DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA
STANDARD SPECIFICATION

Section 927 –Luminaires, LED

927.1 General Description

This section includes the requirements for LED (Light Emitting Diode) luminaires.

927.1.01 Related References

A. Standard Specifications

General Provisions 101 through 150.

Section 680 – Highway Lighting

Section 681 – Lighting Standards and Luminaires

B. Referenced Specifications

ANSI/IES Types (specified on Plans)

927.2 Materials

Use luminaires that are complete, including driver, LED, surge protection device (SPD), and associated hardware and wiring.

927.2.01 Luminaires

A. Requirements

Ensure that LED luminaires meet the following requirements:

- Certified by Nationally Recognized Testing Laboratories (NRTL) as defined by the U.S. Department of Labor. The testing laboratory must be listed by OSHA in its scope of recognition for the applicable tests being conducted as required by this specification. A list of recognized testing labs for products sold in the United States may be found on the U.S. Department of Labor's web site:
- Certification mark by a NRTL as being in compliance with UL 1598 and suitable for use in wet locations.
- Ensure LED light source(s) and driver(s) are RoHS compliant.
- International Electrotechnical Commission (IEC) 529 Ingress Protection (IP) rating of IP66 or greater is used for all luminaires.
- Comply with Electro Magnetic Interference (EMI) requirements as defined by FCC 47 Sub Part 15; CISPR15, CISPR22 Class A (120Vmin).
- Perform testing according to the Illuminating Engineering Society of North America (IESNA) LM-79 and LM-80
    a. Supply testing and data in compliance with LM-79 from a National Institute of Standards and Technology (NIST) National Voluntary Laboratory Accreditation Program (NVLAP) accredited laboratory.
- Listed and labeled in accordance with the U.S. Department of Energy Lighting Facts Program:http://www.lightingfacts.com/default.aspx?cp=content/products

B. Housing

Ensure the housing for LED luminaires meet the following requirements:

- Provide aluminum housing.
    a. If die cast aluminum housing is provided, use Aluminum alloy that is A360 or A380 compliant.
- Anodized and/or painted or powder coated with a minimum thickness of 2.0 mil to increase corrosion resistance. Finish color to be gray unless otherwise specified on plans. Luminaire finish to be tested to withstand a 2000-hour salt spray test in accordance with ASTM B117.
- All hardware on the exterior of the housing including cover and latch to be stainless steel, zinc or steel with zinc alloy electroplate and chromate top coat.
- Ensure roadway luminaires are easy to open when properly mounted or when sitting on its top side when placed on the ground without the use of tools. Ensure underpass luminaires are vandal-proof.
- Have readily accessible internal parts.
- Provisions for a slip fitter type mounting on nominal 2" (2-3/8" OD) pipe brackets.
- Slip fitter mount is to allow a minimum 4 inches of the pole bracket to be inserted in the luminaire mounting assembly.
    a. The mounting assembly is to permit any necessary adjustment to orient the luminaire with the roadway for proper light distribution.
- Ensure the total weight of luminaire(s) and accessories do not exceed the load capacity of the pole and arm.
- Compliant with American National Standard (ANSI) IEEE C136.31 Roadway Lighting Equipment - Luminaire Vibration for both normal applications and bridge and overpass applications.
- Provide luminaires with a flat area on the top of the housing to allow a level to be used for proper orientation of the Luminaire, or supply luminaires with an integral bubble level.
- Provide luminaires that are capable of accommodating a photo-electric control receptacle (PECR). When used (see plans for applicability) the PECR to be rotatable up to 359 degrees. Housing is to provide 360 degree stop to prevent the internal twisting of PECR wire assemblies resulting in potential electrical short.
- Designed to allow water shedding.
- Passive cooling method to be employed with no energized or moving components to manage thermal output of LED light engine and power supply.

C. Electrical Requirements

Ensure that LED luminaires meet the following electrical requirements:

- Electronic components capable of fully operating in a temperature range -40ºC to +50ºC (-40º F to 122°F).
- Have an integral power supply.
- Equipped with a power supply that operates within the voltage range specified in the plans.
- Equipped with a power supply that has a power factor of .90 or greater at full load.
- Equipped with a power supply that has total harmonic distortion of 20% or less at full load.
- Provide lumen output sufficient to meet the lighting criteria as specified in the Plans.
- Equipped with an isolated power supply output.
- Equipped with a power supply that has overheat protection.
- Equipped with a power supply that is self-limited short circuit protected and over load protected.
- Equipped with a power supply that is terminated with quick disconnect wire harnesses for easy maintenance. Wire nut termination is not acceptable.

- Equipped with a terminal block for terminating pole wiring to the luminaire. The terminal block is to be a 3 station, tunnel lug terminal board that accommodates up to #8 AWG wire.
- Have a life rating on all electrical components of 100,000 hours or greater when operating at a continuous 25°C ambient.
- Electrical components protected per ANSI/IEEE standard C62.45; test waveform is to be as described in ANSI/IEEE C62.41.2; and type Category C environments as defined in ANSI/IEEE C62.41.1
- Equipped with a UL-labeled, 3-wire surge protective device (SPD) that provides common and differential mode protection and an inductive filter circuit that reduces the amount of energy passed through to the electronics during a surge event. SPD to be thermally fused and have failure mode such that luminaire is off if SPD fails. SPD to provide IEEE/ANSI C62.41 Category C (10kV/5kA) level of protection for the entire luminaire.

D. LED Performance Requirements

Ensure that LED luminaires meet the following performance requirements:

- Fully operate in a temperature range -40ºC to +50ºC (-40º F to 122°F).
- No more than a 15% reduction in LED's lumen output due to the operating temperature of the luminaire, compared to the LED's lumen output when it is operating at 25°C.
- Deliver an average 80% of initial delivered lumens after 100,000 hours of operation when operated at 25°C.
- A minimum rated life of 70,000 hours when operated at 25° C (77° F).
- Luminaire efficacy of a minimum of 70 lumens/watt.
- Meet the Chromaticity requirements as follows:
  a. The colors conform to the following color regions based on the 1931 CIE chromaticity diagram.
     1) Color Temperature: 4000K (3710-4260K)
     2) Color Rendering Index (CRI): greater than or equal to 60
  b. Intensity and Chromaticity as stated above must be confirmed by an independent test lab.

E. Optical Requirements

Ensure that LED luminaires meet the following optical requirements:

- Luminaire housing is to be a completely sealed optical system with a (IEC) (IP) rating of 66 or greater.
- The light distribution pattern at the road surface is to have an evenly dispersed appearance.
- Provide the IES pattern as identified on the Plans.

F. Fabrication

General Provisions 101 through 150.

G. Acceptance

1. General Provisions 101 through 150.
2. Each Luminaire to be evaluated by the Department for proper operation under a 30 day burn-in period after installation. If any failures are found in the first 30 days after installation, the Luminaire is to be replaced at no cost to the Department and be evaluated for another 30 days from the time of its installation. The system is acceptable when all luminaires pass the 30 day burn-in period with no failures.

H. Materials Warranty

1. General Provisions 101 through 150.

2. The entire Luminaire assembly including material, finish, workmanship, power supply, LED modules and lumen maintenance is to have a minimum of five (5) year warranty from the date of installation. On-site replacement includes transportation, removal and installation of new products. Finish warranty includes deterioration such as blistering, cracking, peeling, chalking or fading.