

Chapter 15
Roadway Lighting

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Chapter 15 Roadway Lighting

15.1 General

15.1.1 This chapter sets forth the design and technical criteria to be used in the preparation of all roadway lighting plans. Where design information is not provided herein, the following standards (most current edition) shall be used:

1. National Electrical Safety Code (NESC)
2. National Electrical Code (NEC)
3. City of Sioux Falls Design Standards, Supplemental Specifications, and Standard Detail Plates
4. Requirements and Standards of the State of South Dakota
5. City of Sioux Falls Electrical Code
6. Illuminating Engineering Society of North America (IESNA)
7. American Association of State Highway and Transportation Officials (AASHTO)

15.1.2 Where a conflict occurs between the above standards, the most restrictive requirement shall apply.

15.1.3 Roadway lights shall be placed on lot/property lines that are perpendicular to Roadway centerline where applicable.

15.1.4 Roadway lighting on cul-de-sacs must terminate with a roadway light on the lot line nearest where the turnaround begins.

15.1.5 Roadway lights, junction boxes, meter pedestals, and conduit shall be free and clear of any permanent obstructions, which would impair the ability of future maintenance operations by Sioux Falls Municipal Light and Power.

Layout of roadway lighting must also consider vertical and horizontal alignment with respect to other utilities that might conflict with the installation of the roadway lighting system.

15.2 Design and Construction Process

15.2.1 The City Light Division's Roadway Lighting Design Policy provides a flow chart that outlines the process of the roadway lighting from design through construction. This policy can be found at the following website:

<https://www.siouxfalls.org/public-works/engineering/construction-mgmt/resources/specs-policies-manuals>.

15.3 Furnishing and Installation Delegation

15.3.1 See the City Light Division's Roadway Lighting Design Policy for the furnishing and installation delegation of the light poles, luminaires, wire, conduit, junction boxes, etc.

15.4 Lighting Design

15.4.1 Generally, roadway lights will be located within the public right-of-way 2 feet from the back of curb unless otherwise noted. Roadway lights shall be located on a lot line whenever possible. Roadways that have sidewalks installed behind the curb and gutter will require roadway lights to be installed behind the sidewalk but still within the public right-of-way. If roadway lights and related appurtenances cannot be installed within the public right-of-way, a utility easement will be required.

15.4.2 When roadway light locations are being considered, overhead obstructions must be evaluated prior to placement location. In general, roadway lights shall maintain a minimum clear distance to meet the local power utilities clearance policies. Other overhead obstructions such as trees, cable television lines, communications lines, billboards, etc., shall be evaluated on a case-by-case basis.

15.4.3 Luminaires mounted on signal poles shall be connected to the lighting system. Guidance for the design of roadway lighting systems is shown below and on the following sheets. The City may modify these criteria to enhance public safety.

15.4.4 Guidance for the design of roadway lighting systems is shown on the following sheets. The City may modify these criteria to enhance public safety.

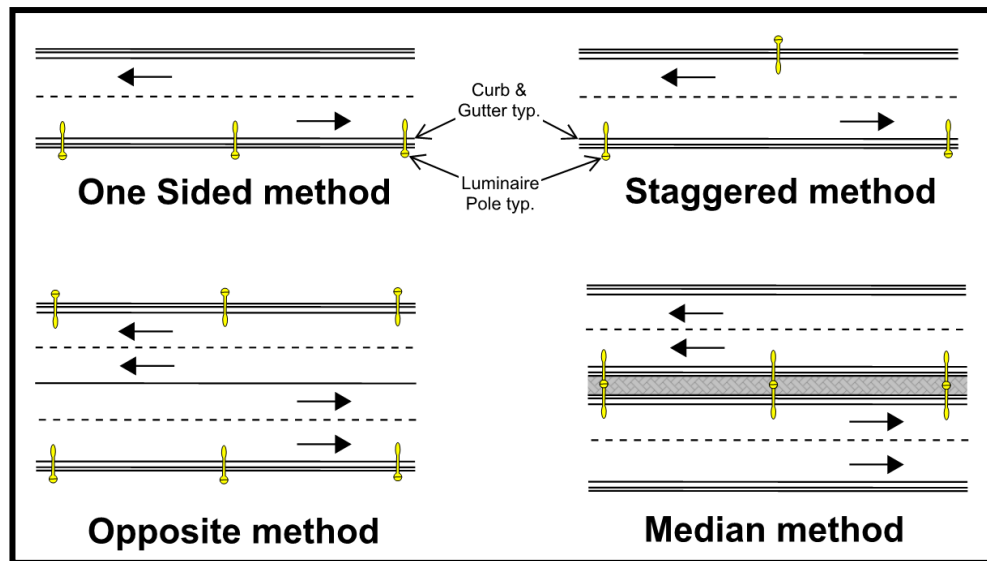
Table 15-1: Guidance for Design and Installation of Roadway Lighting Systems

Roadway Classification ¹	Downtown ² (Historic)	Local	Collector	Minor Arterial	Major Arterial
Roadway Width (BC = back of curb to back of curb)	Not Applicable	Not Applicable	> 33' BC ≤ 55' BC	> 55' BC ≤ 65' BC	> 65' BC
Luminaire Pole Distribution	Per Streetscape Design	One Sided	One Sided	Staggered	Per Engineer's Design or preferred as follows: median, opposite or staggered
Luminaire Pole Spacing	Per Streetscape Design	200' preferred (150'-250' allowed)	200' preferred (150'-250' allowed)	180' preferred between staggered pole locations (150'-200' allowed) or 360' preferred between pole locations on one side (300'-400' allowed)	Per Engineer's Design (150'-250' preferred)
Pole Mounting Height ³	See Standard Plate	20'	30'	40'	40' 50' allowed per approval.
Pole Arm Length	See Standard Plate	8'	8'	8'	8'. 15' allowed on 50' poles per approval.
Luminaire Class	Historic	4K	12K	16K	26K
Luminaire Fixture Spec ⁴	See Standard Plate	Type 2 LED 3000-5000 Lumens 4000K CCT multi-volt 120-277V discrete type B1-U0-G1 ⁵ 0.3 fc average 10:1 average / min 0.90 LLF ⁶ Cooper, American Electric or approved equal	Type 2 LED 11,000-13,000 Lumens 4000K CCT multi-volt 120-277V discrete type B3-U0-G3 ⁵ 0.7 fc average 6:1 average / min 0.90 LLF ⁶ Cooper, American Electric or approved equal	Type 3 LED 15,000-17,000 Lumens 4000K CCT multi-volt 120-277V discrete type B2-U0-G3 ⁵ 0.9 fc average 4:1 average / min 0.90 LLF ⁶ Cooper, American Electric or approved equal	Per Engineer's Design or preferred as follows: Type 2 or 3 LED 25,000-27,000 Lumens 4000K CCT multi-volt 120-277V discrete type B3-U0-G3 ⁵ 1.1 fc average 3:1 average / min 0.80 LLF ⁶ Cooper, American Electric or approved equal
Conduit	PVC or innerduct				
Wire	2/2/2/4 aluminum wire				
Pole Support	Concrete footing with transformer base				
Concrete Footing ⁷	2' diameter. 5' depth.	2' diameter. 6' depth.	2' diameter. 6' depth.	2' diameter. 6' depth.	8' depth allowed for 50' poles per approval.
Meter Pedestal	Standard meter pedestal with 4/0 AL triplex wire from transformer				

1 - Roadway Classification guidance can also be found in Chapter 8 of the City's Engineering Design Standards and from the City's Planning and Development Services website.
 2 - Downtown/Historic Pole is only allowed to be installed within the Downtown Sioux Falls region and is identified as shown on the maps located at the City's Planning and Development website.
 3 - The pole mounting height is the distance from the roadway surface to the luminaire.
 4 - Luminaires shall be LED, Multi-Volt 120-277V, 4000K CCT (Color Temperature).
 5 - BUG rating – Backlight (B) – Uplight (U) – Glare (G).
 6 - Lamp Loss Factor (LLF).
 7 - Precast concrete footings are allowed in lieu of cast-in-place concrete footings.

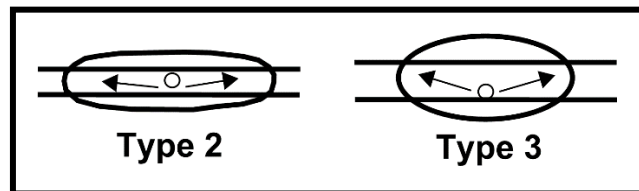
15.4.5 Luminaire Distributions. The luminaire poles shall be distributed using the following methods.

Figure 15-1: Luminaire Pole Distribution Methods



The preferred luminaire distribution types shall be as shown below. Other distribution types may be allowed upon review and approval from the City.

Figure 15-2: Luminaire Distribution Types



15.4.6 Arterial Roadway light designs

For Arterial Roadway designs, the design engineer shall submit photometric data to the City. The lighting design software programs Visual and AGi32 are both allowed to be used to generate the photometric data.

The photometric calculations shall be overlaid onto the roadway geometrics.

- The photometric data shall be submitted to the City in PDF format on a large rollout format to assist in displaying the entire project lighting design system.
- The PDF shall have the north direction indication, Roadway name labels, shall be to scale and have the PDF document scale noted on the document.
- Example photometric calculations and PDF submittals are available upon request from the City.

15.4.7 Light designs for under bridge and tunnels (pedestrian underpasses)

See the City Light Division's Policy for under bridge and tunnel luminaire fixtures approved for installation.

For tunnels (pedestrian underpasses) beneath roadways, luminaires shall be installed on the vertical walls of the tunnel. The luminaires shall be installed every 15 feet to 20 feet longitudinally along the tunnel. The luminaires shall be installed within 2 feet from the top of the tunnel.

For under bridge, luminaires shall be installed on the vertical walls of the abutment or piers. The luminaires shall be installed every 40 feet to 60 feet longitudinally along the wall or pier. The luminaires shall be installed 15 feet to 20 feet above the ground surface.

The luminaires shall be manufactured for a wall mount condition and shall have a polycarbonate or glass shield and vandal resistant.

All conduit and wire installed within the tunnel walls and structure shall be paid for separately.

Due to sunlight not being able to cast onto luminaires within tunnels and under bridges, the luminaires shall be kept on their own circuit which is connected to their own disconnect switch and photocell control box. These items shall provide controls to allow the luminaires to turn on and off for night and day time.

15.5 Conduits

- 15.5.1 All conduit installations shall be in compliance with the National Electrical Code.
- 15.5.2 Generally, conduits will be located within the public right-of-way 2 feet from the back of the curb unless otherwise noted.
- 15.5.3 When bends are required on any conduit run, no more than four 90-degree bends will be allowed in one given conduit run.
- 15.5.4 For conduit stubs less than 10 feet in length, ends shall be capped. No roadway light wire, tracer wire, or locator ball is required. For conduit stubs greater than 10 feet, a tracer wire and locator ball is required.
- 15.5.5 Roadway light conduit and traffic conduit may be buried in the same trench.
- 15.5.6 The primary/power feed wire and roadway light wire shall be kept in separate conduit runs.
- 15.5.7 Conduits shall have a minimum depth of bury of 24 inches, and a maximum of 48 inches, from finished grade.
- 15.5.8 Conduits or direct buried wire must have 12 inches of horizontal clearance from fire hydrants, inlets, cable boxes, etc.

- 15.5.9 All buried roadway lighting conduits shall be Schedule 40 PVC unless otherwise specified. All conduits installed above ground or under roadways and driveways shall be Schedule 80 PVC. Innerduct is allowed in lieu of conduit. When innerduct is used, the innerduct shall not be allowed to be spliced between junction boxes.
- 15.5.10 The maximum size of conduits shall be 2-inch diameter. Additional/parallel runs of conduits installed shall also be a maximum size of 2-inch diameter. The following lists the maximum number of wires that shall be installed within one 2-inch conduit:
 - One quadruplex wire (4/4/4/4 Aluminum Wire)
 - One triplex wire (4/0/4/0/4/0 Aluminum Wire)
 - Up to four single conductor wires (#4 Aluminum Wire, #3 Copper Wire, etc.)

15.6 Downtown Street Light Wiring

- 15.6.1 Street lighting wires installed within the Downtown Sioux Falls region shall have the following installed within a single 2-inch diameter conduit:
 - 2/2/2/4 Aluminum wire installed within conduits for the light fixtures on the poles.
 - Three #6 copper wires installed within conduits for the festoon outlet circuit.
- 15.6.2 The “Downtown” area is identified by the Planning and Development Services Department and can be found at www.siouxfalls.org.

15.7 Wire and Conduit Design Lengths

15.7.1 Wire and conduit design lengths, at a minimum, shall be as shown below.

Table 15-2: Wire Lengths	
Wire Location	Wire Design Length¹
Wire at Luminaire Pole and Signal Pole	Pole Mounting Height + Length of Luminaire Arm + 7'
Wire at Junction Box	Add 5' to each wire entering Add 5' to each wire exiting
Wire at Electric Service Cabinet	Add 15' to each wire entering Add 15' to each wire exiting
Wire at Ground Mounted Transformer	Add 25' to each wire entering
Wire at Pole Mounted Transformer	Pole Height + 25' to each wire entering transformer
1. Design Lengths shall be rounded up to the nearest whole 5' increment.	

Table 15-3: Conduit Lengths	
Conduit Location	Conduit Design Length²
Conduit at Luminaire Pole, Signal Pole and Junction Box	Add 2' for each conduit entering and exiting
Conduit at Electric Service Cabinet	Add 10' to each conduit entering Add 10' to each conduit exiting
Conduit at Ground Mounted Transformer	Add 10' to each conduit entering
Conduit at Pole Mounted Transformer	Pole Height + 10' to each conduit entering transformer
2. Design Lengths shall be rounded up to the nearest whole 5' increment.	

15.8 Junction Boxes

- 15.8.1 Generally, junction boxes will be located within the public right-of-way 2 feet from the back of curb, unless otherwise noted, and on a lot line whenever possible.
- 15.8.2 Junction boxes shall not be located in driveways or accessible (ADA) pedestrian curb ramps and landing areas. Junction boxes are allowed to be installed within sidewalks, but shall be reviewed by the City for ADA/pedestrian concerns.
- 15.8.3 Junction boxes shall be spaced a maximum of 250 feet if there are no intervening luminaire poles. Always use a junction box when crossing a road if the cable within conduit is going to splice.
- 15.8.4 Standard size junction box is 18 inches in diameter. If a greater size junction box is needed, the City will assist in the determination of such junction box size.
- 15.8.5 Maximum number of conduits entering into a junction box shall not exceed four and the minimum number of conduits shall not be less than two.
- 15.8.6 Refer to the City Standard Plates Series 635 for specific junction box details.

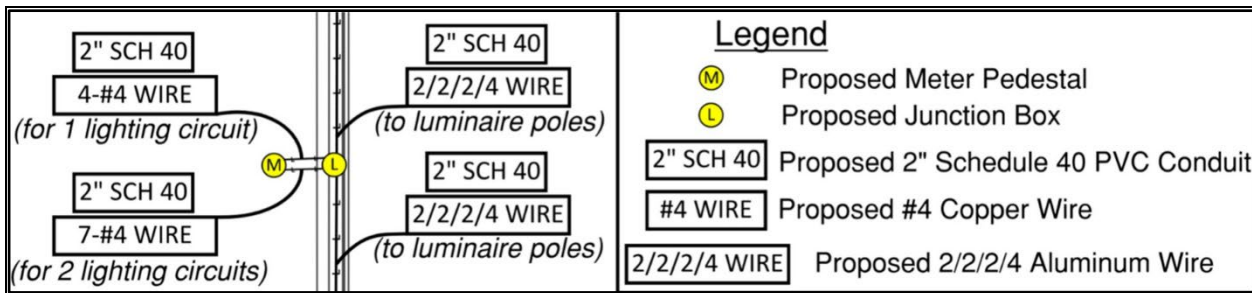
15.9 Concrete Footings

- 15.9.1 Generally, roadway light footings will be located within the public right-of-way 2 feet behind the back of the curb unless otherwise noted and on a lot line whenever possible. Roadways that have sidewalks installed behind the curb and gutter will require roadway light footings to be installed behind the sidewalk, but still within the public right-of-way. If roadway light footings cannot be installed within the public right-of-way, a utility easement will be required.
- 15.9.2 The maximum number of conduits within a roadway light footing shall not exceed four. Included in the total number of conduits will be one spare conduit that will generally be installed facing away from the curb for future lighting needs.
- 15.9.3 Types of footings will be based on the desired location and the physical constraints which are encountered during design of the footing. Typically, the standard roadway light footing will be sufficient; however, specialty footings shall be used when necessary. Specialty footings consist of spread footings and footings for luminaire poles with a mounting height greater than 50 feet. The specialty footings are detailed in the City Standard Plates Series 635.
- 15.9.4 When roadway lighting is installed near a location of pedestrian traffic, ADA clearance requirements will need to be met.
- 15.9.5 Horizontal clearance from fire hydrants shall be a minimum of 15 feet.

15.10 Meter Pedestals

- 15.10.1 Meter pedestals shall be installed according to City Standard Plates Series 635.

- 15.10.2 All meter pedestals must be inspected by a City electrical inspector.
- 15.10.3 The Contractor shall be responsible for completing the application process with the local power companies for the meter installation.
- 15.10.4 From the meter pedestal to the first junction box installed adjacent/nearby to the meter pedestal, each conduit entering the meter pedestal shall have either four #4 copper wires (for one lighting circuit) or seven #4 copper wires (for two lighting circuits) installed within each conduit. If there are more than two lighting circuits entering the meter pedestal, an additional conduit shall be installed. A diagram of this is shown below.



15.11 Power Supply

- 15.11.1 All roadway lighting plans shall indicate a designated power supply feed point. The power supply shall be installed from the designated supply point to a meter pedestal, if required.
- 15.11.2 The design engineer will be required to determine which power company will be utilized to supply power for Roadway lighting and will need to communicate and facilitate the arrangements and paperwork for energizing the new roadway light facility with the power company.
- 15.11.3 Power supplies shall be centrally located within project boundaries for roadway lighting layouts whenever possible.

15.12 Material Specifications

- 15.12.1 Material specifications are included in the Standard Specifications 635B for Roadway Lighting. <https://www.siouxfalls.org/public-works/engineering/construction-mgmt/resources/specs-policies-manuals>.
- 15.12.2 Contractor is responsible for filling out the Roadway Lighting Checklist prior to calling for lights to be hooked up. <https://www.siouxfalls.org/public-works/engineering/construction-mgmt/resources/forms-permits>.

15.13 Private Roadways

- 15.13.1 The City of Sioux Falls Light Division only maintains and operates roadway lighting along City maintained roadways and does not provide lighting to private drives.

15.14 Easements

- 15.14.1 For those lighting systems located outside of the public right-of-way, a public utility easement shall be obtained with a minimum width of 10 feet centered on the utility.

15.15 Rural Subdivision Annexation Standards

- 15.15.1 Existing rural subdivisions annexed into the City after January 1, 2018, shall not be required to have streetlights installed with annexation unless agreed to in an agreement.

15.16 Wiring of Lighting Systems

- 15.16.1 When determining the number of wire runs to install for a project or light circuit, the following standards shall be followed:

- Meter/power feed locations shall be located every 1,500 feet to 2,000 feet.
- Wire voltage drops shall be a maximum of 5 percent.
 - If voltage drop calculations are required, an electrical engineer may need to be consulted.
- Luminaires shall be wired for “alternating hots” for a 120-volt system. Wiring for “dual hots” or a 240-volt system may be allowed upon review and approval from the City.
- The City shall be allowed to review the project lighting layout at both the 50 percent and 95 percent stage of the lighting design/plans. The City shall be allowed to determine how the lighting system shall be circuited/wired to produce an efficient circuit and lighting system. The City may require the Developer/Engineer to complete and submit voltage drop calculations for a project.

As a general rule for determining the number of runs of 2/2/2/4 Quadruplex AWG Aluminum Wire to use for a project:

- One run of 2/2/2/4 Quadruplex is used for a one-sided street light circuit with a maximum of 32 fixtures, 35-40 watts each, spaced a maximum of 200 feet, for a maximum run length of 6400 feet.
- One run of 2/2/2/4 Quadruplex is used for a one-sided street light circuit with a maximum of 19 fixtures, 85-100 watts each, spaced a maximum of 200 feet, for a maximum run length of 3800 feet.
- One run of 2/2/2/4 Quadruplex is used for a staggered street light circuit with a maximum of 17 fixtures, 105-120 watts each, spaced a maximum of 200 feet, for a maximum run length of 3400 feet.
- One run of 2/2/2/4 Quadruplex is used for a staggered street light circuit with a maximum of 13 fixtures, 170-200 watts each, spaced a maximum of 200 feet, for a maximum run length of 2600 feet.
- A separate run of 2/2/2/4 Quadruplex is required for projects exceeding these aforementioned specifics.

15.17 Looping of Lighting Systems

- 15.17.1 When installing new conduits with wires along streets, the conduits with wires shall be connected to any adjacent existing conduit and wires, to allow the street lighting systems to be connected/“looped” between the proposed and existing conduits/wires. Additional junction boxes may need to be installed to allow the new conduits with wires to be connected to the adjacent existing conduit and wires.
- 15.17.2 By connecting/“looping” conduit and wires between systems, the City will be able backfeed the street lights during times of maintenance to a street lighting system.
- 15.17.3 Connecting/“looping” conduit and wires between systems will require additional work and coordination to be completed by the Developer/Engineer during the project design, plans production, and construction.
- 15.17.4 An example of connecting/“looping” conduit and wires between systems is shown in the diagram below.

