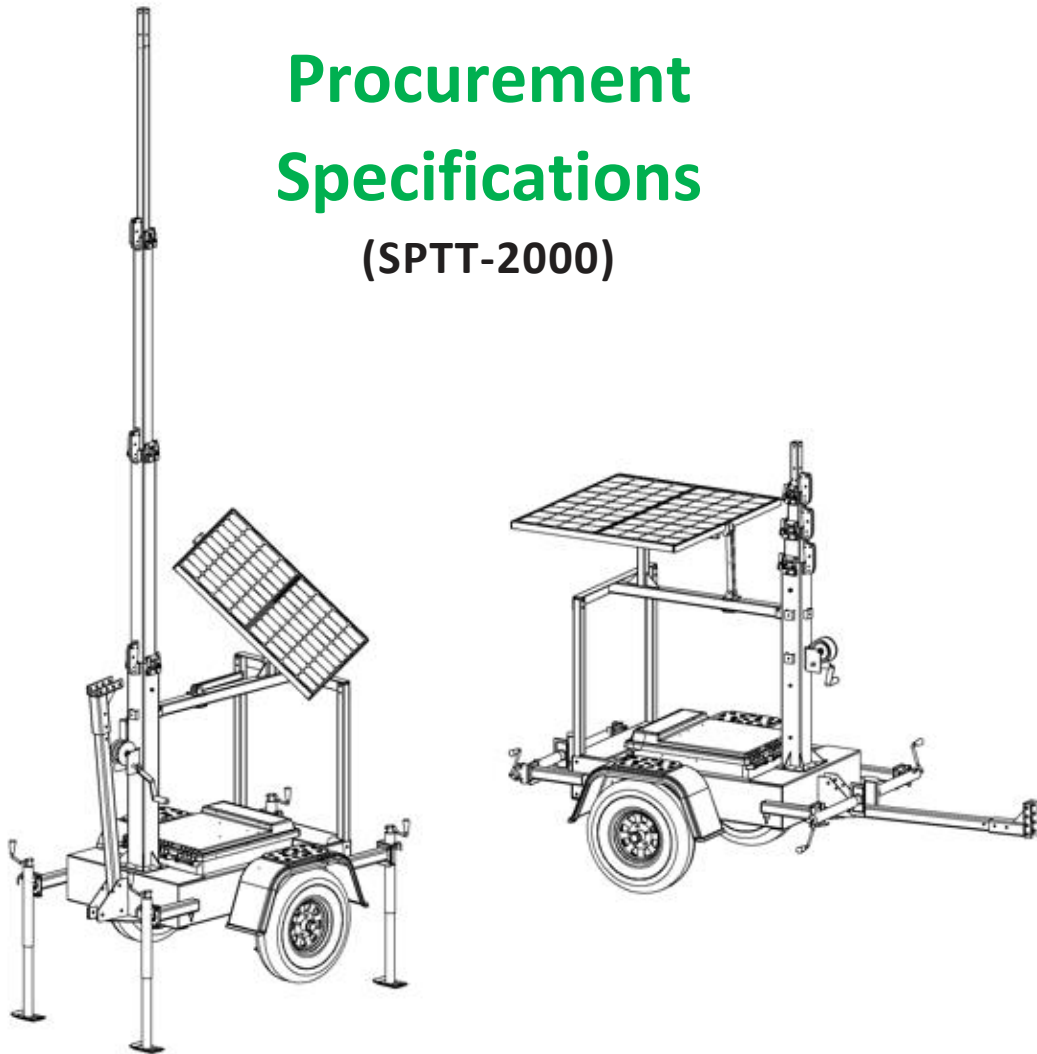


Solar Powered Portable Tower Trailer

20 FOOT TOWER TRAILERS

Procurement Specifications

(SPTT-2000)



As Reliable as the Sun

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This document presents a detailed specification for a portable solar powered tower. 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-2000** is a versatile solar powered portable tower that can be adapted for Intelligent Transportation System (ITS) traffic management applications, Wi-Fi hotspot, or environment sensor data collection.

The **SPTT-2000** consists of a rigid galvanized steel multi-stage telescoping tower, a supporting and stabilizing structure for the tower, a photovoltaic array, a battery power supply, an energy management system control unit and various customizable sensor options, 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 - 20 ft (610 cm).
- 1.3.2 Maximum stability of tower for proper operation of sensors and mounted equipment.
- 1.3.3 Continuous, year-round, uninterrupted power source capable of providing a minimum of 440 watt-hours per day of electrical power (nominal 35 amp hours per day at 12.5 volts DC)
- 1.3.4 One (1) month minimum, three (3) 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 9001:2015 certified quality management system.
- 1.4.2 All units shall be tested to ensure that they are neither susceptible to nor produce any electromagnetic interference.

2. Physical

2.1 Dimensions

2.1.1 Length

2.1.1.1 Transport position – 121 in. (307 cm)

2.1.1.2 Operating position – 79 in (201 cm)

2.1.2 Width Overall – 56 in. (142 cm)

2.1.3 Height

2.1.3.1 Tower in transport position – 8.5 ft. (216 cm)

2.1.3.2 Tower in operating position – 8.5 to 20 ft. (216 to 610 cm)

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

2.1.5 Weight – 1200 lbs. (544 kg) (maximum)

2.2 Environmental

2.2.1 Temperature, operating and storage – -40 to +185 °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 (112 KPH)

2.2.3.2 Operating position, max. height, level ground with jack stands deployed - 90 MPH (145 KPH) sustained (with 4 square foot surface area of equipment at top of mast)

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 7 Gauge formed steel plate reinforced and welded to front crossmember for pivoting tongue.

3.1.1.2 Trailer shall be equipped with a 2 ½ x 2 ½ x 3/16 inch structural steel tubing receiver capable of accepting a standard Class II (2) drawbar and hitch pin to accommodate tandem towing. The rear hitch receiver shall be reinforced and welded to a 7 Gauge (3/16-inch) CNC formed steel plate rear cross member. Tandem trailer towing using rear hitch receiver is intended for off road use only and is subject to local laws and regulations!

3.1.1.3 The trailer tongue shall consist of 2 ½ x 2 ½ x 3/16 inch structural steel tubing. The tongue shall bolt to formed steel plate assembly with an additional removable hitch pin to allow for easy pivoting upward into the storage position.

3.1.1.4 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

3.1.2.1 Trailer shall be equipped with an independent suspension, torsion-type axle with a 2,200 pound overall capacity. Axle load capacity shall be set at 1,400 pounds.

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

3.1.3 Coupler

3.1.3.1 Trailer tongue shall be capable of accepting a 2-inch ball coupler, a 2 1/2-inch pintle ring, an optional removable combination coupler (2-inch ball coupler & 2 1/2-inch pintle ring), or an optional adjustable height coupler (2-inch ball coupler and/or 3-inch pintle ring).

3.1.3.2 Ball coupler and pintle rings shall have a minimum capacity rating of 5000 lbs.

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

3.1.3.4 All coupler and safety chain configurations shall comply with SAE J684 standards for Class II (2) trailers.

3.1.3.5 Hitch Heights

- Pintle couplers are measured from the ground to the bottom of the pintle ring.
- Ball couplers are measured from the ground to the top of the ball socket.

Tongue Angle	2 ½" Pintle	2" Ball	3 Position Pintle	3 Position Ball	6 Position Pintle	6 Position Ball
-1°	18"	18 ¾"	17"-21"	18 ¾"-22 ¾"	17"-27"	18 ¾"-22 ¾"
-4°	13 ¾"	14"	12 ¾"-16 ¾"	14"-18"	12¾"-22¾"	14"-24"

3.1.3.6 Tongue length shall be approximately 54 inches (measured from centerline of 2-inch ball).

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 lighted license plate holder.

3.1.5.4 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 to facilitate easy repair or replacement.

3.1.7 Leveling Jacks

3.1.7.1 Trailer shall be equipped with four (4) swivel type screw jacks, minimum capacity rating of 2,000 pounds, mounted at each corner of the trailer frame.

3.1.7.2 The jacks shall be capable of lifting the trailer frame so trailer wheels and tires can be removed for additional security.

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

3.1.8 Tires and Wheels

3.1.8.1 Tires shall be ST175/80 R13 Load Range C.

3.1.8.2 Wheels shall be 13-inch x 4 1/2-inch, 5-lug pattern (4 1/2-inch bolt circle), white steel wheel.

3.1.8.3 Wheels and tires shall be sized according to load requirements of trailer and axle.

3.2 Main Tower

3.2.1 Main tower shall be attached to trailer frame with removable fasteners to accommodate quick, easy maintenance and repair.

3.2.2 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.

3.2.3 Main mast assembly shall be fabricated from 5" x 1/8" steel tubing with a 1/4-inch thick steel mounting plate secured to the trailer frame with eight (8) 1/2-inch diameter grade 5 bolts. The mast assembly shall be additionally reinforced with four (4) 3" x 3" x 3/16" thick steel gussets to provide for longitudinal and lateral stability.

4. Main Tower

4.1 Dimensions

- 4.1.1 Length Overall (collapsed) – 79.5 in. (202 cm)
- 4.1.2 Height Overall (extended) – 202 in. (513 cm)
- 4.1.3 Max Tower Load Rating – 45 lbs (21 kg)
- 4.1.4 Max Tower Surface Area – 4 sq. ft. (3716 cm)

4.2 Construction

4.2.1 Main Telescoping Tower

- 4.2.1.1 Main tower is to be constructed from four (4) 59-inch long nested sections, square in shape and manufactured from 1/8-inch wall galvanized steel tubing. All rollers, pulleys, and other hardware shall be either nylon, stainless steel or zinc-coated steel to ensure smooth and trouble-free operation for the life of the tower.
- 4.2.1.2 Tower shall be capable of being automatically extended and collapsed by using a minimum 1,000-pound capacity automatic brake type winch with 1/4-inch stainless-steel aircraft type cable.
- 4.2.1.3 Winch shall be zinc-plated to minimize rust and corrosion.
- 4.2.1.4 Winch shall be designed such that the handle can be removed, for added security, without interfering with the operation of the automatic brake.
- 4.2.1.5 Tower sections are stabilized by internal nylon friction pads and external adjustable nylon rollers at the top of each stage. Tower may be deployed at any height from fully retracted to fully extended, and shall be equally stable at any deployed height.
- 4.2.1.6 Tower may include an optional steel or aluminum mount, suitable for a wide array of cameras or sensors, that can be easily attached and removed from the top section with two (2) 3/8- inch diameter bolts.
- 4.2.1.7 Tower shall be capable of supporting equipment up to 45 lbs. (21 kg) with a maximum of 4 sq. ft. (3716 sq. cm) of surface area.

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 at Spring or Fall Equinox (12 hours of daylight, 12 hours of darkness)
- 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: Four (4)
- 5.2.2 Battery type: 6-Volt, heavy duty, deep cycle - Specify Flooded Lead-Acid, Gel-Cell or AGM
- 5.2.3 Energy capacity – 520 Amp Hours nominal (4 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 compartment 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: 110, 160, or 220 Watts (peak) – Specify

NOTE: Solar energy system performance charts are available to assist in selection of appropriate solar array power output requirements

- 5.3.4 Photovoltaic module junction boxes shall be equipped with watertight strain reliefs at all cable entry points.
- 5.3.5 Solar Array may be aimed in any direction, independent of trailer position, at an angle up to 40° from horizontal to allow maximum sun exposure and charging capacity.

5.4 Wiring and Cabling

- 5.4.1 All wiring shall be marine grade, multi-strand, tin-plated copper with PVC insulation rated for outdoor use.
- 5.4.2 All conduit fittings shall be sealed at bulkheads or enclosure entry points.
- 5.4.3 All power system wire terminals shall be tin-plated copper to minimize the effects of galvanic corrosion.
- 5.4.4 Main power wiring shall be 8 AWG minimum.
- 5.4.5 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.
- 5.4.6 Solar panel terminations shall consist of stainless steel screws with #8 tin-plated copper snap spade terminal.
- 5.4.7 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.

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 shall monitor solar array voltage, solar array current, battery voltage, battery current, and ambient temperature and use MPPT (Maximum Power Point Tracking) algorithm based on the monitored inputs to ensure maximum energy transfer from solar array to batteries under all operating conditions.
- 5.5.4 Energy management system control unit shall regulate energy flow from the solar array into the battery bank based on ambient temperature 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 outgoing current 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.
- 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. Documentation**6.1 Operation and Maintenance Manual – available online at www.solartechnology.com**

6.1.1 Setup and Operation

6.1.2 Maintenance

6.1.3 Troubleshooting and Repair

6.1.4 Assembly Diagrams and Parts Lists

6.1.5 Specifications

6.1.6 Appendix

6.2 User Guide – Hard Copy – attached to unit with Nylon lanyard

6.2.1 Pre-transport checklist

6.2.2 Job site setup checklist

6.2.3 Basic programming instructions

6.2.4 Weatherproof card attached to unit with a 5/32-inch diameter nylon lanyard

6.3 Integration Support Documentation – Per request from customer support (1-800-475-5442)

7. Maintenance**7.1 Scheduled Maintenance**

- 7.1.1 Solar Array - Clean with water and mild detergent as needed.
- 7.1.2 Battery Bank - Check electrolyte level once each month and add distilled water as needed. (NOTE: Not required with Gel-Cell or AGM batteries.)

7.2 Preventive Maintenance

- 7.2.1 Inspect and lubricate axle hubs once per year.

8. Warranty

8.1 Standard Warranty

8.1.1 Limited Bumper to Bumper – Five (5) years – consult factory for terms & conditions

8.1.2 Solar Panels – Ten (10) years

9. Options**9.1 Battery Charger**

- 9.1.1 Charger type - Switching regulator, constant voltage with automatic switch to maintenance or trickle charge.
- 9.1.2 Input Voltage – 110 VAC 50/60 Hz (specify 220 VAC 50Hz for international use)
- 9.1.3 Available models with typical recharge times:
 - 45-Amp: 12 hours (4 batteries)
 - 90-Amp: 8 hours (4 batteries)
- 9.1.4 Battery charger unit shall install in the field with minimum effort.