SP- 154040
(New)

SPECIAL PROVISIONS
FOR
LED ROADWAY LUMINAIRES

Pottawattamie County
HDP-1642(680)--71-78

Effective Date
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THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

1.0 NORMATIVE REFERENCES

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 Versions listed shall be superseded by updated versions as they become available.

American National Standards Institute (ANSI)

- C78.377-2011 (or latest), American National Standard for the Chromaticity of Solid State Lighting Products
- C82.77-2002 (or latest), American National Standard for Harmonic Emission Limits -- Related Power Quality Requirements for Lighting Equipment
- C136.2-2014 (or latest), American National Standard for Roadway and Area Lighting Equipment – Dialectric Withstand and Electrical Immunity Requirements
- C136.10-2010 (or latest), American National Standard for Roadway and Area Lighting Equipment -- Locking-Type Photocontrol Devices and Mating Receptacles -- Physical and Electrical Interchangeability and Testing
- C136.15-2011 (or latest), American National Standard for Roadway and Area Lighting Equipment -- Luminaire Field Identification
- C136.22-2004 R2009 (or latest), American National Standard for Roadway and Area Lighting Equipment -- Internal Labeling of Luminaires
- C136.31-2010 (or latest), American National Standard for Roadway Lighting Equipment -- Luminaire Vibration
- C136.37-2011 (or latest), American National Standard for Roadway and Area Lighting Equipment -- Solid State Light Sources Used in Roadway and Area Lighting
- C136.41-2013 (or latest), American National Standard for Roadway and Area Lighting Equipment -- Dimming Control Between an External Locking Type Photocontrol and Ballast or Driver

American Society for Testing and Materials International (ASTM)

- B117-11 (or latest), Standard Practice for Operating Salt Spray (Fog) Apparatus
- D523-08 (or latest), Standard Test Method for Specular Gloss
- D1654-08 (or latest), Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
- G154-06 (or latest), Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials

ENERGY STAR®

- ENERGY STAR TM-21 Calculator, rev. 020712 (or latest, www.energystar.gov/TM-21Calculator)

Federal Communications Commission (FCC)

- 47 CFR Part 15, Telecommunication – Radio Frequency Devices

Federal Trade Commission (FTC)

- Complying with the Made in USA Standard, December 1998 (http://business.ftc.gov/advertising-and-marketing/made-usa)

- Green Guides, 16 CFR Part 260, Guides for the Use of Environmental Marketing Claims

Illuminating Engineering Society of North America (IESNA or IES)

- LM-50-13 (or latest), IES Approved Method for Photometric Measurement of Roadway and Street Lighting Installations

- 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

- LM-63-02 (R2008 or latest), ANSI/IESNA Standard File Format for the Electronic Transfer of Photometric Data and Related Information

- LM-79-08 (or latest), IESNA Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products

- LM-80-08 (or latest), IESNA Approved Method for Measuring Lumen Maintenance of LED Light Sources

- RP-8-00 (or latest), ANSI / IESNA American National Standard Practice for Roadway Lighting

- RP-16-10 (or latest), ANSI/IES Nomenclature and Definitions for Illuminating Engineering

- TM-3-95 (or latest), A Discussion of Appendix E - "Classification of Luminaire Lighting Distribution," from ANSI/IESNA RP-8-83

- TM-15-11 (or latest), Luminaire Classification System for Outdoor Luminaires

- TM-21-11 (or latest), Projecting Long Term Lumen Maintenance of LED Light Sources

International Electrotechnical Commission (IEC)

- 60929 Annex E, Control Interface for Controllable Ballasts (0-10V)

- 62386, Digital Addressable Lighting Interface (DALI)

LED Lighting Facts

- Submission Requirements (http://www.lightingfacts.com/About/Content/Manufacturers/SubmissionRequirements)

Municipal Solid-State Street Lighting Consortium (MSSLC)

- Model Specification for Networked Outdoor Lighting Control Systems, V2.0 (or latest)

National Electrical Manufacturers Association (NEMA)

- LSD 63-2012, Measurement Methods and Performance Variation for Verification Testing of General Purpose Lamps and Systems

Underwriters Laboratories (UL)

- 1598 Third Edition (or latest), Luminaires

2.0 RELATED DOCUMENTS – NOT USED

3.0 DEFINITIONS

3.1 Lighting terminology used herein is defined in IES RP-16. See referenced documents for additional definitions.

3.1.1 Exception: The term "driver" is used herein to broadly cover both drivers and power supplies, where applicable.

3.1.2 Clarification: The term "LED light source(s)" is used herein per IES LM-80 and TM-21 to broadly cover LED package(s), module(s), and array(s).

4.0 PRODUCT REQUIREMENTS

4.1 Tabulated summary of key parameters and product criteria

4.2 This specification applies to luminaires for new installations or replacements at signalized highway intersections within the City of Council Bluffs.

Luminaire Designation: "250W HPS Equivalent LED"

PERFORMANCE CRITERIA LED LUMINAIRE					
INPUT POWER	Maximum nominal luminaire input power				108 W
VOLTAGE	Nominal luminaire input voltage (or range as applicable)				120 V
LUMEN MAINT.	Minimum % of initial output at 36,000 hours operation				90%
WARRANTY	Minimum luminaire warranty				10 years
NOMINAL CCT	Rated correlated color temperature				4000 ± 350 K
BUG RATING	Maximum nominal backlight-uplight-glare ratings				B2-U0-G2
DOWNWARD OUTPUT	Minimum *maintained* luminaire output below horizontal				10,800 lm
FINISH	Luminaire housing finish color				Gray
WEIGHT	Maximum luminaire weight				30 lb
LIGHT DISTRIBUTION	Distribution Type and Range				TYPE III Medium
MOUNTING	Mtg. method	☐ Post-top	☑ Side-arm	☐ Trun./yoke	☐ Swivel-tenon
	Tenon nominal pipe size (NPS)				2 inches
VIBRATION	ANSI C136.31	☑ Level 1 (normal)	☐ Level 2 (bridge/overpass)		
THERMAL ENVIRONMENT	Typical minimum ambient temperature during operation				-20 °C
	Typical maximum ambient temperature during operation				40 °C
ELECTRICAL IMMUNITY	ANSI C136.2 Comb. Wave Test Level	☑ Basic (6kV / 3kA)	☐ Enhanced (10kV / 5kA)		☐ Elevated (20kV / 10kA)
CONTROL INTERFACE	☐ None	☐ ANSI C136.10, 3-pin	☑ ANSI C136.41, 5-pin		☐ ANSI C136.41, 7-pin
LED DRIVER	☐ Not dimmable	☑ Dimmable, 0-10V (IEC 60929)	☐ Dimmable, DALI (IEC 62386)		

4.3 General requirements

4.3.1 Luminaires shall satisfy the key criteria summarized in section 4.1

4.3.2 Transmissive optical components shall be applied in accordance with OEM design guidelines to ensure suitability for the environment (e.g., electromagnetic, thermal, mechanical, chemical)

4.3.3 Luminaire shall be designed for ease of component replacement and end-of-life disassembly

4.3.4 LED light source(s) and driver(s) shall be RoHS compliant

4.3.5 Nominal luminaire input wattage shall account for nominal applied voltage and any reduction in driver efficiency due to sub-optimal driver loading

4.3.6 Luminaire shall accept the voltage or voltage range specified at 50/60 Hz, and shall operate normally for input voltage fluctuations of plus or minus 10 percent

4.3.7 All internal components shall be assembled and pre-wired using modular electrical connections

4.3.8 The following shall be in accordance with corresponding sections of ANSI C136.37

4.3.8.1 Wiring and grounding

4.3.8.2 Terminal blocks for incoming AC lines (electrical mains wires)

4.3.8.3 Photocontrol receptacle

4.3.8.4 Latching and hinging

4.3.8.5 Mounting provisions

4.3.8.6 Ingress protection

4.4 Painted or finished luminaire surfaces exposed to the environment

4.4.1 Shall exceed a rating of six per ASTM D1654 after 1000 hours of testing per ASTM B117.

4.4.2 The coating shall exhibit no greater than 30% reduction of gloss per ASTM D523, after 500 hours of QUV testing at ASTM G154 Cycle 6.

4.5 Thermal management

4.5.1 Luminaire shall start and operate in ambient temperature range specified.

4.5.2 Maximum rated case temperature of driver and other internal components shall not be exceeded when luminaire is operated in ambient temperature range specified.

4.5.3 Mechanical design of protruding external surfaces (heat sink fins) shall facilitate hose-down cleaning and discourage debris accumulation.

4.5.4 Liquids or other moving parts shall be clearly indicated in submittals, shall be consistent with product testing, and shall be subject to review by Owner.

4.6 LED driver, photocontrol receptacle, and control interface

4.6.1 Luminaire designation(s) indicated “None” in section 4.1 need not accept a control signal, and do not require a dimmable driver. If luminaire cannot be furnished without photocontrol receptacle, luminaire shall be furnished with ANSI C136.10 compliant photocontrol receptacle and shorting cap as directed by Engineer.

4.6.2 Luminaire designation(s) indicated “ANSI C136.10, 3-pin” in section 4.1 shall be fully prewired and shall incorporate an ANSI C136.10 compliant receptacle. If a dimmable LED driver is specified, its control wires shall be accessible and electrically isolated.

4.6.3 Luminaire designation(s) indicated “ANSI C136.41, 5-pin” in section 4.1 shall be fully prewired and shall incorporate an ANSI C136.41 compliant receptacle. If a dimmable LED driver is specified, its 0-10V or DALI control wires shall be connected to the receptacle pads as specified in ANSI C136.41.

4.6.4 Luminaire designation(s) indicated “ANSI C136.41, 7-pin” in section 4.1 shall be fully prewired and shall incorporate an ANSI C136.41 compliant receptacle. If a dimmable LED driver is specified, its 0-10V or DALI control wires shall be connected to the receptacle pads as specified in ANSI C136.41; connection of the two remaining pads shall be by Supplier, as directed by Engineer.

4.7 Electrical safety testing

4.7.1 Luminaire shall be listed for wet locations by a U.S. Occupational Safety Health Administration (OSHA) Nationally Recognized Testing Laboratory (NRTL).

4.7.2 Luminaire shall have locality-appropriate governing mark and certification.

4.7.3 Luminaire shall meet the performance requirements specified in ANSI C136.2 for dielectric withstand, using the DC test level and configuration.

4.8 Electrical immunity

4.8.1 Luminaire shall meet the performance requirements specified in ANSI C136.2 for electrical immunity, using the combination wave test level indicated in section 4.1.

4.8.2 Manufacturer shall indicate on submittal form (Appendix A) whether failure of the electrical immunity system can possibly result in disconnect of power to luminaire.

4.9 Interference and power quality

4.9.1 Luminaire shall comply with FCC 47 CFR part 15 interference criteria for Class A (non-residential) digital devices.

4.9.2 Luminaire shall comply with section 5.2.5 (luminaires rated for outdoor use) of ANSI C82.77 at full input power and across specified voltage range.

4.10 Color attributes

4.10.1 Color Rendering Index (CRI) shall be no less than 60.

4.10.2 Nominal Correlated Color Temperature (CCT) shall be as specified in section 4.1.

4.10.2.1 If submitted nominal CCT is listed in Table 4.1 below, measured CCT and Duv shall be as listed in Table 4.1.

Table 4.1. Allowable CCT and Duv (adapted from ANSI C78.377)

Manufacturer-Rated Nominal CCT (K)	Allowable IES LM-79 Chromaticity Values	
	Measured CCT (K)	Measured Duv
2700	2580 to 2870	-0.006 to 0.006
3000	2870 to 3220	-0.006 to 0.006
3500	3220 to 3710	-0.005 to 0.007
4000	3710 to 4260	-0.005 to 0.007
4500	4260 to 4746	-0.004 to 0.008
5000	4746 to 5311	-0.004 to 0.008
5700	5312 to 6020	-0.003 to 0.009
6500	6022 to 7040	-0.003 to 0.009

4.10.2.2 If submitted nominal CCT is not listed in Table 4.1, measured CCT and Duv shall be as per the criteria for Flexible CCT defined in ANSI C78.377.

4.11 Identification

4.11.1 Luminaire shall have an external label per ANSI C136.15.

4.11.2 Luminaire shall have an internal label per ANSI C136.22.

4.12 Photocontrols - Luminaire shall be furnished with a photocontrol as specified.

4.12.1 The locking-type photocontrol shall be an electronic control based on a solid-state photo sensor and relay switch circuit.

4.12.2 Switch operation shall have a rating of 1000 Watts tungsten and 1800 Watts ballast at 105-305 VAC.

4.12.3 For high in-rush LED type fixtures, the photocontrol switch operation shall have an 8 Amp Electronic Ballast rating at 105-305 VAC.

4.12.4 The photocontrol should fail in an ON state.

4.12.5 The photocontrol operating voltage shall be clearly identified on the control housing.

4.12.6 The photocontrol shall be equipped with a 2 to 5 second delay action eliminating activation by light flashes.

4.12.7 The photocontrol shall be equipped with standard 3-prong twist and locking-type plug connection. The plug connection terminals shall be solid brass.

4.12.8 The photocontrol shall consist of industrial grade electronic components, 510 Joule MOV, solid state light sensor, and silver alloy relay contacts.

4.12.9 The photocontrol shall be 100% factory tested and function within specified light levels. The photo control shall be agency certified and tested accordingly.

4.12.10 The photocontrol shall meet agency standards for locking-type devices and all other requirements of ANSI C136.10-2010.

4.12.11 The photocontrol shall operate over a temperature range of -40°F to 158°F.

4.12.12 The photocontrol should have a manufacturer's limited warranty of 12 years minimum.

5.0 REQUIRED SUBMITTALS (Electronic submittals preferred)

5.1 Completed Appendix A submittal form

5.1.1 Family grouping in accordance with LED Lighting Facts is permitted, provided this is clearly indicated on the submittal form provided in Appendix A, and clearly communicated via a letter that includes detailed calculations relating the tested product(s) to the submitted product.

5.2 Product cutsheets

5.2.1 Luminaire cutsheets

5.2.2 Cutsheets for LED light source(s)

5.2.3 Cutsheets for LED driver(s)

5.2.3.1 If dimmable LED driver is specified, provide diagrams illustrating light output and input power as a function of control signal.

5.2.4 Cutsheets for surge protection device, if applicable

5.3 Instructions for installation and maintenance

5.4 Summary of luminaire recycled content and recyclability

5.4.1 Shall be in accordance with the FTC Green Guides, expressed as a percentage of luminaire weight.

5.5 IES LM-79 luminaire photometric report(s)

5.5.1 Shall be produced by the test laboratory

5.5.1.1 The test laboratory shall satisfy LED Lighting Facts accreditation requirements.

5.5.2 Shall include the following information

5.5.2.1 Name of test laboratory

5.5.2.2 Report number

5.5.2.3 Date

5.5.2.4 Complete luminaire catalog number

5.5.2.5 Description of luminaire, LED light source(s), and LED driver(s)

5.5.2.6 Goniophotometry

a. IES TM-15 Backlight-Uplight-Glare (BUG) ratings shall be for initial (worst-case) values, i.e., Light Loss Factor (LLF) = 1.0.

b. If luminaires are tilted upward for calculations in section 5.6.2, BUG ratings shall correspond to the same angle(s) of tilt.

5.6 Lumen maintenance calculations and supporting test data

5.6.1 Shall be in accordance with LED Lighting Facts guidance.

5.6.1.1 Exception: calculations shall be based on the cumulative hours of operation specified in section 4.1.

5.6.2 Submit completed ENERGY STAR TM-21 Calculator as an electronic Excel file.

5.7 Computer-generated point-by-point photometric analysis of maintained light levels

5.7.1 Calculation/measurement points shall be per IES RP-8. Separated vehicular lanes, bikeways, and walkways shall be evaluated separately.

5.7.2 Calculations shall be for maintained values, i.e. Light Loss Factor (LLF) < 1.0, where LLF = LLD x LDD x LATF, and

5.7.2.1 Lamp Lumen Depreciation (LLD) shall be 0.90 or the value calculated in section 5.6, whichever is lower.

5.7.2.2 Luminaire Dirt Depreciation (LDD) = 0.90

5.7.2.3 Luminaire Ambient Temperature Factor (LATF) = 0.96

5.7.3 Mesopic multipliers (i.e., effective luminance factors) shall not be used. All values shall assume photopic visual adaptation.

5.7.4 Submit IES LM-63 format electronic file containing luminous intensity data associated with submitted LM-79 report(s) and used for point-by-point calculations.

5.8 Summary of Joint Electron Devices Engineering Council (JEDEC) or Japan Electronics and Information Technology Industries (JEITA) reliability testing performed for LED packages

5.9 Summary of reliability testing performed for LED driver(s)

5.10 Written product warranty as per section 7.0 below

5.10.1 Applicable testing bodies are determined by the US Occupational Safety Health Administration (OSHA) as Nationally Recognized Testing Laboratories (NRTL) and include: CSA (Canadian Standards Association), ETL (Edison Testing Laboratory), and UL (Underwriters Laboratory).

5.11 Documentation supporting any U.S. origin claims for the product, in accordance with FTC guidance.

6.0 QUALITY ASSURANCE

6.1 Before approval and purchase, Engineer may request luminaire sample(s) identical to product configuration(s) submitted for inspection. Engineer may request IES LM-79 testing of luminaire sample(s) to verify performance is within manufacturer-reported tolerances.

6.2 Electrically test fully assembled luminaires before shipment from factory.

6.3 After installation, Engineer may perform IES LM-50 field measurements to verify performance requirements, giving consideration to manufacturing tolerances and measurement uncertainties as outlined in IES LM-61 and NEMA LSD 63.

7.0 WARRANTY

7.1 Warranty shall be of the minimum duration specified in section 4.1, and shall cover maintained integrity and functionality of the following

7.1.1 Luminaire housing, wiring, and connections

7.1.2 LED light source(s)

7.1.2.1 Negligible light output from more than 10 percent of the LED packages constitutes luminaire failure.

7.1.3 LED driver(s)

7.2 Warranty period shall begin 90 days after date of invoice.

8.0 MANUFACTURER SERVICES

8.1 Manufacturer or local sales representative shall provide installation and troubleshooting support via telephone and/or email.

9.0 ELIGIBLE MANUFACTURERS

9.1 Any manufacturer offering products that comply with the required product performance and operation criteria may be considered.

Appendix A — Product Submittal Form

Luminaire designation	**250W HPS Equivalent LED**			
Luminaire manufacturer				
Luminaire model number				
Nominal IES TM-15 BUG ratings	B =	U =	G =	
Product family testing	☐ Submitted product is identical to tested product	☐ Submitted product differs from tested product(s) as explained in attached letter		
Housing finish color				
Tenon nominal pipe size	inches			
Nominal luminaire weight	lb			
Nominal luminaire EPA	ft^2			
Nominal luminaire input voltage	V			
Control interface	☐ None	☐ ANSI C136.10 (3-pin)	☐ ANSI C136.41, 5-pin	☐ ANSI C136.41, 7-pin
LED driver	☐ Not dimmable	☐ Dimmable, 0-10V (IEC 60929)	☐ Dimmable, DALI (IEC 62386)	
Electrical immunity—ANSI C136.2 combination wave test level	☐ Basic (6kV / 3kA)	☐ Enhanced (10kV / 5kA)	☐ Elevated (20kV / 10kA)	
Upon failure of electrical immunity system	☐ Possible disconnect	☐ No possible disconnect		
ANSI C136.31 vibration test level	☐ Level 1 (Normal)	☐ Level 2 (bridge/overpass)		
Thermal management	☐ Liquids or moving parts	☐ No liquids or moving parts		
Luminaire warranty period	Years			
Rated life of LED driver(s)	Hours			
IES LM-80 test duration	Hours			
LED lumen maintenance *	☐ Reported (restricted)	☐ Calculated (unrestricted)		
Make/model of LED light source(s)				
	Nominal value	Tolerance (%)		
Luminaire input power—initial	W	W		
Luminaire input power—maintained **	W	W		
LED drive current—initial	mA	mA		
LED drive current—maintained **	mA	mA		
In-situ LED T_s	°C	°C		
LED lumen maintenance **	%	%		
CCT	K	K		
Additional product description				

* Manufacturer shall indicate which is applicable (check only one box) as per section 5.6. According to IES TM-21, “Reported” values are restricted to 5.5x or 6x (depending on sample size) the duration of IES LM-80 testing, whereas “Calculated” (i.e., projected) values are unrestricted.

** As per section 5.6.