

## Evaluation Table

<b>PEP ID:</b>	<b>XXXXX</b>
<b>Manufacturer:</b>	<b>Name of Manufacturer</b>
<b>Product Name:</b>	<b>Name of Product</b>

736 Highway and Sign Lighting

736 Uninterruptible Power Supply (UPS)

ADOT Standard Specification: Special Provisions Items 7360235, 7360236

Responsible Section: Traffic Group

<b>Product Property</b>	<b>Specification/ Test Method</b>	<b>Requirement</b>	<b>Results</b>	<b>Pass/ Fail</b>
System Components	Item: 7360235 Item: 7360236	UPS system applications must contain the cabinet, UPS inverter module, battery charging monitoring system, remote battery monitoring system, batteries, and universal automatic transfer switch.		
UPS Type	Item: 7360235 Item: 7360236	Shall be a solid-state single phase system capable of protecting 120V circuits.		
Materials: Cabinet	Item: 7360235 Item: 7360236	The meter pedestal cabinet shall conform to ADOT's Standard T.S. 3-5 drawing		
Materials: Battery Supply, min, hrs.	Item: 7360235 Item: 7360236	The cabinet shall accommodate enough batteries to supply 8 hours of full operation, based on 450W rated system.		
Materials: Mode	Item: 7360235 Item: 7360236	Shall allow load shed from full operation mode to flash mode		
Materials: Transfer switch	Item: 7360235 Item: 7360236	The switch shall revert to utility power in the case of complete battery discharge, inverter failure, charger failure, or battery failure.		
Materials: Power disruption	Item: 7360235 Item: 7360236	There shall be on disruption of power to the traffic signal when removing the batteries, for example during battery replacement.		
Material: Backup operation, min, VAC	Item: 7360235 Item: 7360236	The voltage output shall be 120VAC $\pm$ 2% with a frequency of 60 $\pm$ 0.3Hz		
Materials: Transfer time, max, ms	Item: 7360235 Item: 7360236	40 ms from utility power to inverter and from inverter to utility power		

Product Property	Specification/ Test Method	Requirement	Results	Pass/ Fail
Materials: Operating temperature, min range, °F	Item: 7360235 Item: 7360236	-40 to 165°F		
Materials: UL listing	Item: 7360235 Item: 7360236	The UPS shall be UL 1778 listed.		
Cabinet: Weather proofing	Item: 7360235 Item: 7360236	NEMA 3R, with no exposed nuts, bolts, screws, rivets, or fasteners on the exterior of the enclosure.		
Cabinet: Combination	Item: 7360235 Item: 7360236	The UPS shall be furnished with a cast-in-place concrete foundation specified by the manufacturer.		
Cabinet: Thermostat	Item: 7360235 Item: 7360236	Adjustable thermostat controlled fan.		
Cabinet: Receptacle	Item: 7360235 Item: 7360236	A 15 amp receptacle shall be mounted inside the cabinet and wired to the load side of the UPS for maintenance use.		
Cabinet: Shelves	Item: 7360235 Item: 7360236	Two shelves for batteries shall be provided.		
Cabinet: Support Documentation	Item: 7360235 Item: 7360236	One set of cabinet wiring prints, the latest instruction manual, operation manual, and maintenance manual shall be provided with each cabinet.		
UPS Inverter Module: Protection	Item: 7360235 Item: 7360236	Shall be equipped with an integral system to prevent the batteries from destructive discharge and overcharge		
UPS Inverter Module: Display	Item: 7360235 Item: 7360236	Shall have a backlit LCD display easily viewable during daylight hours and include a keypad for navigating the system information		
UPS Inverter Module: Event Counter	Item: 7360235 Item: 7360236	The module shall include a reset front panel event counter display to indicate the number of times the unit was activated and a hour meter to display the total number hours the unit has operated on battery power		
UPS Inverter Module: Ethernet	Item: 7360235 Item: 7360236	The module shall provide an internal Ethernet SNMP Interface		
UPS Inverter Module: Menus	Item: 7360235 Item: 7360236	All configuration and system menus shall be remotely accessible and programmable		

Product Property	Specification/ Test Method	Requirement	Results	Pass/ Fail
UPS Inverter Module: DC connection	Item: 7360235 Item: 7360236	The inverter DC battery connection shall be of the quick disconnect type of ease of maintenance		
Battery Charging Monitoring System (BCMS): Charge & discharge	Item: 7360235 Item: 7360236	The UPS shall include a battery charging management system that is capable of managing the charge and discharge of the battery string		
Battery Charging Monitoring System (BCMS): Charge distribution	Item: 7360235 Item: 7360236	The BCMS shall perform electrical compensation for differences in each individual battery in the string to distribute charge and discharge voltage equally across the batteries		
Battery Charging Monitoring System (BCMS): Charge distribution	Item: 7360235 Item: 7360236	The BCMS shall perform electrical compensation for differences in each individual battery in the string to distribute charge and discharge voltage equally across the batteries.		
Battery Charging Monitoring System (BCMS): Temperature range, °F	Item: 7360235 Item: 7360236	The BCMS shall operate at temperatures range -40 to 165°F.		
Remote Battery Monitoring System (RBMS): Battery bank Health	Item: 7360235 Item: 7360236	When specified RBMS shall monitor all batteries; it shall have the ability to monitor, read and record the battery string and individual internal battery temperatures providing a real-time evaluation of the battery bank health.		
Remote Battery Monitoring System (RBMS): SNMP	Item: 7360235 Item: 7360236	The RBMS shall have SNMP monitoring and management software for communications.		
Remote Battery Monitoring System (RBMS): Polling	Item: 7360235 Item: 7360236	The RBMS shall include software to automatically poll the batteries.		
Remote Battery Monitoring System (RBMS): Voltage and temperature	Item: 7360235 Item: 7360236	The RBMS shall be capable of reading individual battery voltage and temperature, confirming each within its user programmable parameters.		
Remote Battery Monitoring System (RBMS): Intervals	Item: 7360235 Item: 7360236	The RBMS shall have the ability to program the intervals as to when each reading is taken by days, weeks, and months.		

Product Property	Specification/ Test Method	Requirement	Results	Pass/ Fail
Remote Battery Monitoring System (RBMS): Balancer	Item: 7360235 Item: 7360236	The RBMS shall perform as a battery balancer; continuously monitoring all batteries in the string and to interface with the UPS charger voltage/current so to keep the batteries equal with all batteries within the battery string.		
Remote Battery Monitoring System (RBMS): Temperature range, °F	Item: 7360235 Item: 7360236	The RBMS shall operate at a temperature range of -40 to 165°F		
Batteries: Warranty, min, yrs.	Item: 7360235 Item: 7360236	The batteries shall have a 5 year non-prorated manufacturer's warranty		
Batteries: Warranty, min, yrs.	Item: 7360235 Item: 7360236	The batteries shall have a 5 year warranty		
Batteries: Seal and maintenance	Item: 7360235 Item: 7360236	The batteries shall be completely sealed and maintenance-free		
Batteries: Type	Item: 7360235 Item: 7360236	The batteries shall be comprised of float cycle, GEL VRLA (Valve Regulated Lead Acid) or AGM (Absorbed Glass Mat)		
Batteries: Temperature range, °F	Item: 7360235 Item: 7360236	The batteries shall certified to operate at a range of -40 to 165°F		
Batteries: Terminal covers	Item: 7360235 Item: 7360236	The batteries shall have a terminal covers to protect from accidental contact with metallic terminal components		
Batteries: Replace ability	Item: 7360235 Item: 7360236	The batteries shall be easily replaced with all need hardware and shall not require special tools for installation		
Batteries: Battery heater mats	Item: 7360235 Item: 7360236	Battery heater mats should be available for UPS units installed at elevations 5,000 feet or higher		
Universal Automatic Transfer Switch: Continuous Operation	Item: 7360235 Item: 7360236	The universal automatic transfer switch shall enable providing continuous operation of the traffic signal system either with conditioned line power, battery backup power, or direct utility power		
Universal Automatic Transfer Switch: Combination switches	Item: 7360235 Item: 7360236	The switch should be a combination of automatic and manual transfer switch rated at 120VAC-30 AMP		

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Universal Automatic Transfer Switch: Bypass	Item: 7360235 Item: 7360236	The automatic transfer switch used as a three-stage bypass that allows for the UPS to be bypassed and still maintain the ability to keep batteries fully charged. Acting as a fail-safe device by switching critical load to the utility line should a fault occur within the UPS including standard manual bypassing switch for replacing batteries		
Warranty: Entire system, min, yrs.	Item: 7360235 Item: 7360236	The UPS shall include a minimum five-year manufacturer's warranty on parts for the entire system		