

**LUMINAIRE:
LED, 350mA, 4000k, 70 CRI, 120V
COBRAHEAD STYLE**

**To be used in construction of ;
* AGLER ROAD STREET LIGHTING PILOT PROJECT ONLY ***

I. Quantity

The base bid shall include the indicated number of Light Emitting Diode (LED) luminaires complete with electronic power supply and surge protection installed. The luminaire is to be wired, and erected as hereinafter specified.

II. Material

A. General Characteristics

- 1.1 Luminaire shall be as specified for in Appendix A.
- 1.2 Luminaire shall have an external label per ANSI C136.15
- 1.3 Luminaire shall have an internal label per ANSI C136.22
- 1.4 Luminaire shall be IP-66 rated.
- 1.5 Luminaire shall be UL listed for wet location installation in 40 degrees C ambient temperature per UL-1598 or CSA C22.2 number 250.
- 1.6 Luminaires shall be rated for the ANSI C136.31 Vibration Level indicated in Appendix A.
- 1.7 Nominal luminaire input wattage shall account for nominal applied voltage and any reduction in driver efficiency due to sub-optimal driver loading.
- 1.8 Entire LED luminaire assembly, including housing, light source(s) and driver(s) shall be RoHS compliant.
- 1.9 All internal components shall be assembled and pre-wired using modular electrical connections
- 1.10 Utility supply wiring shall terminate on a barrier type terminal block secured to housing. Terminals shall be suitable for # 10 AWG copper wire.

- 1.11 Luminaire shall start and operate in -20°C to +40°C ambient temperature.
- 1.12 Luminaire shall be designed for ease of component replacement and end-of-life disassembly.

B. Luminaire Construction

- 1.1 The luminaire shall be constructed with a die cast aluminum housing, consisting of low copper aluminum.
- 1.2 The luminaire shall be finished with a TGIC polyester powder coat paint applied after pre treatment.
- 1.3 The luminaire shall be attached by means of a slip-fitter connection to a 2" IPS bracket. The slip-fitter shall include means for securely attaching the luminaire and shall also provide for adjustment of approximately 5 degrees above or below horizontal. Slip-fitter bolts shall be a minimum of 3/8" diameter. The slip-fitter shall be totally enclosed in luminaire housing.
- 1.4 The assembly shall be drip proof and insect proof.
- 1.6 The entire unit shall be pre-wired to 120 volts, and ready for installation.

C. Power Supply (LED driver):

Each luminaire shall be furnished with an internally mounted 120 volt electronic power supply (LED driver) that conforms to the following specifications:

- 1.1 The LED driver shall be installed inside an electrical enclosure.
- 1.2 Wiring inside electrical enclosure shall comply with 600V/105°C rating or higher
- 1.3 The LED driver shall have a "Class A" sound rating.
- 1.4 The LED driver shall be Class 2 rated as per UL 1310
- 1.5 The LED driver shall comply with UL standard UL1012.
- 1.6 The LED driver shall have a minimum operating range of -25 °C to 40°C.

- 1.7 The LED driver has a life expectancy of 50,000 hours at Tcase of $\leq 75^{\circ}\text{C}$.
- 1.8 The LED Driver shall have a life expectancy of 100,000 hours at a Tcase of $\leq 65^{\circ}\text{C}$.
- 1.9 The LED driver shall have a typical self rise of 25°C at maximum load in open air without heat sink.
- 1.10 The LED driver shall have a maximum allowable case temperature of 80°C .
- 1.11 The LED driver shall reduce output power to LEDs if its maximum allowable case temperature is exceeded.
- 1.12 The LED driver shall have a failure rate of $\leq 0.01\%$ per 1,000 hours.
- 1.13 The LED driver shall tolerate sustained open circuit and short circuit output conditions without damage.
- 1.14 The LED driver shall accept the voltage or voltage range indicated in Appendix A at 50/60 Hz, and shall operate normally for input voltage fluctuations of plus or minus 10 percent.
- 1.15 The LED driver complies with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47 CFR Part 15 Non-Consumer (Class A).

D.. Surge Supression

Each luminaire shall be furnished with an internally mounted minimum 10 KV surge suppressor that is tested to ANSI/IEEE C62.41-2002 specification for 120 volt operation.

E. Photocontrol

Each Luminaire shall be furnished with a NEMA Twistlock photo electric cell receptacle installed on the top of the housing. The receptacle shall be a 3-prong twist lock type conforming to ANSI standard C136.10 and have the capability to be directionally adjustable without tools. The photocontrol must be solid state, and designed specifically for operation with LED luminaries. The photocontrol must have a minimum design Life of 90,000 hours.

III. Optical Performance

- A Each luminaire shall meet LM70 specifications for optical performance based on 4000K / 80,000 hours of operation at 40 degrees Celsius.
- B Each luminaire shall have a Minimum Efficacy of 75 LPW in 40° C ambient conditions.
- C Each luminaire shall have a minimum L70 Life of 80,000 hours in 40° C Ambient (based on Driver being used in fixture). For calculation purposes, Lamp Lumen Depreciation will be determined at 80,000 hours. It is the responsibility of each manufacturer to provide a calculation of lamp lumen depreciation (LLD) and luminaire dirt depreciation (LDD) for each photometric file used. LLD shall be based on actual lumen depreciation values reached at 80,000 hours at 40° C luminaire ambient and as proven by LM80 back-up information
- D Lamp Lumen Depreciation Factor shall be supported by LM-79 data.
- E Luminaire Dirt Depreciation (LDD) used in calculations shall be 0.85 for UV Stabilized Acrylic Optics and 0.90 for Glass Optics.
- F Optical system components shall be rated at IP66 to protect against water, dirt, and insect infiltration
- G. Optical system shall be designed with an innovative optic that distributes light evenly across the roadway to achieve a uniform light pattern. Target area being illuminated by fixture must be fully maintained in the event of failure of any individual LED.
- H. Light loss factor used for photometric layout calculations shall be .912 or less
- I. Lumen maintenance shall be a minimum of 70% over 80,000 hours of life when operating at temperatures of 40° C (104° F) or less
- J. The luminaire shall continue to operate and maintain the minimum optical performance criteria for the particular application in which it is installed. The minimum optical performance is defined by the application installation, in conjunction with City of Columbus, Division OF Power and Water (Power) - DOPW(P) Guidelines for Street Lighting Circuit Layout.

IV Testing / Certifications

- A. The luminaire shall conform to the following testing requirements and regulatory certifications.
1. ANSI C136:31 2001 for 100,000 cycles at 3G acceleration for normal road and bridge applications
 2. UL/CUL listed, suitable for wet locations per UL 1598 or CSA C22.2 number 250
 3. The luminaire shall be IP-66 rated per IEC60068-2-3 1987
 4. LM-79 Optical performance tests shall be conducted in accordance with IESNA standard practices for solid state lighting
 5. Luminaire components and applied finishes shall pass the 1000 hour salt/fog test per the ASTM B117 standard
 6. The luminaire shall certified to with a BUG (Backlight, Uplight, Glare) rating of B-1; U-0; G1

V Warranty

- A. The luminaire shall be provided with an all inclusive warranty for a period of no less than 7 years. This warranty shall cover the entire luminaire assembly, including all electrical and non-electrical components for the above term. This warranty shall also cover the cost of additional labor to replace defective luminaires within the warranty period. This cost shall be defined based on current industry standard charges to replace a luminaire. Negligible light output from more than 10 percent of the LED packages constitutes luminaire failure.

VI. Installation

- A. The luminaire shall be installed on the bracket as shown on the drawings. Orientation and leveling of the units shall be so as to provide for uniform appearance, maximum lighting efficiency and ease of maintenance.

VII. Information Required

- A. Bidders shall also provide complete performance data on the luminaire they propose to furnish. The data submitted shall contain at least the following information:
1. Completed luminaire submittal form (attached to this \document)
 2. Utilization Curves
 3. Isolux Lines of Horizontal Foot-candles from a single unit
 4. Total Wattage of Fixture
 5. Isocandle Curves from Photometric Test
 6. Luminaire cut sheets
 7. Cut sheets for LED light sources
 8. Cut sheets for LED driver
 9. Cut sheets for surge protection device
 10. Completed LM-79 Test report certified by a National Voluntary Laboratory Accreditation Program (NVLAP) accredited facility for the LM-79 testing procedure. .

VIII. Quotation

- A. The complete Light Emitting Diode (LED) luminaire shall be quoted as a unit price in the appropriate section of this document.

IX References

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by their basic designation only. Versions listed shall be superseded by updated versions as they become available.
- 1 American National Standards Institute (ANSI)
 - A. C136.2-2004 (or latest), American National Standard for Roadway and Area Lighting Equipment—Luminaire Voltage Classification.
 - B. C136.10-2010 (or latest), American National Standard for Roadway and Area Lighting Equipment - Locking-Type Photocontrol Devices and Mating Receptacle Physical and Electrical Interchangeability and Testing.
 - C. C136.15-2011 (or latest), American National Standard for Roadway and Area Lighting Equipment – Luminaire Field Identification.

- D. C136.22-2004 (R2009 or latest), American National Standard for Roadway and Area Lighting Equipment – Internal Labeling of Luminaires.
- E. C136.25-2009 (or latest), American National Standard for Roadway and Area Lighting Equipment – Ingress Protection (Resistance to Dust, Solid Objects and Moisture) for Luminaire Enclosures.
- F. C136.31-2010 (or latest), American National Standard for Roadway Lighting Equipment – Luminaire Vibration.
- G. C136.37-2011 (or latest), American National Standard for Roadway and Area Lighting Equipment - Solid State Light Sources Used in Roadway and Area Lighting.

2. American Society for Testing and Materials International (ASTM)

- A. B117-09 (or latest), Standard Practice for Operating Salt Spray (Fog) Apparatus
- B. D1654-08 (or latest), Standard Test Method for Evaluation of Painted Or Coated Specimens Subjected to Corrosive Environments
- C. D523-08 (or latest), Standard Test Method for Specular Gloss
- D. G154-06 (or latest), Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials

3. Council of the European Union (EC)

- A. RoHS Directive 2002/95/EC, on the restriction of the use of certain hazardous substances in electrical and electronic Equipment

4. Federal Trade Commission (FTC)

- A. Green Guides, 16 CFR Part 260, Guides for the Use of Environmental Marketing Claim

5. Illuminating Engineering Society of North America (IESNA)
 - A. DG-4-03 (or latest), Design Guide for Roadway Lighting Maintenance
 - B. HB-10-11 (or latest), IESNA Lighting Handbook, 10th Edition
 - C. LM-50-99 (or latest), IESNA Guide for Photometric Measurement of Roadway Lighting Installations
 - D. LM-61-06 (or latest), IESNA Approved Guide for Identifying Operating Factors Influencing Measured Vs. Predicted Performance for Installed Outdoor High Intensity Discharge (HID) Luminaires
 - E. LM-79-08 (or latest), IESNA Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products
 - F. LM-80-08 (or latest), IESNA Approved Method for Measuring Lumen Maintenance of LED Light Sources.
 - G. RP-8-00 (or latest), ANSI / IESNA American National Standard Practice for Roadway Lighting
 - H. RP-16-10 (or latest), ANSI/IESNA Nomenclature and Definitions for Illuminating Engineering
 - I. TM-3-95 (or latest), A Discussion of Appendix E - "Classification of Luminaire Lighting Distribution," from ANSI/IESNA RP-8-83
 - J. TM-15-11 (or latest), Luminaire Classification System for Outdoor Luminaires
 - K. TM-21-11 (or latest), Projecting Long Term Lumen Maintenance of LED Light Sources
6. Institute of Electrical and Electronics Engineers (IEEE)
 - A. IEEE C62.41.2-2002 (or latest), IEEE Recommended Practice Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits

- B. ANSI/IEEE C62.45-2002 (or latest), IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits
7. National Electrical Manufacturers Association (NEMA)
- A. ANSI/NEMA/ANSI C78.377-2008 (or latest), American National Standard for the Chromaticity of Solid State Lighting Products
8. National Fire Protection Association (NFPA)
- A. 70 – National Electrical Code (NEC)
9. Underwriters Laboratories (UL)
- A. 1449, Surge Protective Devices
 - B. 1598, Luminaires
 - C. 8750, Light Emitting Diode (LED) Equipment for Use in Lighting Products

LUMINAIRE SUBMITTAL FORM
MATERIAL SPECIFICATION
Appendix –A-
LUMINAIRE TYPE ”

Catalog Number _____

Manufacturer _____

BENCHMARK LUMINAIRE:		
	Lamp wattage and type	
	Initial downward luminaire output (lumens below horizontal)	
	Light loss factor	
LENS:		
	<input type="checkbox"/> Flat (“cutoff” style) <input type="checkbox"/> Sag/drop	
IES¹ FORWARD TYPE:		
	<input type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV <input type="checkbox"/> V <input type="checkbox"/> VS	
IES¹ LATERAL TYPE:		
	<input type="checkbox"/> Very short <input type="checkbox"/> Short <input type="checkbox"/> Medium <input type="checkbox"/> Long <input type="checkbox"/> Very long	
PERFORMANCE CRITERIA: LED LUMINAIRE		
INPUT POWER:	Max. nominal luminaire input power	
NOMINAL CCT:	Rated correlated color temperature	4000 K
PHOTOPIC² DOWNWARD LUMINAIRE OUTPUT:	Minimum <i>maintained</i> luminaire output below horizontal	
BUG³ RATING:	Max. nominal backlight-uplight-glare ratings	B1-U0-G1
VOLTAGE:	Nominal luminaire input voltage	120 V
FINISH:	Luminaire housing finish color	Gray
WEIGHT:	Maximum luminaire weight	
EPA:	Maximum effective projected area	
MOUNTING:	Mtg. method	<input type="checkbox"/> Post-top <input checked="" type="checkbox"/> Side-arm <input type="checkbox"/> Trunnion/yoke <input type="checkbox"/> Swivel-tenon
	Tenon nominal pipe size (NPS)	2 inches
VIBRATION:	ANSI test level	<input checked="" type="checkbox"/> Level 1 (normal) <input type="checkbox"/> Level 2 (bridge/overpass)
DRIVER:	Control signal interface	<input checked="" type="checkbox"/> Not required <input type="checkbox"/> Required

¹ See IES TM-3 and TM-15 for an explanation of this classification system. “Very” indicates out of defined range.

² Mesopic multipliers are not applicable if speed limit and/or adaptation luminance are unknown.

³ The deprecated “cutoff” classification system cannot be accurately applied to LED luminaires.

