

CHAPTER 13-12
STREET LIGHTING

Divisions:

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Division 13-12-001
General STREET LIGHTING OBJECTIVES

Sections:

13-12-001-0001 STREET LIGHTING OBJECTIVES~~General~~

13-12-001-0001 STREET LIGHTING OBJECTIVES~~General~~

Public ~~thoroughfares~~ ROADWAYS, SIDEWALKS AND SIDE PATHS are illuminated to achieve a number of different objectives that include: providing for clear and comfortable visibility at night; making streets and sidewalks more inviting during hours of darkness; reducing nighttime ~~accidents~~ CRASHES; facilitating NIGHTTIME vehicular and pedestrian circulation; IMPROVING NIGHTTIME SAFETY FOR ALL MODES OF TRAVEL; and promoting business ~~and~~ use of public facilities during the night hours.

The regulations in this chapter are for fixed lighting of the different functional classifications of public streets, including the adjacent pedestrian walkways and associated bikeways. They are appropriate LY SCALED to meet the range of the community's goals, which compete simultaneously for both more and less artificial nighttime illumination. They provide for traveler safety and comfort as well as enhance nighttime business and social activity while reducing the degradation of the nighttime visual environment. Additionally, they are designed to meet other community goals such as supporting local astronomical and tourism industries by minimizing light pollution, glare, and light trespass, ~~and by conserving energy~~ WHILE PRESERVING ~~and~~ THE REGION'S natural DARK SKY resource Ss.

These regulations cover the requirements for City capital improvement ~~projects~~ and private developments PROJECTS subject to off-site improvements requirements. They shall be used as guidelines for all other instances relative to lighting public ways.

~~Title 10, Flagstaff Zoning Code, establishes lighting standards for public thoroughfares in traditional neighborhood developments as approved by the City Council.~~ (Ord. 2017-22, Rep&ReEn, 07/05/2017)

Division 13-12-002
Lighting Required FOR NEW AND REDEVELOPMENT

Sections:

13-12-002-0001 Lighting Required FOR NEW AND REDEVELOPMENT

13-12-002-0001 Lighting Required FOR NEW AND REDEVELOPMENT

Streetlights shall be installed on all public and private streets ADJACENT TO AND WITHIN NEW AND REDEVELOPMENT PROJECTS in accordance with this ~~section~~ DIVISION AND PER ZONING CODE DIVISION 10-30.50 PUBLIC IMPROVEMENTS. The developer shall be responsible for the design and installation and all costs associated with the installation of the street lighting system. Plans shall be submitted to the City Engineer for review and approval, and shall conform to City standards. The streetlights shall become the property of the City when the final inspection of all off-site improvements is made, and the City Engineer accepts said improvements.

When a development project includes both public and private street lighting, then the construction plans shall clearly note for each light fixture whether it is a public fixture or a private fixture. This distinction shall also be shown on any summary or quantities list.

~~The streetlights on public streets shall become the property of the City when the final inspection of all off-site improvements is made and the City Engineer accepts said improvements.~~

The electrical lines serving the streetlights on public streets shall be installed to Arizona Public Service (APS) standards and will become, upon acceptance, the property of APS. The developer shall be responsible for making necessary arrangements with APS for the installation of the electrical service for the street lighting system. (Ord. 2017-22, Rep&ReEn, 07/05/2017)

STREET LIGHTING EQUIPMENT REMOVED AS A PART OF A CONSTRUCTION PROJECT SHALL BE SALVAGED TO THE CITY. NEW EQUIPMENT SHALL BE INSTALLED PER THIS DIVISION OF THE ENGINEERING STANDARDS.

MODIFICATIONS TO AN EXISTING INSTALLATION OF STREETLIGHTS WILL BE EVALUATED ON A CASE BY CASE BASIS BY CITY ENGINEERING STAFF TO ENSURE COORDINATION OCCURS BETWEEN NEW AND EXISTING INSTALLATIONS.

Division 13-12-003
Lighting Layout REQUIREMENTS

Sections:

- 13-12-003-0001 ~~Lighting Layout~~ INTENT OF ROADWAY LIGHTING
- 13-12-003-0002 Streetlights at Intersections
- 13-12-003-0002.1 General REQUIREMENTS
- 13-12-003-0002.2 Streetlights at ~~Non~~UNsignalized Intersections
- 13-12-003-0002.3 Streetlights at Signalized Intersections
- 13-12-003-0003 Spacing of Streetlights
- 13-12-003-0004 Location and Placement of STREETLIGHTS~~Equipment~~

13-12-003-0001 ~~Lighting Layout~~ INTENT OF ROADWAY LIGHTING

The intent of roadway lighting is ~~TO for~~ improved transportation safety and efficiency. The individual elements that compose the lighting installation shall complement this intent. The street lighting design shall include safety considerations to minimize hazards presented by poles as roadside and pedestrian obstacles, and as ~~vision~~ LINE-OF-SIGHT obstructions. (Ord. 2017-22, Rep&ReEn, 07/05/2017)

13-12-003-0002 Streetlights at Intersections

13-12-003-0002.1 General REQUIREMENTS

A. ~~Luminaire Wattage – Single Installation. The size (wattage) of a streetlight at an intersection where only one (1) light is required is determined from Table 13-12-003-01 based on the functional classification of the street over which the light extends.~~ LUMINAIRE TYPE AND OUTPUT – ALL INTERSECTION LIGHTING SHALL GENERALLY FOLLOW TABLE 13-12-003-01 FOR THE CORRESPONDING ROADWAY TYPE AND LAND USE TYPE. AT IMPROVED PEDESTRIAN CROSSING LOCATIONS WITH AND WITHOUT SIGNALIZATION, ADDITIONAL LIGHTING TREATMENTS MAY BE CONSIDERED AS PART OF A COMPREHENSIVE PEDESTRIAN CROSSING ENHANCEMENT PROJECT. AT TRAFFIC SIGNALIZED INTERSECTIONS, PHOSPHOR CONVERTED AMBER (PCA) LED SHALL BE UTILIZED WITH A TYPE III DISTRIBUTION.

B. Luminaire ~~OUTPUT~~ Wattage – Multiple Installation. At intersections where more than one (1) streetlight is required, all lights shall ~~HAVE be~~ the same ~~size~~ OUTPUT. The ~~size~~ LUMINAIRE OUTPUT shall be determined from Table 13-12-003~~5~~5-01 for the functional classification of the leg of the intersection requiring the highest ~~wattage~~ OUTPUT luminaire. (Ord. 2017-22, Rep&ReEn, 07/05/2017)

13-12-003-0002.2 Streetlights at ~~Non~~UNsignalized Intersections

A. A streetlight shall be installed at each ~~non~~UNsignalized public street intersection with the following exceptions:

1. Street Width. At intersections where the width of one (1) or more of the approaches is greater than or equal to fifty (50) feet as measured to the back of curb (on urban street sections) or edge of pavement (on rural street sections), two (2) streetlights shall be installed on diagonally opposite corners.

~~2.—Urban Local Streets. At the intersection of two (2) urban local streets, a streetlight may be omitted if its installation would violate the spacing and uniformity criteria of Section 13-12-003-0003 along either street.~~

~~32. Rural Local and Rural Collector Streets. Streetlights are not required at intersections involving only rural local or rural collector streets. UPON RECEIVING WRITTEN APPROVAL OF THE CITY ENGINEER, Should a designer choose to MAY install streetlights on streets with the same classifications, then the respective urban local or urban minor collector street criteria for intersections and spacing along the streets shall apply. Streetlights are required at all intersections OF LOCAL STREETS INTERSECTING HIGHER CLASSIFICATION STREETS on rural arterial streets.~~

B. Streetlights at unsignalized intersections shall be installed near the curb return with the luminaire extending perpendicular to the street centerline. The luminaire shall extend over the continuous roadway at a "T" intersection or over the roadway with the higher classification at a four (4) way intersection. (Ord. 2017-22, Rep&ReEn, 07/05/2017)

13-12-003-0002.3 Streetlights at Signalized Intersections

Streetlights shall be installed on the signal poles at signalized intersections as follows:

At a minimum, four (4) streetlights shall be installed, one (1) on each corner of A TYPICAL FOUR (4) WAY the intersection. For every leg of an intersection where the width of the leg is greater than or equal to SIXTYEIGHTY (860) feet, measured at the curb returns, an additional streetlight ~~will~~SHALL be installed. The additional streetlight shall project over the right hand curb on that approach. IN ALL CASES THE LUMINAIRES SHALL BE PLACED TO PROVIDE MAXIMUM VISIBILITY OF PEDESTRIANS IN THE CROSSWALK BY PLACING EQUIPMENT TO PROVIDE POSITIVE CONTRAST LIGHTING AND BY UTILIZING PCA LED WITH A TYPE III DISTRIBUTION. (Ord. 2017-22, Rep&ReEn, 07/05/2017)

13-12-003-0003 Spacing of Streetlights

In addition to intersection locations, streetlights shall be spaced along streets in accordance with the following table (13-12-003-01):

Table 13-12-003-01

Streetlight Spacing

<u>FUNCTIONAL CLASSIFICATION</u>	<u># LANES @ BUILDOUT</u>	<u>LAND USE @ BUILDOUT</u>	<u>TYPE</u>	<u>IESNA DISTRIBUTION</u>	<u>OUTPUT (LUMEN) NOTE 4</u>	<u>SPACING (FEET)</u>	<u>SINGLE OR DOUBLE SIDED</u>
MAJOR ARTERIAL	2/3	RURAL	NBA	2	6000	250'	SINGLE
	2/3	SUBURBAN/URBAN	NBA	2	6000	200'	DOUBLE
	4/5	RURAL	NBA	2	6000	250'	DOUBLE
	4/5	SUBURBAN/URBAN	NBA	2	6000	200'	DOUBLE
MINOR ARTERIAL	2/3	RURAL	NBA	2	6000	250'	SINGLE
	2/3	SUBURBAN/URBAN	NBA	2	6000	200'	SINGLE
	4/5	RURAL	NBA	2	6000	250'	DOUBLE
	4/5	SUBURBAN/URBAN	NBA	2	6000	200'	DOUBLE
MAJOR COLLECTOR	2/3	RURAL	NBA	2	6000	250'	SINGLE
	2/3	SUBURBAN/URBAN	NBA	2	6000	200'	SINGLE
	4/5	RURAL	NBA	2	6000	250'	DOUBLE
	4/5	SUBURBAN/URBAN	NBA	2	6000	200'	DOUBLE
MINOR COLLECTOR	2	RURAL /SUBURBAN	NBA	2	2000	250'	SINGLE
	2	URBAN	NBA	2	4000	250'	SINGLE
	3	SUBURBAN/URBAN	NBA	2	4000	250'	SINGLE
LOCAL (ALL)¹	2	URBAN	NBA	1	2000	300'	SINGLE
LOCAL CUL DE SAC	2	URBAN	NBA	3	2000	N/A	SINGLE

FUNCTIONAL CLASSIFICATION	SIZE (watts)	TYPE	LUMENS	SPACING
MAJOR ARTERIAL	180	LPS	33K	300'
	135	LPS	22.5K	250'
MINOR ARTERIAL	180	LPS	33K	300'
	135	LPS	22.5K	250'
MAJOR COLLECTOR	135	LPS	22.5K	300'
	90	LPS	13.5K	250'
MINOR COLLECTOR	90	LPS	13.5K	300'
	55	LPS	8K	300'
COMM. LOCAL	55	LPS	8K	300'

FUNCTIONAL CLASSIFICATION	SIZE (watts)	TYPE	LUMENS	SPACING
LOCAL	55	LPS	8K	300'

~~Note: When streetlights are constructed along an existing street, the wattage and corresponding spacing shall match that of existing lights on the street, or this table, whichever is more restrictive. On new street construction, the designer shall select the most appropriate wattage and spacing from this table based on intersection spacing, driveway locations and other roadway features that would benefit from street light proximity.~~

NOTES:

1. STREET LIGHTING ON LOCAL STREETS IS NOT REQUIRED IN RURAL OR SUBURBAN LAND USE TYPES EXCEPT AT INTERSECTIONS AS OUTLINED IN SECTION 13-12-003-0002.2A2. REQUESTS TO INSTALL STREET LIGHTING ON LOCAL STREETS ABOVE THE REQUIREMENTS OF TABLE 13-12-003-01 SHALL BE MADE IN WRITING TO THE CITY ENGINEER PER SECTION 13-06-002-0001.1, MODIFICATIONS AND APPEALS. IF THE REQUESTED MODIFICATION IS APPROVED BY THE CITY ENGINEER, THE REQUESTING PARTY WILL BE REQUIRED TO PROVIDE FUNDING FOR 20 YEARS OF OPERATIONS AND MAINTENANCE OF THE MODIFIED LIGHTING SYSTEM.
2. MAJOR ARTERIALS, MINOR ARTERIALS AND MAJOR COLLECTORS SHALL USE 38' LIGHTING POLES; ALL OTHER LOCATIONS SHALL USE 30' LIGHTING POLES.
3. ALL 38' LIGHTING POLES UTILIZE 8' X 8' MASTS; ALL 30' POLES UTILIZE 20" X 6' MASTS.
4. LUMINAIRE OUTPUT IS THE MAINTAINED VALUE BASED ON CITY OF FLAGSTAFF CALCULATIONS FOR LUMINAIRE DEPRECIATION AND DIRT DEPRECIATION EXPECTED OVER THE USEFUL LIFE OF EACH ARTERIAL AND MAJOR COLLECTOR FIXTURE, SEE THE CITY OF FLAGSTAFF SPECIFICATIONS FOR LED LUMINAIRES FOR FURTHER INFORMATION.

(Ord. 2017-22, Rep&ReEn, 07/05/2017)

13-12-003-0004 Location and Placement of STREETLIGHTSEquipment

A. In addition to the CRITERIA IN ~~Table~~ 13-12-003-01, the following layout criteria shall be used:

1. When a streetlight location falls near an unlit intersection, the light shall be located at the intersection.
2. Streetlights should be located at property lines to the greatest extent possible, but not in conflict with other utility service locations.
3. Pole spacing along a street may vary from the criteria of Table 13-12-003-01 by up to ten percent (10%), ~~provided the spacing does not exceed three hundred (300) feet.~~ For uniformity of appearance, the variance in spacing between adjacent spans should not be more than ten percent (10%).
4. With relation to roadway cross-sections, poles shall be located as follows (measured to the near edge of the pole):

a. If either the sidewalk is at the back of curb or the parkway is less than four (4) feet wide, ~~TWO~~^{one} (24) ~~feet~~FEET from back of sidewalk.

b. When the sidewalk is separated from the curb by a parkway greater than or equal to four (4) feet in width, two (2) feet back of curb.

c. When there is curbing but no sidewalk, two (2) feet from back of curb.

d. On a rural street, eight (8) feet from the edge of pavement. ~~with a widened shoulder similar to the fire hydrant location in standard drawing 13-03-012.~~

5. Existing utility poles should NOT be used whenever possible.

6. Wiring for streetlights shall be underground and located behind curb.

7. Additional lighting may be required when potential traffic hazards are identified in the plan review process.

~~8. On streets that are wider than seventy (70) feet (back of curb) the required streetlights shall alternate on either side of the street.~~ (Ord. 2017-22, Rep&ReEn, 07/05/2017)

Division 13-12-004 Pedestrian Lighting

Sections:

13-12-004-0001 Pedestrian Lighting

13-12-004-0001 Pedestrian Lighting

A. Lighting for pedestrian or other activity in excess of ~~this street lighting~~ THE standard S IN THIS SECTION is not normally required. However, publicly owned and operated pedestrian level lighting IN EXCESS OF THE CRITERIA ESTABLISHED IN TABLE 13-12-003-01 may be installed with the approval of the City Engineer, or required by the City Engineer on public right-of-way and walkway easements in special cases where there is a demonstrated need for additional illumination to supplement the required street lighting. Examples of such cases would include:

1. Walkways, IMPROVED UNSIGNALIZED CROSSINGS, SIGNALIZED PEDESTRIAN CROSSINGS, HIGH-USE BUS STOPS and OTHER LOCATIONS ~~mid-block crosswalks~~ where ~~there is an extended, high level of~~ nighttime pedestrian activity IS EXPECTED.
2. The approaches to pedestrian under-crossings or other ~~unusual~~ HIGH-USE pedestrian facilities.
3. Areas where special guidance is required to aid pedestrian navigation and decision making.
4. Locations with special walking hazards such as stairways.
5. Locations where a walkway serving a high level of nighttime pedestrian activity adjacent to the street diverges from the street far enough that it is not illuminated by the street lighting.
6. TRANSECT ZONING DISTRICTS WITH A HIGH INTENSITY OF URBAN USES.

B. In addressing supplementary pedestrian level street lighting, the designer or developer shall meet ~~all~~ THE FOLLOWING City standards governing ~~all outdoor~~ ROADWAY lighting in the City, ~~whether public or private as follows:~~

1. All fixtures shall be fully shielded.
2. Fixtures and their installation shall minimize light trespass and glare to pedestrians and other road users.
3. Pedestrian level lighting shall use ~~low-pressure sodium~~ NARROW BAND AMBER as the preferred source unless there is compelling reason that accurate color rendition is important in the pedestrian task AND THEN A MIXTURE OF UP TO 10% OF THE TOTAL LUMEN COUNT MAY BE BROADER SPECTRUM SOURCES SUCH AS PCA LED OR LOW CCT WHITE LED (< 2700 K).

4. LIGHTING EQUIPMENT SHOULD BE PLACED TO ALLOW AT LEAST A MINIMUM FIVE (5) FOOT WALKING SURFACE.

5. DUE TO THE TYPICALLY LOWER MOUNTING HEIGHT OF PEDESTRIAN SCALE LIGHTING, THE DESIGNER SHOULD CONSIDER THE POSSIBLE IMPACT OF TREE CANOPY AND LANDSCAPING BLOCKAGES.

6. ~~4.~~—The designer shall develop a design that uses only the minimum illumination necessary to ~~accomplish~~ LIGHT the identified pedestrian task. (Ord. 2017-22, Rep&ReEn, 07/05/2017)

**Division 13-12-005
Street Light Equipment**

Sections:

- 13-12-005-0001 Luminaire
- 13-12-005-0002 Streetlight Support Structures
- 13-12-005-0003 Structure ~~FINISH Colors and Paint~~ Specifications
- 13-12-005-0004 Streetlight Equipment and Service Line Ownership

13-12-005-0001 Luminaire

Luminaire for street lighting shall be full cut-off fixtures meeting the following criteria for weight and effective projected area (EPA):

Table 13-12-005-01

Luminaire Weight and EPA Criteria

Luminaire <u>OUTPUT</u> (<u>MAINTAINED</u>) <u>Wattage</u>	Maximum Weight Including Ballast, Slipfitter, Lamp and Photo Cell (Pounds)	Maximum EPA (Square Feet)
55 LPS <u>2000 LUMENS</u>	30	1.4
90 LPS <u>4000 LUMENS</u>	35	1.6
135 LPS <u>6000 LUMENS</u>	50	2.0
180 LPS <u>9000 LUMENS</u>	<u>650</u>	2.0

ALL NEW STREET LIGHTING FIXTURES SHALL COMPLY WITH THE FOLLOWING LED LUMINAIRE REQUIREMENTS AND THE CRITERIA IN THE CITY OF FLAGSTAFF SPECIFICATIONS FOR LIGHT EMITTING DIODE (LED) LUMINAIRES, WHICH IS POSTED TO THE CITY WEBPAGE AT WWW.FLAGSTAFFAZ.GOV. THE CITY TRAFFIC ENGINEER WILL MAINTAIN AND AMEND AS NEEDED THE CITY OF FLAGSTAFF SPECIFICATIONS FOR LIGHT EMITTING DIODE (LED) LUMINAIRES ALONG WITH A LIST OF ACCEPTABLE LUMINAIRES. LUMINAIRES THAT ARE NOT ON THIS LIST WILL REQUIRE SUBMITTAL OF TECHNICAL INFORMATION FOR REVIEW AND APPROVAL BY THE CITY TRAFFIC ENGINEER. IN SOME SPECIAL CASES, HIGHER OUTPUT LUMINAIRES WITH CORRESPONDING MAST ARM AND POLE COMBINATIONS MAY BE DESIRABLE. THESE SPECIAL CASES WILL BE REVIEWED BY THE CITY TRAFFIC ENGINEER FOR APPROVAL.

A. GENERAL

1. EACH LUMINAIRE SHALL MEET ALL PARAMETERS OF THESE SPECIFICATIONS AND THE CITY OF FLAGSTAFF SPECIFICATIONS FOR LIGHT EMITTING DIODE (LED) LUMINAIRES THROUGHOUT THE MINIMUM OPERATIONAL LIFE WHEN OPERATED AT AN AVERAGE NIGHTTIME TEMPERATURE OF 70 DEGREES F.
2. STREETLIGHTS SHALL BE FULLY SHIELDED 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. EXTERNAL SHIELD OR REFLECTORS TO PREVENT UP-LIGHT ARE NOT ALLOWED.

3. THE MOUNTING ASSEMBLY SHALL PERMIT ANY NECESSARY ADJUSTMENT TO ORIENT THE LUMINAIRE WITH THE ROADWAY FOR PROPER LIGHT DISTRIBUTION.
4. LUMINAIRE SHALL HAVE A BUILT-IN LEVELING INDICATOR INSIDE THE HOUSING TO ALLOW FOR PROPER ORIENTATION.
5. THE INDIVIDUAL LEDS SHALL BE CONNECTED SUCH THAT A CATASTROPHIC LOSS OR FAILURE OF ONE LED WILL NOT RESULT IN THE LOSS OF THE ENTIRE LUMINAIRE.
6. THE POWER SUPPLY SHALL BE RATED FOR A MINIMUM LIFE EXPECTANCY EQUAL TO OR GREATER THAN THE MINIMUM OPERATION LIFE OF THE LUMINAIRE.
7. DRIVER AND LED MODULES SHALL BE REPLACEABLE AS SEPARATE UNITS AND HAVE PLUG CONNECTIONS.
8. LUMINAIRES SHALL SUPPORT INSTALLATION OF A FUTURE ELECTRONIC CONTROL MODULE (ECM) FOR DIMMING AND LUMINAIRE PERFORMANCE MONITORING.
9. LUMINAIRES SHALL HAVE A LABEL THAT STATES OPERATING VOLTAGE AND CURRENT RANGE. THE LABEL MUST BE CLEARLY VISIBLE ON THE INSIDE OF THE HOUSING.

B. PHYSICAL AND MECHANICAL REQUIREMENTS

1. THE LUMINAIRE SHALL BE A SINGLE, SELF-CONTAINED DEVICE, NOT REQUIRING ON-SITE ASSEMBLY FOR INSTALLATION. THE POWER SUPPLY FOR THE LUMINAIRE SHALL BE INTEGRAL TO THE UNIT.
2. THE MAXIMUM WEIGHT AND EFFECTIVE PROJECTED AREA ARE LISTED IN TABLE 13-12-005-01 ABOVE.
3. THE HOUSING SHALL BE CONSTRUCTED OF ALUMINUM AND FINISHED IN A LIGHT TO MEDIUM GREY COLOR.
4. EACH HOUSING SHALL BE PROVIDED WITH A SLIP-FITTER CAPABLE OF MOUNTING ON A TWO (2) INCH PIPE TENON.
5. THE SLIP-FITTER SHALL FIT ON MAST ARMS FROM 1-5/8 TO 2-3/8 INCH (O.D.).
6. THE SLIP-FITTER SHALL BE AN INTEGRAL PART OF THE LUMINAIRE HOUSING

7. THE SLIP-FITTER SHALL BE CAPABLE OF BEING ADJUSTED A MINIMUM OF +/- 10 DEGREES FROM THE AXIS OF THE TENON.
8. THE CLAMPING BRACKETS OF THE SLIP-FITTER SHALL NOT BOTTOM OUT ON THE HOUSING BOSSES WHEN ADJUSTED WITHIN THE DESIGNED ANGULAR RANGE.
9. NO PART OF THE SLIP-FITTER MOUNTING BRACKETS ON THE LUMINAIRES SHALL DEVELOP A PERMANENT SET IN EXCESS OF 1/32 INCH WHEN THE TWO OR FOUR 3/8-INCH DIAMETER CAP SCREWS USED FOR MOUNTING ARE TIGHTENED TO 10FT-LBS.
10. TWO (2) SETS OF CAP SCREWS MAY BE SUPPLIED TO ALLOW FOR THE SLIP-FITTER TO BE MOUNTED ON ANY PIPE TENON IN THE ACCEPTABLE RANGE WITHOUT THE CAP SCREWS BOTTOMING OUT IN THE THREADED HOLES.
11. THE CAP SCREWS AND THE CLAMPING BRACKET(S) SHALL BE MADE OF CORROSION RESISTANT MATERIALS AND BE COMPATIBLE WITH THE LUMINAIRE HOUSING AND MAST ARM OR TREATED TO PREVENT GALVANIC REACTIONS.
12. THE ASSEMBLY AND MANUFACTURING PROCESS FOR THE LED LUMINAIRE SHALL BE DESIGNED TO ASSURE ALL INTERNAL COMPONENTS ARE ADEQUATELY SUPPORTED TO WITHSTAND MECHANICAL SHOCK AND VIBRATION FROM HIGH WINDS AND OTHER SOURCES.
13. THE HOUSING SHALL BE DESIGNED TO ALLOW WATER, SNOW AND ICE SHEDDING.
14. EXPOSED HEAT SINK FINS SHALL BE ORIENTED SO THAT WATER CAN FREELY RUN OFF THE LUMINAIRE AND CARRY DUST AND OTHER ACCUMULATED DEBRIS AWAY FROM THE UNIT.
15. THE OPTICAL ASSEMBLY OF THE LUMINAIRE SHALL BE PROTECTED AGAINST DUST AND MOISTURE INTRUSION PER IP66.
16. WHEN THE COMPONENTS ARE MOUNTED ON A DOWN OPENING DOOR, THE DOOR SHALL BE HINGED AND SECURED TO THE LUMINAIRE HOUSING SEPARATELY FROM THE REFRACTOR OR LENS FRAME. THE DOOR SHALL BE SECURED TO THE HOUSING WITH CAPTIVE HARDWARE TO PREVENT ACCIDENTAL OPENING. A SAFETY CABLE SHALL MECHANICALLY CONNECT THE DOOR TO THE HOUSING.
17. FIELD WIRES CONNECTED TO THE LUMINAIRE SHALL TERMINATE ON A BARRIER TYPE TERMINAL BLOCK SECURED TO THE HOUSING. THE TERMINAL SCREWS SHALL BE CAPTIVE AND EQUIPPED WITH WIRE GRIPS FOR CONDUCTORS UP TO NO.8. EACH TERMINAL POSITION SHALL BE CLEARLY IDENTIFIED.
18. THE POWER SUPPLY SHALL BE CONTAINED INSIDE THE LUMINAIRE.

19. THE POWER SUPPLY SHALL BE RATED FOR OUTDOOR OPERATION.
20. HOUSING SHALL BE FABRICATED FROM MATERIALS THAT ARE DESIGNED TO WITHSTAND A 3000 HOUR SALT SPRAY TEST AS SPECIFIED IN ASTM DESIGNATION: B117.
21. EACH REFRACTOR OR LENS SHALL BE MADE FROM UV INHIBITED HIGH IMPACT PLASTIC (SUCH AS ACRYLIC OR POLYCARBONATE) OR HEAT AND IMPACT RESISTANT GLASS AND BE RESISTANT TO SCRATCHING.
22. ALL ALUMINUM USED IN HOUSINGS AND BRACKETS SHALL BE A MARINE GRADE ALLOY WITH LESS THAN 0.2% COPPER. ALL EXPOSED ALUMINUM SHALL BE ANODIZED.
23. POLYMERIC MATERIALS OF ENCLOSURES CONTAINING EITHER THE POWER SUPPLY OR ELECTRONIC COMPONENTS OF THE LUMINAIRE SHALL BE MADE OF UL94VO FLAME RETARDANT MATERIALS. THE LENSES OF THE LUMINAIRE ARE EXCLUDED FROM THIS REQUIREMENT.
24. PAINT OR POWDER COATING OF THE HOUSING SHALL CONFORM TO THE REQUIREMENTS TYPICAL TO THE ARIZONA DEPARTMENT OF TRANSPORTATION.

C. PHOTOMETRIC REQUIREMENTS

1. THE DIRECT NARROW BAND AMBER LED (NBA LED) LUMINAIRE DOES NOT HAVE A CCT REQUIREMENT.
2. NARROW BAND AMBER LUMINAIRES DO NOT HAVE A COLOR RENDERING INDEX (CRI) REQUIREMENT.
3. PHOSPHOR CONVERTED AMBER (PCA) LEDS SHALL HAVE AN S/P (SCOTOPIC / PHOTOPIC) RATIO OF 0.50 OR LESS.
4. DIRECT NARROW BAND AMBER (NBA) LEDS SHALL HAVE A PEAK WAVELENGTH BETWEEN 589 AND 595 NM WITH NO MORE THAN A 20NM WIDTH AT 50% OF PEAK OUTPUT.

D. LUMINAIRE IDENTIFICATION

1. EACH LUMINAIRE SHALL HAVE THE MANUFACTURER'S NAME, TRADEMARK, MODEL NUMBER, SERIAL NUMBER, DATE OF MANUFACTURE (MONTH-YEAR), AND LOT NUMBER AS IDENTIFICATION PERMANENTLY MARKED INSIDE EACH UNIT AND THE OUTSIDE OF EACH PACKAGING BOX.
2. THE FOLLOWING OPERATING CHARACTERISTICS SHALL BE PERMANENTLY MARKED INSIDE EACH UNIT: RATED VOLTAGE AND RATED POWER IN WATTS AND VOLT-AMPERE.
3. EACH LUMINAIRE SHALL HAVE A MANUFACTURER AFFIXED LABEL IDENTIFYING THE INPUT WATTAGE. LABEL SHALL BE ONE INCH RETROREFLECTIVE NUMBERS VISIBLE FROM THE GROUND.

~~The City Engineer will maintain a list of acceptable luminaire. Luminaire not on this list will require submittal of technical information for review and approval by the City Engineer. (Ord. 2017-22, Rep&ReEn, 07/05/2017)~~

13-12-005-0002 Streetlight Support Structures

Streetlight support structures consist of the base, pole, and mast arms. The standards of construction for streetlight equipment shall follow those ~~of Arizona Public Service (APS) Construction Standard Drawing No. 8040~~ OF THIS CHAPTER AND THOSE FOUND ON CITY OF FLAGSTAFF STANDARD DETAIL 12-05-010 PAGES 1-3. The streetlight pole, mast arm, and luminaire assembly shall be in accordance with AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals (2001 Design Criteria), to withstand a wind speed of ninety (90) miles per hour.

~~Contact APS for a copy of the current construction standards.~~

The geometry of the support structure varies with the luminaire size as shown in Table 13-12-005-02:

Table 13-12-005-02

Nominal Mounting Height

LUMINAIRE OUTPUT(Watts)	MOUNTING HEIGHT (ft)	POLE (ft)	MAST ARM
55-LPS <u>2000 LUMENS</u>	26	30	20" X 6'
90-LPS <u>4000 LUMENS</u>	26	30	20" X 6'
135-LPS <u>6000 LUMENS</u>	39 <u>34</u>	38	83 <u>8</u> X 8'
180-LPS <u>9000 LUMENS</u>	39	38	8' X 8'

~~Mast arms of different rise and length may be required TO AVOID EXISTING UTILITY CONFLICTS. when existing utility poles are utilized. The design of the mounting and mast arm chosen shall be such as to place the luminaire at the appropriate nominal mounting height and above the curb or edge of the pavement of the street. (Ord. 2017-22, Rep&ReEn, 07/05/2017)~~

13-12-005-0003 Structure FINISH ~~Colors and Paint~~ Specifications

ALL POLES AND MAST ARMS SHALL BE GALVANIZED. WHEN REQUESTED, The City Engineer will evaluate new projects that have streetlights to determine whether the support structure and luminaire MAY ~~will~~ be colored. If it is so determined, then the following will apply:

- A. Poles and mast arms shall be galvanized inside and out. The surfaces to be painted shall be acid washed and cleaned prior to painting. Galvanized coatings on surfaces not being painted shall be protected from the acid wash.
- B. Painting and priming of luminaire and other fixture housings shall be done in accordance with the requirements of ADOT Standard Specification Sections 610 and 1002.

C. The color of the support structure shall match Sherwin-Williams Drylac RAL6012 or approved equal. Alternate colors may be acceptable if approved by the City Engineer.

D. Supplementary pedestrian level lighting structures and luminaire may be finished in other colors providing that the color chosen is sensitive to and complements the environment surrounding the installation. (Ord. 2017-22, Rep&ReEn, 07/05/2017)

13-12-005-0004 Streetlight Equipment and Service Line Ownership

A. For streetlights on public roadways, the division point for ownership is at the junction point where the service line is tapped or spliced for the service to each light. Thus, the streetlight equipment including foundation, pole, mast arm, luminaire, and wiring within each pole and to the junction point, are property of the City of Flagstaff. The electric circuit feeding the lights, the junction box at the foot of each pole, and the connections, splicing, fuses, and other equipment within the junction box are the property and responsibility of the electrical utility that provides power to the streetlights.

B. On private streets, the streetlight ownership, operation, and maintenance are by separate agreement with the utility and the homeowners' association, entity, or organization responsible for the private street. (Ord. 2017-22, Rep&ReEn, 07/05/2017)

**Division 13-12-006
Plan Submittals**

Sections:

13-12-006-0001 Plan Submittals

13-12-006-0001 Plan Submittals

All new site plans, preliminary plats, or construction plan submittals shall show adjacent existing streetlights with their luminaire type and OUTPUT wattage ON PLANS PREPARED BY A LICENSED ENGINEER REGISTERED IN THE STATE OF ARIZONA.

A. New streetlights, auxiliary equipment, changes to streetlights and equipment in the vicinity of the project, which are required as a result of the project, shall also be shown on these plan submittals with the luminaire type, OUTPUT wattage, and other pertinent information.

B. For cases where the support structure or luminaire vary from these standards and in all cases of supplementary pedestrian level lighting, construction and materials details shall be included in the construction plans. (Ord. 2017-22, Rep&ReEn, 07/05/2017)

C. STREET LIGHTING GENERAL CONSTRUCTION NOTES

1. PRIOR TO BID SUBMITTAL, THE CONTRACTOR SHALL EXAMINE ALL CONSTRUCTION DRAWINGS AND VISIT THE CONSTRUCTION SITE TO BECOME FAMILIAR WITH EXISTING CONDITIONS UNDER WHICH THE STREETLIGHTS WILL OPERATE.
2. THE CONTRACTOR SHALL VERIFY DIMENSIONS AT THE SITE AND IMMEDIATELY REPORT DIFFERENCES TO THE CITY'S INSPECTOR AND NOT PROCEED WITH WORK UNTIL THE CITY INSPECTOR RENDERS A DECISION.
3. IT IS THE CONTRACTOR'S RESPONSIBILITY TO CONTACT ARIZONA PUBLIC SERVICE (APS) FOR COORDINATION OF THE TRENCHING, INSTALLATION OF CONDUIT AND PULL BOXES, AND INSTALLATION OF ELECTRICAL CONDUCTORS FOR THE STREET LIGHTING SYSTEM.
4. TRENCHES AND EXCAVATION FOR ELECTRICAL CONDUIT AND PULL BOX INSTALLATIONS SHALL BE PER APS REQUIREMENTS. THE USE OF A COMMON ELECTRIC UTILITY COMPANY TRENCH IS PERMITTED, UNLESS OTHERWISE DIRECTED BY APS OR THE CITY.
5. ELECTRICAL CONDUITS USED FOR CITY STREET LIGHTS SHALL BE UL RATED AND SUITABLE FOR UNDERGROUND USE PER APS REQUIREMENTS.
6. ALL ELECTRICAL CONDUIT SIZES, LOCATIONS AND INSTALLATIONS SHALL BE PER APS PLANS AND INSTALLATION REQUIREMENTS, EXCEPT FOR THE CONDUITS ENTERING LIGHT POLES. THE CONDUIT FROM THE LIGHT POLES TO THE PULL BOXES SHALL BE INSTALLED PER THESE PLANS.

7. ALL ELECTRICAL PULL BOX SIZES, LOCATIONS AND INSTALLATIONS SHALL BE PER THE APS PLANS AND INSTALLATION REQUIREMENTS. THESE PULL BOXES MAY BE REFERRED TO AS JUNCTION BOXES OR J-BOXES ON APS PLANS.
8. AN 8' X 5/8" MINIMUM SIZE COPPER CLAD GROUND ROD SHALL BE INSTALLED IN EACH ELECTRICAL PULL BOX. GROUND ROD SIZES AND INSTALLATIONS SHALL BE PER APS REQUIREMENTS AND SHALL MEET THESE MINIMUM REQUIREMENTS.
9. STREET LIGHT POLE LOCATIONS SHALL BE PER THESE PLANS AND THE APS PLANS. IF A CONFLICT EXISTS BETWEEN THESE TWO LIGHTING PLANS, THE CONTRACTOR SHALL IMMEDIATELY REPORT DIFFERENCES TO THE CITY'S INSPECTOR AND NOT PROCEED WITH THE CONFLICTING WORK UNTIL THE CITY INSPECTOR PROVIDES DIRECTION ON HOW TO PROCEED.
10. THE DEVELOPER SHALL COORDINATE ALL DESIGN AND ELECTRICAL SERVICE NEEDS WITH APS.
11. THE DEVELOPER SHALL CONFORM TO THE LATEST APS REQUIREMENTS AND PAY ALL FEES FOR DESIGN AND ENERGIZATION.
12. ALL STREET LIGHTING POLES SHALL BE LOCATED WITHIN CITY RIGHT-OF-WAY OR EASEMENT.
13. STREET LIGHTING POLES SHALL BE INSTALLED PLUMB IN TWO DIRECTIONS, NINETY (90) DEGREES APART, AND SHALL BE ADJUSTED TO PROVIDE PROPER ALIGNMENT TO THE ROADWAY BEING LIGHTED.
14. LUMINAIRES SHALL BE INSTALLED LEVEL AND INCLUDE A PHOTOCCELL AND OTHER LIGHTING SYSTEM COMPONENTS NEEDED TO BE FULLY OPERATIONAL. THE LUMINAIRES SHALL BE FREE OF DUST, DIRT OR ANYTHING THAT WOULD IMPAIR THE OUTPUT OF THE LIGHT.
15. LUMINAIRES SHALL BE WIRED OR CONNECTED TO MATCH THE VOLTAGE SUPPLIED BY THE ELECTRIC UTILITY COMPANY.
16. THE CONTRACTOR SHALL PROVIDE A FUSE HOLDER INSIDE EACH STREET LIGHT POLE IN ADDITION TO ANY FUSING THAT THE ELECTRICAL UTILITY MAY REQUIRE IN THE PULL BOXES.
17. THE CONTRACTOR SHALL PROVIDE ALL POWER CONDUCTORS AND WIRING CONNECTIONS WITHIN THE LIGHT POLES. ALL CONDUCTORS INSTALLED WITHIN THE LIGHT POLE SHALL BE COPPER.
18. THE CONTRACTOR SHALL PROVIDE #6 AWG BARE COPPER GROUND WIRE BETWEEN THE POLE GROUND LUG AND THE ELECTRICAL PULL BOX ADJACENT TO THE LIGHT POLE. THE CONTRACTOR SHALL CONNECT THIS GROUND WIRE TO THE GROUND LUG WITHIN THE POLE AND THE CONTRACTOR SHALL FOLLOW THE ELECTRICAL UTILITY REQUIREMENTS FOR THE CONNECTION TO THE GROUND ROD AT THE PULL BOX END.

19. THE CONTRACTOR SHALL PROVIDE THE NECESSARY POWER CONDUCTORS BETWEEN THE LIGHT POLE AND THE ELECTRICAL PULL BOX ADJACENT TO THE LIGHT POLE. THESE COPPER POWER CONDUCTORS SHALL BE A MINIMUM SIZE OF #12 AWG, UNLESS OTHERWISE NOTED LARGER WITHIN THESE PLANS, AND SHALL BE CONNECTED TO THE FUSE HOLDER WITHIN THE LIGHT POLE. THE CONTRACTOR SHALL FOLLOW THE ELECTRICAL UTILITY'S REQUIREMENTS FOR THE POWER CONNECTIONS AT THE PULL BOX END.
20. STREET LIGHTING POLES SHALL BE PROPERLY GROUNDED PRIOR TO SUBMITTING A REQUEST TO HAVE THE ELECTRICAL CIRCUITS ENERGIZED.
21. IT IS THE CONTRACTOR'S RESPONSIBILITY TO RESTORE ALL PROPERTY, LANDSCAPING, PAVING AND DRIVEWAYS THAT ARE DISTURBED DURING STREETLIGHT CONSTRUCTION TO THEIR ORIGINAL CONDITION IN CONFORMANCE WITH MAG SPECIFICATION SECTION 107.9.
22. PRIOR TO ACCEPTANCE, THE CONTRACTOR SHALL INSTALL THE POLE NUMBERS ON EACH STREET LIGHTING POLE, PER THE UTILITY COMPANY REQUIREMENTS, AND USE THE POLE NUMBERS IDENTIFIED WITHIN THE ELECTRICAL UTILITY COMPANY'S LIGHTING PLANS.
23. PRIOR TO ACCEPTANCE, THE CONTRACTOR SHALL ENERGIZE AND OPERATE THE ENTIRE ROADWAY LIGHTING SYSTEM FOR SEVEN (7) CONSECUTIVE DAYS WITHOUT FAILURE. IF A LUMINAIRE OR COMPONENT WITHIN THE LUMINAIRE SHOULD FAIL, IT SHALL BE IMMEDIATELY REPLACED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR FURNISHING ALL PERSONNEL AND EQUIPMENT TO SUCCESSFULLY PERFORM THIS TEST.
24. THE CONTRACTOR SHALL GUARANTEE ALL WORK FOR A PERIOD OF ONE YEAR FROM THE DATE OF FINAL ACCEPTANCE BY THE CITY INSPECTOR, AGAINST IMPERFECT WORKMANSHIP, FAILURE, MALFUNCTION OF MATERIALS AND/OR EQUIPMENT DUE TO FAULTY OR IMPERFECT WORKMANSHIP.
25. THIS GUARANTEE IS TO BE IN WRITING TO THE CITY AT THE TIME OF ISSUING FINAL ACCEPTANCE. MATERIALS AND WORKMANSHIP FOUND TO BE DEFECTIVE WITHIN THE WARRANTY PERIOD SHALL BE REPLACED WITHOUT COST TO THE CITY.

Division 13-12-007
REQUESTED Modifications to the Existing System

Sections:

13-12-007-0001 REQUESTED Modifications to the Existing System

13-12-007-0001 REQUESTED Modifications to the Existing System

~~Individual requests for additions to, or deletions from, the City's streetlight system, which are not in accordance with the lighting layout of the standard, shall be acted on by the City Engineer or his authorized representative. (Ord. 2017-22, Rep&ReEn, 07/05/2017)~~

A. REQUESTS FOR MODIFICATION TO THE EXISTING SYSTEM WHERE THE PROPOSED LUMINAIRE SPACING AND OUTPUT MEET THE CURRENT ENGINEERING STANDARDS REQUIREMENTS WILL BE REVIEWED THROUGH THE FOLLOWING PROCESS.

1. AN INDIVIDUAL MAY REQUEST REMOVAL OR ADDITION TO THE EXISTING SYSTEM THROUGH A WRITTEN REQUEST TO THE CITY TRAFFIC ENGINEER.
2. THE CITY TRAFFIC ENGINEER WILL REVIEW THE REQUEST TO DETERMINE IF IT IS ACCEPTABLE BASED ON A REVIEW OF CURRENT ENGINEERING STANDARD REQUIREMENTS AND ACTUAL CRASH HISTORY.
3. AN IMPACTED PROPERTY OWNERS LIST WILL BE DEVELOPED BY THE CITY. IT SHALL BE THE REQUESTING PARTY'S RESPONSIBILITY TO GAIN WRITTEN APPROVAL FROM EACH IMPACTED PROPERTY OWNER.
4. AFTER WRITTEN APPROVAL HAS BEEN ACQUIRED AND COMBINED WITH THE ENGINEERING STANDARD CONCURRENCE AND CRASH HISTORY VERIFICATION DOCUMENTS, THE CITY TRAFFIC ENGINEER WILL SCHEDULE A PUBLIC HEARING TO BE HELD DURING THE NEXT AVAILABLE TRANSPORTATION COMMISSION MEETING.
5. THE TRANSPORTATION COMMISSION WILL REVIEW THE SUBMITTAL AND RECEIVE PUBLIC COMMENT AND THEN ACT ON THE REQUEST FOR MODIFICATION.
6. ALL COSTS AND COORDINATION WITH THE LOCAL UTILITY ASSOCIATED WITH REMOVALS/ADDITIONS TO THE SYSTEM UNDER THIS SECTION SHALL BE THE RESPONSIBILITY OF THE REQUESTING PARTY. THE CITY MAY CHOOSE TO ENTER INTO A COST-SHARING AGREEMENT WITH THE REQUESTING PARTY, AND ANY SUCH AGREEMENT WILL BE CONTINGENT ON FUNDING BEING AVAILABLE.

B. REQUEST FOR RELOCATION OF A STREET LIGHT FOR THE PURPOSE OF PROPERTY OWNER CONVENIENCE WILL BE THE FINANCIAL RESPONSIBILITY OF THE REQUESTING PARTY. RELOCATION REQUESTS FOR CONVENIENCE WILL BE REVIEWED FOR APPROVAL BY THE CITY TRAFFIC ENGINEER.

C. REQUESTS FOR MODIFICATION TO THE EXISTING SYSTEM WHERE THE PROPOSED LUMINAIRE SPACING, AND/OR OUTPUT DO NOT MEET THE CURRENT ENGINEERING STANDARD REQUIREMENTS WILL NOT BE CONSIDERED BY THE CITY TRAFFIC ENGINEER OR THE TRANSPORTATION COMMISSION.

Division 13-12-008
Repair and Replacement

Sections:

13-12-008-0001 Repair and Replacement

13-12-008-0001 Repair and Replacement

If an existing streetlight installation that is not in conformance with these standards suffers AN OUTAGE OR damage ~~to such an extent that the cost of repairing the damage is greater than fifty percent (50%) of the cost of replacing the nonconforming installation~~, then either:

A. The light shall not be repaired, but rather, replaced with an installation which ~~fully~~ conforms to these standards if such an installation would be in conformance with the intersection and spacing requirements of the standards; or

B. The light shall be removed if its repair or replacement would violate the intersection and spacing requirements of the standards.

~~If the repair cost is less than fifty percent (50%) of the replacement cost then the installation shall be repaired in accordance with these standards whenever possible.~~ (Ord. 2017-22, Rep&ReEn, 07/05/2017)