

## 1.0 PERFORMANCE SPECIFICATIONS FOR SATELLITE™ SERIES FIXTURES

### 1.1 Power Supply Driver Specifications

- Power supply must have a 3<sup>rd</sup> party independently tested Mean Time Between Failure (MTBF) Rating to international standard Telcordia SR-332
- Manufacturer to provide projected failures per year per 10,000 lights based on reliability equation  $R = e^{-(\text{time}/\text{MTBF})}$
- Minimum Mean Time Between Failure Ratings of the Following:

<u>SAT-M Series</u>	<u>SAT-S Series</u>
i) 2,300,000 hours @ 280mA drive current	i) 3,300,000 hours @ 280mA drive current
ii) 1,400,000 hours @ 600mA drive current	ii) 2,100,000 hours @ 600mA drive current
- Letter of certification from the manufacturer shall be provided which confirms that the following parts/processes are not included in the power supply driver
  - i) Commercial-grade electrolytic capacitors
  - ii) Potentiometers
  - iii) Opto-couplers
  - iv) Potting compounds
- Available in the following drive currents: 280mA, 350mA, 450mA, 525mA, and 600mA
- Rated for a minimum of 88,000 hours (approximately 20 years based on 12h/day on-time)
- All capacitors used must be aircraft grade and have a minimum life rating of 110,000 hours at 85°C/185°F
- Maximum 600 mA operating current
- RoHS compliant and lead free
- Surge protection devices compliant with ANSI standard C62.41-2002 Class C High (10kV, 10kA)
- Tested to IEC 61000-4-5 (6kV, 3kA), compliant with European Union CE requirements

**1.2 LED Fixture Testing Standards** - The LED fixtures shall comply with the following standards and specifications. Necessary testing shall be from an approved laboratory. Copies of qualifying reports shall be provided.

- ANSI C62.41 Surge Voltages in Low Voltage AC Power Circuits
- ANSI C136.10 Locking-type Photocontrol Devices and Mating Receptacles
- ANSI C136.15 Luminaire Field Identification
- ANSI C136.31 Roadway Luminaire Vibration
- ANSI C136.37 Solid State Light Sources Used in Roadway and Area Lighting
- ANSI C136.3 Roadway Luminaire Attachment - min. of +/- 3° tilt of luminaire about the tenon when mounting.
- IES/ANSI RP-8 American National Standard Practice for Roadway Lighting
- EN-61000-3-2 Harmonic Current Emissions
- IES LM-79-08 Electric and Photometric Measurements of Solid State Lighting Products
- IES LM-80-08 Measuring Lumen Maintenance of LED Light Sources
- NEMA IEC60529 Degrees of Protection Provided by Enclosures - IP Code
- Telcordia SR-332 Electronic Equipment Reliability Standard
- ASTM B117 Salt Spray Test Standard
- MIL-STD-810F Rain/Ice Test Standard
- CIE – 115 2010 Lighting of Roads for Motor and Pedestrian Traffic
- Tested to Category 5 Hurricane winds (256kph/155mph)
- Underwriters Laboratories (UL) – cULus marking is available on all products rated 120V-240V
- QPS (NRTL) - cQPSus mark is available on all products rated 120-240V, 277-480V
- NOM (Mexico) – NOM mark is available on all products rated 120-240V, 277-347V

### 1.3 LED Specification

- LEDs shall be 5000K (±500), with a minimum CRI of 65
- LED LM-80 data shall demonstrate a lumen maintenance of 99% or greater at 55°C/131°F @ 6,000 hours with drive current testing at either 350mA, 700mA, or 1000mA
- LEDs shall be six (6) die chips; single die LEDs shall not be permitted

#### 1.4 Fixture Housing

- Single-piece die cast aluminum alloy A360 housing
- Shall not contain extruded aluminum or inserts, and shall not have multiple pieces screwed, bolted, or fastened together by any other means
- Available in painted finish (E-coat primer with durable polyester powdercoat topcoat).
- Mass no greater than 11.4 kg/25 lbs
- EPA no greater than 0.7 ft<sup>2</sup>
- Area between heat sink fins shall be angled to achieve a self-cleaning design and to prevent debris build-up; horizontal or flat heat sinking systems shall not be acceptable due to the lack of self-cleaning design
- Terminal block compartment accessible via a single trigger-latch based tool-less entry system

#### 1.5 Thermal Management System

- Heat sink fins to be integral with the single-piece cast body
- Heat sink system shall be passive. Systems relying on venting holes, grills, or slots shall not be permitted
- Light engine must consist of aluminum core circuit boards clad directly to the cast aluminum housing
- All LEDs shall have a maximum rated junction temperature (Tj) of 135°C / 275°F
- System shall maintain minimum LED junction temperatures as per the following table (ambient T=20°C/68°F):

Operating Current	LED Tj (junction temperature)	Degrees below LED's maximum rated Tj (135°C/275°F is max junction temp)	LED Max Rated Tj
280mA	42°C/108°F	93°C/167°F	135°C/275°F
350mA	47°C/117°F	88°C/158°F	135°C/275°F
450mA	55°C/131°F	80°C/144°F	135°C/275°F
525mA	63°C/145°F	72°C/130°F	135°C/275°F
600mA	69°C/156°F	66°C/119°F	135°C/275°F

#### 1.6 Fixture Design and Performance

- Dark Sky compliant
- IP 66 Ingress Protection for both light engine chamber and power supply chamber
- Operating Temperature Range -40°C to +60°C/ -40°F to +140°F
- Adjustable Pole Mount Connection 1.625" to 2.375" / 42 to 60 mm O.D.
- Power terminals sized for #14 AWG to #6 AWG wire and accessible from underside of fixture
- IESNA Distributions - Type II and Type III
- Two independent LED light engines are to be angled at 30° to a horizontal roadway in order to maximize targeted lumen output (i.e. high throwing power) for maximum energy savings
- LEDs must be surface-mounted to light engine circuit board; no pin through-hole LEDs shall be permitted
- LED fixture minimum efficacy as per the following tables (5000K, 120 V):

LED Driver Operating Current	LED Fixture Efficacy*
280mA	96 Lm/W
350mA	92 Lm/W
450mA	86 Lm/W
525mA	81 Lm/W
600mA	78 Lm/W

\*Data based on a Type II distribution pattern.

**1.7 Manufacturing Facility** - The LED fixture assembly/manufacturing facility shall have the following designations. Copies of recognized certifications shall be included with the proposal.

- ISO 9001 Quality Management Systems (*submit copy of certificate*)
- Restriction of Hazardous Substances (RoHS) certification by IPC for the light engine manufacturing facility and power supply manufacturing facility (*submit copy of certificates*)
- Electrostatic Discharge (ESD) flooring throughout production area of the light engine manufacturing facility and power supply manufacturing facility (*submit photographs of production floor in both facilities*)
- Nitrogen plumbed into soldering processes to improve quality yield (*submit photographs of nitrogen tank in power supply and light engine manufacturing facilities*)
- LEDs must be stored in moisture-proof cabinets prior to production (*submit photographs of cabinets in the light engine manufacturing facilities*)
- No less than five (5) years of experience in manufacturing LED-based lighting products
- All production staff in power supply, light engine, and fixture assembly facilities to be certified to IPC EDU 101