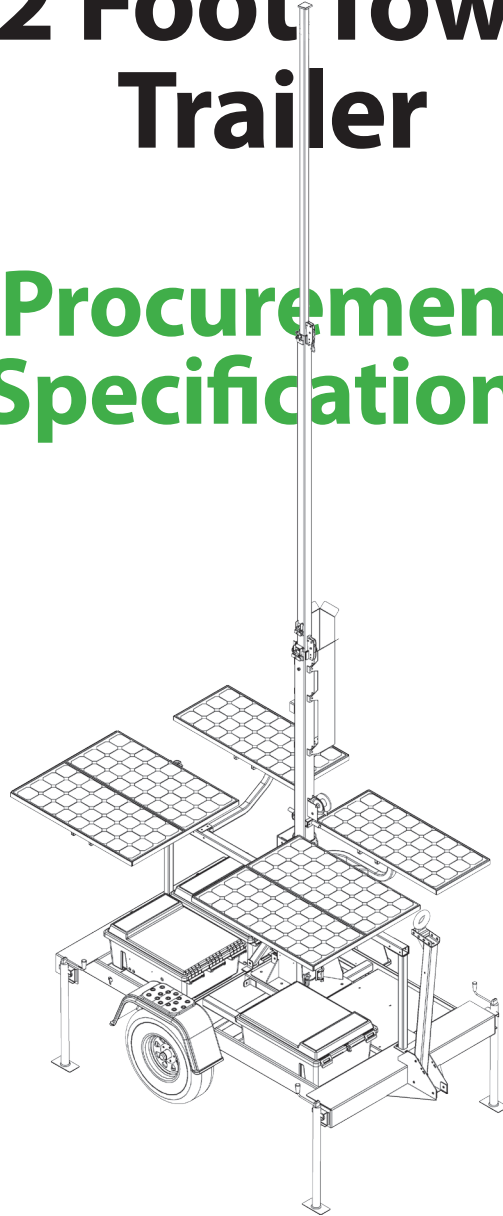


# Solar Powered Portable **42 Foot Tower Trailer**

## Procurement Specifications



*As Reliable as the Sun*

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This document presents a detailed specification for a portable solar powered tower trailer. This specification typically requires additions and/or modifications to meet a user's specific requirements.

This specification is subject to periodic revisions as required without notice.

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## 1. General

### 1.1 Product Description

The **SPTT-4200** is a solar powered portable tower trailer capable of rapidly deploying, powering and sustaining a wide array of electronic sensors and associated recording, processing and communications equipment in remote locations where power and or an existing structure is unavailable or not practical. The **SPTT-4200** consists of a rigid all aluminum multistage telescoping tower, a supporting and stabilizing structure for the tower, a photovoltaic array, a battery power supply and an energy management system control unit, all mounted on a heavy duty trailer frame designed for maximum portability and rapid deployment.

### 1.2 Design Objectives

1.2.1 Maximize reliability by using generally accepted design techniques for outdoor-use electrical and electronic equipment.

1.2.2 Minimize operating cost by using a renewable energy source, requiring minimal maintenance.

1.2.3 Maximize portability, simplicity, ease and rapidity of deployment, stability, and safety.

### 1.3 Performance Objectives

1.3.1 Maximum nominal height for mounting of sensors and/or antennae - 42 ft. (1,201 cm).

1.3.2 Maximum stability of tower for proper operation of sensors and mounted equipment.

1.3.3 Power generation capability - up to 100AH/Day at 12.0 VDC nominal (1.2 KWH/Day) - sustained.

1.3.4 Power reserve capacity - up to 2,400AH at 12.0 VDC nominal (28.8 KWH).

1.3.5 One month minimum, three month typical maintenance interval.

### 1.4 Quality Assurance Objectives

1.4.1 All manufacturing shall be carried out in a facility with a completely implemented and properly maintained ISO 9001:2008 certified quality management system.

1.4.2 All units shall bear the CE Mark indicating acceptable EMC (Electromagnetic Compatibility) to insure that the units are neither susceptible to nor produce any electromagnetic interference.

1.4.3 Manufacturer shall have a factory authorized service center located within 150 miles of point of delivery. Authorized service center shall receive all units from factory in order to inspect for any shipping damage and verify proper operation prior to final delivery. Delivery directly from manufacturer's facility without inspection by an authorized service center shall not be permitted. Additionally, authorized service center shall be capable of performing warranty service and repairs, and shall provide on-site training on the proper use and maintenance of all equipment delivered.

## **2. Physical**

### **2.1 Dimensions**

2.1.1 Length Overall - 177 in. (449 cm)

2.1.2 Width Overall - 92 in. (234 cm)

2.1.3 Height

2.1.3.1 Tower in transport position - 101 in. (256 cm)

2.1.3.2 Tower in operating position - 504 in. (1,280 cm)

2.1.4 Ground Clearance, minimum - 13 in. (33 cm)

2.1.5 Weight - 2,800 lbs. (1,272 kg) (maximum)

### **2.2 Environmental**

2.2.1 Temperature, operating and storage - -40 to +18°F (-40 to +85°C)

2.2.2 Relative Humidity - 20% to 98%, non-condensing

2.2.3 Wind

2.2.3.1 Transport position, maximum trailering speed - 70 MPH (12 KPH)

2.2.3.2 Operating position, max. height, outriggers in place - 80 MPH (128 KPH) sustained

2.2.4 Electrical Interference - Unaffected by RFI (Radio Frequency Interference) and EMI (Electromagnetic Interference).

## **3. Trailer Chassis and Tower Support**

### **3.1 Trailer Chassis**

3.1.1 Frame Construction

3.1.1.1 Trailer frame shall be constructed of welded 7 Gauge (3/16-inch) CNC formed steel plate and structural steel tubing with 3 x 5 x 3/16 inch structural steel tubing extending from the tower support mast mounting frame cross-members forward to the coupler/brake actuator Tongue shall be braced with diagonal 2 x 4 x 1/2 gauge tubing extending outward from the forward section of the tongue at 45 degrees, rearward to the front main cross member

3.1.1.2 Trailer shall be equipped with a 7 Gauge (3/16-inch) CNC formed steel plate rear cross member to provide support for tower and protect structure against rear end collisions.

3.1.1.3 Trailer frame shall be equipped with tie down points to facilitate securing unit to utility trailer or truck deck for transport.

### 3.1.2 Suspension and Brake System

3.1.2.1 Trailer shall be equipped with an independent suspension, torsion-type axle with hydraulic brakes. Axle load capacity shall be set to 3,400 pounds.

3.1.2.2 Axle wheel spindles shall be equipped with grease fittings to accommodate wheel bearing lubrication.

3.1.2.3 Trailer shall be equipped with a bolt-on 7,500-pound capacity hydraulic surge brake actuator

3.1.2.4 Hydraulic surge brake actuator shall be equipped with an emergency break-away cable to automatically set the trailer brakes in the event of a coupler separation from the tow vehicle.

### 3.1.3 Coupler

3.1.3.1 Trailer shall be equipped with an adjustable height coupler mount capable of accepting either a 2-inch ball or a 3-inch pintle ring coupler both with minimum capacity ratings of 5,000 lbs.

3.1.3.2 Trailer shall be equipped with 1/4-inch safety chains with snap-type hooks for secure attachment to tow vehicle hitch.

3.1.3.3 All trailer hitch components shall comply with SAE J684 standards for Class II (2) trailers.

### 3.1.4 Surface Preparation and Finishing

3.1.4.1 Trailer chassis and superstructure shall be completely cleaned and deburred prior to finishing. All metal surfaces shall be prepared for finishing using an iron phosphate wash-down process.

3.1.4.2 A polyamide epoxy primer shall be applied to a dry film thickness of 1.5 mils.

3.1.4.3 A high gloss federal safety orange aliphatic acrylic urethane finish shall be applied to a dry film thickness of 1.25 mils.

### 3.1.5 Lighting

3.1.5.1 Trailer shall be equipped with sealed flush-mounted combination stop, tail and turn lights.

3.1.5.2 Trailer shall be equipped with flush-mounted front and rear side marker lights.

3.1.5.3 Trailer shall be equipped with a rear center identification light bar.

3.1.5.4 Trailer shall be equipped with a lighted license plate holder.

3.1.5.5 Trailer wiring harness shall be completely sealed and water resistant.

### 3.1.6 Fenders

3.1.6.1 Trailer shall be equipped with unbreakable, molded, solid color UV-stabilized HDPE (High Density Polyethylene) fenders, completely closed on the inner side to protect trailer frame.

3.1.6.2 Fenders shall be secured to trailer frame with zinc-plated steel thread forming screws and fender washers so as to facilitate easy repair or replacement.

### 3.1.7 Leveling Jacks

3.1.7.1 Trailer shall be equipped with four swivel type screw jacks, minimum capacity rating of 2,000 pounds, mounted on pivoting stabilizing extensions arms, at each corner of the trailer frame.

3.1.7.2 The outrigger jacks shall be capable of lifting the trailer frame so trailer wheels and tires can be removed for additional security and provide a wide footprint for trailer to maximize stability of tower.

3.1.7.3 Trailer shall be constructed such that the outrigger jacks pivot up for storage and during transport.

3.1.7.4 Trailer shall be equipped with a swivel type screw jack with a dolly wheel, minimum capacity rating of 2,000 pounds, mounted to the tongue of the trailer to provide for easy maneuvering and positioning of the trailer when not attached to a tow vehicle.

### 3.1.8 Tires and Wheels

3.1.8.1 Tires shall be ST225/75R15 Load Range C.

3.1.8.2 Wheels shall be 15-inch x 6-inch, 5-lug pattern (4 1/2-inch bolt circle), white spoke dress wheel.

3.1.8.3 Wheels and tires shall be sized in accordance with load requirements of trailer and axle.

## 3.2 Tower Support

3.2.1 Tower support superstructure shall provide complete support of the tower in the transport (down) position with positive locking mechanism for transport. Cantilevered support of tower is not acceptable!

3.2.2 Tower support superstructure shall be completely assembled with removable fasteners to accommodate quick, easy maintenance and repair.

3.2.3 All fasteners shall be rust resistant and equipped with either all metal (stover) or nylon lock stop-nuts to prevent loosening of fasteners during normal transportation and operation.

3.2.4 Main telescoping tower shall be attached to a pivoting mount on main mast assembly to facilitate raising the tower from the transport position to the operating position safely and quickly by an unassisted operator and easy removal/reinstallation for maintenance and repair.

3.2.5 Main mast assembly shall be fabricated from 2 x 4 x 1/8-inch structural steel tubing reinforced and welded to a 5\16-inch steel plate secured to the trailer frame with eight 5\8-inch diameter steel bolts. The mast assembly shall be additionally reinforced with a minimum of four (4) 2 x 2 x 1/8-inch steel braces to provide for longitudinal and lateral stability.

3.2.6 Main mast assembly shall be equipped with a bulls-eye bubble type leveling device to facilitate proper levelling of trailer during setup and prior to erection of main tower

3.2.7 The main mast assembly shall be equipped with retractable spring-loaded stainless steel locking pins to secure tower in fully erected position.

3.2.8 Tower erecting mechanism shall consist of a minimum 1,000-pound capacity, automatic brake type winch with 1/4-inch wire rope capable of holding the tower in any position from full upright to the

travel (down) position.

3.2.9 Winch shall be zinc-plated to minimize rust and corrosion.

3.2.10 Winch shall be designed such that the handle can be removed, for added security without interfering with the operation of the automatic brake.

## **4. Main Tower**

### **4.1 Dimensions**

4.1.1 Width Overall (nominal - lower triangular section) - 14.5 in. (36.8 cm)

4.1.2 Length Overall (collapsed) - 168 in. (427 cm)

4.1.2 Height Overall (extended) - 432 in. (1,097 cm)

4.1.3 Weight - 125 lb. (57 kg)

### **4.2 Construction**

#### **4.2.1 Main Telescoping Tower**

4.2.1.1 Main tower is to be constructed from three 13' (156-in.) long nested sections, triangular in shape and manufactured from 1/8-inch wall DOM aluminum tubing. All aluminum components shall be manufactured from 6063-T832 and 6061-T6 aluminum alloys and all fabrication shall be accomplished by TIG welding. All rollers, pulleys, and other hardware shall be either pvc, aluminum or stainless steel to ensure smooth and trouble-free operation for the life of the tower

4.2.1.2 Tower is to be automatically erected and collapsed by a worm-gear type manual hand winch with 1/8" stainless-steel aircraft type cable.

4.2.1.3 Tower shall be equipped with a safety catch, to prevent inadvertent lowering of the sections in the event of a main cable failure, which engages automatically when tower is fully erected and disengaged manually prior to retracting tower

4.2.1.4 Each stage of tower is to be designed such that it positively engages and locks with adjacent stages, when fully erected, to provide for a continuous rigid one-piece type structure. No movement between sections shall be allowed when tower is fully erected.

4.2.1.5 Tower shall include an all aluminum mount, suitable for a wide array of cameras, sensors, etc. which is easily attached and removed from the top section with three (3) ball-lock pins secured with stainless steel lanyards.

4.2.1.6 Tower shall include an all aluminum spire which easily extends and retracts from the uppermost section to provide for an additional 5' (152 cm) of extension for mounting of antennae, etc.

4.2.1.7 Tower shall (when full extended) be capable of supporting equipment, etc. up to 45 lbs. (21 kg) with a maximum of 5 sq. ft. (465 sq. cm) of surface area.

4.2.1.8 Tower shall include a system of easily installed and adjustable guy-wires extending from top of uppermost section to the four outriggers on the trailer to provide for maximum rigidity and stability of tower. Guy-wires shall be constructed from 1/8-inch stainless steel aircraft cable, attach with quick

connect type snap-hooks and include adjustable turnbuckles for easy adjustment.

## **5. Power System**

### **5.1 General**

5.1.1 Operating Voltage - 12 Volts DC nominal

5.1.2 Operating Energy Capacity - 100 Amp Hours per day maximum at 12.0 VDC nominal

5.1.3 Main Power Switch - Main power switch shall be a combination switch and electromagnetic, thermal circuit breaker to provide complete electrical system protection without the inconvenience of conventional fuses. Main power switch shall be splash proof and weather resistant.

### **5.2 Battery Bank**

5.2.1 Number of batteries: Sixteen (16)

5.2.2 Battery type: 6-Volt, heavy duty, deep cycle - Specify Flooded Lead-Acid, Gel-Cell or AGM

5.2.3 Energy capacity - 2,080 Amp Hours nominal (16 batteries).

5.2.4 Battery / Equipment Compartments

5.2.4.1 Battery / Equipment Compartments shall be constructed of molded HMWPE (High Molecular Weight Polyethylene), color impregnated with Federal Safety Orange with 0.5% UV stabilizer added to prevent fading.

5.2.4.2 Compartments shall be designed to completely contain spills from a failed or damaged battery case.

5.2.4.3 Compartments shall be capable of supporting an operator standing on top of the battery / equipment compartment to service unit.

5.2.4.4 Compartments shall be designed such that the lid automatically latches in the closed position and holds the batteries in place. Lid shall be capable of being locked in the closed position with a standard padlock.

5.2.4.5 Lid shall be secured to compartment by an integral plastic hinge that permits the lid to be completely removed from the compartment for service. Lid on the compartment containing the control console shall be automatically supported in the open position by a telescoping lid support.

5.2.4.6 Compartments shall be designed to provide adequate ventilation for the batteries during charging yet prevent the ingress of water during use or transport.

5.2.4.7 Each compartments shall be capable of housing four (4) BCI Group GC-2 batteries.

### **5.3 Solar Array**

5.3.1 Photovoltaic module type - Single crystal (monocrystalline) silicon

5.3.2 Number of solar cells per module - 36

5.3.3 Solar array power output: 320 or 480 Watts peak - specify

5.3.6 Photovoltaic module junction boxes shall be equipped with watertight strain reliefs at all cable entry points.



## 5.4 Wiring and Cabling

5.4.1 All power and control wiring and cables shall be in nonmetallic, flexible, liquid tight conduits.

5.4.2 All conduit fittings shall be sealed at bulkheads or enclosure entry points.

5.4.3 All wiring shall be marine grade, multi-strand, tin-plated copper with PVC insulation rated for outdoor use.

5.4.4 All power system wire terminals shall be tin-plated copper to minimize the effects of galvanic corrosion.

5.4.5 Main power wiring shall be 8AWG minimum.

5.4.6 Battery terminations shall consist of 5/16-18 UNC marine stud with stainless steel split lock washer and hex nut with 5/16 tin-plated copper ring terminal.

5.4.7 Solar panel terminations shall consist of stainless steel screws with #8 tin-plated copper snap spade terminal.

5.4.8 All other terminations shall consist of locking-type quick-disconnect connectors with tin-plated terminals for power connections and gold-plated terminals for signal connections. Terminal strips, screw or compression type, shall not be permitted.

## 5.5 Energy Management System

5.5.1 Solar energy management system control unit shall include a completely solid state charge controller capable of operating in an outdoor environment. No mechanical or electromechanical switching to control charging current is permitted.

5.5.2 All wiring connections to the energy management system control unit shall be made with locking-type multi-pin connectors to facilitate quick, easy servicing of the control unit without the need of any tools. Electrical connections shall include an auxiliary 12-Volt power connection to provide power for accessory devices.

5.5.3 Energy management system control unit shall monitor solar array voltage, solar array current, battery voltage, battery current and ambient temperature.

5.5.4 Energy management system control unit shall regulate energy flow from the solar array into the battery bank based on ambient temperature so as to avoid over charging of the batteries and minimize the consumption of electrolyte.

5.5.5 Energy management system control unit shall provide for the controlled periodic pulsing of the solar array current to assist in minimizing sulfate deposit buildup on the battery plates.

5.5.6 Energy management system control unit shall provide for remote monitoring of the battery bank voltage, at the terminals of one of the batteries, to assist in optimizing the transfer of power into the battery bank.

5.5.7 Energy management system control unit shall be equipped with a 2-line by 16-character LCD (Liquid Crystal Display) displaying sequentially, solar array voltage, solar array current, battery voltage, and battery current. In addition, the energy management system control unit shall display a low battery voltage warning message whenever the battery bank voltage drops below 10.9 Volts.

5.5.8 Energy management system control unit shall automatically switch current to the message sign off whenever the battery bank voltage drops below 10.7 Volts to prevent damage to the battery bank due to over-discharging the batteries.

5.5.9 Energy management system control unit shall provide for automatic reverse polarity protection, including reverse polarity indicator lamps, for the solar array and the battery bank.

5.5.10 Energy management system control unit shall provide for automatic fault protection without the need for fuses. The use of fuses for fault protection shall not be permitted.

**6. N/A**

## **7. Documentation**

### **7.1 Operation and Maintenance Manual**

7.1.1 Setup and Operation

7.1.2 Maintenance

7.1.3 Troubleshooting and Repair

7.1.4 Assembly Diagrams and Parts Lists

7.1.5 Specifications

7.1.6 Appendix

### **7.3 User Guide**

7.3.1 Pre-transport checklist.

7.3.2 Job site setup checklist.

7.3.3 Basic operating instructions.

7.3.4 Weatherproof card attached to unit with nylon-coated stainless steel lanyard.

## **8. Maintenance**

### **8.1 Scheduled Maintenance**

8.1.1 SolarArray - Clean with water and mild detergent as needed.

8.1.2 Battery Bank - Check electrolyte level once each month and add distilled water as needed.  
(Note: Not required with Gel-Cell batteries.)

### **8.2 Preventive Maintenance**

8.2.1 Inspect and lubricate axle hubs once per year

## **9. Warranty**

### **9.1 Standard Warranty**

9.1.1 Bumper to Bumper - Full warranty parts and labor - One year

9.1.2 Electrical and Electronic Components, Control Console - Two years

9.1.3 Solar Panels - Ten years

### **9.2 Extended Warranty - Consult factory**

## **10. Options**

### **10.1 Battery Charger**

10.1.1 Charger type - Switching regulator constant voltage with automatic switch to maintenance or trickle charge.

10.1.2 Input Voltage - 110 VAC 50/60 Hz (specify 220 VAC 50 Hz for international use)

10.1.3 Available models with typical recharge times.

10.1.3.1 90-Amp - 32 hours (16 batteries)

10.1.4 Battery charger unit shall install in the field with minimum effort.