Appendix C

SPECIFICATIONS FOR LED LUMINAIRES

1.0 INTRODUCTION

This specification provides the necessary information to allow for selection of LED luminaires which meet the key parameters of this project. Requirements were developed to meet the objectives of this project and allow for a common basis of design against which all proposals can be evaluated for suitability. Incomplete submittals or failure to meet any of the stated criteria may result in rejection of a proposal. Submittal entries will be evaluated based on best overall value rather than lowest price.

2.0 RELATED DOCUMENTS

Contract Drawings and Conditions of Contract (including General Conditions, Addendum to the General Conditions, Special Conditions, Technical Specifications Sections and all other Contract Documents) apply to the work of this section.

3.0 DEFINITIONS

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

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

3.3 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.

Existing Luminaires			New Luminaire Requirements							
Luminaire Type	Lamp Wattage	Source	Minimum Initial Lumens	Maximum Wattage	Distribution Type	Input Voltage	Maximum Weight	Maximum EPA	Mounting	Driver
Flood	250W	HPS	13,500	140	6x6	120-227	120-277	3.1ft^2	Yoke	Dimmable
Flood	400W	HPS	18,500	220	6x6	120-227	120-278	3.1ft^2	Yoke	Dimmable
Roadway	50W	HPS	3900	30	Type 2	120-227	120-290	0.3 ft^2	arm (2" normal)	Dimmable
Roadway	100W	HPS	6800	50	Type 2	120-227	120-286	0.3 ft^2	arm (2" normal)	Dimmable
Roadway	100W	MV	3900	50	Type 2	120-227	120-294	0.3 ft^2	arm (2" normal)	Dimmable
Roadway	105W	INC	3900	30	Type 2	120-227	120-292	0.3 ft^2	arm (2" normal)	Dimmable
Roadway	150W	HPS	6800	50	Type 2	120-227	120-294	0.3 ft^2	arm (2" normal)	Dimmable
Roadway	175W	MV	6800	50	Type 2	120-227	120-294	0.3 ft^2	arm (2" normal)	Dimmable
Roadway	250W	HPS	15,500	140	Type 2	120-227	120-288	0.5ft^2	arm (2" normal)	Dimmable
Roadway	400W	HPS	25,000	220	Type 2	120-227	120-289	0.75ft^2	arm (2" normal)	Dimmable
Roadway	400W	MV	25,000	220	Type 2	120-227	120-297	0.5ft^2	arm (2" normal)	Dimmable
Post	100W	HPS	6800	50	Type 5	120-227	120-284	0.3 ft^2	Tenon (3x3 standard)	Dimmable
Post	50W	HPS	3900	30	Type 2	120-227	120-290	0.3 ft^2	arm (2" normal)	Dimmable

***Please note that all final wattages and luminaires that fall slightly below minimum initial lumens output should be approved by the City through the pilot program and prior to installation, depending on the City's control strategies.**

Existing Luminaires			New Luminaire Lighting Requirements (Maintained Levels)				
			Roadway			Sidewalk	
Luminaire Type	Lamp Wattage	Source	Average at Pavement	Ave:Min Uniformity	Max Veiling Luminance Ratio	Average at Pavement	Ave:Min Uniformity
Roadway	100W	HPS	0.7fc	6	0.4	0.2fc	4
Roadway	100W	MV	0.4fc	6	0.4	0.2fc	4
Roadway	105W	INC	0.4fc	6	0.4	0.2fc	4
Roadway	150W	HPS	0.7fc	6	0.4	0.2fc	4
Roadway	175W	MV	0.7fc	6	0.4	0.2fc	4
Roadway	250W	HPS	1.3fc	4	0.4	0.5fc	4
Roadway	250W	MV	.9fc	4	0.4	0.3fc	4
Roadway	400W	HPS	1.8fc	4	0.4	0.6fc	4
Roadway	400W	MV	1.3fc	4	0.4	0.5fc	4
Roadway	50W	HPS	0.4fc	6	0.4	0.2fc	4

4.2 General requirements

4.2.1 Luminaires shall satisfy the key criteria summarized in section 4.1.

4.2.2 Luminaires shall be listed on the Design Lights Consortium Qualified Products List and qualify for National Grid and OER incentives.

4.2.3 Transmissive optical components shall be applied in accordance with OEM design

guidelines to ensure suitability for the environment (e.g., electromagnetic, thermal, mechanical, chemical).

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

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

4.2.6 Luminaire shall accept the voltage or voltage range specified at 60 Hz and shall operate normally for input voltage fluctuations of plus or minus 10 percent.

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

4.2.8 The following shall be in accordance with ANSI C136.37.

4.2.8.1 Wiring and grounding

4.2.8.2 Terminal blocks for incoming AC supply wiring (electrical)

4.2.8.3 Photocontrol receptacle

4.2.8.4 Latching and hinging

4.2.8.5 Mounting provisions

4.2.8.6 Ingress protection: minimum rating of IP66 for Optical assembly, and IP65 for Electrical components compartment.

4.3 Painted or finished luminaire surfaces exposed to the environment

4.3.1 Shall exceed a scribe creepage rating of 8 (per ASTM D1654) after 3000 hours of exposure testing to salt\fog per ASTM B117.

4.3.2 Coastal finish option shall exceed a scribe creepage rating of 8 (per ASTM D1654) after 5000 hours of exposure testing to salt\fog per ASTM B117.

4.3.3 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.

4.3.4 Fixtures shall be available in a black finish.

4.4 Vibration

4.4.1 Luminaires shall meet requirements for Level 2 (bridge/overpass) per ANSI C136.31

4.5 Thermal management

4.5.1 Luminaire shall start and operate in ambient temperature range from -40C to 40C.

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 Non-passive means of cooling are not allowed. This includes the use of liquids or other mechanical cooling systems.

4.6 Photocontrol receptacle, and photocontrol

4.6.1 Receptacle

4.6.1.1 Luminaires to be supplied with a 7-pin ANSI C136.41 compliant receptacle with the dimming leads from the driver connected to the receptacle pads and specified in ANSI C136.41. Drivers shall all be 0-10 volt dimming capable.

4.6.2 Photocontrol

4.6.2.1 Shall be rated for minimum 20 years, with 10-Year Warranty.

4.6.2.2 Shall have LED inrush protection on the 7-pin node. Please specify type.

4.6.2.3 Shall have extreme surge protection of 1280J/40kA utility or 2120J/40kA UL listed.

4.6.2.4 Shall have double thick enclosure and lens with additional UV inhibitor.

4.6.2.5 Shall be UL listed to U.S. and Canadian safety standards.

4.6.2.6 Shall be 120V to 480VAC, 60Hz.

4.6.2.7 Shall have load rating of 1000 watts, 1800 VA ballast.

4.6.2.8 Shall have average power consumption: <0.5 watts @ 120V.

4.7 Electrical immunity

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

4.7.3 Enhanced surge protection devices (SPD) are required. SPDs shall be rated to protect the luminaire up to 10kV\5kA combination wave surges in accordance with ANSI C136.2 (Most Current) and UL 1449 recognized. Extreme -20kV/10kA can be an option.

4.7.4 Failure mode of surge protection is to leave the luminaire off.

4.8 Interference and power quality

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

4.8.2 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.

4.9 Color attributes

4.9.1 Color Rendering Index (CRI) shall be no less than 70 with the option of 80 or higher.

4.9.2 Nominal Correlated Color Temperature (CCT) options shall be available in 2700K, 3000K and 4000K +/- 8%.

4.10 Identification

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

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

5.0 PRODUCT REQUIREMENTS by product category

5.1 Roadway Luminaires

5.1.1 Optical Features

5.1.1.1 Borosilicate or any tempered glass optical enclosure is preferred not required.

5.1.1.2 Any plastic materials used in the optical assembly that affect the light output and distribution shall be appropriately heat and UV resistant.

Plastic materials shall have been evaluated and exhibit a Yellowness Index (YI) over the useful life of the product of no more than 30%. YI reference ASTM E313 (ASTM D1925). A list of relevant plastic materials used, and the plastic material manufacturer's "YI" data report shall be provided with the bid documents.

5.1.2 Electrical Features

5.1.2.1 Expected life of LED light engines of >100,000 hours at 25C.

5.1.2.2 LED's lumen depreciation equal to or greater than L85 at 100,000 hours.

5.1.2.3 Expected life of the electronic driver of 100,000 hours at 25C ambient.

5.1.2.4 Driver shall be easily accessible.

5.1.2.5 Surge protection device shall be connected in series with the luminaire load and shall disconnect power at the end of life. Device shall allow no more than 10% of pass-through to surge energy under either differential or common mode surge.

5.1.3 Mechanical Features

5.1.3.1 Luminaires with rugged die-cast aluminum housing are preferred. Polycarbonate door is acceptable.

5.1.3.2 Mast arm mount is adjustable for arms from 1-1/4" to 2" (1-5/8" to 2-3/8" O.D.) diameter with 2-bolt clamping mechanism.

5.1.3.3 Tool-less entry to electrical compartment with 3 station terminal block and quick disconnects.

5.1.3.4 Bubble level located inside the electrical compartment for levelling of luminaire during installation.

5.2 Floodlights

5.2.1 Optical Features

5.2.1.1 Shielding options available to control light trespass and uplight where required.

5.2.1.2 Segmented internal reflectors designed to produce beam pattern as specified in the tables in section 5.1.

5.2.2 Electrical Features

5.2.2.1 Expected life of LED light engines of >100,000 hours at 25C.

5.2.2.2 LED's lumen depreciation equal to or greater than L80 at 100,000 hours.

5.2.2.3 Expected life of the electronic driver of 100,000 hours at a 25C ambient.

5.2.2.4 Surge protection device shall be connected in series with the luminaire load and shall disconnect power at the end of life. Device shall allow no more than 10% of pass-through to surge energy under either differential or common mode surge.

5.2.3 Mechanical Features

5.2.3.1 Low copper content die cast aluminum A360 allow castings. Die-cast aluminum housing with integral heat sink fins is preferred.

5.2.3.2 Tool free access to electrical compartment with stainless steel latches.

5.2.3.3 Knuckle adjustable to fit 2-3/8" to 2-7/8" tenon.

6.0 QUALITY ASSURANCE

6.1 Before approval and purchase, Owner may request luminaire sample(s) identical to product configuration(s) submitted for inspection. Owner may request IES LM-79 test reports 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, Owner 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 for a minimum period of ten (10) years 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 15 percent of the LED packages constitutes luminaire failure.

7.1.3 LED driver(s) and associated surge protection device.

7.2 Warranty period shall begin with the date of project completion as per RFP, or as negotiated by owner such as in the case of an auditable asset management system. Note that warranty on labor shall be for a minimum of one (1) year as per RFP.

8.0 MANUFACTURER SERVICES

8.1 Manufacturer shall provide on-site installation and troubleshooting support in addition to via telephone and/or email.

9.0 ELIGIBLE MANUFACTURERS

9.1 While the products indicated above are preferred, any manufacturer offering products that comply with the required product performance and operation criteria may be considered. If you chose to submit alternate products, please clearly indicate in your bid response

9.2 All roadway luminaires supplied must be from the same manufacturer. All floodlights supplied must be from the same manufacturer that may be different from the roadway light manufacturer.

10.0 REQUIRED SUBMITTALS

10.1 Product cutsheets

10.1.1 Luminaire cutsheets

10.1.2 Cutsheets for LED light source(s)

10.1.3 Cutsheets for LED driver(s)

10.1.4 Provide diagrams illustrating light output and input power as a function of control signal.

10.1.5 Cutsheets for surge protection device

10.2 Instructions for installation and maintenance

10.3 IES LM-79 luminaire photometric report(s) from an accredited test laboratory.

10.4 Lumen maintenance calculations and supporting test data

10.4.1 Shall be in accordance with LED Lighting Facts guidance.

10.4.1.1 Exception: calculations shall be based on 100,000 hours of operation and average ambient temperature of 25C

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

10.6 Written product warranty as per section 7.0 above.

10.7 Safety certification and file number indicating compliance with UL 1598

10.7.1 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).

10.8 Documentation from the luminaire and controls manufacturer(s) confirming interoperability of their products and identifying the manufacturer responsible for resolving any interoperability issues.

10.9 Documentation from the controls manufacturer(s) regarding any cybersecurity certifications the system has, including but not limited to UL 2900, IEC 62443, NIST Cybersecurity Framework, or other certifications to test the cybersecurity of system.