

General Specification for the Misericordiae Home Silent Workers of the Cross, Mount of Olives, East Jerusalem

Introduction:

It is the sole responsibility of the contractor when pricing this tender to study the locations, specification, system capacity, cables lengths, arrange transportation, clearance of products and any required fees or work to be done, coordination, licenses, submitting applications to complete the work according to JDECO, Palestinian Electrical Authority instructions, civil defense and submit a complete set of as built drawings for electrical Test with stamp and all other required certificate to Connect the PV system.

It is the sole responsibility of the contractor to remove any obstacles on the roofs of the locations and do any required work to install the PV panels with zero shading and submit shading analysis report with PV panel distribution on the roofs.

The contractor will be held responsible to deliver a working system no variation orders will be applied, the contractor will be responsible to study the work and price the BOQ to handover a working system licensed by all institutions and electricity generated contract is signed between JDECO and the locations owners.

1. Photovoltaic Solar Panels

- Made from M10-182mm Silicon Mono Crystalline Wafer (M10 Gallium Doped Wafer), 9 Bus Bar Half Cut Cells
- Tier One, Top Solar Manufactures for the Latest Quarter
- At Least 540 Wp at STC Conditions
- STC Efficiency not Less than 21.1%
- Must Have More than 15GWp Installed Power
- The Tolerance Rated Peak Power of Solar Module Shall be 0 ~+5 Watt at Least
- The Normal Operating Cell Temperature Shall be Rated at 45±3°C
- Operating PV Temperature Ranges Between -40°C to +85°C
- 20A Minimum Series Fuse Rating
- 20A Maximum Reverse Current Ratings
- Shall be Provided with High Quality Plug and Socket Connection
- PID Free According to IEC 62804/85 Degree Test and Free of Snail Trails
- Anti-Reflective and Anti-Soling Surface with High Transmittance Tempered Glass
- Frame Material is Made from Anodized Aluminum Alloy
- Solar Module Must Have Unique Serial Number and Flash Test Report for Each Module by Manufacturer
- Must Have Third Party Insurance Against Bankruptcy

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- Junction Box is IP 68 or Higher
- PV Panels Have a Max. DC System Voltage of 1500V
- PV Panels Have Factory Pre Mounted DC Connectors of MC4 or H4 Type on Min. 140cm DC Solar Cable
- PV Panel Manufacturer is Certified According to ISO 9001 Quality Standards and ISO 14001 Environmental Standards and NGBS Green Certified
- PV Module Qualification is IEC/EN 61215, TUV & UL & IEC60068-2-68 & IEC62716-61701, and IEC/EN 61730-2, and Application Classification Class A, Certified for Fire Type 13 (UL1703)
- Linear Performance Warranty at Least 98 % of Nominal Power During First Year, Thereafter Max. 0.55 % Degradation per Year, at Least 93.05 % of Nominal Power up to 10 Years, at Least 84.8 % of Nominal Power up to 25 Years

2. Inverter & Full Monitoring System:

- DC/AC Three Phase On Grid Solar Inverter to Match Each Location Requirements in the BOQ
- The Inverter Include Islanding Protection within the Inverter
- Cutting Edge Interface: RS485, Bluetooth, Speed Wire/ Web Connect
- Multi-Function Relay/ Power Control Module/ DC Disconnect Switch/ Grid Management Functions
- Free Full Monitoring User on Internet Web (Production Monitoring, Volt, AMP for Each String)
- Minimum 2 MPPT Inputs & 3 Strings per MPPT on Same Inverter
- Made in Europe / European Brand
- Suitable for Outdoor Mounting (IP65) or Higher with Rotary Switch
- Suitable for Grid Connected System (Automatically Tracking Grid Synchronization).
- Maximum Total Harmonic Distortion $\leq 3\%$ and cutting Edge Grid Management Functions with Integrated Plant Control
- Minimum String Starting Voltage of 150V DC
- Maximum Input Current of 33A per MPPT
- Maximum Short Circuit Current of 43A per MPPT
- Maximum Solar Generator Input of 45000Wp
- AC Output power of 25KVA Three Phase
- Natural Cooling Transform Less Technology / Opticool Cooling
- The Inverter Should be Designed to Operate the PV Array Near its Maximum Power Point (MPP)

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- The Inverter Should be Transform Less Based 3 Phase PV System to be Offered with Efficiency at Full Load not Less than 98.5%
- The Inverter Should be Provided with Integrated Fuses & Rotary Switches and Reactive Power is Available 24/7
- The Inverter Shall be Provided with an LCD Display to Provide Instantaneous Information about the System Performance
- The Inverter Shall Have AC & DC Protection Against Reverse Current, Input Over Voltage, Over Current via Fuses.
- Temperature Operating Range -25°C to +60°C
- The Inverter Should be Capable to be Connected to Monitoring System and Shall Have 5 Years Warranty at Least.
- Red Brick and Steel Structure Umbrella Above Inverters and DB
- Warranty of the Inverter must be at Least 10 Years with Energy Yield Guarantee for the System & Energy Yield Report from the Inverter Manufacturer
- TUV and CE Compliance (Only USA & Europe Products are Acceptable) VDE0126-I-1, AS4777, IEC61727, IEC62109-1, IEC62109-2, EN61000-6-1, EN61000-6-2, EN61000-6-3, EN61000-6-4, EN61000-3-11 & EN61000-3-12

3. Monitoring Data Logger

- RJ45 Connection up to 100m
- Monitoring Shall Include Daily KWh & Daily KWp
- Instantaneous Output of Power (KW) from the PV System
- Instantaneous Output of Power (KW) from the Inverter/ Charger
- Historical Trending of Energy (KWh) Production from the PV System Over User Input Time Interval (15minute integration periods or less)
- It Should be Noted that the Provided System Shall Feature the Possibility of Data Access Through Maximum Required Communication Data Interfaces, with a Maximum Time Interval of Data Collection of 15 Minutes
- Could be Connected with a Weather Station
- At Least the Data Loggers Should Have 10 Years Warranty
- Can Manage Users and User Roles
- Can Manage Multiple Users Over Multiple Systems
- Assign Roles of Guest, Standard User, Installer, Plant Manager & Owner
- Available on Web & Smartphone App
- Can Manage Multiple Inverters for One Site on One Access for the Site & with Energy Yield Comparison Between Inverters in the Same Site

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- Sends Daily, Monthly & Annual Reports by Email
- Track and Send Events, Warnings and System Malfunctions via Email
- Fully Automatic & Continuous Yield Comparison with Email Notification
- Must be Able to Collect Data and History after Connection Failure
- Installation of Cat6A Shielded Data Cable with Proper Termination, Labeling and all Required Network Switches or Sockets, Pipes, Cable Trays, etc...

4. PV Module Aluminum Mounting Structure

- Anodized Aluminum Alloy AL/6005-T5 Mounting Structure Including Cost of Loading the Structure to the Roof Top of the Sites
- Single Stack with Adjustable Aluminum Profile Foundation not Less than 3mm Thickness with Triangle Aluminum Profile
- The Mounting Structure must Provide Adjustable Inclination of the Modules on 25 Degree +/- 10 Degree/ Azimuth +/- 15 Degree
- The Mounting Structure must be Bonded Together at Least per String to Guarantee Potential Equalization
- The Mounting Structure must Use Standardized Profiles and Mounting Clamps for Mounting the PV Modules
- All Bolts and Nuts must be Stainless Steel Corrosion Proof
- Earth for Each Panel to the Structure Individually
- Earth Between the Adjacent Panels
- Earth for the Structure on Each Leg
- The Structure Should Withstand Wind Speed at Least 150 km/h.
- At Least 1.4KN/m² Snow Load Resistance
- Mechanical Calculation and Test to Ensure Safety
- Keep at Least 2cm of Distance Between the Solar Panels
- No Welding Allowed on Structure
- The Contractor must Supply Anodized Aluminum Rails, Mid Clamps, End Clamps, and Rail Clamp, the Rails will be Fixed on Anodized Aluminum Structure
- The PV Mounting Structure Should be Manufactured by Specialized Factory in Producing Solar Mounting Systems
- No Drilling or Penetration to the Roof, the Structure must be Installed Over Concrete and Metal Ballast Made as per International Building Code & ACI318 Specifications
- The Concrete and Metal Ballast must be Done on the Roof with Load not Less than 900Kg/m² and not More than 1000Kg/m²

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- Mounting Structure must Have a Certificate from a Certified Structural and Mechanical Engineer that the Structure Bears the Load Enforced upon it
- At Least 15 Years Warranty and Minimum 20 Years' Service Life
- The Structure must be TUV Certified and the Contractor must Submit TUV Test Reports

5. DC Cables

- Solar Type
- Appropriate Cross Section According to Design Min. 6mm², 10mm², 16mm² Depending on DC Production & String, Array Design to Achieve not Less than 1% Power Loss
- Rating of 1000V Minimum
- Double Insulation
- UV Resistant and Flame Retardant
- Temperature Range: -40 to 120 Degrees Celsius
- TUV, UL, VDE, or KEMA Certification
- Warranty At Least 20 Years
- Must Comply with Local and International Standards

6. AC Cables

- Cable Type: N2XY XLPE
- The Size of Cable Should be Appropriate to the Electrical Design and to Achieve Less than 3% Power Loss
- Double Insulation Multicore
- UV Resistant and Flame Retardant
- Temperature Range: -40 to 120 Degrees Celsius
- TUV, UL, VDE, or KEMA Certification
- Warranty At Least 20 Years
- Must Comply with Local and International Standards
- For Underground Cables:
 - Excavation Work for 70cm Below the Ground with Diameter of 20cm
 - Fire Proof PVC Copra Pipes of 4inch is Requires
 - 70cm Sand above the pipes with Pressure for each 20cm
 - Danger Label 20cm Above the Copra Pipe
 - Concrete B300 Manholes as required by the Site
 - 40Ton Metal Manhole Cover for each Manhole
 - Fixing All Entries and Exits of Cable to and from the Buildings

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- The length and Cross section of the AC cables required for each site are shown in the Electrical Drawing.
- The Cost of AC Cables include all Cables, Pipes, Manholes, Excavation work as follows:
 - Supply all labor and materials to make an excavation for trenches 60cm width x60cm depth in any type of soil and removing extra excavated materials out of site. Work shall include supply and filling works of 20cm sand layers and laying 10cm concrete block with special electrical warning tape. Work shall also include backfilling with chosen excavated materials and compact it with layers 20cm thickness.
 - Supply, install, test and commission a heavy duty 4" UPVC conduits or Cobra with pull wire for PV incoming power cables to main distribution board to be laid in the excavation in item 1.2.1 with all accessories.
 - Supply, install, and test a ready-made main civil heavy round duty electrical manholes and with special cast iron covers 40 Ton Load Capacity and Ø80 with 80cm depth. Work to include pouring all needed concrete materials for manholes bases with steel meshØ12mm/20cm in both directions, work also include backfilling and removing all extra excavated materials and with all necessary accessories.

7. Cable Protection

- All Cables from PV Strings to Inverters, and from Inverter to Electrical Panel must be Inserted in Cable Protecting Flexible Heat Conduits or Cable Tray and with Glands on the Cable Tray and the Electrical Panels
- 2mm Perforated Galvanized Steel Cable Trays with Cover/ Mesh Cable Tray will not be Acceptable
- The Conduits Should have Ventilation Openings
- Cable Tray must be Raised 10cm Above Ground Using Galvanized Steel 2mm Omega (10x10x10cm) with Screw Between the Cable Tray and the Omega
- The Contractor must Separate the DC Cable Tray from the AC Cable Tray Completely and it is not Allowed to Use the Same Cable Tray for DC & AC Cables
- The Contractor must Install 16mm Ground Cable without Cover in All the Cable Trays and for the Length of the Cable Trays.
- The Contractor must Label All the DC & AC Cables Inside the Cable Tray Each 2 Meters to Show the Device Connected to Each Cable, also the Contractor must Label the Cable Tray with the Right Warning Each 2 Meters.

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8. DC Panels

- Supply Electrical Box According to IEC439-1
- Suitable for Outdoor Use (IP65) or Higher
- Appropriately Sized DC Switch for Each String (String Side)
- DC MCB for each MPPT Input (Inverter Side)
- All Strings must be Double Protected
 - DC MCB with IP65 or Higher Enclosure at the String Side on the Structure
 - Factory Made 2mm Steel Coated IP65 or Higher DC Cabinet with 70cm 16mm Earth Bus Bar and Bottom Entry Cable Glands at the Inverter Side with DC MCB Class I or II and DC Surge Arrestor Class I for Each String
- DC Surge Arrestors Type 1/1000V DC for Each String Input (Inverter Side)
- DC Protection, Frequency Protection & Short Circuit Protection
- Should be According to International Standards.
- Appropriate Ventilation
- Labeling & Numbering of the Cables, MCB, Protection Devices and DC Panels

9. AC Panels

- Metal Coated 2mm Steel Cabinet with 70cm 16mm Earth Bus Bar and Cable Glands Entry from Bottom.
- Supply Electrical Box According to IEC439-1
- Suitable for Outdoor Use (IP65) or Higher
- Appropriately Sized AC RCB for Each Inverter
- Appropriately Sized AC 4 Pole MCB 10KA Breaking Capacity for Each Inverter
- Appropriately Sized AC Surge Arrestors Type 1/1000V for Each Inverter
- Appropriately Sized AC 4 Pole MCB 10KA Breaking Capacity for Combined Inverters
- AC Protection, Frequency Protection & Short Circuit Protection
- Should be According to International Standards.
- Appropriate Ventilation
- Labeling & Numbering of the Cables, RCB, MCB, Protection Devices and AC Panels

10. Meter Panels (Priced with AC Panel in the BOQ)

- Metal Coated 2mm Steel Cabinet with Cable Glands Entry from Bottom
- Supply Electrical Box According to JDECO Regulations & IEC439-1
- Suitable for Outdoor Use (IP65) or Higher

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- Should be According to International Standards
- Appropriate Ventilation
- Appropriately Sized AC 4 Pole MCB 10KA Breaking Capacity for the Size of the Solar System One Before the Meter, One After the Meter and One in the Main Distribution Board in the Location
- Labeling & Numbering of the Cables, MCB, Protection Devices and AC Panels

11. System Grounding

- All Equipment Shall be Grounded Based on Electricity Provider Standards
- PV Structure Shall be Grounded (to Main Grounding Box) Using 16mm Cross Section Copper Wire with Two Lines to Each Structure from the Main Earth Bus Bar at the AC Panel and Ensuring Looping on the Structure
- Each PV Module Shall be Grounded (to Aluminum Structure) Using 10mm Cross Section Copper Wire
- Inverters must be Grounded Using 16mm Cross Section Copper Wire with Conduits and Cable Glands
- All Metal Components Including Cable Trays must be Grounded Using 16mm Cross Section Copper Wire
- The Main Grounding Cable (from the Earth Bus Bar to the Copper Rods) must be 70mm²

12. Grid Connection

- Connection to Grid Based on “Net Metering” Scheme
- Inverters Shall be Connected to the Main Distributing Network
- Digital KWh Meter Shall be Installed Between Inverters and Consumption Loads
- The Contractor Should Install a Metering System with Electrical Cut Off Switch, Through Which the Meter System Will Measure the Consumed and Produced Electric Power (Net Metering), and Installing Additional Metering System for the Solar Plant Electricity Production
- All Grid Connection Costs, are to be Covered by the Contractor
- The Contractor Will be Responsible for Any Requirements by the Electricity Company in Order to Install the Bi-Directional Energy Meter and the Solar System Energy Meter
- All Applications, Arrangements, and Approvals for Grid Connection are the Contractor’s Responsibility

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13. System Installation & Operation

- General Conditions:
 - Complete System Installation, Commissioning, and Testing According to Electricity Provider Requirements and Standards
 - The Contractor Shall Prepare a Complete Set of Shop Drawings for the Solar Panel Distribution on the Roof, AC and DC Cables with Cable Tray, Location of Inverter and AC, DC Panels and Earth Boxes. All to be Approved by the Engineer in Charge
 - The Contractor Shall Make a Complete Coordination with JDECO, Municipality, Palestinian Electrical Authority Instructions, and Civil Defense and Submit a Complete Set of As-Built Drawings for Electrical Test with Stamp and all Other Required Certificate to Connect the System with Electrical Company Grid and to be Included in the Rates for No Additional Cost
 - The Contractor Should Install Instruction Signs, SLD, Warning Labels, etc...
 - All Installation Works Shall be Under Contractor Warranty for 24 Month from the Inspection and Acceptance Date
 - The Contractor Should Provide As-Built Drawings After the Finishing of Installation Process
 - All Panel Switches, Breakers or Meters Required Shall be Labeled in English as Well as the Diagrams (Schematics and Circuitry)
 - Panels Shall Have also All the Labeling in English While the Block Diagrams and Components Require to be Clearly Marked also in English
- Rack and Solar Panels Installation:
 - Solar Mounting Structure Must be Fixed on Concrete Blocks (Grade B300) Support of at Least 153Kg per PV Module (No Digging Allowed on Roof)
 - It is Prohibited to Install Parts of the Structure Outside the Edges of the Building, Keep at Least 1.2m of Distance Between the Edge of the Building and End of the Structure Border Which is Carrying the Solar Panels
 - The Height of the Front Edges of the Solar Panels Should be at Most 80cm from the Roof Surface & the Back Edges Must Not Exceed 2m Height
- DC Cables:
 - For the DC Electrical Circuitry Side, Each One of the Panel Strings as Detailed in Electrical Models Must be Protected by a DC Circuit Breaker of 15 Amperes at the String Side and Another at the Inverter DC Panel Side (Dimensioned for the Amount of Current Required Plus Extra 30% of Safety Margin) and Surge Protectors are Connected to Positive and Negative Poles for Overvoltage Protection

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- All DC Cables Between the PV Strings Should be Installed Inside Well Ventilated Perforated Bottom Galvanized 2mm Steel Conduits (5*10*5cm) Raised 10cm from Ground by (10x10x10cm) 2mm Galvanized Steel Omega
- All DC Cables on the PV Structures Should be Installed Inside Plastic Conduits
- AC Cables:
 - AC Cable Connected from the Inverter to the Main AC Panel Shall Have a Differential AC Circuit Breaker of Corresponding Value, C Curve Type, and Resulting One Breaker for Each Inverter to Protect Every Line in a Convenient Way with RCD & SPD Type I
 - All Electrical Circuitry Shall be According to the Design Model Provided. The Connection to the Mains, Installation, Cable Section, and Wiring Will be Done in Accordance with the Directives and Specific Regulations
 - AC Cables Should be Installed Inside PVC Pipes or Cable Trays as Required by Site With Required Excavation
 - The Contractor Shall do all the Required Excavation Work Including Manholes, 4 inch Copra Pipes, Danger Label, Sand Protection, and Shall bear all costs Required to Complete the Work
- System Grounding:
 - All Galvanized Steel Conduits Should be Grounded with 16mm Unshielded Grounding Copper Cable
 - Earthing System Should be Made Under the Regulation and the Requirements of the Electricity Provider
 - For Underground Cables and Wires They Should be Buried at 70cm Beneath the Ground
 - The Contractor Should Install at Least Two Copper Rods for Each Location
 - The Ground Resistance Should Not Exceed 2 Ohms
 - The Lightning Protection Earth Unit and Earth Unit of Each Installed Station Should be Separated from Each Other
 - Lightning Protection Earth Unit Should Not be Connected to the Building, Water Pipes, Unit Steel Structure, or to Any Other Metal Parts
 - The Lightning Protection Earth Unit Should be Installed at the Distance of 6 Meters from the Building or Other Earth Units
 - Lightning Metal Pole on the Roof must be Grounded to the Nearest Earth Bus Bar with 16mm² Earth Cable
 - The Main Earth Cable Thickness Area Should be at Least 70mm² from the Lightning Protector to the Grounding Rods
 - Grounding Bus Bar 70x6x0.6mm² Inside Water Proof Panel IP65 and 25mm Cross Section Copper Wire from Main Earth Bus Bar of Main Electrical Panel to Water Proof Panel at Top Roof

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14. FM200 System

Supply, Test & Commission Smart Fire Extinguishing System (STATX or FM200 with low pressure trouble signal on monitoring & control software) Including smoke detector, heat detector (Cross Zoning for each compartment), Indication Lamp, Horn, Control Release Module, Abort Station, Release Station, UL Standard Gas A Release Control Panel including Batteries, UL Approved Factory Filled and pressurized STATX or FM200 clean Agent with Automatic Actuation Unit, Pressure Gauge, Pressure Switch, flexible Hose, Discharge Nozzles matching the number of compartments and UL Standard, and all Accessories according to UL UL864 10th Standards, Drawings, Specifications and Engineer Approval Completed with all needed Tests Certificates and Official Certificates for Electrical Company and Civil Defense Authorities. Contractor shall provide also all as made tables, data sheets, warranty certificates, manuals...etc original hard copies and software copy.

- The system must include:
 - Dedicated 4 Zones Standard Gas A Fire Alarm Control Releasing Panel with 4 NACs, 3 Programmable Relays, 1 Fire Relay, 1 Trouble Relay, 6.5 A Power Supply, IP Network Card, RS485 Communication Port & 24 Hours Backup Batteries.
 - Two Optical Photoelectric Smoke Detectors for each compartment
 - Manual Release Call Point
 - Abort Call Point
 - Indication Lamp for each compartment
 - Sounder Beacon IP65 Outdoor Siren Flasher
 - 60x40 Colored Printed Aluminum Reflective Instruction Sign
 - 3Kg or 7Kg FM200 Clean Agent (According to BOQ), UL Certified Extinguisher with Factory Calculation Diagram, with Automatic Actuation Unit, Pressure Gauge, Pressure Switch, or Equivalent STATX for each DB Compartment
 - Scodium 40 Pipes, UL Nozzles, and any required fittings
 - Any Required Accessories
 - Only UL Equipment are approved
 - The contractor must submit calculation report for each cabinet FM200 System

15. Manufacturer List

Panels As:

- Canadian Solar
- GCL Systems
- Seraphim
- Longi
- Trina Solar
- Hanwha QCells
- JA Solar

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- Jinko Solar
- Risen Energy

Inverter As:

- KACO
- SMA
- REFUsol