



**SESCO**  **lighting**

*UNIVERSITY OF CENTRAL FLORIDA EXTERIOR LIGHTING  
CAMPUS STANDARDS*

*SESCO LIGHTING / PUBLIC SECTOR / ENERGY TEAM*

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*CUSTOMER TO CONFIRM THE FOLLOWING*

- 1. LUMINAIRE TYPE, COLOR, AND VOLTAGE*
- 2. BRACKET COLOR AND CONFIGURATION*

BRAND	PART NUMBER	DESCRIPTION
PHILIPS	P21-DIM-MA-1-2BL-55LA-NW-XXX-PCR7-SP2XX	MAST ARM MOUNT ROADWAY LUMINAIRE
TBD	TBD	POLE FOR ABOVE
PHILIPS	PBDP103UCF-50W64LED3K-MP-PC-C-LE5-XXX-CLO-RCD7-GR-SP2XX	POST TOP MOUNT PEDESTRIAN PATHWAY LUMINAIRE
TBD	TBD	POLE FOR ABOVE

SECTION XXX-XXX-XXX

ROADWAY LIGHTING AND  
CONTROL

**University of Central Florida (UCF), Florida**

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 2603 (2002) Performance Requirements and Test Procedures For. Pigmented Organic Coatings on Aluminum Extrusions

American National Standards Institute (ANSI)

ANSI C62.45 (2002) IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000V and Less) AC Power Circuits

ANSI C62.41.2 (2002) Transient Surge Requirements

ANSI C136.11 (2006) American Standard for Roadway Lighting Equipment Series Sockets and Series Sockets Receptacles

ANSI C136.2 (2004; R 2009) American National Standard for Roadway and Area Lighting Equipment: Luminaires Voltage Classification

ANSI C136.3 (2005; R 2009) American National Standard for Roadway and Area Lighting Equipment Luminaire Attachments

ANSI C136.31 (2001) Normal Applications Vibration Standards & Bridge & Overpass Vibration Standards

ANSI C136.6 (2004) American National Standard for Roadway Lighting Equipment - Metal Heads and Reflector Assemblies - Mechanical and Optical Interchangeability

AMERICAN SOCIETY FOR TESTING & MATERIALS (ASTM)

ASTM B117	(2011) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM D523	(2014) Standard Test Method for Specular Gloss
ASTM D2244	(2011) Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
ASTM D2247	(2011) Standard practice for Testing Water Resistance of Coatings in 100% Relative Humidity

ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA (IES)

IES HB-10	(2011) IES Lighting Handbook
IES LM-63	(2002) Standard file format for Electronic Transfer of Photometric Data
IES LM-79	(2008) Electrical and Photometric Measurements of Solid-State Lighting Products
IES LM-80	(2008) Measuring Lumen Maintenance of LED Light Sources
IES RP-16	(2010; Addendum A 2008; Addenda B & C 2009) Nomenclature and Definitions for Illuminating Engineering
IES RP-8	(2000; Errata 2004; R 2005; Errata 2007) Roadway Lighting
IES TM-15	(2011) Luminaire Classification System for Outdoor Luminaires
IES TM-21	(2011) Projecting Long Term Lumen Maintenance of LED Light Sources

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(2008) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA ANSLG C78.377	(2011) American National Standard for Electric Lamps— Specifications for the Chromaticity of Solid State Lighting Products

NEMA C136.10 (2010) American National Standard for Roadway and Area Lighting Equipment-Locking-Type Photo control Devices and Mating Receptacles--Physical and Electrical Interchangeability and Testing

NEMA C136.31 (2010) American National for Roadway and Area Lighting Equipment - Luminaire Vibration

NEMA C82.77 (2002) Harmonic Emission Limits - Related Power Quality Requirements for Lighting Equipment

NEMA ICS 2 (2000; R 2005; Errata 2008) Standard for Controllers, Contactors, and Overload Relays Rated 600 V

NEMA ICS 6 (1993; R 2011) Enclosures

NEMA IEC 60529 (2004) Degrees of Protection Provided by Enclosures (IP Code)

NEMA WD 7 (2011) Occupancy Motion Sensors Standard

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2014) National Electrical Code

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

47 CFR 15 Radio Frequency Devices

47 CFR 18 (2011) Industrial, Scientific, and Medical Equipment

UNDERWRITERS LABORATORIES (UL)

UL 1310 (2008) UL Standard for Safety for Class 2 Power Units

UL 1598 (2012) UL Standard for Safety for Luminaires

UL 8750 (2007; Reprint Oct 2012) UL Standard for Safety Light Emitting Diode (LED) Equipment for Use in Lighting Products

## 1.2 DEFINITIONS

- a. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings shall be as defined in IEEE 100 and IES RP-16 and RP-8.
- b. Substantial Completion is defined as the point in time when all luminaires, gateways, and wireless nodes have been installed in the field and are completely mapped within the permanently installed control system software interface. All luminaires must be fully functional via the permanently installed wireless control system & calculated energy savings must be verified via the wireless control system thru the software interface.
- c. For LED luminaire light sources, "Useful Life" is the operating hours before reaching 70 percent of the initial rated lumen output (L70) with no catastrophic failures under normal operating conditions. This is also known as 70 percent "Rated Lumen Maintenance Life" as defined in IES LM-80.

## 1.2 SUBMITTALS

UCF approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

### SD-01 Preconstruction Submittals

Fixture Schedule

Control Hardware Schedule

Control Software Schedule

Equipment and Performance Data

Audit Grade Financial Analysis

### SD-02 Shop Drawings

Mapped Luminaire Locations

Mapped Control System Hardware

User Interface Software Mapping

Installation Drawings

#### SD-03 Product Data

Luminaire Data Sheets

LED Driver Data Sheets

Surge Protection Data Sheets

LED Luminaire - IES LM-79 Test Report

LED Luminaire - IES LM-63 Photometric

LED Light Source - IES LM-80 Test Report

LED Light Source - IES TM-21 LLD Report

Control System Hardware Data Sheets

Control System Software Data Sheets

Installation Instructions

#### SD-06 Test Reports

Operational Tests

"As Built" Map

Interface Guide

Warranty

Support Contacts

#### SD-07 Certificates

Luminaire Useful Life Certificate

Submit certification from the manufacturer indicating the expected useful life of the luminaires provided. The useful life shall be directly correlated from the IES LM-80 test data using procedures outlined in IES TM-21-11. Thermal properties of the specific luminaire and local ambient operating temperature and conditions shall be taken into consideration.

Warranty Certification & Registration

Upon substantial completion submit warranty certification from the manufacturer verifying that the complete system warranty has been registered. The complete system warranty certification is to be issued in writing by the manufacturer and will include all materials for a period of 10 years. Document must include a single manufacturer point of contact to cover all warranty issues in the form of a contact phone number, e-mail address and/or web portal access. The system manufacturer is directly responsible for all warranty claims. No third party, third party component, or pass-thru warranties will be accepted.

Provide all submittal data in accordance with the instructions contained in section 1.2 SD-01, SD-02 & SD-03 and complete all fields on the attached appendix A Luminaire Data Check List and submit with system manufacturer proposal at time of bid. Proposals with one or more items not submitted will be deemed non-responsive and are subject to disqualification.

## PART 2 PRODUCTS

### 2.1 SYSTEM DESCRIPTION

Luminaires shall combine LED performance excellence and advanced LED thermal management technology with a distinct purity of style to provide outdoor area lighting that is both energy efficient and aesthetically pleasing. Luminaire is defined by its high performance, sleek low profile design and rugged construction. All luminaires shall conform to the campus standard aesthetic. Provide LED luminaires, and wireless controls electrically tested as a complete system of drivers, surge protection devices, controls and LED assemblies. Furnish fixtures complete with wiring and mounting devices ready for installation at the locations indicated on the deployment plans. Submit Installation Drawings for the outdoor lighting systems. Indicate on drawings overall physical features, dimensions, ratings, and service requirements of equipment.

### 2.2 STREET-LIGHTING LUMINAIRES

Provide UL/ETL wet location rated street-lighting luminaires in accordance with IES RP-8 for Types II, III, IV and V as required. Fixture schedule shall be based on manufacturer lighting computer point by point design analysis justifying the fixture selection in accordance with the end users illumination requirements. This may include local city, county, State Department of Transportation, the American Association of State Highway and Transportation Officials, and Illuminating Engineering Society of North America standards and guidelines. The fixture/lighting-distribution patterns may need to be tailored for each installation situation on the project.

#### 2.2.1 LED LUMINAIRES

UL 1598, NEMA C82.77 and UL 8750. Provide luminaires as indicated in luminaire schedule, templates or details on project plans. Provide luminaires complete with light sources of quantity, type, and wattage indicated. All roadway, plaza and pedestrian luminaires shall be supplied, constructed and warrantied by a single manufacturer.

#### Housing, Mechanical & Finish

- a. LED luminaire housings shall be low copper die cast constructed from A360 Aluminum alloy. The mast arm mounted luminaire weight shall not exceed 38 pounds with a maximum allowable EPA of .35 square feet. The post top mounted luminaire weight shall not exceed 16 pounds with a maximum allowable EPA of 1.2 square feet. No plastic, steel, fiber, composite, or extruded housings and/or doors will be accepted for mast arm mounted units.



- b. Housing finish shall be baked-on polyester powder coat paint 2.5-.4 mils thick (+/- 1mil). Color shall be Medium grey in accordance with AAMA 2603 standard. Finish shall be discoloration resistant in accordance with ASTM-D 2244 and shall have luster retention keeping with the ASTM-D523 standard and humidity proof in accordance with the ASTM-D2247 standard. This surface treatment shall be capable of surviving ASTM B117 salt fog environment testing for a minimum of 2000 hours without blistering or peeling.
- c. All mast arm mounted luminaires must meet ANSI C136.31, American National Standard for Roadway Luminaire Vibration specifications for Bridge/overpass applications 3g/100kHRS by an independent laboratory. All post top mounted luminaires must meet ANSI C136.31, American National Standard for Roadway Luminaire Vibration specifications for 1.5g/100kHRS by an independent laboratory.
- d. Entry into the wiring compartment of the unit must be achievable with the use of standard number two philips bit no proprietary devices are to be used. Unit shall accept horizontal mast arm style support up to 2" NPS horizontal tenon or vertical tenon not to exceed 3" NPS. The mast arm mounted luminaire door shall be hinged and removable but secured when open, and open downwards towards the ground to provide access to electronic components and terminal block. Driver and SPD shall be wired utilizing quick disconnect harness and be mounted to the luminaire door and removable without further use of tools.
- e. Terminal block shall be rated for 600 volts, 85 amps and accept #2 thru #14 AWG wiring from primary circuit and be located inside the luminaire housing.
- f. Thermal management of the LED system is to be achieved via naturally occurring convection without the use of moving parts, liquids or gases. Heat sink shall be constructed of A360 aluminum alloy and be self-cleaning with maintenance free operation by design.
- g. All seals and sealing devices shall be made and/or lined with EPDM and/or silicone and/or rubber.
- h. Luminaires shall be UL listed for wet locations per UL 1598. LED optical compartment shall be sealed and rated at a minimum of IP66 per NEMA IEC 60529. LED drivers and Surge Protection Devices shall be component rated at a minimum of IP65.
- i. All exposed screws are to be provided as stainless steel with ceramic primer-seal base coat to reduce seizing of the parts.

#### Optical, Electrical, & Thermal

- a. Luminaires shall have IES distribution and NEMA field angle classifications per IES HB-10.
- b. Luminaire lenses shall be constructed of UV-resistant, high-performance optical grade polymer refractor lenses to achieve desired distribution. Glass lenses will be accepted only as an auxiliary method of sealing the optical chamber. Polymer optics shall be IP66 rated without the use of glass. Optical systems shall be tested per IESNA LM-63, LM-79 and published in accordance to TM-15 certifying photometric performance.
- c. LED's shall be mounted to a metal core board. No fiber reinforced plastic, composite or non-metallic boards will be accepted.

- d. All mast arm mount luminaires shall deliver light output with a minimum efficacy rating of 98 lumens per watt per LM-79 absolute photometry test data. LED's are to maintain a minimum of 91% lumen maintenance at 60,000 hours per IES LM-80 test data as calculated per IESNA TM-15 guidelines. The CCT of the light will be 4000K (+/- 275K) producing a minimum color rendering index value of 70 as verified per IES LM-80 testing.
- e. All post top mount luminaires shall deliver light output with a minimum efficacy rating of 90 lumens per watt per LM-79 absolute photometry test data. LED's are to maintain a minimum of 70% lumen maintenance at 70,000 hours per IES LM-80 test data as calculated per IESNA TM-15 guidelines. The CCT of the light will be 3000K (+/- 275K) producing a minimum color rendering index value of 80 as verified per IES LM-80 testing.
- f. All mast arm mounted luminaires shall be Dark Sky compliant with 0% up light and a "U" rating of zero per IESNA TM-15.
- g. LED drivers are to be provided as electronic with a power factor 95%. The operating range is 50/60 Hz. The drivers shall be self-adjusting universal voltage input from 120-277 or 347-480 volt Class 1 with a total THD not to exceed 20%. Driver must reduce the current supplying the LED's if it experiences internal overheating to protect the LED's and electrical components. Output shall be protected from short circuits, voltage overload and current overload with automatic recovery after correction. Driver must be supplied with 2.5kV minimum surge protection that is coordinated with upstream 20kV/20kA surge protection device.
- h. The electrical system is to be protected via a surge protection device integral to the luminaire, connected at the wiring terminal block and tested in accordance with ANSI/IEEE C62.45 per ANSI/IEEE C62.41.2 Scenario 1 Category C High Exposure 20kV/20kA waveforms for L/G, L/N, & N/G and in accordance with DOE MSSLC Model Specification for LED Roadway Luminaires Appendix D Electrical Immunity High test level 20kV/20kA.
- i. Luminaires shall be provided with an ANSI C136.41 7 pin NEMA twist lock controller that controls the power to the fixture and passes dimming signals through the socket to the LED driver (0-10V).
- j. Mast arm mount luminaires shall not exceed the following IES TM-15 Backlight, Uplight and Glare (B.U.G.) ratings:
  - 1. Maximum Backlight (B) rating shall be B1.
  - 2. Maximum Uplight (U) rating shall be U0.
  - 3. Maximum Glare (G) rating shall be G1.
- k. Post top mount luminaires shall not exceed the following IES TM-15 Backlight, Uplight and Glare (B.U.G.) ratings:
  - 1. Maximum Backlight (B) rating shall be B3.
  - 2. Maximum Uplight (U) rating shall be U2.
  - 3. Maximum Glare (G) rating shall be G2.
- l. Luminaires shall be fully assembled and electrically tested prior to shipment from factory.
- m. LED luminaires shall be rated as a complete system for operation within an ambient temperature range of minus 40 degrees C to 40 degrees C.

- n. Rated system life of the luminaire as a complete assembly is required to be a minimum of 70,000 hours when tested at 25C ambient temperature and forward current of 700mA. This shall include but not be limited to the LED(s), Driver(s), and Surge Protection Device(s). For the purpose of this system life rating LED life is to be calculated per LM80 testing & TM15 methodology extrapolated to illustrate expected lamp lumen depreciation at 70,000 hours without catastrophic failure of supporting components.
- o. Luminaire shall be UL or ETL listed. It is also to be "Listed" on the Qualified Products List of the Design Lights Consortium, and compliant with the current version of the DOE MSSLC Model Specification for LED Roadway Luminaires at time of bid.
- p. The complete luminaire including all components therein and the control system shall be covered by the manufacturers complete system warranty for a period of ten years. A single point of contact phone number, e-mail address, and/or web portal is to be provided for all warranty claims. No third party, third party component, or pass-thru warranties will be accepted.

#### 2.1.2 LED Power Supply and Surge Protection Units (Drivers)

UL 1310 LED Power Supply Units (Drivers) shall meet the following requirements:

- a. Minimum efficiency shall be 85 percent.
- b. Drive current to each individual LED shall not exceed 350 mA, plus or minus 10 percent.
- c. Shall be rated to operate between ambient temperatures of minus 40 degrees C and 55 degrees C
- d. Shall be designed to operate on the voltage system to which they are connected, typically ranging from 120-277V OR 347V-480V nominal.
- e. Operating frequency shall be: 50 or 60 Hz.
- f. Power Factor (PF) shall be greater than or equal to 0.90.
- g. Total Harmonic Distortion (THD) current shall be less than or equal to 20 percent.
- h. Shall meet requirements of 47 CFR 15, Class B.
- i. Shall be RoHS-compliant.
- j. Shall be mounted integral to luminaire. Remote mounting of power supply is not allowed.
- k. Shall be dimmable, and compatible with a standard dimming control circuit of 0 - 10V or other approved dimming system.
- l. Shall be equipped with over-temperature protection circuit that reduces the current supply to the LED's until normal operating temperature is achieved.
- m. Provide surge protection integral to luminaire to meet C Low waveforms as defined by IEEE/ANSI C62.45 per C62.41.2 Scenario 1 Category C High Exposure L/G, L/N, N/G at 20kV/20kA properly coordinated to protect the LED driver and downstream components.
- n. Surge Protection Device shall also comply with MSSLC Model Specification for LED Roadway Luminaires Appendix D Electrical Immunity High test level 20kV/20kA and be properly coordinated to protect the LED driver and downstream components.

- o. The complete luminaire including all components therein and the control system shall be covered by the manufacturers complete system warranty for a period of ten years. A single point of contact phone number, e-mail address, and/or web portal is to be provided for all warranty claims. No third party, third party component, or pass-thru warranties will be accepted.

### 2.1.3 Wireless Control System

The LED lighting fixtures shall be controlled using a FCC licensed frequency, star network control system that is linked to the data server through the existing communications network. Each fixture shall be provided with a NEMA twist lock controller that controls the power to the fixture and passes dimming signals through the socket (hardwired) to the LED driver (0-10V).

#### 2.2.3.1 Wireless control modules

Testing of the control modules shall as a minimum meet the following standards:

- a. Conducted emission FCC 47 Part 15
- b. Radiated emission FCC 47 Part 15
- c. ANSI 136.10
- d. Flammability UL 94V-0
- e. Housing material Polycarbonate (PC)
- f. Damp heat IEC 60068-2-60
- g. Salt mist IEC 60068-2-11
- h. Mixed Gas Corrosion IEC 6008-2-60
- i. Vibration IEC 60068-5-6
- j. Rain Tightness test UL773
- k. Temperature Sensor +-3C (-30degC to +60degC range)
- l. Agency Marking - UL, CSA

#### 2.2.3.2 Each control node shall as a minimum provide the following features:

- a. Report the system variables - Volts, Current, Watts, KVAR, PF, hours of operation, KWH consumed, faults or errors in correct operation of the fixture.
- b. The local control modules shall maintain a 7 day schedule for the respective fixture. The control module shall revert to the onboard photo cell after 7 days if communications to the server is lost.
- c. Each controller shall provide local 10% to 100% dimming control with up to 10 different dimming levels each evening. Dimming control schedules shall be stored along with the operational schedules "on board" the NEMA controller.
- d. All software updates shall be provided "over the air". No local programming shall be necessary.
- e. Each device shall have a unique address code that used to identify the asset in the system. This asset tag shall be coordinated with the GPS location of the asset in the server software to provide a graphic interface for each field device.
- f. Load wattage shall be 1000VA, MIN.
- g. Stand-by wattage less than or equal to 0.75W
- h. Metering Accuracy shall be plus or minus .5%
- i. Software updates for the fixture controller shall be provided over the air. No on site interface shall be required to adjust, diagnose, or update the operating software in the controllers.

2.2.3.3 Central Asset Management Software shall communicate in real time to each of the field devices through a graphical interface. The system shall provide the following features as a minimum:

- a. Data base of all assets shall provide the ability to document the GPS location, pole type, and pole ID code, Segment ID, mounting height, controller ID, LED wattage, Manufacture, Type, Model Number and street address.
- b. Data base creation shall be provided by the ability of the software to import existing customer data base information and parse same to create the control software data base.
- c. Scheduling tools in the software shall allow for the individual, area/group, or total system scheduling of all of the assets in the lighting control system utilizing fixed or astronomic time bases. Operation time shall be supplemented by up to 10 dimming levels for each period.
- d. Report generation shall be selectable by variable and date range, grouped by individual fixture, groups of fixtures or any common variable in the data base.
- e. The status of and access to each street light asset in the system shall be displayed on an interactive graphical interface (Goggle Maps®. As basis).
- f. Software updates and maintenance shall be provided as part of a total package of services provided by the manufacturer on a yearly basis. The term of these services shall be provided in the request for proposal cost volume.

2.2.3.4 Site Survey and Training on the asset data base system load, commissioning and operation of the outdoor lighting control system shall be provided as follows:

- a. Three days (min.) of on the ground pre-deployment engineering and planning to coordinate the transfer of UCF Data Bases, establish deployment schedules by zone, street type or other criteria, obtain CAD backgrounds for deployment maps and installation details for each fixture type, and Customer requirements based on project funding and Contractor logistical requirements.
- b. RF site survey to determine the optimal location of base station and repeater controllers in band and adjacent band existing emitters that might impede the proper operation of the system. Site survey report shall be provided within two weeks of the RF site survey for review and approval of recommendations for the specific installation. The survey shall utilize both off the shelf frequency spectrum analyzers as well as manufacturer specific "like" devices that operate with the same characteristics as the deployed sensors. The "like" devices shall provide RF statistical sweep data to allow for analysis by supplier engineers to optimize the system.
- c. Provide one half day of training for contractor installation crews that review the controller bar code association, fixture fusing requirements, controller initial operation and start-up.
- d. Provide a minimum of one full day of classroom training in the initial operation, commissioning and set-up of the outdoor lighting control system.

- e. Provide a minimum of two more 1 day training sessions within six months of the initial operation.

3.1 FIELD TESTING AND DOCUMENTATION

Each fixture shall be initially tested on the pole by connecting the new LED fixture to the incoming power line through a 15A, time delay fuse. A shorting cap shall be inserted in the NEMA socket to energize the fixture and insure that the basic operation of the fixture is correct after shipping and free of short circuits. Remove the shorting plug and install the lighting controller and insure that the fixture operates as instructed during the training. Document the barcode/pole GPS location utilizing a tablet/Android® phone application that is provided to the Customer/Contractor as part of the base proposal. Provide custom application software and tested devices for field commissioning systems as follows:

No. of fixture Locations	Tablet/Scanner	Cell Phone/Scanner
300-4,000	1	2
4,001-10,000	2	3
10,001-50,000	3	4
50,000-150,000	4	6

The new lighting control system will report fixtures that are not operating properly. Contractor shall provide a weekly report to the Customer during the warranty period that documents the required repairs and/or replacements of defective components.

Defective components shall be replaced in kind by the manufacture during the warranty period.

3.2 ROI Calculation Methodology

- a. The energy analysis must represent the specified product per UCF lighting standards and shall include actual blended kWh rates without rate inflation adjustments. The analysis must site annual kWh usage for the reference area and existing lighting system. Measurements shall be based on complete system wattage input for the specified luminaires. The energy analysis must be in a format that allows for a single page side by side comparison that includes; annual energy usage, annual cost savings based on actual hours of operation, kWh rate, system efficiency, and overall on target delivered lumens. Maintenance cost must be based on component replacements calculated in accordance with TM-21-11.

-- End of Section --

	UCF	Mast Arm Mount	Post Top Mount
Insert Manufacturer Name	Philips	Philips	Philips
Insert Product Name/Series	PureForm	PureForm	TownGuide
Insert Description	P21	P21	Classic T
Insert Product Number	P21-DIM-MA-1-2BL-55LA-NW*-xxx-PCR7-SP2xx	P21-DIM-MA-1-2BL-55LA-NW*-xxx-PCR7-SP2xx	PBDP103UCF-50W64LED3K-MP-PC-C-LE5-xxx-CLO-RCD7-GR*-SP2xx
<b>LED Chips</b>			
LED Chip Brand &Type	Vendor to Provide Product Specific Data	Cree XPG-2	Cree XPG-2
LM-80-08	Vendor to Provide Product Specific Data	YES	YES
LM-80 Rated Life Claims per TM-21 Methodology	Vendor to Provide Product Specific Data	YES	YES
Expected L70 Life with supporting curve documentation	L70 of 60kHrs @ 25C	91% LM @ 25° C	L70 @ 70kHrs @ 25° C
<b>Luminaire Performance</b>			
Initial Luminaire Lumens	Vendor to Provide Product Specific Data	5981	5354
LM-79-08 From NVLAP Lab	Vendor to Provide Product Specific Data	YES	YES
Name of Independent Test Lab	Vendor to Provide Product Specific Data	Philips - San Marcos	Philips
Report Number	Vendor to Provide Product Specific Data	LRP0956N	LVP0030400
Date of Report	Vendor to Provide Product Specific Data	3/28/2014	11/14/2013
CRI - Color Rendering Index (+/- 2 CRI maximum deviation)	Mast Arm 70 Min / Post Top 80 Min	70	80
CCT - Correlated Color Temperature	4000K (+/-350)	4000	3000
Luminaire Efficacy Rating	Mast Arm 95 Min / Post Top 90 Min	98	90
DOE - Department of Energy Approved	Must Be MSSLC Compliant	MSSLC Compliant	MSSLC Compliant
DLC - Design Lights Consortium Listed	Must be DLC QPL Listed	Listed	Listed
Light Distribution Type	Mast Arm Type II / Post Top Type V	Type II	Type V
Bug Rating per IESNA TM15-11	Mast Arm B1-U0-G1 or less / Post Top B3-U2-G2 or less	B1-U0-G1	B3-U2-G2
Operating Temperature of Complete System	-40 / +40 c	-40 / +40 c	-40 / +40 c
L70 Per TM21	Minimum L70 @ 70K Hrs	YES	YES
Warranty Period	10 Years	10 Years	10 Years
<b>Driver System Performance</b>			
Voltage Input	As Required	120-277 or 347-480	120-277 or 347-480
Wattage Consumption in ON State (Luminaire Total)	Mast Arm 55 Max / Post Top 105 Max	54	50
Wattage Consumption in OFF state	0.0 Watts	0.0 Watts	0.0 Watts
Operating Frequency	50/60 HZ	50/60 HZ	50/60 HZ
Onboard Surge Protection Rating	20kV (min)	20kV (min)	20kV (min)
Adjustable Output Current	YES	YES	YES
Module Temperature Protection	YES	YES	YES
Power Factor at 100% load	.95 (min)	.95 (min)	.95 (min)
Total Harmonic Distortion (Driver THD)	20% (max)	20% (max)	20% (max)
UL Listed Driver	YES	YES	YES
Title 47 CFR Part 15 Class A for Interference	YES	YES	YES
Damp Location Rated Driver	UL listed damp & Dry	UL listed damp & Dry	UL listed damp & Dry
LED Driver Expected Rated Life Tcase ≤ 65° C	100K Hrs Minimum	100K Hrs	100K Hrs
LED Driver Operating Temperature	-40° to 55° C	-40° to 55° C	-40° to 55° C
<b>Physical &amp; Mechanical Characteristics</b>			
Weight in Pounds	Mast Arm 40 Max (incl. arm) / Post Top 18 Max	38	16
EPA	Mast Arm .40 Max (incl. arm) / Post Top 1.3 Max	.35 SQ. FT.	1.2 SQ. FT.
Housing Construction	Die Cast Aluminum	Die Cast Aluminum	Die Cast Aluminum
Heat Sink Construction	Die Cast Aluminum	Die Cast Aluminum	Die Cast Aluminum
Lens Material	UV Resistant Acrylic	Glass	UV Resistant Acrylic
Optical Refractors	UV Resistant Acrylic	UV Resistant Acrylic	UV Resistant Acrylic
UL Listed	CSA, UL, cUL	CSA, UL, cUL	CSA, UL, cUL
Optical Chamber IP Rating	IP66 Minimum	IP66	IP66
Wiring Compartment / Fixture Body IP Rating	IP54 Minimum	IP54	IP54
Photocell Options Available	Required	YES	YES
Wireless Control Compatible Photo-Cell Option Availability	Required	YES	YES
Hardware Corrosion Resistance	SS Screws / Zinc Plated Bolts	SS Screws / Zinc Plated Bolts	SS Screws / Zinc Plated Bolts
Custom Customer Label Internal to Wiring Compartment	Option Required	Option Available	Option Available
Power Access located on Bottom of Unit	Required	YES	YES
ROHS Compliant	Required	YES	YES
ANSI C136.36 Table 1 (1.5G Roadway Test) for Post Top	Required	N/A	YES
ANSI C136.36 Table 2 (3G Bridge & Overpass Test) for Mast Arm	Required	YES	N/A
<b>Finishes</b>			
Poly Powder Coated Finish Minimum Thickness	2.5 mm (+/- 1mil) Minimum	2.5-4.0 mm (+/- 1mil)	2.5-4.0 mm (+/- 1mil)
Color Selection	AMA 2603 Medium Gray	AMA 2603 Medium Gray	AMA 2603 Medium Gray
Salt Spray Test 2000 Hour Minimum per ASTM-B117	Required	YES	YES
<b>Surge Suppression</b>			
UL/DOE / Surge Suppression IEEE/ANSI C62.45 per C62.41.2			
Senario 1 Category C High Exposure L/G, L/N, N/G	20kV, 20kA Required	20kV, 20kA	20kV, 20kA
MSSLC Model Specification for LED Roadway Luminaires Appendix D Electrical Immunity High test level 10kV/10kA	20kV, 20kA Required	20kV, 20kA	20kV, 20kA
Surge Suppression Wired to Fail into OFF mode	Required	YES	YES
<b>Manufacturer Qualifications</b>			
ISO	ISO-9000-2008 Required	ISO-9000-2008	ISO-9000-2008
UL Lab Onsite in North America	Required	YES	YES
Minimum 15 Years Experience Manufacturing LED Products	Required	YES	YES
Assembled per IEC61340-5-1 & ANSI/ESD S20.20 ESD Standards	Required	YES	YES

\*Note: Color to be coordinated upon final selection.