

1 STREET LIGHT DESIGN GUIDELINES

1.1 NEW DEVELOPMENT/PUBLIC STREETS

Street light installation on public streets shall conform to the standards set forth in this document. Electricity costs for street lighting on collector and local roadways in new developments will be provided by a Street Light Improvement District. Electricity costs for street lighting on arterial roadways shall be provided by Town.

Contact the Public Works Department for information on the process for creating a Street Light Improvement District in Town of Queen Creek.

Developers of all residential, commercial, industrial or other types of properties are responsible for the design and installation of street lighting on all streets within and adjacent to their sites. Street light plans shall be prepared and sealed by a licensed electrical engineer registered in the State of Arizona. The street lighting design shall be reviewed and approved by the Town.

1. Street light plans and details shall be included with the improvement plans.
2. All new subdivisions, new roadways, and in-fill projects on existing roadways shall use LED luminaires as specified in this Section unless otherwise approved by the Town Engineer. LED luminaires shall conform to the Town specifications.
3. Street lights shall be fully shielded (full cut-off) in such a manner that light emitted by the fixture, either directly from the lamp or indirectly from the luminaire, is projected below a horizontal plane running through the lowest point on the fixture where light is emitted. External reflectors are not allowed.
4. Spacing of street lights shall be based on the criteria shown in Table 1 below.
 - a. For roads that are wider than shown in Table 1 due to deceleration lanes, dual left turn lanes, or landscape islands or other intermittent reasons, the street light spacing shall be reduced by 10-15% in these areas.
 - b. For roads of non-standard cross sections, the Town may require photometric calculations.

Table 1: Street Light Spacing for Standard Districts

Street Type	Width FC-FC (ft)	Nominal Lumens	Maximum Spacing (ft)	Spacing Type
Principal Arterial	102'	12,500	95'	Staggered*
Major Arterial	76'	12,500	125'	Staggered*
Major Collector	50'	4,900	125'	Staggered*
Urban Residential Collector	36'	4,900	250'	Single Side
Urban Local	32'	4,900	500'	Single Side

*Staggered spacing is the distance between lights on opposite sides of street.

5. With Town approval, the maximum spacing shown above may be exceeded by 15% when there are extenuating circumstances such as utility conflicts.
6. On local streets, a light shall be located at each intersection, corner, and cul-de-sac, with maximum spacing as shown in Table 1.
7. Local/local, local/collector, and collector/collector intersections shall have at least one street light at the intersection. Arterial/collector, and arterial/local intersections shall have at least 2 street lights at the intersection. At signalized intersections, street light plans shall be coordinated with street lights mounted on traffic signals. Arterial/arterial intersections shall have at least 4 lights at the intersection typically mounted on the signal poles.
8. All new street lighting circuits shall be installed underground and will be owned and maintained by the utility company.
9. The developer shall coordinate all power distribution design and electrical service criteria with the utility company serving the lighting system.
10. The developer shall conform to the latest requirements of the serving utility and pay all fees for design and energization.

1.2 PRIVATE STREETS

The Town of Queen Creek does not require street lights on private streets. If developer chooses to install lights on private streets it must meet the following requirements.

1. Developer is responsible for all costs of design and installation of street light system.
2. Street light plans and details shall be included with the improvement plans.

3. Street lights shall be fully shielded (full cut-off) in such a manner that light emitted by the fixture, either directly from the lamp or indirectly from the luminaire, is projected below a horizontal plane running through the lowest point on the fixture where light is emitted. External reflectors are not allowed.
4. Maximum mounting height of 32 feet.
5. Minimum setback of 2.5' from back of curb.
6. The developer/HOA is responsible for all maintenance and operations of all private street lighting.

1.3 STREET LIGHT PLAN REQUIREMENTS

Street light plans shall include the following information:

1. Show all proposed and existing curb, utility locations and sizes, easements, right-of-way, lot numbers, and other structural features.
2. Show pole type, luminaire mounting height, luminaire wattage, and lumen output.
3. Show centerline station and offset for all street lights.
4. On cover sheet include a key map showing all streets.
5. Provide a legend on the plans identifying the following items:
 - a. Street light types with lumen output
 - b. Pull boxes
 - c. Conduit
6. Meandering sidewalks shall not conflict with street light poles.
7. Where sidewalk is attached to curb, street lights shall be centered 1' behind sidewalk. Where sidewalk is detached, the standard setback on arterial streets is 5' from back of curb, the standard setback on collector and local streets is 4' from back of curb.
8. If there are utility or other conflicts the setback can be reduced to a minimum of 2.5' from back of curb.
9. Street light poles shall be a minimum of 6 feet from the edge of a driveway wing.
10. Street light poles shall be a minimum of 6 feet from hydrants.
11. Street light poles shall not be located in the radius of intersections.
12. Street light poles shall be oriented perpendicular to street.
13. All street lights to be located within right-of-way. When necessary due to conflicts, street lights may be in PUE or roadway easement with Town approval.

14. Tops of all pole foundations and pull boxes shall be flush with sidewalk grade unless otherwise noted.
15. Show all existing and proposed water lines and fire hydrants and provide dimensional ties to water lines and fire hydrants where potential conflicts may occur.
16. All future and existing street lights adjacent to and within 300 feet from the first proposed street light must be shown with stationing and dimensional ties to the street centerline.
17. Street lights on lot frontages in residential areas shall be located at property lines whenever possible.
18. All construction phasing must be shown and labeled on the plans.
19. Street light plans will be submitted at a scale no smaller than 50 feet to one inch. Final light pole locations will be shown on the Paving and/or Utility plans.
20. Street light plan submittals will be coordinated through the normal plan approval process and shall be submitted with the civil improvement plans.
21. The approved street light plans shall be submitted to SRP for final design of power distribution for street lights. The developer is responsible for all coordination with SRP.

1.4 STREETLIGHT POLES

1. All poles and mast arms shall be steel construction with dark bronze finish per TOQC Details.
2. Pole heights and arm types to be used on standard local, collector, and Arterial streets shall be per Table 2 below.

Table 2: Pole and Arm Dimensions

Street Type	Mounting Height	Arm
Arterial	32'-0"	12'x8'
Collector	25'-6"	2'
Local	25'-6"	2'

3. All poles shall be foundation mounted.
4. Poles in the Downtown District shall match the style of existing poles in this area.

- Contractors shall submit technical material specifications on all items listed above for Town review and approval.

1.5 LED LUMINAIRES

LED luminaires shall meet the following specifications.

- Luminaire Correlated Color Temperature (CCT) shall be 3000K binned per ANSI C78.377-2008.
- Luminaire shall have typical Color Rendering Index (CRI) ≥ 65 .
- CCT and CRI of luminaire shall be tested and measured in accordance with LM-79.
- Luminaire shall have the lumen output, and IESNA TM-15 BUG rating per table below. Uplight shall be zero (0) light above 90-degrees.

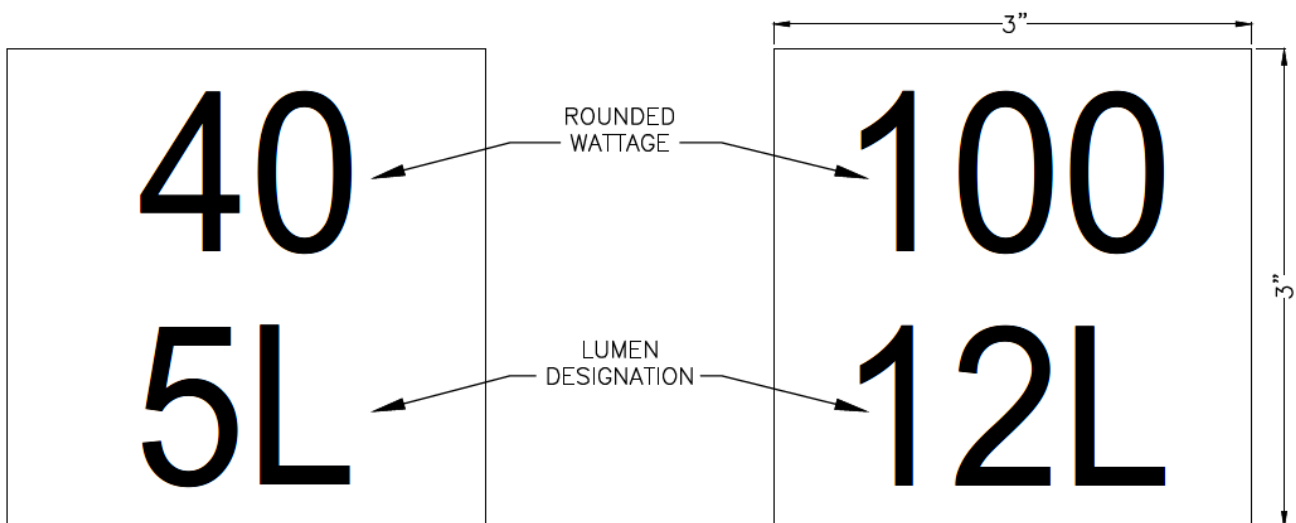
Table 3: Luminaire Types

Lumen Designation	Nominal Lumens	Max BUG Rating	Replaces HPS
5L	4,900 $\pm 12\%$	B1-U0-G1	100W
12L	12,500 $\pm 10\%$	B2-U0-G3	250W

- Luminaire efficacy shall be a minimum of 100 lumens per watt.
- Luminaires must be independently tested and comply with IESNA LM79-08 and LM80-08. A copy of all LM79 and LM80 independent test reports shall be provided to the Town upon request.
- Luminaires shall have discreet LED chips. Chip on board are not allowed.
- The luminaire shall operate from a nominal 120-277 volt, 60 Hz power source and shall be capable of starting and operating the optic assembly(s) within the limits specified by the LED manufacturer.
- Luminaire shall have a minimum system power factor of 0.9 tested and specified at 120V input at full power.
- Luminaire shall have maximum total harmonic distortion (THD) $< 20\%$ tested and specified at 120V input at full power.
- Driver shall have a minimum life rating of 90,000 hours at 25° C.
- The luminaire shall contain prewired integral drivers and optical assembly that shall provide an asymmetric medium distribution type. Internal labeling shall be in accordance with ANSI standards.

13. Luminaire shall have UL Class 1 power supply units (i.e. drivers) operating in DC constant current mode.
14. Luminaire shall have EMI compliance with FCC 47 CFR Part 15 Class A.
15. The luminaire circuitry shall include surge protection devices (SPD) to withstand high repetition noise transients as a result of utility line switching, nearby lightning strikes, and other interference. Minimum surge protections shall be 10 kV/5 kA per ANSI C136.2 (2015) Enhanced category.
16. Off-state power draw shall be 0 watts (excluding PE or remote-control devices).
17. Electrical cavity shall use only copper wire within the fixture.
18. Terminal block shall be oriented to be lineman friendly within the electrical cavity to allow for easy wiring. Luminaire shall have a minimum 3-lead terminal board mounted within the housing. Terminal board screws shall be of the captive type with wire grips that raise and lower with the terminal screw. Terminals shall be capable of accepting #8 to #14 AWG wire.
19. Cooling shall be done with heat sinks. No fans, pumps, or liquids shall be used.
20. Manufacturer must have a minimum of a 15-year history of designing and manufacturing outdoor luminaires and at least 10 years of LED design history in some form of outdoor application which can include signage, traffic signals or roadway/parking fixtures.
21. A limited system warranty must be provided for the replacement or repair of the luminaire due to any electrical failure (including light source and or power supplies/drivers) for ten (10) years.
22. Warranty shall not be affected by opening the power door and/or accessing the electrical cavity.
23. Luminaire shall meet 3G vibration per ANSI C136.32-2001.
24. Finish shall be corrosion resistant Polyester powder paint capable of surviving the ASTM B117 salt fog environment for a minimum of 500 hours without blistering or peeling.
25. The coating must demonstrate the gloss retention of greater than or equal to 90% for 500 hours QUV test per ASTM G154 UVB-313, 4-hour UV-B 60 degrees Celsius, 4-hour condensation 50 degrees. Dry film thickness of the powder paint shall be a minimum of 2.5 mils thickness. Fixture color shall match the pole color.
26. Finish Color shall be dark bronze unless otherwise approved by engineering department.
27. Luminaire housing and door shall be die-cast aluminum, and shall be UL listed for wet locations.

28. Luminaire shall be UL 1598 listed for operating temperature range of -10° C to +50° C.
29. Lumen maintenance at 50,000 hours and 40°C ambient based on testing per TM-21 shall be 90% or greater. Lumen depreciation data per LM-80 and TM-21 at 40°C ambient shall be available.
30. Luminaire shall have 7-pin locking ANSI C136.41 photocell receptacle.
31. Drivers shall be dimming type with 0-10 volt leads wired to 7-prong photocell receptacle.
32. Heat sink fins shall be incorporated into housing to maximize heat transfer and minimize thermal impacts of environmental conditions such as debris-clogged fins.
33. Slipfitter in the housing shall contain two or four-bolt clamp fastening to mount on 1.66" to 2.375" O.D. horizontal tenons and provide +/- 5 degrees of tilt adjustment.
34. The effective projected area (EPA) shall not exceed 1.2 square feet maximum and 35 lb weight.
35. Luminaire shall have an option for a field installable house side shield from the manufacturer.
36. Luminaire shall have an external label for field identification.
 - a. Label shall meet the physical requirements, dimensions, and font size per ANSI C136.15 (2015): large 3" marker type.
 - b. Top row of label shall indicate luminaire wattage rounded to nearest 10 watts per ANSI C136.15 (2015).
 - c. Bottom row of label shall indicate Lumen Designation per Table 3.
 - d. See example labels below for information to be shown on label:



1.6 PHOTOELECTRIC CONTROL

All photocells for LED luminaires shall be long-life NEMA twist-lock type that meet the following requirements:

1. 15-year rated life with minimum 10 year warranty.
2. Meet surge protection level 10 kV/5 kA per ANSI C136.2 (2015) enhanced category
3. Minimum 510 Joule MOV surge protection component
4. Designed to withstand high in-rush current of LED luminaires
5. ANSI C136.10 compliant
6. Fail mode OFF
7. 2-5 second turn-off delay
8. Voltage range 105-305 VAC, 60 Hz
9. Operating temperature range -40° to 70°C
10. Load Rating 1800 VA driver or ballast

1.7 APPROVED PRODUCTS

Contact the Town of Queen Creek Engineering department for the current approved products list of for LED luminaires and photocells.

For a luminaire or photocell to be considered as an approved product documentation showing compliance with all performance, mechanical, and photometric requirements as detailed above shall be provided to the Town. The documentation shall be highlighted and have numbers corresponding to each item in specification Section 1.5 for luminaires or Section 1.6 for photocells. For example, the portion of luminaire cutsheet sheet that shows compliance with 3000K CCT shall be highlighted and have number 1 written next to it.

Contact Town of Queen Creek to acquire examples of the typical photometric calculations that must be provided for the roadway types listed in Table 1.

1.8 AUTONOMOUS SOLAR STREET LIGHTING

Solar Powered Lighting System consists of four (4) components and assemblies: (1) Photovoltaic (PV) Module(s), (2) LED Luminaire, (3) Sealed Power Center, (4) Pole and mounting structure. Luminaire and PV assemblies shall be separate units, allowing for independent orientation of both the lighting and solar panel to achieve optimal performance.

General Requirements

1. Solar street lighting manufacture must have over 10 years' experience designing and manufacturing solar street lighting
2. Manufacturer shall provide a 10-year NON-prorated parts AND labor warranty
3. Manufacturer shall be Fonroche, FirstLight Technologies, or approved equal, and comply with all specifications here within. Any alternate luminaires shall be reviewed and tested by the Town prior to approval for use.
4. The Town of Queen Creek's Traffic Engineering Division must approve all applications of solar lighting within the Town on public streets.

Product Requirements: Solar lighting systems must comply with all the following 4 category specifications.

1. Photovoltaic Modules
 - a. Crystalline silicon solar module
 - b. Solar module frame must be formed from marine grade aluminum
 - c. UL 1703 or IEC 61730-1:2019 and IEC 61215-2:2021
 - d. RoHS Compliant
 - e. Water-tight junction box
 - f. UV Resistant Cables with Waterproof Connectors
 - g. Backing plates or enclosures shall not be directly attached to the solar panel frame to avoid heat trap generated by the solar panel and associated energy loss during normal operation
 - h. 20 Year or More Performance Warranty
 - i. Panel mounting shall allow for 360-degree rotation independent of the arm and luminaire.

- j. Panel tilt setting shall include a bolt through fitting to prevent movement over time.

2. LED Luminaire

- a. Luminaire Correlated Color Temperature (CCT) shall be 3000K
- b. Luminaire shall have typical Color Rendering Index (CRI) ≥ 70
- c. CE or UL Certified
- d. International Dark Sky Certification
- e. Luminaires must be independently tested and comply with IESNA LM79-08 and LM80-08. A copy of all LM79 and LM80 independent United States Lighting Laboratory test reports shall be provided to the Town upon request
- f. Photometric performance verified by a Nationally Recognized Testing Laboratory (NRTL)
- g. Minimum Efficacy of 160 lumens per watt based on drive current and distribution selection
- h. L70 >100,000hr
- i. Fixture Driver located in power center enclosure
- j. Luminaire shall have optional pre-installed backlight shield.
- k. Luminaires shall be available in lumen outputs shown in table below.

Lumen Designation	Nominal Lumens
5L	4,900 $\pm 10\%$
12L	12,500 $\pm 10\%$

3. Sealed Power Center, Includes: Batteries, Microprocessor, Enclosure

- a. Batteries
 - i. Batteries shall be Non-Toxic Nickel-Metal Hydride (NiMH) or lithium iron phosphate (LiFePO4) Formulation
 - ii. Specifically formulated for temperature range of -4°F to +120°F
 - iii. Service life of 10 Years for Queen Creek's location and application

- iv. Lead Acid AGM or Gel Batteries are not acceptable due to service life in high heat temperatures, and toxicity.
 - v. Battery SOC will be managed to ensure all night lighting throughout the year
 - b. Microprocessor includes Programmable Lighting Profile, Anti-Blackout Capabilities and protections.
 - c. Light profiles must be factory set and must be field adjustable with a wireless mobile application.
 - d. Default dimming profile: 100% brightness from dusk to dawn.
 - e. Capable of alternate dimming profile: 100% brightness from dusk to midnight, 30% brightness from midnight to 5:00am, 100% brightness from 5:00am to dawn
 - f. Enclosure
 - i. IP65 Ingress Protection
 - ii. Polycarbonate or aluminum construction
 - iii. Modular design for easy replacement
- 4. Pole and Support Structure Performance
 - a. Pole Design will meet engineering requirements based on the system's weight, EPA and wind rating for Queen Creek's geographic location
 - b. Independently verified pole strength and base details by licensed Professional Engineer and Test Lab
 - c. Pole manufacturer must be able to supply both anchor base and direct burials
 - d. Pole manufacturer must be able to supply pole arms in 4' & 6' options
 - e. Pole and arm shall be powder coated steel or aluminum with dark bronze finish color