outdoor)/ IP 65 (for indoor) as per IEC 529.

7. AC/DC CABLING

All cables and conduit pipes shall be clamped to the rooftop, walls and ceilings with thermo-plastic clamps at intervals not exceeding 50cm; the minimum DC and AC cables size shall be 4.0mm² copper.

Cable conductors shall be terminated with tinned copper end ferrules to prevent fraying and breaking of individual wire strands. The termination of the DC and AC cables at the Solar Grid Inverter shall be done as per instructions of the manufacturer, which in most cases will include the use of special connectors.

Cable Marking: All cable/wires are to be marked in proper manner by good quality ferule or by other means so that the cable can be easily identified. The following colour code shall be used for cable wires

- DC positive: red (the outer PVC sheath can be black with a red line marking)
- DC negative: black
- AC single phase: Phase: red; Neutral: black
- AC three phase: phases: red, yellow, blue; neutral: black
- Earth wires: green
- Voltage rating: 660/1000V for AC cables and 1500V for DC cables
- Total voltage drop allowed between two end point should be less than 3
- STANDARDS

IS/IEC 69947/IEC 60227 / IS 694 & IEC 60502 / IS 1554 standards, IS:7098 part I&II.
EN-50618/2014, IEC: 62930, TuV 2PFG, 1990/05.12, AS/NZS:5000.1: 2005,

8. MODULE MOUNTING STRUCTURE

- Bolted structure shall be used, no welding is permitted.
- The materials used for structure shall be Hot dip Galvanized Mild Steel conformed to IS 2062:1992. Galvanization thickness shall be minimum 80 microns as per IS 4759.
- The Bolts, Nuts, fasteners, and clamps used for panel mounting shall be of Stainless-Steel SS 304.
- The loading on the terrace shall not be more than 60 kg/m² with wind velocity withstanding capacity of 150 km/hr .
- Installation of structure for solar PV mounting should not tamper with the water proofing

9. CAUTION SIGNS

In addition to the standard caution and danger boards or labels as per Indian Electricity Rules, the cable junction box near the solar grid-tie inverter, the building PCC board to which the AC output of the solar PV system is connected shall be provided with a non-corrosive caution label. The size of the caution label shall be minimum 105mm (width) x 20mm (height) with white letters on a red background.

1.1. LOW TENSION (LT) CABLES

Low voltage power cables shall be 1100V grade, XLPE insulated, extruded PVC inner sheathed, armoured / unarmoured (as per BOQ) extruded FRLS-PVC outer sheathed. The cables shall conform to IS 1554 Part I in all respects.

1100V stranded copper conductor PVC insulated extruded PVC inner sheathed, armoured / unarmoured (as per BOQ) extruded FRLS-PVC outer sheathed. The cables shall conform to IS 1554 Part I in all respects.

1.2. COPPER CABLES/WIRES

Conductor: 2.5sq.mm. electrolytic copper wire tinned stranded conductors

Inner sheath: 85degC Grade PVC

Overall Screen: copper wire braid

Armour: Galvanized steel wire

Outer sheath: FRZH

All cables which are laid indoor shall be of armoured/ unarmoured and outdoors shall be armoured only.

1.3. MINIATURE CIRCUIT BREAKERS (MCB)

MCBs shall comply with IEC 60898-2002/IS 8828-1996. MCBs shall be 35mm symmetrical rail mounted type and available in one, two, three, three pole and neutral or four poles version. The Minimum short circuit rating shall be 10kA. The operating mechanism shall be mechanically trip free from the operating handle so as to prevent the contacts from being held closed against short circuit conditions.

1.4. EARTH LEAKAGE CIRCUIT BREAKERS (ELCB)

Current operated earth leakage circuit breakers shall be in accordance with IS 12640 and IEC 61008 providing the functions of isolation, switching and earth leakage

protection of electrical circuits.

1.5. DISCONNECT SWITCH

Disconnect switches shall be heavy duty (AC23) with operating handle interlocked with the switch cover, in general purpose rust proof aluminium enclosure and grey stove finish.

1.6. SURGE PROTECTION

Surge protection shall be provided on both the DC and the AC side of the solar system. The DC surge protection devices (SPDs) shall be installed in the DC distribution box adjacent to the solar grid inverter. The AC SPDs shall be installed in the AC distribution box adjacent to the solar grid inverter. The SPDs shall be of type 2 as per IEC 60364-5-53.

1.7. ELECTRICAL PANEL BOARDS

The degree of protection according to IEC 439.1 shall be IP 41 minimum for indoor installation and IP 55 for outdoor installation.

The Panel shall be painted with good quality Epoxy/polyurethane painting (after minimum two coats Zinc chromate primer). Inside surface of the enclosure shall be applied with anti-condensation paint if humidity is more than 30%.

The frame shall be provided with square type compressed rubber gasket. The 16SWG MS partitions/barriers shall be provided between adjacent top and bottom compartments. All the live parts shall be properly shrouded with Bakelite barriers. All the equipment shall be accessible from the front. Adequate ventilation shall be ensured by providing ventilation for the inlet and exhaust of air.

A hinged door fitted with lock and key has to be opened for operating the switchgear. Access to the cabling space and to the switchgear shall be obtained by removing a front cover bolted fastener.

Ample-wiring space shall be provided. Detachable blank gland plates shall be provided at the top and bottom. Anti condensation heater shall be provided

10. MAKE OF MATERIALS

Any components used in this project shall got approved by consultant.

- Solar Modules: Waree/ RenewSys/Atitec/Adani (Any makes subject to approval)
- Online Inverters: ABB/Polycab/Delta/V-Guard
- AC/DC Cables and Wires: Polycab/Havells/ Finolex/RR/CCM/APAR/WAA Cable
- Earthing Materials: OBO/Cape
- Switchgears: ABB/Schnieder/Legrand
- Support structures: TATA/Jindal
- SPD-Cape/OBO/Schnieder
- Netmeter and Check Meter: L& T/ Visiontech/ Secure

VOLUME III
BILL OF QUANTITIES

CONTENTS

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1. BILL OF MATERIALS

Si.No	Item	Quantities	To be filled by the Contractor
1	SPV Modules	Total Quantities (nos)	
		No. of Arrays	
		Nos. of SPV modules in each array	
2	Power Conditioning Units (PCUs) (Centralized / string type)	Type	
		Quantity	
3	DC Junction Boxes		
4	AC Junction Boxes		
5	Other related items viz. control & power cables, cable trays, surge diverters, earthing etc. for the complete work as required & specified	LOT	

2. RATE FOR SOLAR POWER PLANT

SI.No.	Description	Unit	Rate
1	Design, Supply, Installation, Testing and Commissioning of 15kWp on grid Solar Photovoltaic Power Plant conforming to specifications as consisting of Mono Crystalline silicon solar PERC cells, net metering facility, necessary protections, earthing, mounted on Aluminium/GI structure of suitable strength with following components complete as required: - a) Solar Photovoltaic Module of capacity 540 Wp or above, conforming to standards and specifications. b) Power Conditioning Unit (PCU) of 600-1000 V DC Input voltage range and 400 V AC, three phase, 4 wire, 50Hz +/- 2.5 Hz, output voltage suitable to generate AC Power with efficiency not less than 98%, total harmonic distortion less than 3% and suitable for ambient temperature from 0 to 50-degree C. c) Data Monitoring System complete with accessories. d) Fixing of Array junction box & Main junction box with IP 65 protection and termination arrangement for incoming and outgoing cable along with glands, lugs and other accessories etc. as required. e) Lightning and surge voltage protection.	Item	

	f) Connections & Interconnections by supplying & fixing required size copper conductor 1.1/1.5 kV grade armoured power and control cables between solar modules, main power cable to grid supply PCU unit along with supplying & fixing of necessary channel/conduit lugs and other accessories etc. as required. g) All Approval and documentation works h) Statutory fee will be reimbursed on producing original receipts.		
2	Total For Solar Installation Works		
3	Add GST		
4	Grand Total		

2. RATE FOR COMPREHENSIVE MAINTANANCE CONTRACT

Sl.No.	Description	Unit	Rate
1	CMC Charge 1st Year		
2	CMC Charge 2nd Year		
3	CMC Charge 3rd Year		
4	CMC Charge 4th Year		
5	CMC Charge 5th Year		

3. TECHNICAL DATA SHEET

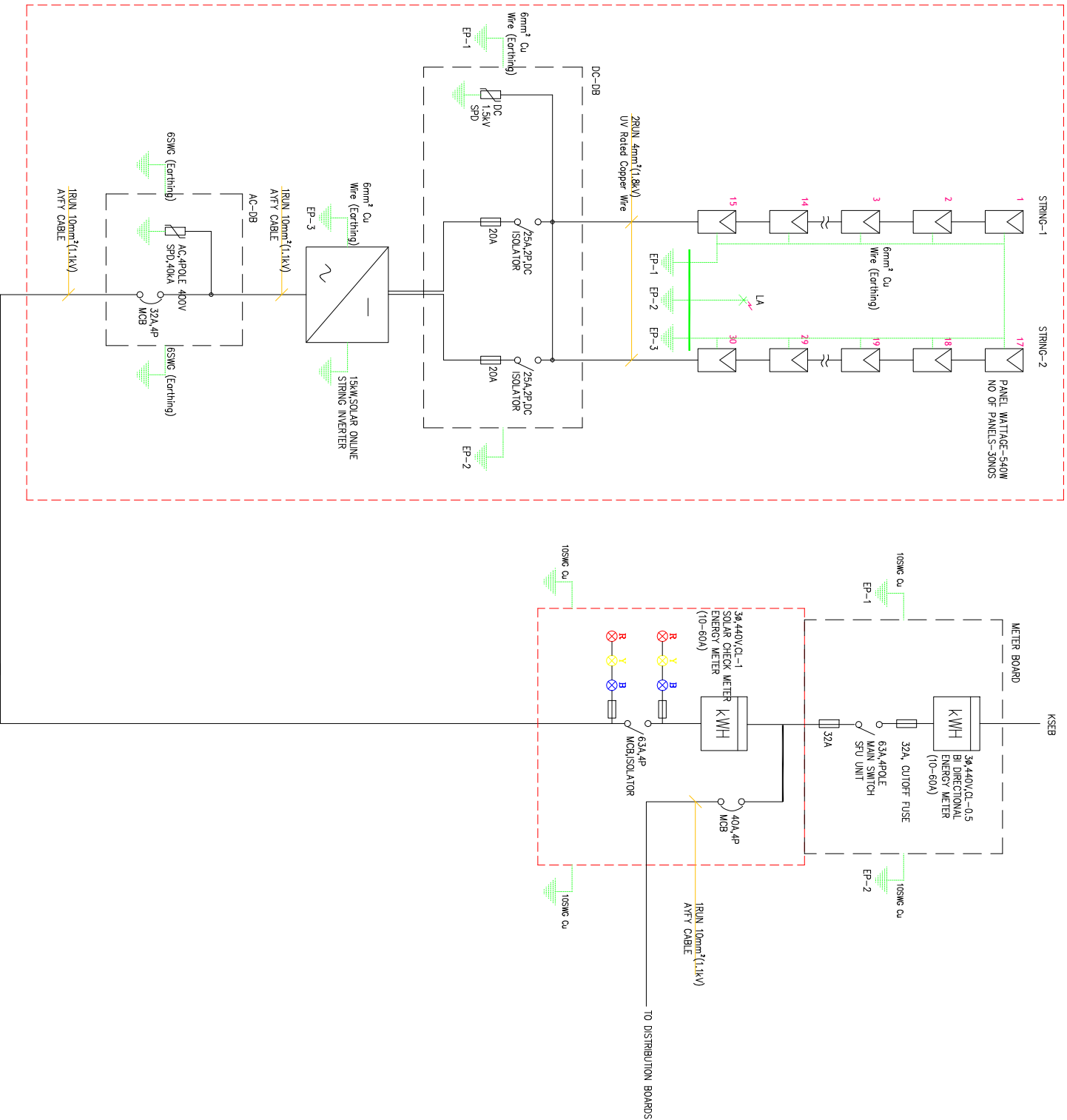
a	SPV MODULE	
i	Manufacture's Name & Address	
ii	Type of Modules with cat. Reference	
iii		
	Design of module at standard test condition	
	a) Peak power watt	
	b) Peak power voltage	
	c) Peak power current	
	d) Open circuit voltage	
iv	No. of SPV Modules proposed branch wise to achieve minimum KWp DC power (i),ii,iii,iv,v,vi	
v	Short circuit current of PV module (Amp.)	
vi	Open circuit voltage of PV Module (V)	
vii	Max. power rating of one PV Module (KWp) (not less than 540Wp)	
viii	Photo electrical conversion efficiency of SPV module (not less than 19%)	
ix	Fill factor of the SPV module (> 0.80)	
x	Designated life of the SPV modules	
xi	Overall dimensions (in mm)	

xii	Weight	
xiii	Frame materials	
xiv	Reference of Standards / approval, if any	
xv	Life of SPV Module (Years of Operation)	
b	PV ARRAY CAPACITY	
	Number of Module in series in each array	
	Peak power rating of one array	
	Number of array considered to achieve the specified output	
c	MODULE MOUNTING STRUCTURE	
i	Type of structure and its materials used in frame and accessories	
ii	Type of mounting structures (Fixed or any other type)	
iii	Overall dimensions	
iv	Type of mounting	
v	Surface azimuth angle of PV Modules	
vi	Tilt angle (Slope) of PV module	
vii	Confirm structure & module frame shall be designed at wind speed 150 km/hr.	
d	POWER CONDITIONING UNITS (PCUs)	
i	Manufacturer's name & address	
ii	Type of PCU (Centralized or string type)	
iii	Number of units proposed	
iv	Rated capacity of each PCU	
v	Input DC Voltage range	
vi	Output voltage	
vii	Frequency	
viii	Minimum efficiency at full load	
ix	Location (outdoor/indoor)	
x	Output wave shape	
xi	Dimensions in mm	
xii	IP protection level	
xiii	Type of cooling required	
xiv	Type of mounting	
xv	Suitability for specified Ambient Temp. range & Humidity at	
xvi	Type of Protection provided	
xvii	Over Load Condition	Yes/No
xviii	Short Circuit Protection	Yes/No
xix	Low/High Voltage Protection	Yes/No
xx	Power Electronic Component Protection Yes/No	Yes/No
e	METERING	
i	Nos. of meters proposed to be provided	
ii	Location of meters	
iii	Manufacturer's name & address	
iv	Confirm compliance with laid down specification	

a	SPV MODULE	
i	Manufacture's Name & Address	
ii	Type of Modules with cat. Reference	
iii		
	Design of module at standard test condition	
	a) Peak power watt	
	b) Peak power voltage	
	c) Peak power current	
	d) Open circuit voltage	
iv	No. of SPV Modules proposed branch wise to achieve minimum KWp DC power (i),ii,iii,iv,v,vi	
v	Short circuit current of PV module (Amp.)	
vi	Open circuit voltage of PV Module (V)	
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ix	Fill factor of the SPV module (> 0.80)	
x	Designated life of the SPV modules	
xi	Overall dimensions (in mm)	
xii	Weight	
xiii	Frame materials	
xiv	Reference of Standards / approval, if any	
xv	Life of SPV Module (Years of Operation)	
b	PV ARRAY CAPACITY	
	Number of Module in series in each array	
	Peak power rating of one array	
	Number of array considered to achieve the specified output	
c	MODULE MOUNTING STRUCTURE	
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ii	Type of mounting structures (Fixed or any other type)	
iii	Overall dimensions	
iv	Type of mounting	
v	Surface azimuth angle of PV Modules	
vi	Tilt angle (Slope) of PV module	
vii	Confirm structure & module frame shall be designed at wind speed 150 km/hr.	
d	POWER CONDITIONING UNITS (PCUs)	
i	Manufacturer's name & address	
ii	Type of PCU (Centralized or string type)	
iii	Number of units proposed	
iv	Rated capacity of each PCU	
v	Input DC Voltage range	
vi	Output voltage	

vii	Frequency	
viii	Minimum efficiency at full load	
ix	Location (outdoor/indoor)	
x	Output wave shape	
xi	Dimensions in mm	
xii	IP protection level	
xiii	Type of cooling required	
xiv	Type of mounting	
xv	Suitability for specified Ambient Temp. range & Humidity at	
xvi	Type of Protection provided	
xvii	Over Load Condition	Yes/No
xviii	Short Circuit Protection	Yes/No
xix	Low/High Voltage Protection	Yes/No
xx	Power Electronic Component Protection Yes/No	Yes/No
e	METERING	
i	Nos. of meters proposed to be provided	
ii	Location of meters	
iii	Manufacturer's name & address	
iv	Confirm compliance with laid down specification	

**VOLUME IV
DRAWINGS**



Client

DhanlaxmiBank
 Dhanlaxmi Bank
 Malabar Branch, Kochin

Building System Consultant

esbs

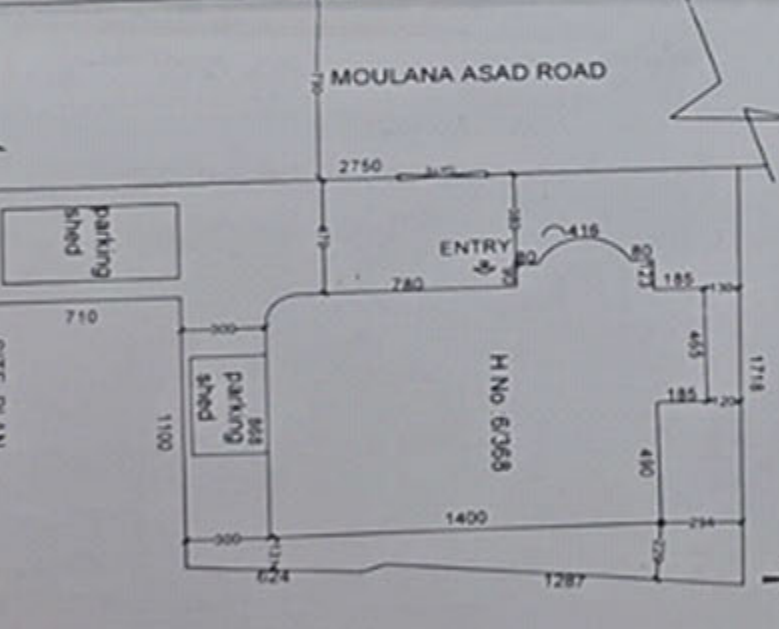
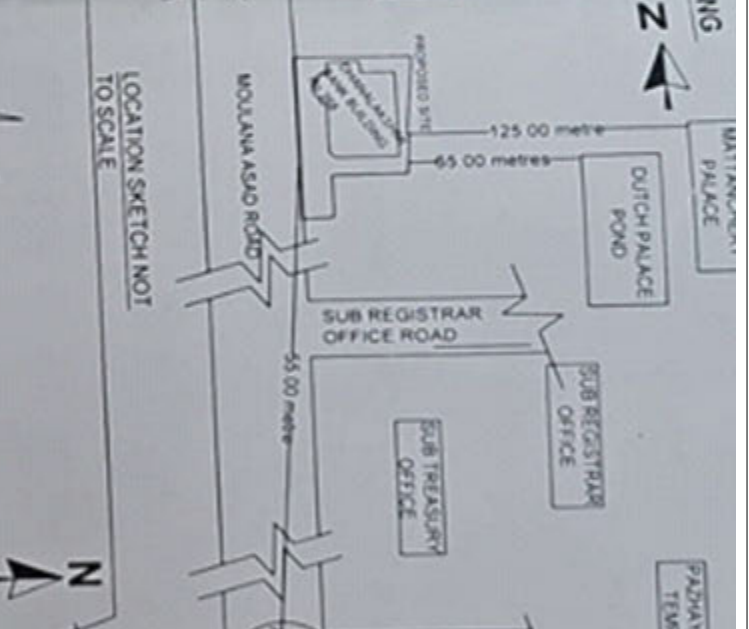
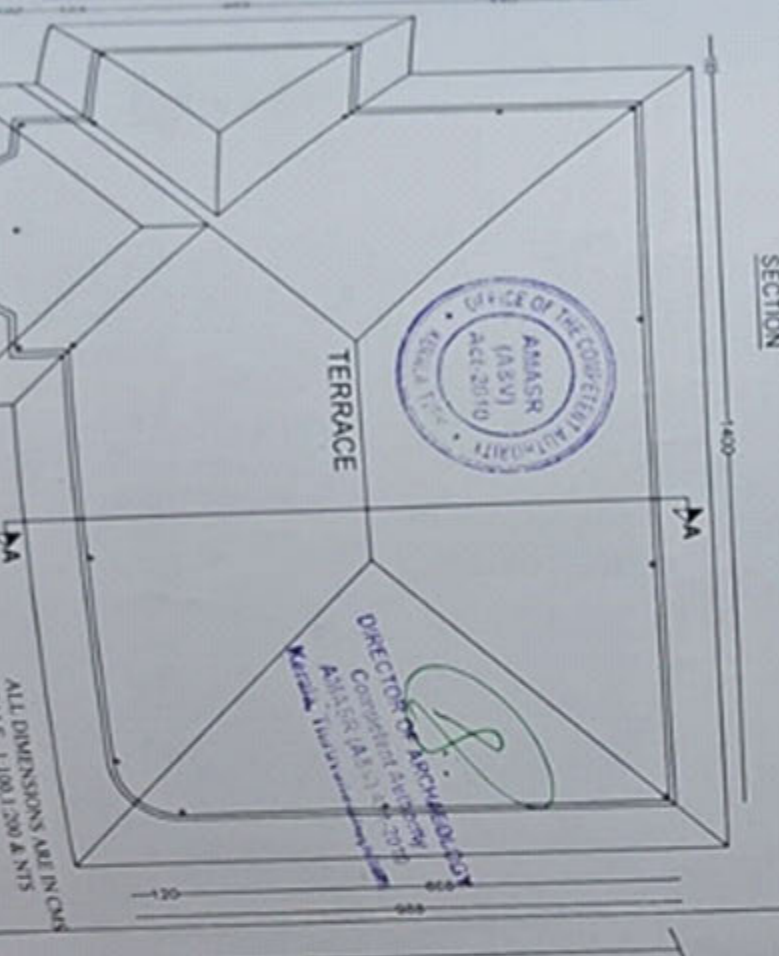
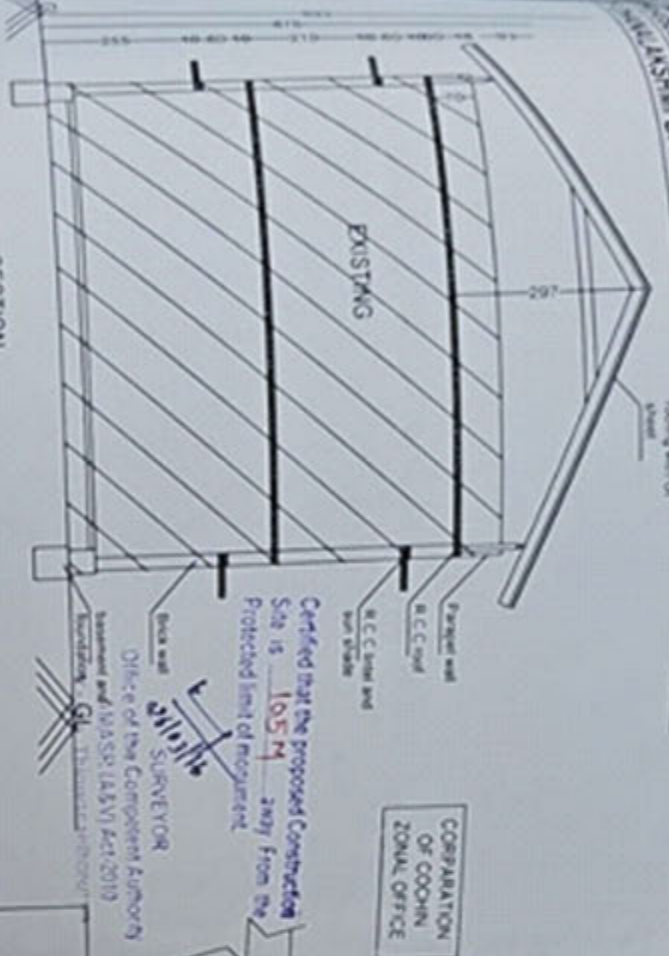
PROJECT

**15kW SOLAR GRID TIED SOLAR
 INSTALLATION AT
 DHANLAXMI BANK
 MATTANCHERRY BRANCH**

DRAWING TITLE

**SCHEMATIC LAYOUT
 PV SYSTEM, INVERTER, DG, PANEL
 AND DB DETAILS**

DRAW NO : ESBS/01	DATE 18/01/2024
DRAWN : SHAN	REV : 00



Client



Dhanlaxmi Bank
 Mattancherry Branch, Kochin

Building System Consultant



CP Tower, Send Floor
 Calicut Airport road, Nayabazhar, Karipur
 Malappuram dist, Kerala, 673647
 +917735484248, esbs.bd@gmail.com

PROJECT

15kW SOLAR GRID TIED SOLAR
 INSTALLATION AT
 DHANLAXMI BANK
 MATTANCHERRY BRANCH

DRAWING TITLE

ROOF PLAN

DRAW NO : ESBS/02 DATE 18/01/2024

DRAWN : SHAN REV : 00