



WRCOG LightSuite For Outdoor Lighting Regulations

September 5, 2017

Introduction

Most communities have some sort of outdoor lighting regulation. Older regulations tend to focus on preventing objectionable light trespass and overlighting of sites, but more recently ordinances strive to prevent environmental impacts and to preserve dark skies at night for astronomy and star-gazing. The urgency of creating modernized lighting regulations recently increased dramatically with the 2016 announcement by the American Medical Association (AMA) of its concern about the impact on human health and the environment caused by some types of LED lighting.

Riverside County is one of the first governing bodies in the world to restrict outdoor lighting to preserve the dark night sky. While the intent was primarily to benefit the Palomar Observatory, it also served to maintain one of the largest areas of dark skies in populated areas of Southern California, considered by many to be a significant contribution to quality of life in the County. But the original ordinances have been rendered obsolete by Light-emitting diode (LED) technology. In fact, LED lighting is now being installed throughout the County and without modern regulations, years of care and concern will be quickly undone by the careless installation of LED's that don't meet the recommendations of the AMA.

As part of the WRCOG Regional Streetlight Program, a group of modern lighting regulation documents and resources, called the LightSuite, has been developed for use by WRCOG member jurisdictions. In addition to ensuring that all LED lighting complies with AMA recommendations, LightSuite proposes modernization to all existing ordinances and coordinates them with State of California outdoor lighting regulations put in place since 2006. Properly implemented, LightSuite will help improve planning, permitting and enforcement in every community.

In addition, the technical aspects of LightSuite have been reviewed by CalTech's principal astronomers and scientists and determined to be consistent with best practices to mitigate light pollution that could affect the work of Palomar Observatory and CalTech.

Regulating Outdoor Lighting

In California, outdoor lighting became restricted by the California Code of Regulations on January 1, 2006. Title 24 Part 1 instituted a statewide lighting zone system. It has default zones for the entire state, but communities can change the zones throughout their jurisdiction. Title 24 Part 6, the Energy Efficiency standards, restrict the amount of light by limited power (watts) and energy per zone and need – including, to a certain extent, signs. Title 24, Part 11, CAL Green, the statewide sustainability code, restricts upward light, glare and off-site impacts per the lighting zone using the BUG (Backlight, Uplight, Glare) rating system for outdoor lighting. **Communities already have these tools** to regulate lighting through planning, permitting and inspection of all new buildings as well as for renovations, remodeling and additions.

Title 24 alone does not restrict residential lighting in specific important ways that have been proven to be needed for communities to resolve the common complaints among neighbors. It also does not restrict streetlights. Jurisdictions must individually develop or modernize and implement several standards and regulations to address remaining community outdoor lighting components:

1. A **lighting ordinance** regulating lighting for buildings, site development such as parking lots and walkways, and other uses of outdoor lighting other than streets or signs.
2. A **design standard** that specifies the design of street lighting for developer projects that will become part of the community lighting system.
3. **Street lighting standards** for new roadways and intersections and for maintaining or revising existing street lighting.
4. **Specifications** for all LED street lighting products.

The WRCOG LightSuite

This suite of proposed ordinances, standards, and general outdoor lighting resources is provided after multiple rounds of review and input from WRCOG Public Works, Planning Directors, Technical Advisory, Executive Committees and WRCOG member jurisdictional staff for use by WRCOG communities and includes the following:

- LightSuite 1 - Specification of LED Lighting fixtures for New and Relocated Street Lighting Systems
- Light Suite 2 – Design Standards for New or Relocated Street Lighting
- LightSuite 3 – Specifications of LED Lighting fixtures for Replacement of Cobrahead Street Lighting Systems
- LightSuite 4 – Design Standards for LED Replacement Street Lighting
- LightSuite 5 – Proposed Riverside County Ordinance 655P Regulating Outdoor Lighting
- LightSuite 6 – Proposed Modernization of Riverside County Ordinance 915P Regulating Outdoor Lighting
- LightSuite 7 – Template Community Outdoor Lighting Ordinance

For questions concerning the WRCOG LightSuite or the WRCOG Regional Streetlight Program, feel free to contact Tyler Masters, WRCOG Program Manager, at tmasters@wrcoq.us.

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**SPECIFICATION OF LED LIGHTING FIXTURES FOR NEW AND RELOCATED STREET
LIGHTING SYSTEMS**

PART 1 – GENERAL

1.1. SCOPE

Luminaires to be used for new and relocated LED street lighting systems.

1.2. 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.

A. American National Standards Institute (ANSI)

1. C136.2-2004 (or latest), American National Standard for Roadway and Area Lighting Equipment—Luminaire Voltage Classification
2. 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
3. C136.15-2011 (or latest), American National Standard for Roadway and Area Lighting Equipment – Luminaire Field Identification
4. C136.22-2004 (R2009 or latest), American National Standard for Roadway and Area Lighting Equipment – Internal Labeling of Luminaires
5. 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
6. C136.31-2010 (or latest), American National Standard for Roadway Lighting Equipment – Luminaire Vibration
7. C136.37-2011 (or latest), American National Standard for Roadway and Area Lighting Equipment - Solid State Light Sources Used in Roadway and Area Lighting.

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

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

C. Council of the European Union (EC)

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

D. DesignLights Consortium (DLC)

1. Qualified Products List (QPL)

E. Federal Trade Commission (FTC)

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

F. Illuminating Engineering Society of North America (IESNA or IES)

1. DG-21-15, Design Guide for Residential Lighting
2. DG-4-03 (or latest), Design Guide for Roadway Lighting Maintenance
3. HB-10-11 (or latest), IES Lighting Handbook, 10th Edition
4. LM-50-99 (or latest), IESNA Guide for Photometric Measurement of Roadway Lighting Installations
5. IES RES-1-16, Measure and Report on Luminaire Dirt Depreciation (LDD) in LED Luminaires for Street and Roadway Lighting Applications
6. LM-61-06 (or latest), Approved Guide for Identifying Operating Factors Influencing Measured Vs. Predicted Performance for Installed Outdoor High Intensity Discharge (HID) Luminaires
7. LM-79-08 (or latest), IESNA Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products
8. LM-80-08 (or latest), IESNA Approved Method for Measuring Lumen Maintenance of LED Light Sources
9. RP-8-14 ANSI / IESNA American National Standard Practice for Roadway Lighting
10. RP-16-10 (or latest), ANSI/IES Nomenclature and Definitions for Illuminating Engineering
11. TM-3-95 (or latest), A Discussion of Appendix E - "Classification of Luminaire Lighting Distribution," from ANSI/IESNA RP-8-83
12. TM-15-11 (or latest), Luminaire Classification System for Outdoor Luminaires
13. TM-21-11 (or latest), Projecting Long Term Lumen Maintenance of LED Light Sources

G. Institute of Electrical and Electronics Engineers (IEEE)

1. IEEE C62.41.2-2002 (or latest), IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits
2. 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

H. National Electrical Manufacturers Association (NEMA)

1. ANSI/NEMA/ANSI C78.377-2008 (or latest), American National Standard for the Chromaticity of Solid State Lighting Products

I. National Fire Protection Association (NFPA)

1. NFPA-70-14 – National Electrical Code (NEC)

- J. Southern California Edison
 - 1. Standards for services to customer-owned street lighting systems
 - 2. Standard specifications for Public Works Construction (Greenbook) (latest edition), Subsections 700 and 701 and all included cross references
- K. Underwriters Laboratories (UL)
 - 1. 1449, Surge Protective Devices
 - 2. 1598, Luminaires and Poles
 - 3. 8750, Light Emitting Diode (LED) Equipment for Use in Lighting Products
- L. City Standards for Street Lighting

1.3. RELATED DOCUMENTS

- A. LightSuite 2, Design Standards for New or Relocated Street Lighting Systems.

1.4. DEFINITIONS

- A. Lighting terminology used herein is defined in IES RP-16. See referenced documents for additional definitions.
 - 1. Exception: The term “driver” is used herein to broadly cover both drivers and power supplies, where applicable.
 - 2. Clarification: The term “LED light source(s)” is used herein per IES LM-80 to broadly cover LED package(s), module(s), and array(s).

1.5. QUALITY ASSURANCE

- A. Luminaires shall be listed on the Qualified Products List (QPL) of Design Lights Consortium.
- B. Before approval and purchase, furnish luminaire sample(s) of proposed products for inspection and approval.

1.6. LIGHTING SYSTEM PERFORMANCE

- A. Energy Conservation
 - 1. Lighting Controls
 - a. See section 2.1-B below for driver control interface and performance requirements.
 - b. See section 2.1-K below for photocontrol receptacle requirements.
- B. Photometric Requirements
 - 1. Luminaires shall meet the general criteria provided in the body of this specification and the criteria for each luminaire type defined in Table A.

1.7. REQUIRED SUBMITTALS FOREACH PROPOSED LUMINAIRE

- A. Use Table B attached hereto for each proposed luminaire.
- B. General submittal content shall include
 - 1. Completed Table B submittal form

2. Luminaire cutsheets
 3. Cutsheets for LED light sources
 4. Cutsheets for LED driver(s)
 - a. If dimmable LED driver is specified, provide diagrams illustrating light output and input power as a function of control signal.
 5. Cutsheets for surge protection device, if applicable
 6. Instructions for installation and maintenance
 7. Summary of luminaire recycled content and recyclability per the FTC Green Guides, expressed by percentage of luminaire weight
- C. LM-79 luminaire photometric report(s) shall be produced by the test laboratory and include
1. Name of test laboratory
 - a. The test laboratory must hold National Voluntary Laboratory Accreditation Program (NVLAP) accreditation for the IES LM-79 test procedure.
 2. Report number
 3. Date
 4. Complete luminaire catalog number
 - a. Provide explanation if catalog number in test report(s) does not match catalog number of luminaire submitted
 - i. Clarify whether discrepancy does not affect performance, e.g., in the case of differing luminaire housing color.
 - ii. If nominal performance of submitted and tested products differs, submit additional LM-79 report(s) and derivation.
 5. Description of luminaire, LED light source(s), and LED driver(s)
 6. Goniophotometry by means of both PDF printed photometric report and .ies file.
 7. Colorimetry
 8. IES TM-21-11 calculations that derive the lumen maintenance (lamp lumen depreciation or LLD) factor applied to photometric calculations specified herein. TM-21 calculations must apply to the maximum LED case temperature from ISTMT, shall not extrapolate beyond six times the duration of available LM-80 test data, and submitted in the spreadsheet format of the ENERGY STAR TM-21 calculator.
- D. Predicted dirt depreciation per IES RES-1-16 Page 72 Tables 7 and 8 for the optical system used.
- E. Computer-generated point-by-point photometric analysis of maintained photopic light levels.
1. Calculations shall be for maintained values, i.e. Light Loss Factor (LLF) < 1.0, where $LLF = LLD \times LDD \times LATF$, and
 - a. Lamp Lumen Depreciation (LLD)
 - i. Shall be 0.8 (L_{80}) for all luminaires
 - b. Luminaire Dirt Depreciation (LDD) per IES RES-1-16 and assuming 5-year cleaning cycle.
 - c. Luminaire Ambient Temperature Factor (LATF) = 1.00

2. Use of IES HB-10 mesopic multipliers
 - a. Shall be disallowed herein, by assuming an S/P ratio of 1.00 for all luminaires.
 3. Calculation/measurement points shall be per IES RP-8.
 4. Software shall be AGI32 using roadway methods and insofar as possible, on representative sections of all planned new or relocated designs.
- F. Summary of Joint Electron Devices Engineering Council (JEDEC) or Japan Electronics and Information Technology Industries (JEITA) reliability testing performed for LED packages
- G. Summary of reliability testing performed for LED driver(s)
- H. Written product warranty as per section 1.8 below
- I. Safety certification and file number
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).

1.8. WARRANTY

- A. Provide a minimum ten-year warranty covering maintained integrity and functionality of
1. Luminaire housing, wiring, and connections
 2. LED light source(s)
 - a. Negligible light output from more than 10 percent of the LED packages constitutes luminaire failure.
 3. LED driver(s)
 - a. Failure to dim if connected to a control system and using proper components constitutes luminaire failure
- B. Warranty period shall begin upon installation, or as negotiated by owner such as in the case of an auditable asset management system.
- C. Warranty to provide for replacement of product with new product of equivalent appearance, CCT, CRI, and photometric performance.
- D. Upon request prior to approval, manufacturer may be required to provide proof of financial viability which may include any information deemed necessary to determine the manufacturer's ability to fully service their warranty.

PART 2 – PRODUCTS

2.1. LUMINAIRES

A. General Requirements

1. Luminaires shall be as specified for each type in Table B.
2. Luminaire shall have an external label per ANSI C136.15
3. Luminaire shall have an internal label per ANSI C136.22.
4. Nominal luminaire input wattage shall account for nominal applied voltage and any reduction in driver efficiency due to sub-optimal driver loading.
5. Luminaires shall start and operate in -20°C to +40°C ambient.
6. Electrically test fully assembled luminaires before shipment from factory.
7. Effective Projected Area (EPA) of the luminaire shall not exceed the EPA of the luminaire being replaced.
8. Luminaires shall be designed for ease of component replacement and end-of-life disassembly.
9. Luminaires shall be rated for the ANSI C136.31 Vibration Level indicated in Table B.
10. LED light source(s) and driver(s) shall be RoHS compliant.
11. Transmissive optical components shall be applied in accordance with OEM design guidelines to ensure suitability for the thermal/mechanical/chemical environment.

B. Driver

1. Rated case temperature shall be suitable for operation in the luminaire operating in the ambient temperatures indicated in section 2.1-A above.
2. Shall operate at any single-phase voltage between 100 and 277 volts 50/60 Hz, and shall operate normally for input voltage fluctuations of plus or minus 10 percent.
3. Shall have a minimum Power Factor (PF) of 0.90 at full input power and across specified voltage range.
4. Control signal interface
 - a. Table B submittal should indicate whether the driver is dimmable.
 - b. If dimmable, it should further indicate “0-10”, “1-10”, “DALI”, or “other”.

C. Electrical transient and surge immunity

1. Luminaire shall meet the “Elevated” requirements.

D. Electromagnetic interference

1. Shall have a maximum Total Harmonic Distortion (THD) of 20% at full input power and across specified voltage range.
2. Shall comply with FCC 47 CFR part 15 non-consumer RFI/EMI standards.

E. Electrical safety testing

1. Luminaire shall be listed for wet locations by an OSHA NRTL.
2. Luminaires shall have locality-appropriate governing mark and certification.

F. Painted or finished luminaire components exposed to the environment

1. Shall exceed a rating of six per ASTM D1654 after 1000hrs of testing per ASTM B117.

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.
- G. Thermal management
1. Mechanical design of protruding external surfaces (heat sink fins) for shall facilitate hose-down cleaning and discourage debris accumulation.
 2. 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.
- H. IES TM-15 limits for Backlight, Uplight, and Glare (BUG Ratings) shall be as specified for each luminaire type in Table A.
1. Calculation of BUG Ratings shall be for initial (worst-case) values, i.e., Light Loss Factor (LLF) = 1.0.
- I. Minimum Color Rendering Index (CRI): 70.
- J. Correlated Color Temperature (CCT)
1. Nominal 2700K (3000K for certain applications only).
 2. Allowable 2580 to 2870K per IES LM-79.
 3. Allowable -.006 to .006 D_{uv} per IES LM-79.
- K. The following shall be in accordance with corresponding sections of ANSI C136.37
1. Wiring and grounding
 - a. All internal components shall be assembled and pre-wired using modular electrical connections.
 2. Terminal blocks for incoming AC lines
 3. Photo control receptacle
 4. Latching and hinging
 5. Ingress protection
- L. Luminaire Construction
1. Weight
 - a. The net weight of each luminaires less than 46 (21 kg) pounds including mounting devices and backlight shields.
 2. Housing
 - a. Tool-less entry
 - b. Die-cast aluminum alloy meeting ASTM Specification A380. Alternate materials may be considered but shall be submitted to the Owner for review and approval.
 - c. Encloses the mounting hardware, LED arrays, control receptacle, terminal board, and electronic driver.
 - d. Includes a surface to facilitate leveling with a spirit level.
 - e. Integral heat sink characteristics, such that all enclosed components will operate within their designed operating temperatures under expected service conditions. No external or removable heat shields or heat sinks are permitted.
 - f. Designed to encourage water shedding.
 - g. Designed to minimize dirt and bug accumulation on the optic surface.
 - h. Permanently affixed easily-viewable nameplate inside of each luminaire housing containing the manufacturer's name, manufacturer's catalog number, date of manufacture (month and year), plant location, input

power consumption, driver output current, IEC IP Rating, correlated color temperature (CCT), IES light distribution type, IESNA TM-15 BUG ratings, and serial number.

- i. City approved luminescent name plate meeting American National Standard for Roadway and Area Lighting Equipment-Luminaire Field Identification (ANSI C136.15-2015) shall be permanently affixed on the exterior of the Luminaire to be visible from the ground.

3. Mounting Provisions.

- a. Standard heavy gauge slip-fitter clamping assembly suitable for secure attachment over the end of a nominal two 2" IP (2.375" OD) steel pipe with an approved means of clamping it firmly in mounting bracket. The slip fitter mounting clamp must contain an approved shield around the pipe entrance to block the entry of birds.
- b. Leveling adaptor to permit at least 15 degrees of correction to level luminaire with respect to normal to photometric nadir (straight down).
- c. Adaptor fittings for nominal 1.5-inch IP, 1.75-inch IP, 2.25-inch IP and 2.5-inch IP mast arms.

4. Access Door-Panel.

- a. Die-cast aluminum door-panel composed of aluminum alloy A380. Alternate materials may be considered but shall be submitted to the Owner for review and approval.
- b. Provides access to the terminal strip and LED driver.
- c. Hinged to the luminaire housing and suitably latched and fastened at the closing end.
- d. Easily removed.
- e. Captive hardware for the hinge and fastening devices.

5. Hardware.

- a. Machine screws, locknuts, pins and set screws necessary to make a firm assembly, and for its secure attachment to the mast arm, must be furnished in place.
- b. Hardware must be of stainless steel, zinc plated steel, copper silicon alloy or other non-corrosive metal, and where necessary must be suitably plated to prevent electrolytic action by contact with dissimilar metals.

6. Finish.

- a. Polyester powder coat with a minimum 2.0 mil thickness.
- b. Surface texture and paint quality subject to approval.
- c. Color must be as specified in the order.
- d. Finish must exceed a rating of six per ASTM D1654 after 1000 hours of testing per ASTM B117.
- e. The coating must exhibit no greater than 30% reduction of gloss per ASTM D523 after 500 hours of QUV testing at ASTM G154 Cycle 6.

7. Ingress Protection.

- a. Electric compartment housing must have an ingress protection rating of IP54 or better as described in ANSI C136.25-2013.
- b. The optical system must have a minimum rating of IP 66.

- c. Listed for wet locations by a U.S. Occupational Safety Health Administration (OSHA) Nationally Recognized Laboratory (NRTL) and have a safety certification and file number indicating compliance with UL 1598.
- 8. LED Optical Arrays
 - a. Factory installed.
 - b. No required field adjustment for specified photometric performance.
- 9. Terminal Block
 - a. High grade molded plastic of the barrier or safety type.
 - b. Within the water tight part of the housing in a readily accessible location.
 - c. Pre-wired to all luminaire components
 - d. Copper plated clamp-type pressure connector approved type for "line" connections, to accommodate wire sizes from #14 to #6 A.W.G.
 - e. Internal component connections either the screw-clamp or quick disconnect type.

2.2. PRODUCT MANUFACTURERS AND PRODUCTS

- A. Specific products proposed for a project should be submitted using Table B along with a physical sample.
- B. Specify products and companies meeting project requirements.
- C. Optimize performance for the existing conditions.

2.3. MANUFACTURER SERVICES

- A. The manufacturer shall provide full support for the project including, but not limited to, AGI-32 lighting calculations, required tests and certifications, and all other services necessary to permit products to be applied as intended by these specifications.
- B. The manufacturer shall notify the contractor immediately of product changes and bulletins and provide new specifications and test reports.
- C. Manufacturer or local sales representative shall provide installation and troubleshooting support in person and shall identify the name of a factory trained sales agent in Riverside County to service the Project.

TABLE A**RECOMMENDED PHOTOMETRIC PERFORMANCE REQUIREMENTS****(Coordinate with LightSuite 4 Decisions)**

Less than 5 Kilolumens

	Type II	Type III	Type IV
Street-side Coefficient of Utilization ³	67% min.		
Backlight (B)	0 or 1		
Uplight (U)	0		
Glare (G)	0 or 1		
House Side Shield Required ¹	If B1, otherwise by request		
Cul-de-sac shield required ²	By request		

Nominal 5 to 7.5 Kilolumens

	Type II	Type III	Type IV
Street-side Coefficient of Utilization ³	73% min.	70% min.	63% min.
Backlight (B)	0 or 1		
Uplight (U)	0		
Glare (G)	0 or 1		
House Side Shield Required ¹	If B1, otherwise by request		
Cul-de-sac shield required ²	Yes		

Nominal 7.5 to 12.5 Kilolumens

	Type II	Type III	Type IV
Street-side Coefficient of Utilization ³	76% min.	74% min.	70% min.
Backlight (B)	0, 1 or 2		
Uplight (U)	0		
Glare (G)	0, 1, or 2	0, 1, 2 or 3	0, 1, 2 or 3
House Side Shield Required ¹	If B2, otherwise by request		
Cul-de-sac shield required ²	Yes		

Nominal 12.5 to 17.5 Kilolumens

	Type II	Type III	Type IV
Street-side Coefficient of Utilization ³	80% min.	76% min.	75% min.
Backlight (B)	0, 1 or 2		
Uplight (U)	0		
Glare (G)	0, 1, or 2	0, 1, 2 or 3	0, 1, 2 or 3
House Side Shield Required ¹	If B2 or B3; otherwise by request		
Cul-de-sac shield required ²	Yes		

Nominal 17.5 to 30 Kilolumens

	Type II	Type III	Type IV
Street-side Coefficient of Utilization ³	80% min.	76% min.	75% min.
Backlight (B)	0, 1 or 2		
Uplight (U)	0		
Glare (G)	0, 1, or 2	0, 1, 2 or 3	0, 1, 2 or 3
House Side Shield Required ¹	If B2 or B3; otherwise by request		
Cul-de-sac shield required ²	Yes		

Footnotes for all luminaires

- ¹ If installed on a residential street or residential collector; optional to install by request by Owner or as additional service
- ² If installed on a residential cul-de-sac or L intersection
- ³ Without detachable shields

TABLE B
PRODUCT SUBMITTAL FORM

Luminaire Type ¹		
Manufacturer		
Model number		
DLC Listing and Date		
Housing finish color		
Tenon nominal pipe size (inches)		
Nominal luminaire weight (lb)		
Nominal luminaire EPA (ft ²)		
Nominal input voltage (V)		
ANSI vibration test level	☐ Level 1 (Normal)	☐ Level 2 (bridge/overpass)
Nominal BUG Ratings		
Make/model of LED light source(s)		
Make/model of LED driver(s)		
Dimmability	☐ Dimmable	☐ Not dimmable
Control signal interface		
Upon electrical immunity system failure	☐ Possible disconnect	☐ No possible disconnect
Thermal management	☐ Moving parts	☐ No moving parts
Lumen maintenance testing duration in hours		
Reported lumen maintenance life (hr) ²		
Warranty period (yr)		
Parameter	Nominal value	Tolerance (%)
Initial photopic output (lm)		
Maintained photopic output (lm)		
Lamp lumen depreciation		
Initial input power (W)		
Maintained input power (W)		
Initial LED drive current (mA)		
Maintained LED drive current (mA)		
Drive current used		
In-situ LED T _c (°C)		
CCT (K)		
Additional product description		

END OF SECTION

¹ See Table A, and attach supporting documentation as required.

² Value shall be no less than as specified in section 1.6-C, and shall not exceed six times the testing duration indicated in the row above. Value shall be consistent with values submitted in the rows below for maintained light output, maintained input power, and maintained drive current.

DESIGN STANDARDS FOR NEW OR RELOCATED STREET LIGHTING

Section 1. INTENT

The purpose of this Standard is to establish standards for street lighting that will:

- A. Provide high quality street lighting for the community meeting or exceeding minimum national recommendations.
- B. Help mitigate light pollution, reduce skyglow and improve the nighttime environment for astronomy and the Palomar Observatory and the overall enjoyment of the naturally dark night sky.
- C. Minimize adverse offsite impacts of lighting such as light trespass, and obtrusive light.
- D. Help protect human health and wellness and the natural environment from the adverse effects of man-made outdoor lighting.
- E. Conserve energy and resources to the greatest extent possible.

Section 2. CONFORMANCE WITH APPLICABLE LAWS, CODES, REGULATIONS and STANDARDS

All street lighting shall be installed in conformance with the provisions of this standard and the applicable provisions of the standards of the community regulating the installation of such fixtures, the California Building Code Title 24 Part 1, the California Electrical Code Title 24 Part 3, the California Building Energy Efficiency Standards Title 24 Part 6, the California Sustainability Standards Title 24 Part 11 "CalGreen", and all other applicable requirements.

Section 3. SCOPE

This standard shall apply to the construction, alteration, movement, enlargement, replacement and installation of street lighting and its related electrical service throughout the community including but not limited to:

- A. Street lighting for public streets, roadways, alleys and other rights of way including walkways and bikeways.
- B. Street lighting for private roadways, walkways and bikeways.
- C. Street lighting for private developments where the street lighting will be deeded to the community at some time in the future.

Exceptions to Section 3

- 1. Facilities, sites or roadways under the sole jurisdiction of the Federal or State Governments or within the jurisdiction of a sovereign nation.
- 2. Lighting specifically governed by a Federal or State regulation or statute.

3. Lighting subject to the terms of a Special Plan approved by the community.

Section 4. ALTERNATE MATERIALS AND METHODS OF INSTALLATION

This standard is not intended to prevent the use of any design, material or method of installation not expressly forbidden, provided any such alternate has been approved if it:

- A. Provides at least approximate equivalence to the applicable specific requirements of this standard; and
- B. Is otherwise satisfactory and complies with the intent of this standard.

Section 5. DEFINITIONS

- A. **Street Lighting** means luminaire(s), installed outdoors, and used to illuminate a street or roadway and/or any part of the public right of way including but not limited to, sidewalks, bikeways, alleys, intersections, ramps, underpasses, overpasses, curbs, medians, or shoulders.
- B. **Street** means major, collector and local roads where pedestrians and bicyclists are generally present.
- C. **Roadway** means, freeways, expressways, limited access roads, and roads on which pedestrians, cyclists and parked vehicles are generally not present.
- D. **Residential Street** means a street that is exclusively serving residential properties and for which the posted speed limit is 25 mph (40 kph) or less.
- E. **Luminaire** means a complete illuminating device, lighting fixture or other device that emits light, consisting of light source(s) together with the parts designed to distribute the light, to position and protect the light source(s), to regulate the electrical power, and to connect the light sources to the power supply.
- F. **IES** means the Illuminating Engineering Society of North America.
- G. **RP-8** means the current version of the IES Recommended Practice for Roadway Lighting, RP-8.
- H. **RP-22** means the current version of the IES Recommended Practice for Tunnel Lighting RP-22.
- I. **DG-21** means the current version of the IES Design Guide for Residential Street Lighting.
- J. **TM-15** means the current version of the IES Technical Memorandum, Luminaire Classification System for Outdoor Luminaires

- K. **Palomar Zone A** is established by Riverside County Ordinance 655 and means all properties and land uses in plan view within the circular area fifteen (15) miles in radius centered on Palomar Observatory.
- L. **Palomar Zone B** is established by Riverside County Ordinance 655 and means all properties and land uses in plan view the circular ring area between by two circles, one forty-five (45) miles in radius centered on Palomar Observatory, and the other the perimeter of Zone A.
- M. **Palomar Zone C** means the remainder of Riverside County outside of the perimeter of Zone B.
- N. **BUG rating of an outdoor luminaire** means the ranking of the luminaire using a photometric report to establish the Backlight (B), Uplight (U) and Glare (G) ranking per IES TM-15.
- O. **LED** means light emitting diode solid state lighting source.
- P. **Dedicated LED** means a luminaire with a hard-wired LED light generating module and a separate driver.
- Q. **Photometric Report** means a complete photometric report from a NVLAP certified test laboratory.
- R. **AASHTO** means the American Association of State Highway Traffic Officials.
- S. **Special Plan** means a plan for a specific property or district approved by community legal action that permits variances to these requirements.

Section 6. TITLE 24 LIGHTING ZONES

- A. For the purposes of complying California Code of Regulations, Title 24, Part 1, Section 10-114 and Title 24, Part 11, Section 5.106.8, Zone A as defined above shall be Lighting Zone 1 (LZ-1), Zone B as defined above shall be Lighting Zone 2 (LZ-2). The balance of the County shall be LZ-2 or LZ-3 per the statewide default zones or as set by the community.
- B. The community shall establish a method for applicant(s) to request and to set a different lighting zone per Title 24, Part 1 Section 10-114 for a specific parcel or project.

Section 7. GENERAL REQUIREMENTS

- A. Streetlights shall utilize dedicated LED luminaries and shall be designed per these Standards, field inspected and approved prior to requesting energizing or acceptance.
- B. All wiring for street lighting shall be underground, per these standards and these specifications for power to be supplied from community owned service points from the utility.
- C. Street lighting on private roads shall be constructed per these Standards.

- D. Street lighting shall be designed and installed per the Title 24 Lighting Zones as described herein.
- E. Street lighting shall be fully shielded and emit no uplight (BUG rating U=0).

Exception to Section 7. (D.) Decorative street lights not meeting the BUG requirements for the Lighting Zone in which they are proposed and having uplight (BUG rating U≠0) may be permitted by Special Plan or special permission of the community.

Section 8. ILLUMINATING ENGINEERING REQUIREMENTS FOR NEW STREET LIGHTING INSTALLATIONS

A. Scope

- 1. All streets and roadways unless otherwise directed by community.
- 2. Walkways and sidewalks directly associated with streets and roadways to be illuminated. Walkways and bikeways not directly associated with a street or roadway are not in scope of this document.
- 3. Service roads for public facilities and parks, unless otherwise directed by community.

B. Street and Roadway lighting requirements

- 1. Lighting for all streets and roadways shall be per RP-8.
- 2. The community shall establish whether the street to be lighted is a “major”, “collector”, or “local” for the purposes of designing street lighting.
- 3. The pedestrian area classification shall be “LOW” conflict except for the following:
 - a. Within ¼ mile (400 m) of the property line of any school, library, city hall, retail shopping districts senior center, park, bus stop or hospital, the pedestrian area classification shall be “MEDIUM”.
 - b. Within 1/8 mile (200 m) of any transit station, the pedestrian area classification shall be “HIGH”
 - c. As determined by community.

EXCEPTION to Section 8. (A.)

- 1. In Zone A and Lighting Zone 1 (LZ-1), for residential streets, street lighting shall be limited to (1) light at each residential street or residential street/residential minor collector intersection and (1) light mod block per DG-21. There shall be no requirements to meet illuminance, luminance or uniformity requirements.

Lighting for walkways and sidewalks may be incidental because of the street lights.

2. Exception 1 to Section 8. (A.), may be applied to any residential street with the approval of community.

C. Intersection lighting requirements

1. Unless otherwise permitted by community, provide at least four pedestrian crossing safety lights at each signaled intersection.
2. Light levels shall be per RP-8.
3. The pedestrian area classification shall be the highest of any of the intersecting streets or roadways within 1/8 mile (200m) of the intersection.

EXCEPTION to Section 8. (D.)

1. Partial lighting for isolated intersections per RP-8 when permitted by community.

D. Other lighting requirements

1. The following shall be illuminated per RP-8 unless otherwise directed by community.
 - a. Railroad grade crossings
 - b. Overpasses and bridges
 - c. Roundabouts
 - d. Ramps and similar elements
2. The pedestrian area classification shall be the highest of any of the connecting streets or roadways.
3. Tunnels and underpasses shall be illuminated per RP-22.

E. Chromaticity

1. Per Table 8-1.

Table 8-1. Maximum Allowed Color Temperature Per Lighting Zones

	Palomar Zone A and Lighting Zone LZ-1	Palomar Area B and C and Lighting Zones LZ-2 through LZ-4
Maximum Color Temperature		
Intersection Safety Lights	2700K	2700K or 3000K
Highways, Arterials and Major Collectors	2700K	2700K or 3000K
Minor Collectors and Streets	2700K	2700K
Residential Streets	2700K	2700K

Application Notes

- A. 2700K has been tested by WRCOG and accepted through public input of tested site locations for intersection safety lights, state route, arterials and major collectors.
- B. Per IES there no significant difference in any performance characteristic involving safety or security between 2700K and 3000K.
- C. 2700K causes less light pollution per lumen than does 3000K.

Section 9. PRODUCT SPECIFICATIONS

- A. Luminaires shall comply with the current WRCOG LightSuite 1, Specification of LED Lighting Fixtures for New and Relocated Street Lighting Systems.
- B. Design shall include selection of luminaires, poles, mast arms, and other components affecting the performance of the street lighting system.
- C. Poles, mast arms, bases, electrification and all other parts of the street lighting system shall meet engineering standards of the community.

Application Note: LightSuite 4 Table 7-2 suggests a system for minimizing the number of different types of luminaires (SKU's) in order to simplify product ordering, replacement and stock management

Section 10. SUBMITTALS FOR APPROVAL

- A. Plan(s) of the proposed lighting installation clearly identifying:
 - 1. The criteria for each roadway segment, intersection, and other elements as required in Section 8. (C.), (D.), and (E.), above. Information affecting criteria selection, such as proximity to a school or transit stop shall be included. Calculations representing typical stretches of roadways or streets may be permitted for each condition of Lighting Zone, pedestrian area classification, posted speed or other differences.
 - 2. The AASHTO pavement type(s), e.g. R1, R2, etc.
 - 3. Point-by point lighting calculations on a grid not larger than 2.5' x 2.5' (.75m x .75m).
 - 4. Calculation summaries showing average, minimum, and maximum values and ratios as contained in the tables of criteria in RP-8.
 - 5. Calculations to include roadways, intersections, walkways, and all other parts of the project for which criteria were developed under Section 9. (A.) 1.
 - 6. Schedule of luminaires including mounting height, mast arm length, and pole base locations.

B. Specifications for each luminaire to include:

1. Product datasheet.
2. Photometric report.
 - a. Must clearly indicate BUG rating per TM-15.
3. Drawing of pole or standard including base details.
4. Drawing of mast arm if used.
5. Datasheet for driver and surge suppressor.
6. Datasheet for photocell.

END OF SECTION

**SPECIFICATIONS OF LED LIGHTING FIXTURES FOR REPLACEMENT OF COBRAHEAD
STREET LIGHTING SYSTEMS**

PART 1 – GENERAL**1.1. SCOPE**

Luminaires to be used for replacement of legacy high intensity discharge street lighting systems.

1.2. 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.

- A. American National Standards Institute (ANSI)
 - 3. C136.2-2004 (or latest), American National Standard for Roadway and Area Lighting Equipment—Luminaire Voltage Classification
 - 4. 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
 - 5. C136.15-2011 (or latest), American National Standard for Roadway and Area Lighting Equipment – Luminaire Field Identification
 - 6. C136.22-2004 (R2009 or latest), American National Standard for Roadway and Area Lighting Equipment – Internal Labeling of Luminaires
 - 7. 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
 - 8. C136.31-2010 (or latest), American National Standard for Roadway Lighting Equipment – Luminaire Vibration
 - 9. C136.37-2011 (or latest), American National Standard for Roadway and Area Lighting Equipment - Solid State Light Sources Used in Roadway and Area Lighting
- B. American Society for Testing and Materials International (ASTM)
 - 10. B117-09 (or latest), Standard Practice for Operating Salt Spray (Fog) Apparatus
 - 11. D1654-08 (or latest), Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
 - 12. D523-08 (or latest), Standard Test Method for Specular Gloss
 - 13. G154-06 (or latest), Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials
- C. 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
- D. DesignLights Consortium (DLC)
 - a. Qualified Products List (QPL)
- E. Federal Trade Commission (FTC)
 - a. Green Guides, 16 CFR Part 260, Guides for the Use of Environmental

Marketing Claims

- F. Illuminating Engineering Society of North America (IESNA or IES)
 - a. DG-21-15, Design Guide for Residential Lighting
 - b. DG-4-03 (or latest), Design Guide for Roadway Lighting Maintenance
 - c. HB-10-11 (or latest), IES Lighting Handbook, 10th Edition
 - d. LM-50-99 (or latest), IESNA Guide for Photometric Measurement of Roadway Lighting Installations
 - e. IES RES-1-16, Measure and Report on Luminaire Dirt Depreciation (LDD) in LED Luminaires for Street and Roadway Lighting Applications
 - f. LM-61-06 (or latest), Approved Guide for Identifying Operating Factors Influencing Measured Vs. Predicted Performance for Installed Outdoor High Intensity Discharge (HID) Luminaires
 - g. LM-79-08 (or latest), IESNA Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products
 - h. LM-80-08 (or latest), IESNA Approved Method for Measuring Lumen Maintenance of LED Light Sources
 - i. RP-8-14 ANSI / IESNA American National Standard Practice for Roadway Lighting
 - j. RP-16-10 (or latest), ANSI/IES Nomenclature and Definitions for Illuminating Engineering
 - k. TM-3-95 (or latest), "A Discussion of Appendix B - "Classification of Luminaire Lighting Distribution, from ANSI/IESNA RP-8-83". Annex B
 - l. TM-15-11 (or latest), Luminaire Classification System for Outdoor Luminaires
 - m. TM-21-11 (or latest), Projecting Long Term Lumen Maintenance of LED Light Sources
- G. Institute of Electrical and Electronics Engineers (IEEE)
 - a. IEEE C62.41.2-2002 (or latest), IEEE Recommended Practice on 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
- H. 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
- I. National Fire Protection Association (NFPA)
 - a. NFPA-70-14 – National Electrical Code (NEC)
- J. Underwriters Laboratories (UL)
 - a. 1449, Surge Protective Devices
 - b. 1598, Luminaires and Poles
 - c. 8750, Light Emitting Diode (LED) Equipment for Use in Lighting Products
- K. City Standards for Street Lighting
- L. Southern California Edison
 - a. Standards for services to customer-owned street lighting systems
 - b. Standard specifications for Public Works Construction (Greenbook) (latest edition), Subsections 700 and 701 and all included cross references.

1.3. RELATED DOCUMENTS

- A. LightSuite 2, Design Standards for New or Relocated Street Lighting Systems.

1.4. DEFINITIONS

- A. Lighting terminology used herein is defined in IES RP-16. See referenced documents for additional definitions.
 - 1. Exception: The term “driver” is used herein to broadly cover both drivers and power supplies, where applicable.
 - 2. Clarification: The term “LED light source(s)” is used herein per IES LM-80 to broadly cover LED package(s), module(s), and array(s).

1.5. QUALITY ASSURANCE

- A. Before approval and purchase, furnish luminaire sample(s) identical to product configuration(s) submitted for inspection. Furnish IES LM-79 testing of luminaire sample(s) to verify performance is within manufacturer-reported tolerances.
- B. Product shall be listed by Design Lights Consortium (DLC).

1.6. LIGHTING SYSTEM PERFORMANCE

- A. Energy Conservation
 - 1. Lighting Controls
 - a. See section 2.1-B below for driver control interface and performance requirements.
 - b. See section 2.1-K below for photocontrol receptacle requirements.
- B. Photometric Requirements
 - 1. Luminaires shall meet the general criteria provided in the body of this specification and the criteria for each luminaire type defined in Table B

1.7. REQUIRED SUBMITTALS FOR EACH LUMINAIRE TYPE

- A. Use Table B attached hereto for each proposed luminaire.
- B. General submittal content shall include
 - 1. Completed Table B submittal form
 - 2. Luminaire cutsheets
 - 3. Cutsheets for LED light sources
 - 4. Cutsheets for LED driver(s)
 - a. If dimmable LED driver is specified, provide diagrams illustrating light output and input power as a function of control signal.
 - 5. Cutsheets for surge protection device, if applicable
 - 6. Instructions for installation and maintenance
 - 7. Summary of luminaire recycled content and recyclability per the FTC Green Guides, expressed by percentage of luminaire weight
- C. LM-79 luminaire photometric report(s) shall be produced by the test laboratory and include
 - 1. Name of test laboratory
 - a. The test laboratory must hold National Voluntary Laboratory Accreditation

- Program (NVLAP) accreditation for the IES LM-79 test procedure.
2. Report number
 3. Date
 4. Complete luminaire catalog number
 - a. Provide explanation if catalog number in test report(s) does not match catalog number of luminaire submitted
 - i. Clarify whether discrepancy does not affect performance, e.g., in the case of differing luminaire housing color.
 - ii. If nominal performance of submitted and tested products differ, submit additional LM-79 report(s) and derivation.
 5. Description of luminaire, LED light source(s), and LED driver(s)
 6. Goniophotometry
 7. Colorimetry
 8. IES TM-21-11 calculations that derive the lumen maintenance (lamp lumen depreciation or LLD) factor applied to photometric calculations specified herein. TM-21 calculations must apply to the maximum LED case temperature from ISTMT, shall not extrapolate beyond six times the duration of available LM-80 test data, and submitted in the spreadsheet format of the ENERGY STAR TM-21 calculator.
- D. Predicted dirt depreciation per IES RES-1-16 Page 72 Tables 7 and 8 for the optical system used.
- E. Computer-generated point-by-point photometric analysis of maintained photopic light levels.
1. Calculations shall be for maintained values, i.e. Light Loss Factor (LLF) < 1.0 , where $LLF = LLD \times LDD \times LATF$, and
 - a. Lamp Lumen Depreciation (LLD)
 - ii. Shall be 0.8 (L_{80}) for all luminaires
 - b. Luminaire Dirt Depreciation (LDD) per IES RES-1-16 and assuming 5-year cleaning cycle.
 - c. Luminaire Ambient Temperature Factor (LATF) = 1.00
 2. Use of IES HB-10 mesopic multipliers
 - a. Shall be disallowed herein, by assuming an S/P ratio of 1.00 for all luminaires.
 3. Calculation/measurement points shall be per IES RP-8.
 4. Software shall be AGI32 using roadway methods and insofar as possible, on WRCOG standard test designs.
- F. Summary of Joint Electron Devices Engineering Council (JEDEC) or Japan Electronics and Information Technology Industries (JEITA) reliability testing performed for LED packages
- G. Summary of reliability testing performed for LED driver(s)
- H. Written product warranty as per section 1.8 below
- I. Safety certification and file number
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).

1.8. WARRANTY

- A. Provide a minimum ten-year warranty covering maintained integrity and functionality of
 - 1. Luminaire housing, wiring, and connections
 - 2. LED light source(s)
 - a. Negligible light output from more than 10 percent of the LED packages constitutes luminaire failure.
 - 3. LED driver(s)
 - a. Failure to dim if connected to a control system and using proper components constitutes luminaire failure
- B. Warranty period shall begin upon installation, or as negotiated by owner such as in the case of an auditable asset management system.
- C. Warranty to provide for replacement of product with new product of equivalent appearance, CCT, CRI, and photometric performance.
- D. Upon request prior to approval, manufacturer may be required to provide proof of financial viability which may include any information deemed necessary to determine the manufacturer's ability to fully service their warranty.

PART 2 – PRODUCTS

2.1. LUMINAIRES

- A. General Requirements
 - 1. Luminaires shall be as specified for each type in Table B.
 - 2. Luminaire shall have an external label per ANSI C136.15
 - 3. Luminaire shall have an internal label per ANSI C136.22.
 - 4. Nominal luminaire input wattage shall account for nominal applied voltage and any reduction in driver efficiency due to sub-optimal driver loading.
 - 5. Luminaires shall start and operate in -20°C to +40°C ambient.
 - 6. Electrically test fully assembled luminaires before shipment from factory.
 - 7. Effective Projected Area (EPA) of the luminaire shall not exceed the EPA of the luminaire being replaced.
 - 8. Luminaires shall be designed for ease of component replacement and end-of-life disassembly.
 - 9. Luminaires shall be rated for the ANSI C136.31 Vibration Level indicated in Table B.
 - 10. LED light source(s) and driver(s) shall be RoHS compliant.
 - 11. Transmissive optical components shall be applied in accordance with OEM design guidelines to ensure suitability for the thermal/mechanical/chemical environment.

B. Driver

1. Rated case temperature shall be suitable for operation in the luminaire operating in the ambient temperatures indicated in section 2.1-A above.
2. Shall operate at 100 to 277 volts AC at 50/60 Hz, and shall operate normally for input voltage fluctuations of plus or minus 10 percent.
3. Shall have a minimum Power Factor (PF) of 0.90 at full input power and across specified voltage range.
4. Control signal interface
 - a. Table B submittal should indicate whether the driver is dimmable.
 - b. If dimmable, it should further indicate "0-10", "1-10", "DALI", or "other".

C. Electrical transient and surge immunity

1. Luminaire shall meet the "Elevated" requirements. Manufacturer shall indicate on submittal form Table B.

D. Electromagnetic interference

1. Shall have a maximum Total Harmonic Distortion (THD) of 20% at full input power and across specified voltage range.
2. Shall comply with FCC 47 CFR part 15 non-consumer RFI/EMI standards.

E. Electrical safety testing

1. Luminaire shall be listed for wet locations by an OSHA NRTL.
2. Luminaires shall have locality-appropriate governing mark and certification.

F. Painted or finished luminaire components exposed to the environment

1. Shall exceed a rating of six per ASTM D1654 after 1000hrs of testing per ASTM B117.
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.

G. Thermal management

1. Mechanical design of protruding external surfaces (heat sink fins) for shall facilitate hose-down cleaning and discourage debris accumulation.
2. 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.

H. IES TM-15 limits for Backlight, Uplight, and Glare (BUG Ratings) shall be as specified for each luminaire type in Table A.

1. Calculation of BUG Ratings shall be for initial (worst-case) values, i.e., Light Loss Factor (LLF) = 1.0.

I. Minimum Color Rendering Index (CRI): 70.

J. Correlated Color Temperature (CCT)

1. Nominal 2700K (3000K for certain applications only).
2. Allowable 2580 to 2870K per IES LM-79.
3. Allowable -.006 to .006 D_{uv} per IES LM-79.

- K. The following shall be in accordance with corresponding sections of ANSI C136.37
1. Wiring and grounding
 - a. All internal components shall be assembled and pre-wired using modular electrical connections.
 2. Terminal blocks for incoming AC lines
 3. Photocontrol receptacle
 4. Latching and hinging
 5. Ingress protection
- L. Luminaire Construction
1. Weight
 - a. The net weight of each luminaire less than 46 (21 kg) pounds including mounting devices and backlight shields.
 2. Housing
 - a. Tool-less entry
 - b. Die-cast aluminum alloy meeting ASTM Specification A380. Alternate materials may be considered but shall be submitted to the Owner for review and approval.
 - c. Encloses the mounting hardware, LED arrays, control receptacle, terminal board, and electronic driver.
 - d. Includes a surface to facilitate leveling with a spirit level.
 - e. Integral heat sink characteristics, such that all enclosed components will operate within their designed operating temperatures under expected service conditions. No external or removable heat shields or heat sinks are permitted.
 - f. Designed to encourage water shedding.
 - g. Designed to minimize dirt and bug accumulation on the optic surface.
 - h. Permanently affixed easily-viewable nameplate inside of each luminaire housing containing the manufacturer's name, manufacturer's catalog number, date of manufacture (month and year), plant location, input power consumption, driver output current, IEC IP Rating, correlated color temperature (CCT), IES light distribution type, IESNA TM-15 BUG ratings, and serial number.
 - i. City approved luminescent name plate meeting American National Standard for Roadway and Area Lighting Equipment-Luminaire Field Identification (ANSI C136.15-2015) shall be permanently affixed on the exterior of the Luminaire to be visible from the ground. In addition, the name plate shall indicate nominal lumen package rounded to the nearest thousand lumens, e.g. 2800 lumens would read as "3KL" and 11200 lumens would read as "11KL".

3. Mounting Provisions.
 - a. Standard heavy gauge slip fitter clamping assembly suitable for secure attachment over the end of a nominal two 2" IP (2.375" OD) steel pipe with an approved means of clamping it firmly in mounting bracket. The slip fitter mounting clamp must contain an approved shield around the pipe entrance to block the entry of birds.
 - b. Leveling adaptor to permit at least 15 degrees of correction to level luminaire with respect to normal to photometric nadir (straight down).
 - c. Adaptor fittings for nominal 1.5 inch IP, 1.75 inch IP, 2.25 inch IP and 2.5 inch IP mast arms.
4. Access Door-Panel.
 - a. Die-cast aluminum door-panel composed of aluminum alloy A380. Alternate materials may be considered but shall be submitted to the Owner for review and approval.
 - b. Provides access to the terminal strip and LED driver.
 - c. Hinged to the luminaire housing and suitably latched and fastened at the closing end.
 - d. Easily removed.
 - e. Captive hardware for the hinge and fastening devices.
5. Hardware.
 - a. Machine screws, locknuts, pins and set screws necessary to make a firm assembly, and for its secure attachment to the mast arm, must be furnished in place.
 - b. Hardware must be of stainless steel, zinc plated steel, copper silicon alloy or other non-corrosive metal, and where necessary must be suitably plated to prevent electrolytic action by contact with dissimilar metals.
6. Finish.
 - a. Polyester powder coat with a minimum 2.0 mil thickness.
 - b. Surface texture and paint quality subject to approval.
 - c. Color must be as specified in the order.
 - d. Finish must exceed a rating of six per ASTM D1654 after 1000 hours of testing per ASTM B117.
 - e. The coating must exhibit no greater than 30% reduction of gloss per ASTM D523 after 500 hours of QUV testing at ASTM G154 Cycle 6.
7. Ingress Protection.
 - a. Electric compartment housing must have an ingress protection rating of IP54 or better as described in ANSI C136.25-2013.
 - b. The optical system must have a minimum rating of IP 66.
 - c. Listed for wet locations by a U.S. Occupational Safety Health Administration (OSHA) Nationally Recognized Laboratory (NRTL) and have a safety certification and file number indicating compliance with UL 1598.

8. LED Optical Arrays
 - a. Factory installed.
 - b. No required field adjustment for specified photometric performance.
9. Terminal Block
 - a. High grade molded plastic of the barrier or safety type.
 - b. Within the water tight part of the housing in a readily accessible location.
 - c. Pre-wired to all luminaire components
 - d. Copper plated clamp-type pressure connector approved type for "line" connections, to accommodate wire sizes from #14 to #6 A.W.G.
 - e. Internal component connections either the screw-clamp or quick disconnect type.

2.2. PRODUCT MANUFACTURERS AND APPROVED PRODUCTS

- A. Minimum photometric performance of products shall comply with Table A.
- B. Select products to replace existing luminaires using Tables A and B, including application notes, as recommended in LightSuite 4.
- C. Specific products proposed for a specific project should be submitted using Table B along with a physical sample.
- D. Optimize performance for the existing conditions. For illuminating engineering, WRCOG will provide access to AGI32 models to determine best possible performance under common circumstances found throughout Western Riverside County.

2.3. MANUFACTURER SERVICES

- A. The manufacturer shall provide full support for the project including, but not limited to, AGI-32 lighting calculations, required tests and certifications, and all other services necessary to permit products to be applied as intended by these specifications.
- B. The manufacturer shall notify the contractor immediately of product changes and bulletins and provide new specifications and test reports.
- C. Manufacturer or local sales representative shall provide installation and troubleshooting support in person and shall identify the name of a factory trained sales agent in Riverside County to service the Project.

TABLE A
MINIMUM PHOTOMETRIC PERFORMANCE REQUIREMENTS

Less than 5 Kilolumens

	Type II	Type III	Type IV
Street-side Coefficient of Utilization ³	67% min.		
Backlight (B)	0 or 1		
Uplight (U)	0		
Glare (G)	0 or 1		
House Side Shield Required ¹	If B1, otherwise by request		
Cul-de-sac shield required ²	By request		

Nominal 5 to 7.5 Kilolumens

	Type II	Type III	Type IV
Street-side Coefficient of Utilization ³	73% min.	70% min.	63% min.
Backlight (B)	0 or 1		
Uplight (U)	0		
Glare (G)	0 or 1		
House Side Shield Required ¹	If B1, otherwise by request		
Cul-de-sac shield required ²	Yes		

Nominal 7.5 to 12.5 Kilolumens

	Type II	Type III	Type IV
Street-side Coefficient of Utilization ³	76% min.	74% min.	70% min.
Backlight (B)	0, 1 or 2		
Uplight (U)	0		
Glare (G)	0, 1, or 2	0, 1, 2 or 3	0, 1, 2 or 3
House Side Shield Required ¹	If B2, otherwise by request		
Cul-de-sac shield required ²	Yes		

Nominal 12.5 to 17.5 Kilolumens

	Type II	Type III	Type IV
Street-side Coefficient of Utilization ³	80% min.	76% min.	75% min.
Backlight (B)	0, 1 or 2		
Uplight (U)	0		
Glare (G)	0, 1, or 2	0, 1, 2 or 3	0, 1, 2 or 3
House Side Shield Required ¹	If B2 or B3; otherwise by request		
Cul-de-sac shield required ²	Yes		

Nominal 17.5 to 30 Kilolumens

	Type II	Type III	Type IV
Street-side Coefficient of Utilization ³	80% min.	76% min.	75% min.
Backlight (B)	0, 1 or 2		
Uplight (U)	0		
Glare (G)	0, 1, or 2	0, 1, 2 or 3	0, 1, 2 or 3
House Side Shield Required ¹	If B2 or B3; otherwise by request		
Cul-de-sac shield required ²	Yes		

Footnotes for all luminaires

¹ If installed on a residential street or residential collector; optional to install by request by Owner or as additional service

² If installed on a residential cul-de-sac or L intersection

³ Without detachable shields

TABLE B
PRODUCT SUBMITTAL FORM

Luminaire Type ³		
Manufacturer		
Model number		
DLC listing and date		
Housing finish color		
Tenon nominal pipe size (inches)		
Nominal luminaire weight (lb)		
Nominal luminaire EPA (ft ²)		
Nominal input voltage (V)		
ANSI vibration test level	☐ Level 1 (Normal)	☐ Level 2 (bridge/overpass)
Nominal BUG Ratings		
Make/model of LED light source(s)		
Make/model of LED driver(s)		
Dimmability	☐ Dimmable	☐ Not dimmable
Control signal interface		
Upon electrical immunity system failure	☐ Possible disconnect	☐ No possible disconnect
Thermal management	☐ Moving parts	☐ No moving parts
Lumen maintenance testing duration (hr)		
Reported lumen maintenance life (hr) ⁴		
Warranty period (yr)		
Parameter	Nominal value	Tolerance (%)
Initial photopic output (lm)		
Maintained photopic output (lm)		
Lamp lumen depreciation		
Initial input power (W)		
Maintained input power (W)		
Initial LED drive current (mA)		
Maintained LED drive current (mA)		
Drive current used		
In-situ LED T _c (°C)		
CCT (K)		
Additional product description		

END OF SECTION

³ See Table A, and attach supporting documentation as required.

⁴ Value shall be no less than as specified in section 1.6-C, and shall not exceed six times the testing duration indicated in the row above. Value shall be consistent with values submitted in the rows below for maintained light output, maintained input power, and maintained drive current.

DESIGN STANDARDS FOR LED REPLACEMENT STREET LIGHTING

Section 1. INTENT

The purpose of this document is to provide technical specifications and direction that will

- A. Ensure a high-quality conversion of existing street lighting that insofar as possible maintains essential qualities of the existing installation.
- B. Typically allow for reduced energy consumption of the existing street lighting by at least 40% compared to the existing legacy lighting system.
- C. Equip each luminaire with the means to communicate to a community-wide lighting network.
- D. Help mitigate light pollution, reduce skyglow and improve the nighttime environment for astronomy and the Palomar Observatory and the overall enjoyment of the naturally dark night sky;
- E. Minimize adverse offsite impacts of lighting such as light trespass, and obtrusive light.
- F. Help protect human health and wellness and the natural environment from the adverse effects of man-made outdoor lighting.

Section 2. CONFORMANCE WITH APPLICABLE LAWS, CODES, REGULATIONS and STANDARDS

All street lighting shall be installed in conformance with the provisions of this standard and the applicable provisions of the standards of the community regulating the installation of such fixtures, the California Building Code Title 24 Part 1, the California Electrical Code Title 24 Part 3, the California Building Energy Efficiency Standards Title 24 Part 6, the California Sustainability Standards Title 24 Part 11 “CalGreen”, and all other applicable requirements.

Section 3. SCOPE

This standard shall apply the conversion of legacy street lighting systems employing high intensity discharge (HID) lighting sources to light-emitting diode (LED) light sources for:

- A. Street lighting for public streets, roadways, alleys and other rights of way including walkways and bikeways.
- B. Street lighting for private roadways, walkways and bikeways.
- C. Street lighting for private developments where the street lighting will be deeded to the community at some time in the future.

Exceptions to Section 3

- 1. Facilities, sites or roadways under the sole jurisdiction of the Federal or State Governments or within the jurisdiction of a sovereign nation.

2. Lighting specifically governed by a Federal or State regulation or statute.
3. Lighting subject to the terms of a Special Plan approved by the community.

Section 4. ALTERNATE MATERIALS AND METHODS OF INSTALLATION.

This standard is not intended to prevent the use of any design, material or method of installation not expressly forbidden, provided any such alternate has been approved if it:

- A. Provides at least approximate equivalence to the applicable specific requirements of this standard; and
- B. Is otherwise satisfactory and complies with the intent of this standard.

Section 5. DEFINITIONS.

- A. **Street lights** means luminaire(s), installed outdoors, and used to illuminate a street or roadway and/or any part of the public right of way including but not limited to, sidewalks, bikeways, alleys, intersections, ramps, overpasses, curbs, medians, or shoulders.
- B. **Street** means major, collector and local roads where pedestrians and bicyclists are generally present.
- C. **Roadway** means, freeways, expressways, limited access roads, and roads on which pedestrians, cyclists and parked vehicles are generally not present.
- D. **Residential street** means a street that is exclusively serving residential properties and for which the posted speed limit is 25 mph (40 kph) or less.
- E. **Luminaire** means a complete illuminating device, lighting fixture or other device that emits light, consisting of light source(s) together with the parts designed to distribute the light, to position and protect the light source(s), to regulate the electrical power, and to connect the light sources to the power supply.
- F. **Legacy luminaire** means an existing cobrahead luminaire using a high intensity discharge light source including high pressure sodium (HPS), low pressure sodium (LPS), metal halide (MH), ceramic metal halide (CMH), or mercury vapor (MV).
- G. **IES** means the Illuminating Engineering Society of North America.
- H. **RP-8** means the current version of the IES Recommended Practice for Roadway Lighting, RP-8.
- I. **RP-22** means the current version of the IES Recommended Practice for Tunnel Lighting RP-22.
- J. **DG-21** means the current version of the IES Design Guide for Residential Street Lighting.
- K. **TM-15** means the current version of the IES Technical Memorandum, Luminaire Classification System for Outdoor Luminaires

- L. **Palomar Zone A** is established by Riverside County Ordinance 655 and means all properties and land uses in plan view within the circular area fifteen (15) miles in radius centered on Palomar Observatory.
- M. **Palomar Zone B** is established by Riverside County Ordinance 655 and means all properties and land uses in plan view the circular ring area between by two circles, one forty-five (45) miles in radius centered on Palomar Observatory, and the other the perimeter of Zone A.
- N. **Palomar Zone C** means the remainder of Riverside County outside of the perimeter of Zone B.
- O. **BUG rating of an outdoor luminaire** means the ranking of the luminaire using a photometric report to establish the Backlight (B), Uplight (U) and Glare (G) ranking per IES TM-15.
- P. **LED** means light emitting diode solid state lighting source.
- Q. **Dedicated LED** means a luminaire with a hard-wired LED light generating module and a separate driver.
- R. **Photometric Report** means a complete photometric report from a NVLAP certified test laboratory.
- S. **AASHTO** means the American Association of State Highway Traffic Officials.
- T. **Roadway lighting distribution types as defined by IES**
 - a. **Type I** is a long, narrow symmetrical distribution having a preferred lateral width of 15 degrees in the cone of maximum candlepower. Typically, luminaires are located in the center of a roadway, such as in a median, where the mounting height is approximately equal to the roadway width on either side.
 - b. **Type II** is a mildly asymmetric distribution is used for wide walkways, on ramps and entrance roadways, and narrow streets. Typically, the width of the roadway does not exceed 1.75 times the mounting height.
 - c. **Type III** is an asymmetric distribution commonly used for lighting streets and roadways. Typically, the width of the roadway does not exceed 2.75 times the mounting height.
 - d. **Type IV** is the most asymmetric distribution, commonly used for intersection safety lighting and extremely wide roadways. Typically, the width of the roadway does not exceed 3.75 times the mounting height.

Section 6. TITLE 24 LIGHTING ZONES

- A. For the purposes of complying California Code of Regulations, Title 24, Part 1, Section 10-114 and Title 24, Part 11, Section 5.106.8, Zone A as defined above shall be Lighting Zone 1 (LZ-1), Zone B as defined above shall be Lighting Zone 2 (LZ-2). The balance of

the County shall be LZ-2 or LZ-3 per the statewide default zones or as set by the community.

- B. The community shall establish a method for applicant(s) to request and to set a different lighting zone per Title 24, Part 1 Section 10-114 for a specific parcel or project.

Section 7. DESIGN OF REPLACEMENT LIGHTING

A. General

1. Obtain a GIS computer database of the community's street lighting system. Determine the extent to which the database is acceptably accurate for the determinations to be made in this section. If necessary, devise an alternative course of action acceptable to the community.
2. Determine whether any street lights are made unnecessary by an immediately adjacent street light. Typical situations include intersections where intersection safety lights were added after the street light system was already in place. As approved by the community, identify redundant lighting for removal.
3. Determine whether the community currently has street lighting standards, and determine the extent to which they are met.
4. Review the current lighting system's performance relative to RP-8. Discuss and determine the desired outcome with the community.
 - a. If the existing lighting system does not meet RP-8, it is unlikely that simply replacing legacy luminaires with LED luminaires will bring an existing installation into compliance without changing pole locations, mounting heights, or mast arm lengths.
 - b. If the existing lighting system meets RP-8, matching IES distribution type and lumen package within $\pm 20\%$ will essentially replace existing lighting with an equally RP-8 compliant outcome.
 - c. If the existing lighting system exceeds RP-8, determine whether reducing light levels to RP-8 is acceptable.
5. Review a map of the community with the community. Make and confirm determinations of characteristics in RP-8 (regardless of whether complying or not) that are to be used to determine lighting levels, including but not limited to:
 - a. Which are streets and which are roadways.
 - b. Which streets and roadways are "major", "collector", or "local" as defined by RP-8.
 - c. Where pedestrian conflict levels are low, medium or high.

- d. Which streets are adjacent to or share the ROW with mass transit stops or bicycle paths.
 - e. Other considerations used to establish lighting requirements at the discretion of the community
- 6. For each legacy luminaire in the system, determine the appropriate LED replacement per Section 7. (D.) or (E.) below.
- B. Street lighting shall be fully shielded and emit no uplight (BUG rating U=0).
- C. Street lighting chromaticity shall be determined from Table 7-1.
- D. Typical procedure for selecting appropriate LED luminaires without RP-8 compliance.
 - 1. Determine each legacy luminaire's primary characteristics
 - a. Light Source
 - b. Wattage of lamp
 - c. Photometric type (e.g. type II medium, type III short, etc.)
 - 2. Determine replacement strategy. The following three strategies are the most likely choices.
 - a. Most energy efficiency – recommended for most applications, generally maintains existing minimum light levels, improves uniformity. Typically considered acceptable when replacing HPS or LPS legacy systems with 2700K or 3000K LED lighting.
 - b. Compromise between energy efficiency and higher light levels – recommended for certain applications where the pedestrian area classification or some other factor suggests a modestly higher light level.
 - c. Higher light levels - provides average light levels higher than existing lighting – in locations where community needs transcend energy and cost savings.

Application Notes:

- Table 7-2 represents strategy (b.), compromise.
 - To achieve strategy (a.) choose the low end of the rated lumens; to achieve strategy (b.) choose the middle of the range of rated lumens; to achieve strategy (c.) choose the high end of the rated lumens.
 - Kilolumen classification system takes lumen maintenance into account.
- 3. For intersection safety lighting, type IV luminaires may be considered in place of existing Type III or Type II.

Note nominal LED kilolumen classifications in Table 7-2. To minimize the number of different luminaires to stock and maintain, this system is based on nominal lumen packages for up to six lumen package groups (Small, Medium Small, Medium, Medium High, High, and Very High).

4. Select nominal LED luminaire kilolumens of matching photometric type from Tables 7-2 and 7-3.

EXCEPTION TO Section 7. (D.)

In Zone A and Lighting Zone 1 (LZ-1), for residential streets, street lighting shall be limited to (1) light at each residential street or residential street/residential minor collector intersection and (1) light mod block per DG-21. There shall be no requirements to meet illuminance, luminance or uniformity requirements. Lighting for walkways and sidewalks may be incidental because of the street lights. This exception may be applied to any residential street with the approval of community.

- E. Procedure for selecting appropriate LED luminaires where RP-8 or another similar standard is preferred or required.
 1. Refer to LightSuite 2

**Section 8.
PRODUCT SPECIFICATIONS**

- A. Luminaires shall comply with the current WRCOG LightSuite 3, Specification of LED Lighting Fixtures for Replacement of Cobrahead Street Lighting Systems.

**Section 9.
SUBMITTALS FOR APPROVAL**

- A. Plan(s) of the proposed lighting installation clearly identifying:
 1. The criteria for each roadway segment, intersection, and other elements as required in Section 8. (C.), (D.), and (E.), above. Information affecting criteria selection, such as proximity to a school or transit stop shall be included. Calculations representing typical stretches of roadways or streets may be permitted for each condition of Lighting Zone, pedestrian area classification, posted speed or other differences.
 2. The AASHTO pavement type(s), i.e. R1, R2, R3, or R4.
 3. Point-by point lighting calculations on a grid not larger than 2.5' x 2.5' (.75m x .75m).
 4. Calculation summaries showing average, minimum, and maximum values and ratios as contained in the tables of criteria in RP-8.
 5. Calculations to include roadways, intersections, walkways, and all other parts of the project for which criteria were developed under Section 9. (A.) 1.
 6. Schedule of luminaires including mounting height, mast arm length, and pole base locations.
- B. Specifications for each luminaire to include:
 1. Product datasheet.

2. Photometric report.
 - a. Must clearly indicate BUG rating per TM-15.
3. Drawing of pole or standard including base details.
4. Drawing of mast arm if used.
5. Datasheet for driver and surge suppressor.
6. Datasheet for photocell.

Table 7-1 Maximum Correlated Color Temperature for any Exterior Lighting

	Palomar Zone A and Lighting Zone LZ-1	Palomar Area B and C and Lighting Zones LZ-2 through LZ-4
Maximum Color Temperature		
Intersection Safety Lights	2700K	2700K or 3000K
Highways, Arterials and Major Collectors	2700K	2700K or 3000K
Minor Collectors and Streets	2700K	2700K
Residential Streets	2700K	2700K

Application Notes

- a) 2700K has been tested by WRCOG and accepted through public input of tested site locations for intersection safety lights, state route, arterials and major collectors.
- b) Per IES there no significant difference in any performance characteristic involving safety or security between 2700K and 3000K.
- c) 2700K causes less light pollution per lumen than does 3000K.
- d) Most street luminaires in Western Riverside County are either LPS or HPS.
- e) Conversion tables 7-2 and 7-3 is suggested for general purpose use in replacing legacy lighting systems with 2700K to 3000K LED's available in the winter of 2016-2017. To adjust for future improvement in luminous efficacy, be sure to provide approximately the same number of LED lumens. LED watts are typical for products available in spring, 2017.
- f) LED luminaire lumens are generally lower in lumen output than legacy luminaires because of the ability of LED optical systems to achieve a greater percentage of utilization than legacy luminaires.
- g) Acceptable results will generally occur if care is taken to replace luminaire distribution types (e.g. Type III medium) with like.
- h) All values are nominal and represent average expected outcomes. Differences of less than 15-20% are probably not significant for this table.
- i) Use of this table does not ensure compliance with IES RP-8-14. In many cases, pole height, mast arm length and/or pole spacing may not permit compliance with RP-8-14 regardless of existing legacy source luminaires. If compliance with RP-8-14 is required, lighting calculations will be necessary and may result in different LED luminaire watts and lumens. Analysis using WRCOG standard AGI32 street models is recommended. See LightSuite 3 for recommended illuminating engineering standards.

- j) Lumen maintenance of the legacy light source as compared to LED lighting has been considered for each lamp type. Some legacy light sources have less lumen depreciation than others.

TABLE 7-2

**SUGGESTED KILOLUMEN (KL) CLASS REPLACEMENT LUMINAIRE SYSTEM FOR
MINIMUM TYPES (SKU's) OF LED LUMINAIRES**

Refer to application notes, below and Section 7. (D.)

Luminaire Class	Nominal Rated Lumens	Nominal Rated Watts @ 120- 240v in 2017
Extra Small (XS)	2000-3000	25
Small (S)	5000-6000	50
Medium (M)	8000-9000	85
Large (L)	12000-14000	110
Extra Large (XL)	18000-20000	150
Extra-extra Large (XXL)	22000-28000	275

TABLE 7-3

**RECOMMENDED NOMINAL DIRECT CONVERSION LED LUMINAIRE WHEN REPLACING
EXISTING LEGACY LUMINAIRES**

Incumbent Legacy Luminaire				New Luminaire Class	Approx. Watts Saved Each
Source	Lamp Watts	System Watts	Approximate Luminaire Lumens		
Low Pressure Sodium (LPS)	35	63	3360	XS	38
	55	84	5600	S	34
	90	131	9450	M	46
	135	182	15750	L	72
	180	229	23100	XL	79
High Pressure Sodium (HPS)	70	83	4060	XS	58
	100	117	6650	S	67
	150	193	11200	M	108
	200	246	15400	L	136
	250	313	19250	XL	163
	400	485	35000	XXL	210
Metal Halide (MH)	70	90	3960	XS	65
	100	129	6120	S	79
	175	210	10800	M	125
	250	295	15800	L	185
	400	458	27300	XXL	183
Mercury Vapor (MV)	100	120	2880	XS	95
	175	205	6040	S	155
	250	285	9000	M	200
	400	454	16500	L	344

Section 1. INTENT

The purpose of this Ordinance is to provide regulations for outdoor lighting that will:

- a. Ensure adequate outdoor illumination can be provided.
- b. Help mitigate light pollution, reduce skyglow and improve the nighttime environment for astronomy and the Palomar Observatory and the overall enjoyment of the naturally dark night sky;
- c. Minimize adverse offsite impacts of lighting such as light trespass, and obtrusive light.
- d. Help protect human health and wellness and the natural environment from the adverse effects of man-made outdoor lighting.
- e. Conserve energy and resources to the greatest extent possible.

Section 2. CONFORMANCE WITH APPLICABLE LAWS, CODES, REGULATIONS and ORDINANCES.

All outdoor luminaires shall be installed in conformance with the provisions of this ordinance and the applicable provisions of the ordinances of the County of Riverside regulating the installation of such fixtures, the California Building Code Title 24 Part 2, the California Electrical Code Title 24 Part 3, the California Building Energy Efficiency Standards Title 24 Part 6, the California Sustainability Standards Title 24 Part 11 "CalGreen", and all other applicable requirements.

Section 3. SCOPE

The provisions of this code apply to the construction, alteration, movement, enlargement, replacement and installation of outdoor lighting throughout the unincorporated areas of Riverside County, including but not limited to:

- A. Lighting on private property, such structures, areas, features, security and advertising.
- B. Lighting for private roadways, walkways and bikeways.
- C. Lighting for public property such as structures, areas, features, security and advertising.

Exceptions to Section 3

1. Facilities, sites or roadways under the sole jurisdiction of the Federal or State Governments or within the jurisdiction of a sovereign nation.
2. Lighting specifically governed by a Federal or State regulation or statute.
3. Lighting subject to the terms of a special plan approved by the County.

Section 4.

APPROVED MATERIALS AND METHODS OF INSTALLATION.

This ordinance is not intended to prevent the use of any design, material or method of installation not specifically forbidden, provided any such alternate has been approved. The Planning Director may approve any such proposed alternate if it:

- A. Provides at least approximate equivalence to the applicable specific requirements of this ordinance; and
- B. Is otherwise satisfactory and complies with the intent of this ordinance.

Section 5. DEFINITIONS.

- A. **Luminaire** means a complete illuminating device, lighting fixture or other device that emits light, consisting of light source(s) together with the parts designed to distribute the light, to position and protect the light source(s), to regulate the electrical power, and to connect the light sources to the power supply.
- B. **Outdoor luminaire** means a luminaire, whether permanently installed or portable, that is installed outdoors, whether completely or partly exposed or under a canopy, and used for general or task illumination for any of the following applications:
 1. Lighting for and around buildings and structures.
 2. Lighting for parks and recreational facilities.
 3. Parking lots and garages.
 4. Landscape lighting.
 5. Outdoor advertising displays and other signs.
 6. General area lighting for commerce, industry or security.
 7. Street and roadway lighting.
 8. Walkway, bikeway and lighting.
- C. **Class I lighting** means all outdoor luminaires used for but not limited to outdoor sales or eating areas, assembly or repair area, outdoor advertising displays and other signs, recreational facilities and other similar applications when color rendition is important.
- D. **Class II lighting** means all outdoor lighting used for but not limited to illumination for walkways, private roadways and streets, equipment yards, parking lot and outdoor security when color rendering is not important.
- E. **Class III lighting** means that lighting not meeting Class I or Class II purposes and used primarily for decorative effects. Examples of Class III lighting include, but are not limited to, the illumination of flag poles, trees, fountains, statuary, and building walls.
- F. **Planning Director** means the Director of Planning of the County of Riverside or representative(s) designated by the Planning Director.
- G. **IES** means the Illuminating Engineering Society of North America.

- H. **Zone A** means the circular area fifteen (15) miles in radius centered on Palomar Observatory.
- I. **Zone B** means the circular ring area defined by two circles, one forty-five (45) miles in radius centered on Palomar Observatory, and the other the perimeter of Zone A.
- J. **Zone C** means the remainder of the County outside of the perimeter of Zone B.
- K. **Individual** means any private individual, tenant, lessee, owner or any commercial entity, including, but not limited to, companies, partnerships, joint ventures or corporations.
- L. **Installed** means any installation of outdoor luminaires after the effective date of this ordinance. Projects with construction plans approved by the County prior to the effective date of this ordinance are excluded from installation in compliance with this ordinance.
- M. **BUG rating of an outdoor luminaire** means the ranking of the luminaire using a photometric report to establish the Backlight (B), Uplight (U) and Glare (G) ranking according to IES TM-15-11.
- N. **Fully Shielded Luminaire** means an outdoor luminaire where no light is emitted at or above an angle of 90 degrees above the nadir as evidenced by a photometric test report from a NVLAP accredited testing laboratory in which the uplight value (U) is 0. Any structural part of the luminaire providing shielding shall be permanently attached.
- O. **Partly Shielded luminaire** means outdoor luminaires that have a U (uplight) rating between 1 and 4.
- P. **Unshielded luminaire** means outdoor luminaires that are not Fully Shielded or Partly Shielded and have a U (uplight) rating of 5 or no rating at all.
- Q. **Outdoor Advertising Display** means advertising structures and signs used for outdoor advertising purposes, not including onsite advertising signs, as further defined and permitted in Article XIX of Ordinance No. 348.
- R. **Outdoor Recreational Facilities** means public or private facilities designed and equipped for the conduct of sports, leisure time activities and other customary and usual recreational activities. Outdoor recreational facilities include, but are not limited to, fields for softball, baseball, football, soccer, and any other field sports, courts for tennis, basketball, volleyball, handball and other court sports, for which the level of play according to IES RP-6-15 Section 4.4 is Class III or Class IV.
- S. **Outdoor Sports Facilities** include fields for softball, baseball, football, soccer, and other field sports, courts for tennis, basketball, volleyball, handball and other court sports, and outdoor stadiums in which the level of play, according to RP-6-15 Section 4.4 is Class I or Class II.
- T. **Lamp or source.** Generic term for a man-made source of light. In the context of this Code, a lamp is the user-replaceable electrically powered light bulb, fluorescent or neon tube, or LED light source.
- U. **LED** means light emitting diode solid state lighting source.
 - 1. **LED Hybrid** means a dedicated LED luminaire employing LED devices of two or more different colors, typically a white LED and a colored LED. For the purposes of this Ordinance, the white LED shall not exceed 3000K and the other color LED(s) must be green, amber, orange and/or red. Blue or violet LEDs are not permitted.

- 2. **LED Amber** means an LED luminaire employing amber or yellow colored LED devices.
- 3. **Filtered LED (FLED)** means a dedicated LED luminaire employing white LED devices and has a permanently affixed color filter to remove blue light and giving the appearance of an amber or yellow-green light.
- V. **Curfew** means a time established for listed lighting systems to be automatically extinguished.
- W. **Dedicated LED** means a luminaire with a hard-wired LED light generating module and a separate driver.
- X. **Outdoor Luminaire Light Output** means the amount of light, measured in lumens, generated by a luminaire. The luminaire lumens shall be the rated lumens of the luminaire according to a photometric report from a NVLAP certified test laboratory.

Section 6.

TITLE 24 LIGHTING ZONES

For the purposes of complying California Code of Regulations, Title 24, Part 1, Section 10-114 and Title 24, Part 6, Section 140.7, Zone A as defined above shall be Lighting Zone 1 (LZ-1), Zone B as defined above shall be Lighting Zone 2 (LZ-2) . The balance of the County shall be LZ-2 or LZ-3 per the statewide default zones.

The Planning Director shall establish a method for applicant(s) to request and for the Planning Director to set a different lighting zone per Title 24, Part 1 Section 10-114 for a specific parcel or project.

Section 7.
GENERAL REQUIREMENTS.

Light sources are restricted by lighting zone according to the following Tables:

TABLE 7-1 Class I Lighting (color rendering is important)

ALL LUMINAIRES SHALL BE FULLY SHIELDED			
Source	Zone A and LZ-1	Zone B and/or LZ-2	Zone C and/or LZ-3
LED >3000K	Not allowed	Not allowed	Not allowed
LED 3000K	Allowed	Allowed	Allowed
LED 2700K or less	Allowed	Allowed	Allowed
Incandescent or 2700K or lower LED replacement lamps	Allowed	Allowed	Allowed
LED amber, hybrid or filtered	Allowed ¹	Allowed ¹	Allowed ¹
Metal halide, fluorescent, compact fluorescent, induction	Not allowed	Allowed if 3000K or less	Allowed if 3000K or less
High pressure sodium	Allowed ¹	Allowed ¹	Allowed ¹
Low pressure sodium	Allowed ²	Allowed ²	Allowed ²
Neon or cold cathode	Not allowed	Not allowed	Not allowed
Other light sources ³	Not allowed	Not allowed	Not allowed

Notes

- ¹ Not recommended due to poor color rendering
- ² Not recommended – source is obsolete and has no color rendering
- ³ For light sources not listed, applicants may appeal as provided under Section 3.

TABLE 7-2 Class II Lighting (color rendering is not important)

ALL LUMINAIRES SHALL BE FULLY SHIELDED			
Source	Zone A and LZ-1	Zone B and LZ-2	Zone C and LZ-3 or 4
LED >3000K	Not allowed	Not allowed	Not allowed
LED 3000K	Not allowed	Allowed	Allowed
LED 2700K or less	Allowed	Allowed	Allowed
Incandescent or 2700K or lower LED replacement lamps	Allowed	Allowed	Allowed
LED amber, hybrid or filtered	Allowed	Allowed	Allowed
Metal halide, fluorescent, compact fluorescent, induction	Not allowed	Not allowed	Not allowed
High pressure sodium	Allowed	Allowed	Allowed
Low pressure sodium	Allowed ¹	Allowed ¹	Allowed ¹
Neon or cold cathode	Not allowed	Not allowed	Not allowed
Other light sources ²	Not allowed	Not allowed	Not allowed

Notes

- ¹ Not recommended – source is obsolete and has no color rendering
- ² For light sources not listed, applicants may appeal as provided under Section 3.

TABLE 7-3 Class III Lighting (decorative lighting)

LUMINAIRES SHALL BE FULLY SHIELDED EXCEPT AS NOTED			
Source	Zone A and LZ-1	Zone B and LZ-2	Zone C and LZ-3 or 4
LED >3000K	Not allowed	Not allowed	Not allowed
LED 3000K	Not allowed	Allowed	Allowed
LED 2700K or less	Allowed May be partly shielded or unshielded up to 450 lumens	Allowed May be partly shielded or unshielded up to 600 lumens	Allowed May be partly shielded or unshielded up to 1000 lumens
LED amber, hybrid or filtered			
Incandescent or 2700K or lower LED replacement lamps			
Metal halide, fluorescent, compact fluorescent, induction	Not allowed	Not allowed	Not allowed
High pressure sodium	Allowed	Allowed	Allowed
Low pressure sodium ¹	Allowed ¹	Allowed ¹	Allowed ¹
Neon or cold cathode	Not allowed	Not allowed	Not allowed
Other light sources ²	Not allowed	Not allowed	Not allowed

Notes

¹ Not recommended – source is obsolete and has no color rendering

² For light sources not listed, applicants may appeal as provided under Section 3.

Section 8.

SUBMISSION OF PLANS AND EVIDENCE OF COMPLIANCE.

The application for any required County approval for work involving nonexempt outdoor luminaires shall include evidence that the proposed work will comply with this ordinance. The submission shall contain, but not be limited to, the following:

- A. The location of the site where the outdoor luminaires will be installed;
- B. Plans indicating the location and type of fixtures on the premises;
- C. A description of the outdoor luminaires, including, but not limited to, manufacturer's catalog cuts and drawings.
- D. Photometric reports from a NVLAP accredited laboratory indicating luminaire light source type, color temperature, and BUG rating.

The above required plans and descriptions shall be sufficiently complete to enable the County to readily determine whether compliance with the requirements of this ordinance will be secured. If such plans and descriptions cannot enable this ready determination, by reason of the nature or configuration of the devices, fixtures or lamps proposed, the applicant shall submit further evidence of compliance enabling such determination.

Section 9.
PROHIBITIONS.

- A. All lighting shall be off between 11:00 p.m. and one hour before sunrise, except as follows:
 - 1. Motion sensors may be used for Class I lighting after 11:00 p.m.
 - 2. Class II lighting may remain on all night but shall employ motion sensors to turn lights off or dim lights when there is no motion after 11:00 p.m.
 - 3. On-premise advertising signs shall only be illuminated while the business facility is open to the public
 - 4. Outdoor advertising displays may remain lighted until midnight.
 - 5. Outside sales, commercial, assembly, repair, and industrial areas shall only be lighted when such areas are actually in use.
 - 6. Outdoor recreational facilities may remain lighted to complete recreational activities that are in progress and under illumination in conformance with this ordinance at 11:00 p.m.
- B. Operation of searchlights or aerial lasers for advertising purposes is prohibited.
- C. All external sign and billboard lighting shall be top-down. Bottom mounted signs are prohibited. Signs shall comply with the sign code.
- D. Use of mercury vapor lamps is prohibited.

Section 10.
PERMANENT EXCEPTIONS.

- A. Nonconformance. All outdoor luminaires existing and legally installed prior to the effective date of this ordinance are exempt from the requirements of this ordinance except that:
 - 1. When existing luminaries are reconstructed or replaced, such reconstruction or replacement shall be in compliance with this ordinance.
 - 2. Section 9 regarding hours of operation shall apply.
- B. Fossil Fuel Light. All outdoor luminaires producing light directly by combustion of fossil fuels (such as kerosene lanterns, and gas lamps) are exempt from the requirements of this ordinance.
- C. Holiday Decorations. Lights used for holiday decorations are exempt from the requirements of this ordinance.

D. Outdoor Sports Facilities may employ either:

- a. Up to 6000K LED lighting systems provided (1) the lighting system employs shielding to completely prevent uplight; (2) the lighting is controlled by motion sensors or from a control booth; and (3) the lighting is dimmable and designed to use the least amount of light necessary for the activity; and (4) the lighting system has a fixed curfew of 11:00PM that can be overridden from the control booth.
- b. Up to 5700K Metal halide lighting systems provided (1) the lighting system employs shielding to completely prevent uplight; (2) the lighting is controlled from a control booth and does not automatically turn on; (3) the lighting system has a fixed curfew of 11:00PM that can be overridden from the control booth.

Section 11.
TEMPORARY EXEMPTIONS.

- A. Information Required. Any individual may submit a written request to the Planning Director for a temporary exemption from the requirements of this ordinance. The filing fee for the temporary exemption shall be \$50.00. The Request for Temporary Exemption shall contain the following information:
1. Name, address and telephone number of the applicant;
 2. Location of the outdoor luminaires for which the exemption is requested;
 3. Specific exemption(s) requested;
 4. Use of the outdoor luminaires involved;
 5. Duration of the requested exemption(s);
 6. Type of outdoor light fixture to be used, including the light source and color temperature, total lumen output, character of the shielding, if any;
 7. Previous temporary exemptions, if any;
 8. Such other data and information as may be required by the Planning Director. The Planning Director shall have ten (10) business days from the date of receipt of the Request for Temporary Exemption to approve or disapprove the request. The applicant will be notified of the decision in writing.
- B. Duration of Approval. The exemption shall be valid for not more than thirty (30) consecutive days from the date of issuance of approval. Exemptions are renewable for a period of not more than fifteen (15) consecutive days. Requests for renewal of a temporary exemption shall be processed in the same manner as the original request. No outdoor luminaires shall be exempted from this ordinance for more than forty-five days during any twelve (12) month period.

Exception to Section 11 (B.): An exemption for portable lighting for construction shall be valid for one year and may be renewable on an annual basis.

- C. Appeals. An applicant or any interested person may file an appeal from the decision of the Planning Director within 10 days of the date of mailing of the notice of decision to the applicant. The appellant may appeal that decision, in writing, to the Board of Supervisors, on forms provided by the Planning Department, which shall be accompanied by a filing fee of \$25.00. Upon receipt of a completed appeal, the Clerk of the Board shall set the matter for hearing before the Board of Supervisors not less than five days nor more than 30 days thereafter and shall give written notice of the hearing to the appellant and the Planning Director. The Board of Supervisors shall render its decision within 30 days following the close of the hearing on the appeal.

Section 12.

EMERGENCY EXEMPTIONS.

This ordinance shall not apply to portable temporary lighting used by law enforcement or emergency services personnel to protect life or property.

Section 13.

CONFLICTS.

Where any provision of the statutes, codes or laws of the United States of America or the State of California conflicts with any provision of this ordinance, the most restrictive shall apply unless otherwise required by law.

Section 14.

VIOLATIONS AND PENALTIES.

It shall be unlawful for any individual to operate, erect, construct, enlarge, alter, replace, move, improve, or convert any lighting structure, or cause the same to be done, contrary to or in violation of any provision of this ordinance.

Any individual violating any provision of this ordinance shall be deemed guilty of an infraction or misdemeanor as hereinafter specified. Such individual shall be deemed guilty of a separate offense for each and every day or portion thereof during which any violation of any of the provisions of this ordinance is committed, continued, or permitted.

Any individual convicted of a violation of this ordinance shall be (1) guilty of an infraction offense and punished by a fine not exceeding one hundred dollars (\$100) for a first violation: (2) guilty of an infraction offense and punished by a fine not exceeding two hundred fifty dollars (\$250) for a second violation on the same site and perpetrated by the same individual. The third and any additional violations on the same site and perpetrated by the same individual shall constitute a misdemeanor offense and shall be punishable by a fine not exceeding one thousand dollars (\$1,000) or six months in jail, or both. Payment of any penalty herein shall not relieve an individual from the responsibility for correcting the violation.

Section 15.
VIOLATIONS CONSTITUTE PUBLIC NUISANCE.

Any lighting structure erected, constructed, enlarged, altered, replaced, moved, improved, or converted contrary to the provisions of this ordinance shall be, and the same is hereby declared to be, unlawful and a public nuisance and subject to abatement in the manner provided by law. Any failure, refusal or neglect to obtain a permit as required by this ordinance shall be prima facie evidence of the fact that a public nuisance has been committed in connection with the erection, construction, enlargement, alteration, replacement, improvement, or conversion of a lighting structure erected, constructed, enlarged, altered, repaired, moved, improved, or converted contrary to the provisions of this ordinance.

Section 16.
SEVERABILITY.

If any provision of this ordinance or the application thereof to any individual or circumstance is invalid, the invalidity shall not affect other provisions or applications of this ordinance which can be given effect without the invalid provision or application, and to this end the provisions of this ordinance are severable.

Section 17.
EFFECTIVE DATE.

This ordinance shall take effect and be in force thirty (30) days after the date of its adoption.

PROPOSED MODERNIZATION OF RIVERSIDE COUNTY ORDINANCE NO.915P REGULATING
OUTDOOR LIGHTING

Proposed changes are underlined and in bold.

The Board of Supervisors of the County of Riverside ordains as follows:

Section 1. FINDINGS

The Board of Supervisors finds that inadequately shielded outdoor lighting results in a waste of natural resources and **causes** light trespass. The Board of Supervisors further finds that ~~at certain levels, light trespass, and associated glare, may jeopardize the health, safety or general welfare of Riverside County residents and degrade their quality of life.~~ **The Board of Supervisors also finds that these concerns are sufficiently different from the negative impacts of light pollution that are currently regulated by Ordinance 655 to warrant this specific Ordinance.**

Section 2. PURPOSE

The purpose of this Ordinance is to provide minimum requirements for outdoor lighting in order to reduce light trespass, and to protect the health, property, and well-being of residents in the unincorporated areas of the County.

Section 3. AUTHORITY

This Ordinance is adopted pursuant to the Board of Supervisors' police power as set forth under Article XI, section 7 of the California Constitution.

Section 4. DEFINITIONS

As used in this Ordinance, the following terms shall have the following meanings:

- a. Adequately shielded. ~~Shielding of an outdoor luminaire by opaque components or materials, such that light rays are limited to the parcel of origin and the light source is not visible from another property or public right-of-way.~~ A luminaire using a combination of internal or attached shielding and/or aiming to control light radiation onto the property on which is it located.
- b. Glare. Light emitting from an outdoor luminaire that causes ~~reduced vision or momentary blindness.~~ visual disability or discomfort.
- c. Light source (lamp). An electrical bulb, tube, diode, or other device that produces artificial light or illumination.
- d. ~~Light trespass.~~ **Trespassing Light.** Light falling across a property line onto another lot or parcel of land or onto a public right-of-way. The presence of ~~light trespass~~ **trespassing light** shall be determined in accordance with Section 7 of this Ordinance.
- e. Luminaire. A complete lighting unit consisting of one or more lamps, **LED arrays or**

other light sources, ~~the lamp~~ light source mounting or holder, any reflector or lens, and any other components or accessories.

f. Outdoor Luminaire. ~~Outdoor luminaires~~, A luminaire, whether permanent or portable, ~~including general light fixtures, searchlights, spotlights, and floodlights; and the light cast by such fixtures installed outdoors.~~

Section 5. STANDARD

- a. All outdoor luminaires ~~in~~ shall be located, adequately shielded, and directed such that no direct light falls outside the parcel of origin, or onto the public right-of-way, **except as allowed in Section 7.** Outdoor luminaires shall not blink, flash, or rotate.

EXCEPTION TO Section 5.(a.). Less than fully shielded decorative luminaires permitted by Ordinance 655 Table 7-3.

- b. **All outdoor luminaires shall be rated 3000K or less correlated color temperature (CCT).**

EXCEPTION TO Section 5(b.) New luminaires shall comply with Ordinance 655.

- c. **All outdoor luminaires shall be turned off or dimmed at least 50% after a curfew time, defined as the later of either (1) 10:00PM or (2) 1 hour after the close of business. Luminaires may be controlled by motion sensors after curfew.**

Section 6. EXEMPTIONS

The following outdoor luminaires shall be exempt from the provisions of this Ordinance when properly installed and in compliance with all County ordinances:

- a. Luminaires used or otherwise required by law enforcement or other emergency personnel.
- b. Luminaires used to illuminate publicly-owned property, including but not limited to, parks, recreation areas, schools, streets, street signs and sidewalks.
- c. Luminaires used to illuminate authorized public and private monuments.
- d. Luminaires authorized by a provision of state or federal law as long as that lighting conforms to the requirements of the state or federal law.
- e. Luminaires used for holiday decoration.
- f. Luminaires producing light directly by the combustion of fossil fuels (such as kerosene lanterns, and gas lamps).
- g. Neon luminaires.
- h. Luminaires used to illuminate agricultural activities, operations or facilities as defined in Section 5 of Riverside County Ordinance No. 625.

i. Luminaires used to illuminate for parking areas and other outdoor spaces directly serving a facility operating 24 hours are not required to be turned down or off as required under Section 5 (c.).

j. Luminaires used to illuminate sports courts and fields, provided that they are equipped with controls to prevent operation after 10PM Sunday through Thursday and 11PM Friday and Saturday.

Section 7. DETERMINATION OF LIGHT TRESPASS

A determination of light trespass shall be made by observation of the allegedly non-conforming luminaire(s) measurement of the allegedly trespassing light onto from the complaining party's property. A "complaining party" may be either an owner or occupant of private property or a public entity. Trespassing light occurs when the amount of light measured at the property line in any plane caused by one or more luminaires exceeds the following limits:

<u>Maximum Light Limit</u>	<u>Pre-curfew</u>	<u>Post-curfew</u>
<u>Onto any residential property, in-patient health care facility, dormitory, hotel or motel</u>	<u>3 lux (0.3 foot-candle)</u>	<u>1 lux (0.1 foot-candle)</u>
<u>Onto any non-residential property or public right of way</u>	<u>8 lux (0.8 foot-candle)</u>	<u>3 lux (0.3 foot-candle)</u>

Section 8. SECURITY LIGHTING

Security lighting solely triggered by motion or noise shall be allowed subject to all of the provisions of this Ordinance except Section 5 (c.).

Section 9. NON-CONFORMING OUTDOOR LUMINAIRES

Outdoor luminaires existing on the effective date of this Ordinance that do not meet the requirements as set forth herein shall be brought into compliance or removed as follows:

- a. Within three (3) months of the effective date of this Ordinance, where redirection of the light fixture is feasible and will bring the light fixture into compliance; or
- b. Within six (6) months of the effective date of this Ordinance, in all other cases.

Section 10. COMPLIANCE METHODS

Outdoor luminaires not meeting the standards of Section 5 be brought into compliance in any of the following ways:

- a. Redirection of the luminaire;
- b. Shielding of the light source;
- c. Redesign or relocation of the luminaire;
- d. Replacement of the luminaire with a conforming luminaire; or
- e. Removal of the luminaire.

Section 11. ENFORCEMENT

The Riverside County Sheriff and Code Enforcement Departments shall have the primary responsibility for enforcing this Ordinance.

Section 12. VIOLATIONS AND PENALTIES

Any person who violates any provision of this Ordinance once or twice within a one hundred and eighty (180) day period shall be guilty of an infraction. Any person who violates any provision of this Ordinance more than twice within a one hundred and eighty (180) day period shall be guilty of a misdemeanor. Each day a violation is committed or allowed to continue shall constitute a separate offense and shall be punishable as such. Penalties shall not exceed the following amounts.

- a. For the first violation within a one hundred and eighty (180) day period the minimum mandatory fine shall be one hundred dollars (\$100).
- b. For the second violation within a one hundred and eighty (180) day period the minimum mandatory fine shall be two hundred and fifty dollars (\$250).
- c. For any further violations within a one hundred and eighty (180) day period the minimum mandatory fine shall be five hundred dollars (\$500) or imprisonment in the County jail for a period not exceeding six (6) months, or both.

Section 13. CONFLICT BETWEEN ORDINANCE REQUIREMENTS

This Ordinance shall neither replace the requirements of the zoning Ordinance or any other County ordinances, including but not limited to County Ordinance No. 655, nor supersede the terms of any private Covenants, Conditions and Restrictions (CC&Rs). However, when there is a conflict in the requirements of this and any other ordinance, the more stringent requirements shall apply. The County of Riverside does not enforce private CC&Rs.

Section 14. SEVERABILITY.

If any provision of this Ordinance or the application thereof to any person or circumstance, is held invalid, such invalidity shall not affect the remainder of the Ordinance or the application of such provision(s) to other persons or circumstances.

Section 15. SAVINGS CLAUSE

The adoption of this Ordinance shall not in any manner affect the prosecution of ordinance violations, which violations were committed prior to the effective date of this Ordinance, nor be construed as a waiver of any permit, license, penalty or penal provisions applicable to such violations. The provisions of this Ordinance, insofar as they are substantially the same as ordinance provisions previously adopted by Riverside County relating to the same subject matter, shall be construed as restatements and continuations, and not as new enactments.

Section 16. EFFECTIVE DATE

This Ordinance shall take effect 30 days after its adoption.

TEMPLATE COMMUNITY OUTDOOR LIGHTING ORDINANCE

Section 1. PURPOSE

The purpose of this ordinance is to implement the goals of the General Plan and protect and promote public health, safety, welfare, and quality of life by establishing regulations and a process for review of outdoor lighting that will accomplish the following:

- A. Protect against light pollution in all its forms, thereby reclaiming the ability to view the night sky and thereby help preserve the quality of life and scenic value of this desirable visual resource;
- B. Help protect and enhance human health and wellness and wildlife habitation and migration by minimizing light pollution and its impact on all forms of life, consistent with the June 2016 position on outdoor lighting by the American Medical Association.
- C. Promote lighting practices and systems to conserve energy, decrease dependence on fossil fuels and limit greenhouse gas emissions consistent with the California Global Warming Solutions Act and other applicable state and federal law.
- D. Ensure that sufficient lighting can be provided where needed to promote safety and security on public and private property, and to allow for reasonable lighting for commercial properties and activities,
- E. Provide easily understood regulations for residential lighting that help minimize obtrusive light and mitigate neighbor-to-neighbor lighting issues;
- F. Provide practical regulations for non-residential lighting that are consistent with the California Code of Regulations, Title 24, Parts 1, 2, 6 and 11.
- G. Allow reasonable flexibility in the style of lighting fixtures and the technology used to generate and control light; and,
- H. Permit appropriate lighting employing historic and current technology, evolving advancements, energy use and economic needs.

Section 2. APPLICABILITY

- A. Except as described below, all outdoor lighting installed or modified after the date of effect of this Ordinance shall comply with these requirements. This includes, but is not limited to, new lighting, replacement lighting, additions and alterations, or any other lighting whether attached to structures, poles, the earth, or any other location, including lighting installed by any third party.

Exception to Section 2. (A.): Any lighting-specific requirements in the following shall take precedence over this ordinance.

- a. Specific use permit.
- b. Federal, state, or county laws or regulations.

Exemptions from Section 2. (A.) The following are not regulated by this Ordinance:

1. Indoor lighting.
 2. Lighting within public right-of-way or easement for the principal purpose of illuminating streets, roads, sidewalks, walkways, bikeways, bridges, tunnels and other public means of conveyance and travel.
 3. Lighting permitted prior to the effective date of this Ordinance
 4. Lighting solely for signs (lighting for signs is regulated by the Sign Ordinance).
 5. Repairs to existing luminaires, but not including new replacement luminaires or modifications to existing luminaires.
 6. Temporary lighting for one-time events.
 7. Underwater lighting in swimming pools and other water features.
 8. Temporary lighting and seasonal lighting, except that temporary lighting and seasonal lighting are not permitted in or within 100 feet (30.5 meters) of Public Open Space.
 9. Short-term lighting associated with activities authorized by a valid temporary use permit, special event permit or film permit.
 10. Construction or emergency lighting provided such lighting is temporary and is discontinued immediately upon completion of the construction work or abatement of the emergency necessitating said lighting.
- B. Applications for land use entitlements after the effective date of this ordinance shall include compliance with this chapter as a condition of approval.

Section 3. GENERAL REQUIREMENTS FOR ALL OUTDOOR LIGHTING.

- A. **Compliance with State Code** All lighting and controls shall comply with the California Title 24 California Code of Regulations, Title 24, Parts 1, 2, 6 and 11.
- B. **Shielding** All luminaires shall be fully shielded and shall not emit light into the upper hemisphere around the luminaire once installed. Support and mounting systems for luminaires shall not allow post-installation adjustments that could defeat compliance of this requirement.

Exceptions to Section 3. (A.)

- a. Decorative lighting as permitted herein.
 - b. Landscape lighting as permitted herein.
 - c. Architectural floodlighting and outlining as permitted herein.
- C. **Turned off or reduced after curfew** Automated control systems, such as motion sensors, astronomic timer switches and lighting control systems, shall be used to meet the curfew requirements of 17.41.050 and the technical and energy efficiency requirements of California Code of Regulations Title 20 Section 1605.1(I) and Title 24 Part 6 Sections 130.2, 140.7 and 150.1. Manual initiation switches are permitted as long as they do not defeat the automatic shut off function.

Exceptions to Section 3. (B.)

- a. Egress lighting as required by Title 24 Part 2 Section 1006.
- b. Lighting for facilities having 24 hour operations or business.
- c. Lighting required for accessibility.
- d. Lighting required by statute, law or ordinance to operate all night.

- e. One luminaire per residence that illuminates the address or apartment number.
 - f. Lighting by special permit.
- D. **Lighting Color (Chromaticity).** The correlated color temperature of all outdoor lighting shall be 3000 Kelvin or less, with tolerance within the ANSI standard C78.377 of LED sources.
- Exceptions to 17.41.040 (C.)**
- a. Amber sources necessary to protect beach and environmentally sensitive habitat areas, as determined by the planning director.
 - b. Legally required monochromatic light sources including but not limited to, aviation obstruction lighting, traffic signal lighting, and marine lighting
 - c. As allowed by a special use permit.
- E. **Prevention of Light Trespass** All lighting shall be designed and implemented to mitigate light trespass onto adjacent properties. The maximum allowable light trespass shall be per Table 1 and Table 2.
- F. **Lighting Not Permitted** None of the following are permitted except by special permit:
- 1. Dynamic lighting, such as moving lights, color changing lighting,
 - 2. Luminaires exceeding 500,000 peak candelas or 500,000 lumens
 - 3. Laser lighting
 - 4. Unshielded lighting such as string lights, light rope, neon lighting, or LED tubing.
 - 5. Lighting within Public Open Space areas.

Section 4. LIGHTING ZONES

- A. **Lighting Zones** The Planning Director shall develop and maintain a lighting zone map of the community identifying the following zones as defined and required by the California Code of Regulations, Title 24, Part 1, Section 10-114 as follows:

Lighting Zone 0 (Zero), which shall include Environmentally Sensitive Habitat Area (ESHA), Public Open Space (POS) Area, and other areas within the community that are undeveloped or intended to be preserved in a natural state and for which lighting is only provided for safety or to meet applicable Federal, State or community requirements.

Lighting Zone 1 (One), which shall include all areas of the community that are adjacent to Lighting Zone 0, rural in character, and/or which are determined by the Planning Director to be suitable for low levels of exterior lighting at night.

Lighting Zone 2 (Two), which shall include all areas of the community that are semi-urban or urban in character, and/or which are determined by the Planning Director to be suitable needs for modest levels of exterior lighting at night.

Lighting Zone 3 (Three), which shall include all areas of the City that are urban in character or have high night light level requirements for specific property uses which are determined by the Planning Director to be suitable needs for medium to high levels of exterior lighting at night.

Lighting Zone 4 (Four) shall not be used in the community except by special permit.

- B. **Posting of Zoning Map** The Lighting Zone Map shall be posted on the Web Site of the City and made available to the public.
- C. **Administration of Lighting Zones** The Planning Director shall develop a process to review proposed changes and appeals to the Lighting Zone map, which shall be approved by City Council. Approved changes and appeals shall be updated onto the Lighting Zone Map. The Planning Director shall notify the California Energy Commission according to California Code of Regulations, Title 24, Part 1, Section 10-144(d).

Section 5. LIGHTING ZONE SPECIFIC LIGHTING REQUIREMENTS

- A. **Applicability** In addition to the foregoing, all outdoor lighting must meet the following requirements per Lighting Zone and whether the property being lighted is residential or non-residential. Residential properties shall comply with Table 1 and non-residential properties shall comply with Table 2 as described below. For the purposes of these requirements, multi-family residential properties of 8 domiciles or more shall be considered non-residential.
- B. **Curfew**
 - 1. **Residential lighting** All exterior lighting shall be extinguished at the curfew time by an automatic shut off device. Motion sensor controlled lighting may be used after curfew if it is fully shielded and located within 10 feet of a building entrance.
 - 2. **Non-residential lighting** All exterior lighting shall be extinguished or dimmed 50% at the curfew time under the control of an automatic device. Motion sensor controlled lighting may be used to turn on or increase the light level for fully shielded lighting at building entrances, exits, parking lots and walkways.
- C. **Maximum Lumens** For a dedicated fluorescent, LED or HID luminaire, the allowed maximum rated lumens per a photometric report or manufacturer's product literature. For a line voltage socket luminaire or a low voltage socket luminaire, the rated lumens of the lamp installed in it.
- D. **Maximum Mounting Height** The maximum mounting height above adjacent grade. See Figure 2.

Exception 1 to 17.41.060 (D): There is no maximum mounting height for fully recessed luminaires.

Exception 1 to 17.41.060 (D): For multi-story residential buildings and motels with exterior entrance doors, the maximum mounting height shall be 8 feet above adjacent floor unless recessed into an adjacent ceiling, soffit or overhang.
- E. **Landscape lighting** Landscape lighting is permitted per Table 1 and Table 2. Downlight only means that the luminaire emits no light above 90 degrees relative to

nadir (no light upwards). Shielded uplight means a luminaire aimed upward within 30 degrees of straight up that employs a baffle or louver to prevent glare. See Figure 3.

F. **Architectural Floodlighting and Outlining** The use of lighting to illuminate building facades, statuary, and similar edifices for appearance or other needs not involving visual tasks such as walking or driving may be permitted in lighting zones 2 and 3 if all the following conditions are met:

1. A plan and rendering is submitted for review and approval by the Planning Director.
2. The amount of exposed light sources does not exceed 20,000 lumens per acre of the site.
3. The average illumination of a façade or edifice shall not exceed 5 footcandles (50 lux).
4. Such lighting shall be extinguished at curfew.

No such lighting may be used without a permit, and shall not be allowed in lighting zones 0 and 1 under any conditions.

Section 6. PLAN REVIEW AND PERMITTING

A. **Plan Review** All outdoor lighting installations or installations involving new lighting or the modification, alteration, or replacement of outdoor lighting shall submit plans and related information as listed below and receive a permit prior to proceeding with any work.

1. Plans depicting the proposed luminaires.
2. Product specification data such as manufacturer's data sheets for each luminaire and control device(s) or systems being used.
3. For non-residential properties, signed pages of required documents for Title 24 – Part 6 Section 140.7 and Title 24 – Part 11 Section 5.106.8 demonstrating compliance.
4. Details, elevations, summaries or calculations as required to demonstrate compliance with this Ordinance.

B. **Alternative Means and Methods** Deviations from the lighting standards provided in this chapter may be approved pursuant to a site plan review in accordance with Section 17.62.40. The request shall state the circumstances and conditions relied upon for the site plan review and shall be accompanied by accurate plans and a legal description of the subject property. In addition, the following information shall be submitted:

1. Plans depicting the proposed light fixtures;
2. Detailed description of the circumstances which necessitate the deviation;
3. Details on the use of the proposed light fixtures for which the deviation is requested, including the type of outdoor light fixture(s) to be used, the total light output and character of the shielding, if any; and

4. Such other data and information as may be required by the planning director.

C. **Appeals** The site plan review may be granted if the community makes the following findings:

1. There are special circumstances or conditions applying to the land, buildings or outdoor light fixtures for which the site plan review is sought, which are peculiar to the project and do not apply generally to the land, buildings, or outdoor light fixtures in the surrounding area.
2. The strict application of this chapter would deprive the applicant of the reasonable use of the land or buildings, and the proposed deviation is the most restrictive means that will accomplish the purpose.
3. The proposed deviation will achieve the purpose and intent of this chapter, including light trespass, and will not adversely affect neighborhood character or the public health, safety or welfare.
4. The proposed project will not be contrary to or in conflict with the general purposes and intent of this title, nor the goals, objectives and policies of the general plan.

Section 7. LIGHTING ALLOWED BY TEMPORARY USE PERMIT ONLY (RESERVED)

Section 8. CONFLICTS WITH OTHER LAWS

In the event the provisions in this Ordinance conflict with other laws, this Ordinance shall be applied in a manner intended to carry out all provisions of law to the maximum extent feasible. When there is an irreconcilable conflict between the provisions of this Ordinance and the provisions of federal or state law, the provisions of federal or state law shall prevail over the provisions contained in this Ordinance only to the extent necessary to avoid a violation of those other laws or code provisions.

Section 9. APPLICATION OF ORDINANCE TO LEGAL NON-CONFORMING LIGHTING

A. **Amortization.** A property owner shall comply with the requirements of this Ordinance by (date.) Any non-compliant lighting still in place after this compliance deadline shall become and remain extinguished. A property owner may apply for an extension of this deadline by submitting a request to the planning director thirty days before the compliance deadline detailing why an extension is needed. Any non-compliant lighting shall remain extinguished while the request is pending. Upon demonstration of good cause for providing a property owner additional time to comply with the requirements of this section, the planning director may extend the property owner's time to comply and/or may require a plan for compliance that required partial compliance in advance of full compliance. For purposes of this section, the term "good cause" shall mean a significant financial or other hardship which warrants an extension or

conditional extension of the time limit for compliance established herein. In no instance, shall the planning director issue an extension of the compliance period in excess of one year's time. The planning director's decision shall be appealable.

B. Change of Use. If a property with non-compliant lighting changes use, then all outdoor lighting shall be brought into compliance with this chapter before the new use begins. Any uncorrected non-compliant lighting shall be removed or remain extinguished.

C. Resumption of Use after Abandonment. If a property with non-compliant lighting is abandoned for a period of six months or more, then all outdoor lighting shall be brought into compliance with this chapter before any resumption of use of the property occurs. Any uncorrected non-compliant lighting shall be removed or remain extinguished.

Section 10. ENFORCEMENT AND PENALTIES (RESERVED)

Section 11. DEFINITIONS

For the purposes of this Chapter only, the following words and phrases are defined as follows:

1. "Curfew" means the time of day when lighting restrictions, based on zoning district, are in effect.
2. "Directional lighting" means methods of directing light downward, rather than upward or outward, with the intention of directing light where it is needed.
3. "Fully shielded" means a light fixture constructed and installed in such a manner that all light emitted by the fixture, either directly from the lamp or a diffusing element, or indirectly by reflection or refraction from any part of the luminaire, is projected below the horizontal plane through the fixture's lowest light-emitting part.
4. "Glare" means lighting entering the eye directly from a light fixture or indirectly from reflective surfaces that causes visual discomfort or reduced visibility.
5. "Hardscape" means permanent surface improvements to the site including parking lots, driveways, entrances, curbs, ramps, stairs, steps, medians, walkways and non-vegetated landscaping that is 10 feet or less in width, that are made of materials such as, but not limited to, concrete, asphalt, stone and gravel.
6. "Lamp" means, in generic terms, a source of optical radiation (i.e., "light"), often called a "bulb" or "tube". Examples include incandescent, fluorescent, high-intensity discharge (HID) lamps, and low pressure sodium (LPS) lamps, as well as light-emitting diode (LED) modules and arrays.
7. "Light pollution" means the material adverse effect of artificial light including, but not limited to, glare, light trespass, sky glow, energy waste, compromised safety and security, and impacts on the nocturnal environment, including light sources that are left on when they no longer serve a useful function.
8. "Light trespass" means light that falls beyond the property it is located on. Permissible levels of light trespass shall be limited to those specific, quantitative thresholds of light intensity set forth in Tables 1 and 2. Light trespass shall be measured in the vertical plane of the property line on which the lighting in question is located. Field measurements to determine light trespass compliance shall not include

the effect of light produced by street lights or other lighting not produced by luminaires under the jurisdiction of this Ordinance or produced by luminaires on other properties.

9. "Lumen" means the unit of measure used to quantify the amount of visible light produced by a lamp or emitted from a luminaire (as distinct from "watt," a measure of power consumption).
10. "Luminaire" means outdoor electrically powered illuminating devices, including a light source, outdoor reflective or refractive surfaces, lenses, electrical connectors and components, and all parts used to mount the assembly, distribute the light and/or protect the lamp, whether permanently installed or portable.
11. "Seasonal lighting" means lighting installed and operated in connection with holidays or traditions. Seasonal lighting must be temporary lighting as defined herein and removed within 30 days of the date of installation, and shall not be re-installed within the same calendar year.
12. "Sky glow" means the brightening of the nighttime sky that results from scattering and reflection of artificial light by moisture and dust particles in the atmosphere. Sky glow is caused by light directed or reflected upwards or sideways and reduces one's ability to view the night sky.
13. "Temporary lighting" means lighting that (a) employs a cord and plug and is not permanently wired and (b) is installed and removed when the temporary need is over, not to exceed 30 days without a special use permit.
14. "Shielded Uplighting" means landscape lighting illuminating trees and landscape features employing an extended tube baffle or louver and aimed at least 60 degrees above horizontal.
15. "Outlining" means exposed light sources attached to structures for the primary purpose of attraction, branding or decoration.
16. "Dynamic lighting" means lighting that flashes, chases, changes color, or changes intensity for any purpose other than serving as a traffic signal, safety light, or aviation or marine marker.
17. "Light trespass" means light from one property also lighting an adjacent property. The amount of trespass is calculated and measured in the vertical plane at 5' above grade at the property line of the site on which the light(s) is located. If the adjacent property is a public street or sidewalk, then the point at which trespassing light is calculated and measured shall be the center of the public property or right-of-way between the property on which the light originates and any adjacent property.

Section 12 TABLES

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Table 1 – Residential Lighting Limits

Restriction	Lighting Zone 0 (Zero)	Lighting Zone 1 (One)	Lighting Zone 2 (Two)	Lighting Zone 3 (Three)
Curfew	1 hour after sunset	11:00PM	11:00PM	11:00PM
Maximum lumens per fully shielded luminaire	600 Must be 2700K or lower	900	900	900
Unshielded and decorative lighting	None allowed	One per residence not to exceed 300 lumens	Two per residence not to exceed 300 lumens	Three per residence not to exceed 600 lumens
Maximum mounting height above adjacent grade	8 feet	12 feet	12 feet	15 feet
Landscape lighting	None allowed	Downlight only not to exceed 300 lumens	Downlight and/or shielded uplight not to exceed 450 lumens per luminaire	Downlight and/or shielded uplight not to exceed 600 lumens per luminaire
Maximum landscape lighting lumens per acre	0	6000	12000	18000
Maximum allowable light trespass pre-curfew	0	0.1 footcandle (1 lux)	0.2 footcandle (2 lux)	0.5 footcandle (5 lux)

Table 2 – Non-Residential and Multi-Family Residential Lighting Limits

Restriction	Lighting Zone 0 (Zero)	Lighting Zone 1 (One)	Lighting Zone 2 (Two)	Lighting Zone 3 (Three)
Curfew	1 hour after sunset	11:00PM	11:00PM	11:00PM
Maximum lumens per fully shielded luminaire	600	2500	5000	15000
Unshielded and decorative lighting	None allowed	None allowed	Maximum 600 lumens per luminaire not to exceed 12000 lumens per acre.	Maximum 900 lumens per luminaire not to exceed 18000 lumens per acre
Maximum mounting height above adjacent grade	8 feet	20 feet	25 feet	35 feet
Landscape lighting	None allowed	Downlight only not to exceed 450 lumens	Downlight and/or shielded uplight not to exceed 600 lumens per luminaire	Downlight and/or shielded uplight not to exceed 900 lumens per luminaire
Maximum landscape lighting lumens per acre	0	9000	12000	18000
Maximum allowable light trespass pre-curfew	0	0.1 footcandle (1 lux)	0.2 footcandle (2 lux)	0.5 footcandle (5 lux)

End of Ordinance