

# SOLAR POWER SYSTEMS SPECIFICATIONS

## PART 1 - GENERAL

### 1.01 SCOPE

A. EACH SOLAR ELECTRIC POWER SYSTEM SHALL CONSIST OF A ROOF MOUNTED POWER ASSEMBLY AND ALL REQUIRED WIRING AS MANUFACTURED BY SOLAR ELECTRIC POWER COMPANY (SEPCO) OR EQUAL.

B. EACH SOLAR ELECTRIC POWER ASSEMBLY SHALL HAVE A SEPCO 170 WATT POWER ASSEMBLY AND SHALL CONSIST OF THREE PARTS:

1. PANEL ASSEMBLY: A 170 WATT SINGLE ARRAY CONSISTING OF TWO SINGLE CRYSTAL 85 WATT MODULES WHICH ARE MECHANICALLY BOUND TOGETHER. SOLAR ARRAY PRODUCES 9.8 AMPS CHARGE CURRENT AND MEASURES 42" W X 48" L X 2.1" D. THE ARRAY HAS A 10 YEAR WARRANTY FOR 10% POWER LOSS AND 25 YEAR WARRANTY FOR 25% POWER LOSS. SOLAR ARRAY HAS A LIFE CYCLE TESTING AND ACTUAL FIELD PROVEN LIFE FOR OVER 30 YEARS. COMPLETE WITH ALL STAINLESS STEEL MOUNTING HARDWARE. ALL METAL CRAFTING SHALL BE PERFORMED BY HIGH SPEED ROBOTIC PRESSES USING COMPUTER PROGRAMMED INSTRUCTIONS.

2. BATTERY ASSEMBLY: A VENTED ALUMINUM BOX CONTAINING 2-112 AMP HOUR SEALED GEL BATTERY(S) (TOTAL 224 AH) WHICH IS INTEGRALLY MOUNTED AND PRE-WIRED TO INCLUDE A STANDARD WIRE HARNESS WITH SIMPLE PLUG IN CONNECTIONS FOR THE SEPCO LGU-1 LIGHTING COMPUTER/CONTROL UNIT AND THE SOLAR POWER ASSEMBLY. THE LOW PROFILE DESIGN CONTAINS A PREFORMED AND WELDED BACK MOUNTING PLATE FOR EASY SLIDE ON ATTACHMENT TO THE POWER BRACKET. BATTERY ASSEMBLY CONTAINS SEPCO UNIQUE "THROUGH THE POLE" REAR WIRE ROUTING OUTPUT FOR NO EXPOSED WIRING TO PROVIDE A NEAT CLEAN APPEARANCE FOR THE FINISHED INSTALLATION. THE BATTERY IS FULLY WARRANTED FOR 5 YEARS AND DESIGNED FOR 5 TO 7 YEARS OF OPERATION. THE LGU-1 LIGHTING COMPUTER UNIT IS FULLY WARRANTED FOR 5 YEARS. BATTERY ASSEMBLY IS COMPLETE WITH ALL STAINLESS STEEL MOUNTING HARDWARE. ALL METAL CRAFTING HAS BEEN PERFORMED BY HIGH SPEED ROBOTIC PRESSES USING COMPUTER PROGRAMMED INSTRUCTIONS.

3. POWER BRACKET: AN ALL ALUMINUM DOUBLE SUPPORT 5/15/45 DEGREE POWER BRACKET CONSISTS OF A SUBSTANTIAL ALUMINUM CHANNEL AFFORDING MOUNTING TO ANY ROOFTOP. CIRCUMFERENCE WELDING OF STRONG SCHEDULE 40-25" ALUMINUM PIPE IN DOUBLE SUPPORT ARRANGEMENT TO PROVIDE MAXIMUM STRENGTH FOR WIND LOADING IN EXCESS OF 150 MPH. THE POWER BRACKET CONTAINS PREDRILLED AND TAPPED BATTERY SLIDE MOUNT BOLTS OF STAINLESS STEEL AND TWO 1/16" MOUNTING HOLES FOR UTILITY STANDARD 5/8" MOUNTING BOLTS. THE BRACKET CONTAINS THE UNIQUE "THROUGH THE POLE" BATTERY WIRE HOLE FOR NO EXPOSED SYSTEM WIRING.

## PART 2 - PRODUCTS

### 2.01 SOLAR PANEL ASSEMBLY

A. THE SOLAR PANEL(S) SHALL BE OF SINGLE CRYSTAL TECHNOLOGY, WITH A FULL SOLAR PANEL REPLACEMENT WARRANTY OF 10 YEARS AGAINST THE POWER OUTPUT OF THE SOLAR PANEL DEGRADING OVER 10% PLUS A 25 YEAR WARRANTY AGAINST THE SOLAR PANEL DEGRADING BY OVER 20%. THE PANEL(S) SHALL HAVE PASSED COMPLETE ENVIRONMENTAL REQUIREMENTS OF THE JET PROPULSION LABORATORY, JPL SPECIFICATION NO. 5101-61 (BLOCK V). THE PANEL(S) SHALL HAVE PASSED SALT/FOG TESTS TO MIL-STANDARD 810. FURTHER, THE PANEL(S) SHALL HAVE BEEN PERFORMANCE TESTED ACCORDING TO THE METHODS SPECIFIED IN IEC 904 AND ASTM E 1036. THE SOLAR PANEL(S) SHALL BE CERTIFIED THAT THE ESTABLISHMENT HAS ISSUED A MODULE QUALIFICATION CERTIFICATE, REGISTRATION NO. PV-MT-503-66/94, ACCORDING TO THE REQUIREMENTS LAID DOWN IN CEC SPECIFICATION NO. 503. IT SHALL BE FURTHER CERTIFIED THAT THE PANEL(S) HAVE BEEN APPROVED BY THE FACTORY MUTUAL RESEARCH UNDER APPROVAL AGREEMENT REFERENCE NO. IZ2A6.AX.

B. THE SOLAR POWER ARRAY SHALL BE SIZED SUCH THAT THE SYSTEM WILL PROVIDE POWER THE FOLLOWING:

- ONE (1) 15 WATT 12VDC LED FIXTURE - OPERATING 2 CUMULATIVE HOURS PER DAY VIA OCCUPANCY SENSOR.
- TWO (2) 4 WATT 12VDC FANS - OPERATING 5 CUMULATIVE HOURS PER DAY VIA SPRING LOADED TIMER.
- ONE (1) 60 WATT 12VDC AMPLIFIER - OPERATING 5 CUMULATIVE HOURS PER DAY VIA SPRING LOADED TIMER.

C. THE SOLAR PANEL ASSEMBLY POWER WIRES SHALL BE OF 10 GAUGE THIN STRANDED WIRE. THE WIRES SHALL EXIT THE REAR OF THE PANEL ASSEMBLY THROUGH FLEXIBLE CONDUIT AND TERMINATE IN A WEATHER PROOF ELECTRICAL CONNECTOR USED TO DISCONNECT THE SOLAR POWER ASSEMBLY AND ALLOW FOR QUICK, EASY INSTALLATION AND FAST COMPONENT CHANGE OUT. THIS ELECTRICAL CONNECTOR SHALL CONSIST OF COPPER BLADED TERMINALS THAT ARE CRIMPED AND SOLDERED TO THE WIRES. THESE COPPER BLADED TERMINALS SHALL USE POSITIVE CONTACT SPRING PRESSURE AND A MINIMUM OF 75% SURFACE CONTACT AREA WITH THE MATING TERMINAL. THE CONNECTOR SHALL HAVE A CAPTIVE DEVICE TO MECHANICALLY LOCK THE CONNECTOR THE PLUG.

### 2.02 BATTERY ASSEMBLY

A. THE STORAGE BATTERY(S) SHALL BE OF A SEALED VALVE REGULATED THIXOTROPIC GEL LEAD ACID TYPE. IT SHALL BE PRESSURIZED THROUGH THE USE OF BUNSEN TYPE VENTS, MAINTENANCE FREE, AIR SHIPPABLE, 100% RECYCLABLE.

B. THE BATTERY SHALL BE MOUNTING A VENTED ALUMINUM BOX CONSTRUCTED OF .040 ALUMINUM SHEET AND OF A HIGH QUALITY MARINE GRADE TO A MINIMUM TEMPER OF 5052-H32. THE BATTERY BOX SHALL BE VENTED IN A LEAST EIGHT LOCATIONS USING A MINIMUM 3" MACHINE PUNCH VENT PLACED IN SUCH A FASHION AS TO ALLOW COOLING AIR TO CIRCULATE THROUGH THE BATTERY AND TO MINIMIZE RAIN WATER INTRUSION. THE STORAGE BATTERY IN THE ALUMINUM BOX CAN BE MOUNTED IN THE SHADE BEHIND THE SOLAR PANEL ASSEMBLY AND SEPARATED FROM THE PANEL ASSEMBLY SO THAT THE BATTERY WILL NOT BE IN THERMAL COMMUNICATION WITH THE SOLAR PANELS. THE STORAGE BATTERY IN THE ALUMINUM BOX CAN ALSO BE MOUNTED IN AN AREA INDEPENDENT OF SOLAR ARRAY. THE BATTERY BOX SHALL BE A LOW PROFILE DESIGN AND CONTAIN A PREFORMED AND WELDED BACK MOUNTING PLATE FOR EASY SLIDE ON ATTACHMENT. THE BATTERY ASSEMBLY SHALL CONTAIN A "THROUGH THE POLE" REAR WIRE ROUTING OUTPUT FOR NO EXPOSED WIRING TO PROVIDE A NEAT CLEAN APPEARANCE FOR THE FINISHED INSTALLATION. ALL METAL CRAFTING SHALL BE PERFORMED BY HIGH SPEED ROBOTIC PRESSES USING COMPUTER PROGRAMMED INSTRUCTIONS.

C. THE BATTERY SHALL BE FIELD REPLACEABLE WITHIN THE ALUMINUM BOX THROUGH THE USE OF AN INTERNAL WIRING HARNESS WHICH SHALL BE OF 12 GAUGE THIN WIRE. THE HARNESS SHALL TERMINATE IN A WEATHER PROOF ELECTRICAL CONNECTOR USED TO DISCONNECT THE SOLAR POWER ASSEMBLY FROM THE CONTROLLER AND THE CONTROLLER FROM THE BATTERY. THIS WILL ALLOW FOR QUICK, EASY INSTALLATION WITH NO HARD WIRING OR INCORRECTLY PLACED WIRES, AND ALSO ALLOW FOR FAST COMPONENT CHANGE OUT AND TROUBLE SHOOTING. THE HARNESS SHALL BE EQUIPPED WITH A FUSE LOCATED IN A WATERPROOF FUSE HOLDER WITH A POSITIVE SEALING COVER. THE BATTERY ASSEMBLY SHALL CONTAIN A SPARE FUSE THE ELECTRICAL CONNECTORS ON THE HARNESS SHALL CONSIST OF COPPER BLADED TERMINALS THAT ARE CRIMPED AND SOLDERED TO THE WIRES. THESE COPPER BLADED TERMINALS SHALL USE POSITIVE CONTACT SPRING PRESSURE AND A MINIMUM OF 75% SURFACE CONTACT AREA WITH THE MATING TERMINAL. THE CONNECTOR SHALL HAVE A CAPTIVE DEVICE TO MECHANICALLY LOCK CONNECTOR TO MATING PLUG.

D. THE BATTERY SHALL BE FULLY WARRANTED FOR A MINIMUM OF 2 YEARS AND PRORATED FOR THE FOLLOWING 3 AND DESIGNATED FOR 5 TO 7 YEARS OF OPERATION.

### 2.03 CONTROL ELECTRONICS

A. THE ENTIRE CHARGE AND DUSK TILL DAWN LOAD CONTROL ELECTRONICS SHALL BE HOUSED IN AN ABS CASE WHICH IS TOTALLY ENCAPSULATED WITH A UL APPROVED POLYMER EPOXY FOR PROTECTION FROM WEATHER, WHICH SHALL RENDER THE CONTROL ELECTRONICS AS WATERPROOF TO THE POINT WHEREBY IT ACTUALLY CAN BE USED UNDERWATER. NO EXPOSED CIRCUIT BOARDS, EVEN WITH CONJUGAL COATING WILL BE ALLOWED. EACH OF FOUR INPUT LEADS SHALL BE LIGHTNING PROTECTED AND THE CONTROLLER SHALL BE EQUIPPED WITH A FOUR PRONG BLADE TYPE PLUG WITH CAPTIVE MECHANICAL LOCKING MECHANISM TO PROVIDE FOR QUICK DISCONNECT TO FACILITATE INSTALLATION AND SERVICE.

B. THE CHARGE CURRENT FROM THE SOLAR PANEL SHALL BE CONTROLLED IN A 3-STAGE, PULSE WIDTH MODULATION (PWM) FASHION TO CHARGE THE GEL BATTERY TO A FLOAT OF 14.1 VDC. THE SERIES CHARGE SHALL NOT BE ALLOWED TO RESUME UNLESS THE BATTERY VOLTAGE FALLS BELOW 13.4 VDC. THE CHARGE SHALL NOT CONNECT UNLESS THE SOLAR PANEL CAN ACTUALLY CHARGE THE BATTERY WITH A CURRENT OF AT LEAST 200MA. THE CHARGE CONDITION SHALL BE INDICATED BY A GREEN MICRO L.E.D. AND THERE SHALL ALSO BE AN L.E.D. OF RED TO INDICATE A MORE THAN 3 MA OF POWER FROM THE BATTERY DURING THE CHARGE PROCESS AND THE CONTROLLER SHALL NOT REPRESENT MORE THAN .003 OHMS OF RESISTANCE IN THE CHARGE PATH.

C. THE CONTROLLER SHALL BE EQUIPPED WITH AN INTERNAL CIRCUIT WHICH CAN BE REMOTELY ACTUATED BY AN INVISIBLE FORCE THAT CAN BE ACTUATED FROM GROUND LEVEL TO TEST THE SYSTEM AT ANY TIME, DAY OR NIGHT WITHOUT ACCESSING THE SYSTEM. THIS TEST CIRCUIT SHALL NOT INCLUDE ANY THROUGH THE CASE SWITCH WHICH CAN BECOME CORRODED AND/OR INOPERATIVE RENDERING THE CONTROL ELECTRONICS USELESS. THIS CIRCUIT SHALL CAUSE THE CONTROLLER TO PERFORM A SELF TEST, AND TEST EVERY FUNCTION AND COMPONENT OF THE SYSTEM AND DISPLAY THROUGH THE LED READOUTS WHICH COMPONENT SECTION OF THE SYSTEM HAS FAILED.

D. THE CONTROL SHALL BE ENTIRELY SOLID STATE AND CONSTRUCTED WITH NO RELAYS, BLOCKING DIODES, OR WIRE CRIMP/SCREW TERMINAL CONNECTORS. THE ENTIRE CONTROL SHALL BE SEALED AS INDICATIVE OF ITS ABILITY TO OPERATE COMPLETELY SUBMERGED IN SALT WATER. THE ENTIRE CHARGE ELECTRONICS SHALL BE FULLY WARRANTED FOR 5 YEARS AND LIFE CYCLE TESTED OVER 15 YEARS OF OPERATION.

### 2.04 POWER BRACKET

A. THE SOLAR POWER ASSEMBLY AND BATTERY ASSEMBLY WITH LIGHTING CONTROLLER SHALL BE MOUNTED UPON AN ALUMINUM POWER BRACKET CONSTRUCTED OF T6063 TEMPERED EXTRUSIONS. THE BRACKET SHALL CONSIST OF A SUBSTANTIAL VERTICAL ALUMINUM CHANNEL WITH LIKE CHANNELS HORIZONTALLY ORIENTED AT THE DISTAL ENDS OF THE SUBSTANTIAL CHANNEL. THE DOUBLE SUPPORT BRACKET SHALL BE CAPABLE OF ATTACHMENT TO ANY POLE OR WALL WITH A SECTION OF 4" OR GREATER. THE HORIZONTAL SUBSTANTIAL CHANNEL MEMBERS SHALL HAVE TWO TRIANGULAR DISPOSED ALUMINUM PIPE SECTIONS. THESE SECTIONS SHALL BE CIRCUMFERENCE WELDED IN SIX PLACES AND FORMED IN SUCH A MANNER THAT THE POWER BRACKET CAN BE INSTALLED TO ALLOW THE SOLAR PANEL ASSEMBLY TO BE A FIXED MOUNT OF 15 OR 45 DEGREES OF TILT. THE POWER BRACKET SHALL BE OF SUFFICIENT STRENGTH TO HOLD THE SOLAR PANEL AND BATTERY UP TO WITHSTAND 150 MPH WINDS. ALL ASSOCIATED HARDWARE SHALL BE OF STAINLESS STEEL.

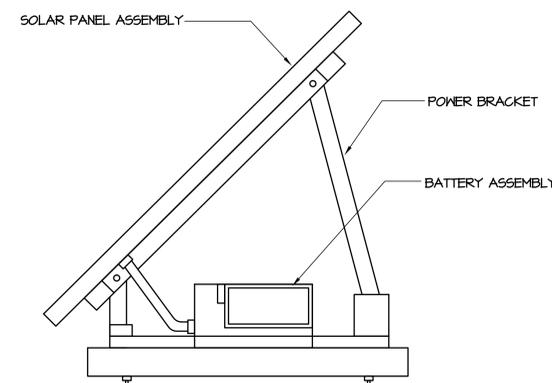
## PART 3 - EXECUTION

### 3.01 SUPPORT MATERIALS

A. THE SYSTEM SHALL BE SUPPLIED WITH COLOR LITERATURE SHOWING ACTUAL INSTALLATIONS AND OPTIONAL MOUNTING COMBINATIONS TO AID IN INSTALLATIONS. THE SYSTEM SHALL BE SUPPLIED WITH A TECHNICAL MANUAL DESCRIBING SYSTEM FEATURES AND SPECIFICATIONS AND INCLUDING A STANDARD WARRANTY AND REGISTRATION. THE SYSTEM SHALL ALSO BE SUPPLIED WITH A COMPLETE INSTALLATION MANUAL WHICH INCLUDES, PARTS LISTS, ASSEMBLY INSTRUCTIONS, WIRING DIAGRAMS, TESTING INSTRUCTIONS AND A TROUBLE SHOOTING GUIDE.

### 3.02 SYSTEM REQUIREMENTS

A. THE SYSTEM SPECIFIED SHALL MEET ALL REQUIREMENTS OF THE ENCLOSED SPECIFICATIONS AND SHALL BE A MASS-PRODUCED, STANDARD SYSTEM OF A TYPE WHICH HAS BEEN IN PRODUCTION FOR A MINIMUM OF 14 YEARS WITH HUNDREDS OF SYSTEMS SOLD OF THE TYPE SPECIFIED. THE SUCCESSFUL BIDDER SHALL DELIVER WITH PRODUCT SUBMITTALS A VERIFIED REFERENCE LIST WITH PHOTOS OF INSTALLATIONS. THE MATERIAL REQUIREMENTS SHALL INCLUDE COMPLETE INSTALLATION INSTRUCTIONS, A COMPLETE TESTING PROCEDURE AND OPERATING INSTRUCTIONS PAMPHLET INCLUDING TROUBLESHOOTING INSTRUCTIONS AND REPLACEMENT PARTS LIST AND INFORMATION ON HOW TO REPLACE EACH INDIVIDUAL COMPONENT IN THE SYSTEM.



1 SOLAR POWER SYSTEM DETAIL

NO SCALE

CONSTRUCTION DOCUMENTS

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Revisions	Date



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NATIONAL  
CEMETERY  
ADMINISTRATION

Drawing Title	SOLAR POWER SYSTEMS DETAILS	
Approved: Director, Office of Construction Management	Building Number	Checked MSS
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Project No.	870CM3023B	
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