

City of Sioux Falls
Standard Specifications
for
Roadway Lighting
Section 635B

Adopted: September 3, 2008
Revised: February 1, 2018
Revised: November 9, 2018
Revised: January 1, 2020
Revised: July 5, 2023

City of Sioux Falls
Public Works/Engineering
224 West Ninth Street
P.O. Box 7402
Sioux Falls, SD 57117-7402

635B.1 DESCRIPTION

This work consists of furnishing and installing materials and equipment necessary for the operation of roadway lighting.

635B.2 MATERIALS**A. Electrical Grounding and Bonding**

1. **Bonding Conductors:** Bonding conductors shall be a #8 solid copper conductor per NEC.
2. **Ground Rods:** Ground rods shall be copper coated electrodes with the dimension of ½ inch diameter and 8 feet long in accordance with Underwriters Laboratory (UL).

B. Locator Balls: Electronic Marker System (EMS) 4 inch diameter locator ball, red in color, for power industry application. 5 feet bury depth detection range. EMS Ball Marker 1402-XR, as manufactured by 3M or approved equal.

C. Conduit

1. **Rigid PVC Conduit:** Conduit and fittings shall be polyvinyl chloride heavy wall meeting the requirements of UL 651 and 514. Use and installation of PVC Schedule 40 and 80 shall be in accordance with NEC and each section shall bear the UL label. The nominal conduit size shall be as indicated in the plans.
2. **Innerduct:** Innerduct shall be SDR 13.5 polyethylene or high-density polyethylene (HDPE) continuous conduit and shall bear the UL label. The innerduct shall be red in color. The nominal innerduct size shall be as indicated in the plans.

D. Electrical Wire: Electrical wires shall have suitable markings on the outer surface of the jacket at regular intervals to indicate the manufacturer, conductor size, type of insulation, type of conductor, voltage rating, and year of manufacture. All wires shall be colored coded by the wire manufacturer, by use of insulation colors / striping to identify the wire type. No taping of the wire for wire identification during installation shall be allowed. The color code shall be as follows:

Aluminum quadruplex and triplex wire	
<ul style="list-style-type: none"> • 1st hot wire = black with a sequential footage numbering • 2nd hot wire = black with blue stripe 	<ul style="list-style-type: none"> • Neutral wire = black with yellow stripe • Ground = black with green stripe
Copper wire (single strands)	
<ul style="list-style-type: none"> • 1st hot wire = black • 2nd hot wire = red 	<ul style="list-style-type: none"> • Neutral wire = white • Ground = green

1. Aluminum Wire:

a. 4/4/4/4 AWG Aluminum Wire - Quadruplex.

- 600-volt secondary underground aluminum wire.
- Three #4 wires and a #4 neutral wire cabled to produce a quadruplex cable configuration.
- Rated for 90 degree Celsius in continuous operation.
- Wires shall be stranded, compressed 1350-H16/H26 aluminum insulated with cross-linked polyethylene insulation meeting requirements of ANSI/ICEA S-81-570.
- The wire shall be suitable for use in conduit or direct burial application.
- Code word "Tulsa" as manufactured by Southwire 'HI-SCORE' cable, **Prysmian Group** or approved equal.

b. 2/2/2/4 AWG Aluminum Wire - Quadruplex.

- 600-volt secondary underground aluminum wire.
- Three #2 wires and a #4 ground wire cabled to produce a quadruplex cable configuration.
- Rated for 90 degree Celsius in continuous operation.
- Wires shall be stranded, compressed 1350-H16/H26 aluminum insulated with cross-linked polyethylene insulation meeting requirements of ANSI/ICEA S-81-570.
- The wire shall be suitable for use in conduit or direct burial application.
- Code word "Dyke" as manufactured by Southwire 'HI-SCORE' cable, **Prysmian Group** or approved equal.

- c. 4/0 / 4/0 / 4/0 AWG Aluminum Wire - Triplex.
- 600-volt secondary underground aluminum wire.
 - Two #4/0 wires and a #4/0 neutral wire cabled to produce a triplex cable configuration.
 - Rated for 90 degree Celsius in continuous operation.
 - Wires shall be stranded, compressed 1350-H16/H26 aluminum insulated with cross-linked polyethylene insulation meeting requirements of ANSI/ICEA S-81-570.
 - The wire shall be suitable for use in conduit or direct burial application.
 - Code word “Monmouth” as manufactured by Southwire ‘HI-SCORE’ cable, **Prysmian Group** or approved equal.
- d. 6/6/6 AWG Aluminum Wire - Triplex.
- 600-volt secondary underground aluminum wire.
 - Two #6 wires and a #6 neutral wire cabled to produce a triplex cable configuration.
 - Rated for 90 degree Celsius in continuous operation.
 - Wires shall be stranded, compressed 1350-H16/H26 aluminum insulated with cross-linked polyethylene insulation meeting requirements of ANSI/ICEA S-81-570.
 - The wire shall be suitable for use in conduit or direct burial application.
 - Code word “Erskine” as manufactured by Southwire ‘HI-SCORE’ cable, **Prysmian Group** or approved equal.
- e. #4/0 thru #6 AWG Aluminum Wire – Single Conductors (1/C):
- 600-volt secondary underground aluminum wire.
 - Rated for 90 degree Celsius in continuous operation.
 - Wires shall be stranded, compressed 1350-H16/H26 aluminum insulated with cross-linked polyethylene insulation meeting requirements of ANSI/ICEA S-81-570.
 - The wire shall be suitable for use in conduit or direct burial application.
 - The wire shall be as manufactured by Southwire, **Prysmian Group** or approved equal.

2. Copper Wire:

a. #4/0 thru #8 AWG Copper Wire – Single Conductors (1/C):

- Insulation shall be 600 volt rated thermosetting, cross linked polyethylene meeting the requirements of ICEA S-66-524 (NEMA WC-7).
- Conductors shall be annealed copper meeting the requirements of ASTM B3.
- Suitable for use in conduit or direct burial application.
- Wire shall be UL Listed Type USE-2 per UL Standard 854 and Type RHH or RHW-2 per UL Standard 44.
- The wire shall be as manufactured by Southwire, **Prysmian Group** or approved equal.

b. #10 thru #14 AWG Copper Wire – Single Conductors (1/C):

- Intended for tracer wire application.
- UL listed as a tracer wire.
- Insulated with high molecular weight polyethylene (HMWPE).
- Suitable for direct burial on applications up to 600V.
- Color in accordance with the American Public Works Administration Uniform Color Code.
- Southwire Company or approved equal.

c. UF 14/2 Luminaire Wire (Pole & Bracket Wire):

- 600-volt secondary underground copper wire.
- Type UF 14/2 with ground, sunlight-resistant (UL) gray in color.

- E. Luminaires:** Luminaires shall be ANSI Standard light emitting diode (LED). Acceptable manufacturers are American Electric, Cooper, Leotek, General Electric, or approved equal.

Luminaires shall be complete with all materials and accessories as needed for a complete installation as specified herein. Luminaires shall be Design Lights Consortium® (DLC) qualified and shall meet the light level performance requirements outlined in this specification.

The Contractor shall furnish a standard warranty package with the equipment. The warranty shall extend 60 months (5 years) from date of delivery. The warranty shall be comprehensive, without deductibles, and shall cover all equipment supplied by the Contractor, whether or not it is manufactured by the Contractor.

Materials shall be as specified herein and shall be in accordance with the applicable NEMA, ANSI, IEEE, ASTM Standards, NEC, IES, and the Standards of the Underwriters Laboratory.

An isoilluminance chart and a photometric analysis output must also be provided to show lighting distribution is equivalent to the units specified. A photometric output analysis generated from the website Visual Roadway Tool™ [Visual \(visual-3d.com\)](http://visual-3d.com) or approved equal.

Provide test reports for the LM-79, LM-80 and TM-21 standards; and the In-Situ Temperature Measurement Test.

1. Housing:
 - a. Cobra head design.
 - b. Cast aluminum and have a 3G vibration rating.
 - c. Allow for water shedding.
 - d. Adequately manage the thermal output of the LED driver.
 - e. Clearly labeled on the inside with operating voltage and current range.
 - f. Include a bubble level.
 - g. Entry shall be tool-less and easy to access.
 - h. Include removable “power door” assembly.
 - i. Clearly labeled on the inside with operating voltage and current range.
 - j. Gray paint finish that obtains a scribe creepage rating of 8 after 5,000 hours of salt spray.
 - k. Include a fully wired photocontrol receptacle with rain tight twist on cap unless otherwise stated.
 - l. Photocontrol receptacle shall have a 20-year rated life with a 5-year warranty.
 - m. Shall be an ANSI standard 7 pin receptacle.
 - n. Receptacle shall be set up to face north.
 - o. Furnish Dark to Light DLL series or equal.

- p. Mounting shall be adjustable to orient luminaire for proper light distribution.
 - q. Fixture shall be IP66 rated.
 - r. UL or CSA listed.
 - s. Optical chamber shall be sealed from diver chamber.
 - t. On the underside of the housing door and visible from the ground, affix a 2" x 3" reflective sticker. The sticker shall list the lumen output of the fixture as either 4K, 12K, 16K or 26K for the lumen output as follows:
 - 4K for 3000 to 5000 Lumens
 - 12K for 11,000 to 13,000 Lumens
 - 16K for 15,000 to 17,000 Lumens
 - 26K for 25,000 to 27,000 Lumens
2. Electrical:
- a. Driver shall be made by same manufacturer as fixture.
 - b. Driver shall have a multi-voltage rating of 120–277 VAC at 60 Hz.
 - c. Power factor shall be greater than 0.90 at full load.
 - d. Shall have a surge protection external from the driver that shall meet ANSI C62.41 cat. C (20kV/10kA, with a minimum of 10kV/10kA).
 - e. Driver life expectancy shall be 100,000 hours minimum.
 - f. Power supply efficiency shall be greater than 95% at full load.
 - g. Power supply shall have a total harmonic distortion of less than 20% at full load.
 - h. Ambient operating temperature shall be from -40°C to 40°C.
 - i. Driver protection shall include overload, thermal overload, and self-limited short circuit.
 - j. Fully wired to include a three position set screw terminal block with labels to accommodate pole wiring.
 - k. Shall include a fully wired photocontrol with rain tight twist on cap unless otherwise stated.
 - i. Photocontrol shall have a 20-year rated life with a 5-year warranty.
 - ii. Shall be an ANSI standard receptacle with number of pins specified under the fixture section.”
 - iii. Receptacle shall be set up to face north.
 - iv. Furnish Dark to Light DLL series or equal.
 - v. One Photocontrol shall be included with each fixture.

3. Mounting:
 - a. Shall be capable of mounting to arms 2" in diameter.
 - b. Shall include leveling steps.
 - c. Shall include a rubber bird guard provided at the mounting hole of the luminaire fixture.
 - d. Shall be leveled with the longitudinal slope of the roadway / street.

4. Optics:
 - a. Correlated color temperature shall be 4000K, 70 CRI minimum or equivalent.
 - b. LED fixtures shall be discrete type fixtures. Chip-on-board (COB) or high density design LED fixtures shall not be allowed.
 - c. LED fixtures shall be dimmable, by using the 7 Pin Photocontrol Receptacle with a Dimmable Driver included, which shall also include dimming controls that are terminated within the fixture housing.
 - d. Full cutoff and Dark Sky compliant.
 - e. Maintenance Life from the TM-21 Report shall meet L₇₀ minimum of 100,000 hours at 25°C.

- F. **Photo Eyes:** TE Connectivity 8000 series photocontrol or equivalent
 1. Physical: Enclosure to meet ANSI c136.10 with power consumption less than 0.5 watts at 120 VAC
 2. Temperature: Minus 40 degrees Celsius to 65 degrees Celsius at 96 percent relative humidity
 3. Control: DC electromagnetic switch type exceeds 20,000 ON/OFF operations per ANSI C136.10
 4. Relay Rating: 30 Amp general purpose
 5. Load Rating: 1000 Watt Tungsten 1800 VA
 6. Light Sensor: Non drifting phototransistor
 7. Cover: High impact polypropylene with UV stabilized polycarbonate window
 8. Base: High temperature polyester (PBT)
 9. Gasket: Cross linked polyethylene
 10. Connection: 3 pole locking type with solid brass legs

G. Connectors: Equipment used to connect the electrical wires shall be as listed below.

*Note: Several of the items listed below have direct bury or submersible specifications; however, the items listed below **shall not** be installed in either direct bury or submersible conditions; as all connections shall be within the light pole bases.*

1. Fuses:
 - Fuses shall be 20 Amperes, 600Vac, 300Vdc, Time Delay, Class CC KLDR Series, POWR-GARD Fuse as manufactured by Littelfuse or approved equal.
2. Fuse-holder kits:
 - Break-away type.
 - Fully insulated, watertight and submersible connection.
 - Dual rated for aluminum or copper wire connections.
 - Rated for heavy duty conditions.
 - Rated for 600V with 30 Amperes.
 - HOMAC SLK-M Flood Seal, Model # 78378675227 as manufactured by Thomas & Betts or approved equal.
3. In-Line Fuse Holders:
 - Bussmann Series HEB Breakaway In-Line Fuse Holders for UL 13/32 inches x 1-1/2 inches Supplemental Fuses, setscrew style, Model HEB-JW-RYC or approved equal.
 - The In-Line Fuse Holders shall be crimped shut per the manufacturer's recommendations.
4. Splice Kits:
 - Raychem Gel Tap, GTAP-2(B18), Model # 446451-000 as manufactured by TE Connectivity or approved equal.
5. Stub Connection Kits:
 - For 3 wire conditions: Raychem GELCAP-SL-2/0-3HOLE-B100, Model # CP1967-000 as manufactured by TE Connectivity or approved equal.
 - For 4 wire conditions: Raychem GELCAP-SL-2/0-4HOLE-B100, Model # CP1967-000 as manufactured by TE Connectivity or approved equal.
6. Multi-Cable Connectors:
 - UL Listed (UL486D) for direct burial and submersible conditions.
 - Rated for 600V
 - Polaris IPLW and ITW Multi-cable connectors, Model # ITW-4, IPLW4-3, ITW-1, IPLW1-3 or approved equal.

H. Splice Kits:

*Note: Splice kits **shall not** be used for installation of new roadway lighting systems. Splice kits shall only be used for repair of existing direct bury systems.*

Splice kits shall be butt splice with heat shrink wrap. Splice kits and heat shrink wrap shall be appropriately sized for the wire being spliced. Splice kits shall be rated for 600V.

Splice kits shall be Blackburn – ICS or approved equal.

Heat shrink wraps shall be 3M ITCSN stick type or approved equal.

- I. **Luminaire Poles:** Luminaire poles, arms, pole bases and breakaway bases shall be as listed in **Table 635B-1**, as well as meeting the following criteria.
1. Design and fabrication shall be in accordance with the current edition of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all subsequent interims and plan details.
 2. Wind load shall be calculated using the 50 year mean recurrent interval basic wind speed.
 3. All poles shall be galvanized. Specifications for galvanized must meet ASTM-A 123. Color of galvanized shall be a flat grey color.
 4. The steel pole-to-base-plate connection shall be a full-penetration groove-welded connection with a backing ring as described in the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals.
 5. The design yield strength shown in the **design calculations** for steel shall be no higher than 55,000 psi. The actual yield strength of the steel **used in fabrication** of the poles may be higher than 55,000 psi, but shall not be lower than 36,000 psi.
 6. Pole arm lengths, single or twin, shall be as specified on the plans. The arms shall be removable from the pole. The arms shall be single-member steel and H.D. galvanized finish, with 2-inch Schedule 40 pipe.
 7. The pole mounting heights shall be plus or minus 5 percent of the heights listed in the table shown on the following sheet.
 8. A "J" hook for a cable strain relief grip or other strain relief device shall be provided at the top of the pole or electrical fixture.
 9. The poles shall not have hand holes.
 10. The poles shall be furnished with permanently attached galvanized steel material anchor bases.
 11. Pole designs must provide for drainage with no laps or edges to hold moisture.
 12. Connections at the base of the pole shall be made with water tight connectors approved for outdoor use.
 13. Anchor bolt or rod circle, anchor bolt or rod size, and other structural properties of the pole and base are to be designed and determined by the pole manufacturer.
 14. The poles shall have aluminum transformer bases. Adhesive breakaway and caution labels are to appear on the inside wall opposite of the base door opening.

15. 50 foot tall poles shall be furnished and installed with a vibration dampener that is internal to the pole.
16. A statement is required, signed by a Professional Engineer registered in the state of South Dakota, certifying the pole designs meet all plan and specification requirements, including breakaway and structural adequacy, of the AASHTO Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals. The physical testing procedures outlined in the Aluminum Association's Specifications for Aluminum Structures may be used to establish service limits for structural adequacy certification of aluminum breakaway transformer bases and frangible couplings. If requested, test data of production samples to support the certification shall be provided.

Included in the shop drawings submitted for the light poles, the Contractor shall submit comprehensive design calculations for the light poles and anchor bolts. The design calculations shall be signed and sealed by a SD registered Professional Engineer.

Table 635B-1: Luminaire Pole and Base Specifications¹

Pole Mounting Height ²	20' with base	30' with base	40' with base	50' with base	50' with base and 15' Truss Arm
Pole / Base ³	<u>Millerbernd</u> SFL-065-22 <u>Valmont</u> DS210-650A176- GV-NC-LAB-LESS TBASE	<u>Millerbernd</u> SFL-071-30 <u>Valmont</u> DS210-700A250- GV-NC-LAB-LESS TBASE	<u>Millerbernd</u> SFL-086-40 <u>Valmont</u> DS210-850A350- GV-NC-LAB-LESS TBASE	<u>Millerbernd</u> SFL-102-50 <u>Valmont</u> DS210-T00A456- GV-NC-LAB-LESS TBASE	<u>Millerbernd</u> SFL-102-50T <u>Valmont</u> DS60-T50B436-0S- GV-NC-LAB-LESS TBASE
Pole Material	Steel	Steel	Steel	Steel	Steel
8' Single Arm ³	<u>Millerbernd</u> SFL-8S-UP <u>Valmont</u> MS321-080-020-GV	<u>Millerbernd</u> SFL-8S-UP <u>Valmont</u> MS321-080-020-GV	<u>Millerbernd</u> SFL-8S-UP <u>Valmont</u> MS321-080-020-GV	<u>Millerbernd</u> SFL-8S-UP <u>Valmont</u> MS321-080-020-GV	Not Applicable
8' Twin Arm ³	<u>Millerbernd</u> SFL-8T-UP <u>Valmont</u> MD322-080-020-GV	<u>Millerbernd</u> SFL-8T-UP <u>Valmont</u> MD322-080-020-GV	<u>Millerbernd</u> SFL-8T-UP <u>Valmont</u> MD322-080-020-GV	<u>Millerbernd</u> SFL-8T-UP <u>Valmont</u> MD322-080-020-GV	Not Applicable
15' Single Truss Arm ³	Not Applicable	Not Applicable	Not Applicable	Not Applicable	<u>Millerbernd</u> SFL-15T-2BS <u>Valmont</u> DS60-15T Truss Arm
36" Bullhorn Arm ³	Not Applicable	<u>Millerbernd</u> SFL-36-BH <u>Valmont</u> MD102	<u>Millerbernd</u> SFL-36-BH <u>Valmont</u> MD102	<u>Millerbernd</u> SFL-36-BH <u>Valmont</u> MD102	Not Applicable
Pole base dimensions ³ (Pole base bolt circle diameter Ø)	<u>Millerbernd</u> 12"x12" (12"Ø) <u>Valmont</u> 12"x12" (12"Ø)	<u>Millerbernd</u> 12"x12" (12"Ø) <u>Valmont</u> 12"x12" (12"Ø)	<u>Millerbernd</u> 12"x12" (12"Ø) <u>Valmont</u> 12"x12" (12"Ø)	<u>Millerbernd</u> 15"x15" (15"Ø) <u>Valmont</u> 15.13"x15.13" (15.13"Ø)	<u>Millerbernd</u> 15"x15" (15"Ø) <u>Valmont</u> 15.13"x15.13" (15.13"Ø)
Transformer Base	<u>Akron Foundry</u> TB1-17 <u>Height⁴</u> 17" <u>Top Dimension⁴</u> 13.5"x13.5" <u>Bottom Dimension⁴</u> 15.5"x15.5"			<u>Akron Foundry</u> TB3-17 <u>Height⁴</u> 17" <u>Top Dimension⁴</u> 15.1"x15.1" <u>Bottom Dimension⁴</u> 17.5"x17.5"	
Concrete Footing anchor bolt circle diameter	15"			17"	
Concrete Footing anchor bolt size / diameter	1" diameter concrete footing anchor bolts shall be used unless manufacturer's design proves a larger anchor bolt diameter is required. 1 ¼" diameter maximum concrete footing anchor bolts shall be allowed upon approval.				

1. Approved equal is allowed for all items listed above.
2. The pole mounting height is the distance from the roadway surface to the luminaire.
3. Details of the items listed above are shown on the following sheets. Approved equals are allowed for these details.
4. Dimensions are allowed to vary +/- 0.5".

- J. Historic Street Light Pole and Luminaire:** The Historic Street Light Pole and Luminaire shall be as detailed on Standard Plate 635.73, as well as meeting the following criteria. The Historic Street Light Pole within the Downtown Sioux Falls region. The Downtown Sioux Falls region is identified as shown on the maps located at this website [Downtown Development - City of Sioux Falls](#).
1. Design and fabrication shall be in accordance with the current edition of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all subsequent interims and plan details.
 2. Wind load shall be calculated using the 50 year mean recurrent interval basic wind speed.
 3. Pole to be provided with templates, anchor bolts, washers, shims, nuts, and installation instructions.
 4. All hardware shall be corrosion-resistant stainless steel.
 5. All pole components (including base, pole, receptacle covers, and banner arms) shall have matching color.
 6. All listed items above shall be able to fit together and function as one complete unit.
 7. Prior to coating, the assembly shall be chemically cleaned and etched in a 5-stage washing system which includes alkaline cleaning, rinsing, phosphoric etching, reverse osmosis water rinsing, and non-chrome sealing to ensure corrosion resistance.
 8. The head / luminaire system installed at the top of the pole shall consist of a decorative cast aluminum capital and a high efficiency acrylic rippled one piece acorn shaped globe, with a cast aluminum 4 vane finial installed on top of the globe. The capital shall be heavy wall cast aluminum for high tensile strength, with a toolless entry door that provides open access to all components. The capital shall be screwed to top of pole tenon and have bug gasket to resist insect penetration into globe assembly. The acorn shaped globe shall be replaceable without replacing LED component parts and shall be securely attached to capital, with toolless Roto-Lock or Twist on/off features. The housing finish shall be installed with a 13 step polyester TGIC powder coat.
 9. The luminaire fixture light engine shall include 30 discrete LED emitters and shall be mounted to a flat metal core circuit board using SMT (surface mount) technology. External light control shall consist of high precision nano-optics mounted above the LED emitter array in such a way to achieve optimum uplight control. The luminaire fixture warranty shall extend 84 months (7 years) from date of delivery.

10. Pole anchor bolt or rod circle, anchor bolt or rod size, and other structural properties of the pole and base are to be designed and determined by the pole manufacturer.
11. A statement is required, signed by a Professional Engineer registered in the state of South Dakota, certifying the pole designs meet all plan and specification requirements, including structural adequacy, of the AASHTO Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals.
12. Included in the shop drawings submitted for the poles, the Contractor shall submit comprehensive design calculations for the poles and anchor bolts. The design calculations shall be signed and sealed by a SD registered Professional Engineer.

K. Concrete Footings: See City Standard Plates Series 635.

L. Power Feed: See City Standard Plates Series 635.

M. Disconnect Switch: Disconnect switches shall be used with tunnel and under bridge luminaires.

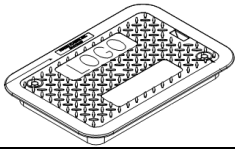

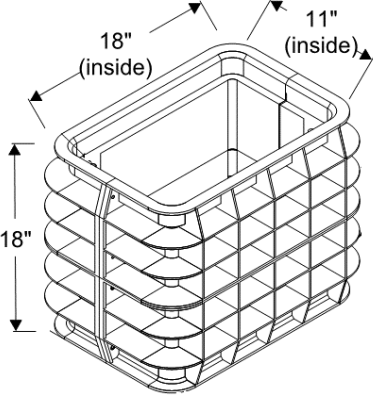
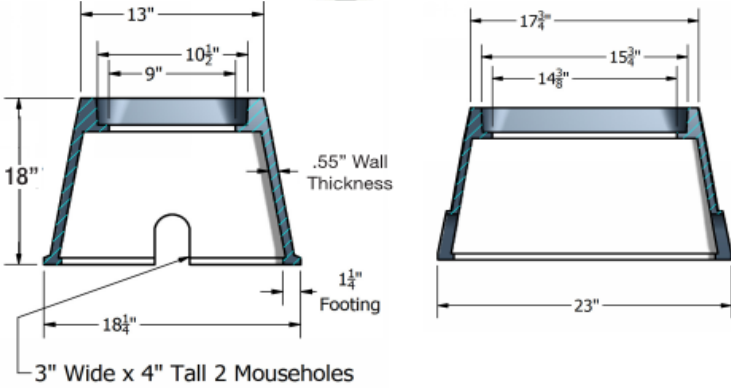
The Disconnect Switch shall be a NEMA 3R Heavy Duty Lockable Fused Disconnect Switch. It shall be fused for 20 Amps.

N. Photocell Control Box: Photocell control boxes shall be used with tunnel and under bridge luminaires.

The Photocell Control Box shall be a K4121M Photo Controls as manufactured by Intermatic or approved equal.

- O. **Junction Boxes:** Corrugated metal pipe shall conform to the requirements of AASHTO M 36. Lid and cover assemblies for corrugated metal junction boxes shall be cast iron Neenah Foundry Co. R5900 Series or an Engineer approved equal.
- P. **Junction Boxes for Residential Streets:** Junction boxes for residential streets shall be the 11x18x18 Assembly Junction Box, Drawing # DT111818HDH00 as manufactured by Pen-Cell Plastics; 1015 MSBC Heavy Wall Junction Box with a Flush Solid Cover as manufactured by Carson Plastics or approved equal. Details of the specified junction boxes are shown below.

The junction boxes shall be rated for a minimum of 5000 pounds / medium duty traffic loading. The junction boxes and their covers shall be of either of plastic, polyethylene or ductile iron material. The junction boxes shall bear the UL label.

Pen-Cell junction box	Carson Plastics junction box
<p style="text-align: center;"><u>Cover</u></p> 	<p style="text-align: center;"><u>Cover</u></p> 
<p style="text-align: center;"><u>Box / Base</u></p> 	<p style="text-align: center;"><u>Box / Base</u></p> 

- Q. **Surface Mounted Junction Box:** Surface mounted junction boxes shall be used with tunnel and under bridge luminaires.

Surface mounted junction boxes shall comply with NEMA 4X stainless steel shall be UL-listed and, at a minimum, shall be sized according to Article 314 of the 2008 National Electrical Code. Stainless steel junction boxes shall have the cover held in place with a continuous hinge and kept closed with screws and clamps on the remaining three sides. The cover shall be removable by removing the pin with the continuous hinge. All seams shall be continuously welded. Gaskets shall be closed cell neoprene.

Surface Mounted Junction Boxes shall have a fuse holder for the luminaires.

635B.3 CONSTRUCTION REQUIREMENTS

A. General: Installations shall comply with applicable sections of the NEC, state regulations, and local ordinances. Licenses or permits required shall be obtained by and at the expense of the Contractor.

The Contractor shall be responsible for the locating of all roadway lighting infrastructure from the start of the project until the roadway lighting work has been energized, accepted and the as-built information has been provided to the City.

Equipment and materials furnished by the Contractor shall be new.

The Contractor shall arrange for necessary electrical services at locations specified, which have previously been agreed to by the City and the utility company. The Contractor shall check with the electrical utility company for connections, conduits, wires, energizing and de-energizing at the connection to the transformer. The electrical utility company territories can be located using the PUC map at this website: <http://arcgis.sd.gov/server/PUC/ElectricServiceTerritories/>.

The City shall be responsible for completing the application process with the utility companies for the electrical services.

<p><u>Xcel Energy - FastApp</u> contact # 1-800-628-2121 https://xcelenergy.force.com/FastApp</p>	<p><u>Southeastern Electric</u> contact # 605-934-1961 www.southeasternelectric.com/request-service</p>	<p><u>Sioux Valley Energy</u> contact # 605-256-1629 https://www.siouxvalleyenergy.com/fo rms/new-service-request</p>	<p><u>Sioux Falls Municipal Light and Power</u> contact # 605-373-6979</p>
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The City Light Department shall make all line-to-line connections and shall furnish and install all items listed under Section 635B.G (Connectors) in these Specifications for fuses, fuse-holder kits, in-line fuse holders, splice kits, stub connection kits and multi-cable connectors to be furnished and installed within the junction boxes, light pole bases and meter locations.

- It shall be the responsibility of the Contractor to contact the City Light Department, after an electrical inspection and before the system is ready, for the line-to-line connections and fuse/connector equipment installation.
- Prior to requesting line to line connections, the Contractor is required to complete the Roadway Lighting Checklist through the Contractor Inspection Certification Section. The Roadway Lighting Checklist can be found at the following website: <http://www.siouxfalls.org/public-works/engineering/construction-mgmt/resources/forms-permits>

The City Light Department can be contacted as follows:

- Sioux Falls Municipal Light & Power
- Office # 605-373-6979
- 2000 N. Minnesota Avenue
- Sioux Falls, SD 57117-7402

- B. City Furnished Materials:** For materials that are to be furnished by the City, the Contractor shall pick-up the materials at the Sioux Falls Municipal Light & Power address shown above or at the address specified on the plans. The Contractor shall provide notice five days prior to pick-up to arrange for pick-up of materials.
- C. Shop Drawings:** Prior to ordering or fabrication of any project materials, the Contractor shall submit shop plans or catalog cuts for the project materials to the Engineer for review and approval.

The shop drawings shall be submitted electronically in pdf format via email. The shop drawings shall be sent to City's Project Manager shown on the plans and to the City's Municipal Light and Power (ML&P) Superintendent.

- ML&P Email: jjongeling@siouxfalls.org
- ML&P Office # 605-373-6979

The Contractor shall not begin ordering or fabrication of any project materials prior to the City's review and final approval of the shop drawings.

- D. Remove Luminaire Pole Footing:** The Contractor is to completely remove the luminaire footings when specified. When field conditions prevent a luminaire pole footing from being completely removed, the footing shall be removed to a depth of 2 feet below the final grade.
- E. Remove Luminaire Pole:** The Contractor is responsible to remove luminaire poles as specified. The base, pole or shaft, luminaire arm, and luminaire are all considered part of the luminaire pole. The removed luminaire poles shall become property of the Contractor upon removal of them. The City Light department shall de-energize luminaire poles to be removed.
- F. Salvage Luminaire Pole:** The Contractor is responsible to salvage luminaire poles as specified in the plans. The base, pole or shaft, luminaire arm, and luminaire are all considered part of the luminaire pole. The luminaire pole shall be removed undamaged and returned to the City Light Department. The base, luminaire arm, and luminaire shall be removed from the pole or shaft prior to delivery to the Light Department. Any salvaged poles damaged during removal or transportation shall be replaced at the expense of the Contractor.

The City Light department shall de-energize luminaire poles to be salvaged.

- G. Remove and Reset Luminaire Pole:** The Contractor is responsible to remove, salvage and reset the existing luminaire poles at the locations shown on the plans.

It shall be the Contractor's responsibility to obtain the bolt circle pattern and anchor bolts for the salvaged poles from the original pole manufacturer.

Luminaire poles and luminaires damaged during relocation shall be repaired or replaced by the Contractor at no cost to the City.

- H. Remove Street Light Wire:** The Contractor is responsible to remove all electrical wire as specified in the plans. The removed electrical wire shall become property of the Contractor upon its removal.
- I. Remove Junction Box:** The Contractor is responsible to remove all junction boxes as specified in the plans. The rings and covers shall be removed undamaged and returned to the City Light Department.
- J. Tie to Existing Conduit, Luminaire Pole Base, Junction Box, or Power Source:** When specified, the Contractor shall tie the proposed conduit to an existing conduit, luminaire pole base, junction box, or power source. The Contractor shall furnish all materials to properly tie into the specified location.
- K. Electrical Grounding and Bonding:** Use and installation shall conform to NEC.
- L. Locator Balls:** Locator balls shall be installed per the manufacturer's recommendations and per the City's Standard Plates Series 635.
- M. Conduit:** Use and installation shall conform to NEC and the following requirements:
1. Conduit sizes and types shall be as specified on the plans.
 2. When PVC conduit is specified, the Contractor has the option to install innerduct in lieu of PVC conduit. When innerduct is used, PVC conduit shall still be required to be used entering and within the footings and junction boxes. The Contractor must use the proper PVC/innerduct connections at these locations. When innerduct is used, the innerduct shall not be allowed to be spliced between junction boxes.
 3. The location and direction of conduit runs shown on the plans are allowed to be altered and shifted to meet field conditions.
 4. The minimum depth of conduit installation is 24 inches, and a maximum of 48 inches, from finished grade.
 5. Underground conduit shall be placed by trenching methods.
 - Trenching methods for placement of conduit under existing roadway pavements shall be permitted only after boring attempts have failed.
 - Trenches shall be backfilled and compacted to 95 percent standard proctor density.
 - Roadway surfaces, sidewalks, curb and gutters, sod, etc., which are removed by trenching operations shall be replaced. The cost of removing and replacing these materials shall be incidental to the bid price for the conduit, unless they are shown for removal and replacement on the plans.
 6. Where trenching operations require the removal of pavements, the pavements shall be sawed full depth along the removal lines or the pavement shall be removed to existing joints. The Contractor shall receive approval from the City prior to the pavement removals.
 7. Conduit open ends shall have an approved bell end or bushing installed to prevent damage to cable or conductors. Stubbed ends shall be capped and marked. See the City's Standard Plates for additional reference.

- N. Conduit Boring:** Bored conduit shall be placed by jacking or drilling methods. The Contractor shall not use equipment requiring flowing water for installation of conduit by boring methods unless approved by the City.
- O. Electrical Wire:** Electrical wire shall be installed per the manufacturer's recommendations and by methods that shall not injure the jacket, insulation, or conductors.

The tracer wire shall be continuous from junction box to junction box. The tracer wire shall be spliced using a Buchanon crimp sleeve and left bare (uninsulated). Tracer wire shall be installed in all empty conduits 10 feet and longer in length

All wire within a single conduit shall be placed at the same time. When powder or compound is required to ease pulling, the powder or compound shall be used according to manufacturer recommendations and the use shall not injure the cable.

- P. Luminaires:** Luminaires shall be installed per manufacturer's specifications.
- Q. Photo Eyes:** Photo eyes shall be installed per manufacturer's specifications.
- R. Connectors:** Connectors shall be installed per the manufacturer's recommendations.
- S. Splice Kits:** Splice kits shall be installed per the manufacturer's recommendations. No splices are allowed within a conduit. All splices shall occur in either a junction box or light pole base.
- T. Luminaire Poles:**
1. Luminaire poles shall be installed per the City's Standard Plates Series 635.
 2. Poles and base plates shall be plumb when the installation is complete and nuts are firmly tightened as per manufacturer's recommendations and per the City's Standard Plates Series 635.
 3. The luminaire's arm shall be set perpendicular to the project centerline.
 4. Field repair of damaged galvanizing shall be done in accordance with AASHTO M36.

- U. Concrete Footings:** The bottom of concrete footings shall rest on firm ground. The sides of the footings shall be formed by using an auger and then placing the concrete against the natural soil. A suitable form shall be used above existing ground line and all exposed portions shall be formed to present a neat appearance. An acceptable form shall be used if the excavation is larger than the standard footing dimensions. Backfill shall be compacted to 95 percent standard proctor density. Finished base shall be level and have a steel trowel finish.

If casings are required due to unstable soil conditions during the footing installation, all costs for the casings shall be incidental to the footings.

Precast concrete footings are allowed in lieu of cast-in place concrete footings. The Contractor shall review the standard plates for the requirements for the precast concrete footings for the trenching during installation and the backfill requirements.

Anchor bolts for the concrete footings shall be furnished by the Contractor when the Contractor is furnishing the light poles.

Anchor bolts for the concrete footings shall be furnished by the City when the City is furnishing the light poles.

- V. Power Feed:** The power feed equipment shall be installed in accordance with the plans and manufacturer's recommendations. See City Standard Plates Series 635.
- W. Disconnect Switch:** Disconnect switches shall be used with tunnel and under bridge luminaires.

The disconnect switch box shall be mounted to a 6 inches x 6 inches treated lumber post with a concrete base. The bottom of disconnect switch shall be at 3 feet above finished grade. All conduit leading to and from the disconnect switch shall be mounted to the treated lumber post.

- X. Photocell Control Box:** Photocell control boxes shall be used with tunnel and under bridge luminaires.

The photocell control box shall be wired to control the luminaires for turning on and off per day and night conditions.

The photocell control box shall be in clear view of the sky.

The photocell control box shall be installed per the manufacturer's specifications.

- Y. Junction Boxes:** Unless otherwise specified, the junction boxes shall be furnished and installed by the Contractor.

The top of the junction box cover shall be flush with final surfaced areas. The top of the junction box must match the grade of the surrounding surface.

The diameter of the holes in the junction or pull box walls shall be no more than 1/4 inch larger than the diameter of the conduit. The area around the conduit shall be sealed with a waterproof silicon sealant.

- Z. Junction Boxes for Residential Streets:** Unless otherwise specified, the junction boxes for residential streets shall be furnished and installed by the Contractor.

The top of the junction box cover shall be flush with final surfaced areas. The top of the junction box must match the grade of the surrounding surface.

The diameter of the holes in the junction or pull box walls shall be no more than 1/4 inch larger than the diameter of the conduit. The area around the conduit shall be sealed with a waterproof silicon sealant.

- AA. Surface Mounted Junction Boxes:** Surface mounted junction boxes shall be used with tunnel and under bridge luminaires.

The surface mounted junction boxes shall be installed per the manufacturer's specifications.

635B.4 METHOD OF MEASUREMENT AND BASIS OF PAYMENT

A. General: All bid items shown on the proposal form shall be for fully furnishing and installing the item; unless the term “Furnish” or “Install” is stated in front of the bid item.

- When the term “Furnish” is stated in front of the bid item, the item shall only be furnished.
- When the term “Install” is stated in front of the bid item, the item shall only be installed.

B. Tax on City Furnished Roadway Lighting Material: Tax on City furnished materials shall be per Section 2.11 of the General Conditions.

C. Incidental Work, Lighting: Measurement and payment for this item shall be on a lump sum basis. Payment shall be full compensation for all labor, equipment, and incidentals.

Work that shall be completed for this item shall be as discussed on the plans. If no description is given for this item on the plans, the following shall be included in the item:

- Tree trimming where required
- Removal of existing conduit and cable where required
- Remove of existing street light wire where required

D. Remove Luminaire Pole Footing: Measurement shall be per actual number of luminaire pole footings removed. Payment shall be at the contract unit price per each and shall be full compensation for all labor, equipment, and incidentals.

E. Remove Luminaire Pole: Measurement shall be per actual number of luminaire poles removed. Payment shall be full compensation for all labor, equipment, and incidentals.

F. Salvage Luminaire Pole: Measurement shall be per actual number of luminaire poles salvaged. Payment shall be full compensation for all labor, equipment, and incidentals.

G. Remove and Reset Luminaire Pole: Measurement shall be per actual number of luminaire poles removed and reset, including new anchor bolts with associated hardware for poles that are reset on new concrete footings. Payment shall be full compensation for all labor, equipment, and incidentals.

- H. Remove Street Light Wire:** No measurement or payment shall be made. The costs to remove the wire shall be considered incidental to the other roadway lighting items on the project.
- I. Remove Junction Box:** Measurement shall be per actual number of junction boxes removed. All rings and covers shall be returned to the City Light Department. Payment shall be full compensation for all labor, equipment, and incidentals.
- J. Tie to Existing Conduit, Luminaire Pole Base, Junction Box, or Power Source:** Measurement shall be by actual count of the various types of connections made. Payment for this item shall be at the contract unit price per each. Payment shall be full compensation for required materials, labor, equipment, and incidentals.
- K. Electrical Grounding and Bonding:** No field measurement shall be made. The cost of furnishing and installing grounding and bonding items shall be considered incidental to the other roadway lighting items on the project.

L. Locator Balls:

Furnish: Measurement shall be by actual count of locator balls furnished to the project or to the location noted on the plans. Payment for this item shall be at the contract unit price per each. Payment shall be full compensation for required materials, labor, equipment, and incidentals.

Install: Measurement shall be by actual count of locator balls installed. Payment for this item shall be at the contract unit price per each. Payment shall be full compensation for required materials, labor, equipment, and incidentals.

M. Conduit:

Furnish: The plans shown quantity of each type and size specified shall be the measured quantity unless changes are ordered by the Engineer. If field measurement is required due to field changes, measurement shall be from center to center of the pole footing, junction box, service cabinet, transformer, etc.; and shall include design lengths as discussed in Section 15.6 and shown in Table 15-4 of Chapter 15 of the City's Engineering Design Standards.

Conduit of each type and size specified shall be paid for at the contract unit price per linear foot furnished to the project or to the location noted on the plans. Payment shall be full compensation for required materials, labor, equipment, and incidentals.

Install: The plans shown quantity of each type and size specified shall be the measured quantity unless changes are ordered by the Engineer. If field measurement is required due to field changes, measurement shall be from center to center of the pole footing, junction box, service cabinet, transformer, etc.; and shall include design lengths as discussed in Section 15.6 and shown in Table 15-4 of Chapter 15 of the City's Engineering Design Standards.

Conduit of each type and size specified shall be paid for at the contract unit price per linear foot installed. Payment shall be full compensation for required materials, labor, equipment, and incidentals.

N. Conduit Boring: Measurement shall be per linear foot of the conduit installed by boring methods. Payment shall be full compensation for required materials, labor, equipment, and incidentals. The conduit installed by the boring methods shall be paid for separately under the appropriate size conduit bid item.

O. Electrical Wire:

Furnish: The plans shown quantity of each type and size specified shall be the measured quantity unless changes are ordered by the Engineer. If field measurement is required due to field changes, measurement shall be from center to center of the pole footing, junction box, service cabinet, transformer, etc.; and shall include design lengths as discussed in Section 15.6 and shown in Table 15-3 of Chapter 15 of the City's Engineering Design Standards.

Wire of each type and size specified shall be paid for at the contract unit price per linear foot furnished to the project or to the location noted on the plans. Payment shall be full compensation for required materials, labor, equipment, and incidentals. Contractor is responsible for temporary markings on wire indicating direction.

Install: The plans shown quantity of each type and size specified shall be the measured quantity unless changes are ordered by the Engineer. If field measurement is required due to field changes, measurement shall be from center to center of the pole footing, junction box, service cabinet, transformer, etc.; and shall include design lengths as discussed in Section 15.6 and shown in Table 15-3 of Chapter 15 of the City's Engineering Design Standards.

Wire of each type and size specified shall be paid for at the contract unit price per linear foot. Payment shall be full compensation for required materials, labor, equipment, and incidentals. Contractor is responsible for temporary markings on wire indicating direction.

P. Luminaires:

Furnish: Measurement shall be by actual count of the various types and sizes of luminaires furnished to the project or to the location noted on the plans. The luminaire and photo eye are considered part of the luminaire and shall be measured as one unit unless otherwise specified. Payment for this item shall be at the contract unit price per each. Payment shall be full compensation for required materials, labor, equipment, and incidentals.

Install: Measurement shall be by actual count of the various types and sizes of luminaires installed. The luminaire and photo eye are considered part of the luminaire and shall be measured as one unit unless otherwise specified. Payment for this item shall be at the contract unit price per each. Payment shall be full compensation for required materials, labor, equipment, and incidentals.

- Q. Photo Eyes:** No measurement or payment shall be made. The costs for the photo eyes shall be considered incidental to the other roadway lighting items on the project.
- R. Connectors:** No measurement or payment shall be made. The costs for the connectors shall be considered incidental to the other roadway lighting items on the project.
- S. Splice Kits:** No measurement or payment shall be made. The costs for the splice kits shall be considered incidental to the other roadway lighting items on the project.

T. Luminaire Poles:

Furnish: Measurement shall be by actual count of the various types and sizes of luminaire poles furnished to the project or to the location noted on the plans. The pole/shaft, base, anchor bolts and luminaire arm are all considered part of the pole and shall be measured as one unit unless otherwise specified. Payment for this item shall be at the contract unit price per each. Payment shall be full compensation for required materials, labor, equipment, and incidentals.

Install: Measurement shall be by actual count of the various types and sizes of luminaire poles installed. The pole/shaft, base, anchor bolts and luminaire arm are all considered part of the pole and shall be measured as one unit unless otherwise specified. Payment for this item shall be at the contract unit price per each. Payment shall be full compensation for required materials, labor, equipment, and incidentals.

U. Concrete Footings:

Concrete footings of the various diameters shall be measured to the nearest vertical foot furnished and installed, including precast concrete footings. Payment for concrete footings of the various diameters shall be at their respective contract unit prices per foot, including precast concrete footings.

Spread footings shall be measured per each footing furnished and installed. Payment for spread footings shall be at their respective contract unit price per each. Payment shall be full compensation for all materials, labor, and incidentals necessary to furnish and install the footings.

V. Power Feed:

Measurement shall be by actual count of the type of power feed locations furnished and installed. Payment for this item shall be at the contract unit price per each. Payment shall be full compensation for furnishing and installing power feed equipment including meter panel and base, circuit breakers, fuses, contactor, manual on/off switch and other materials and fixtures required. Any fees charged by the power company associated with the power feed hookup shall be the responsibility of the City.

All conduit and wire required between the transformer and meter shall be paid for separately under their respective bid items. The connection to the transformer shall be paid for as "Tie to Existing Power Source".

W. Disconnect Switch:

Furnish: Measurement shall be by actual count of disconnect switches furnished to the project or to the location noted on the plans. Payment for this item shall be at the contract unit price per each. Payment shall be full compensation for required materials, labor, equipment, and incidentals.

Install: Measurement shall be by actual count of disconnect switches installed. Payment for this item shall be at the contract unit price per each. Payment shall be full compensation for required materials, labor, equipment, and incidentals.

X. Photocell Control Box:

Furnish: Measurement shall be by actual count of photocell control boxes furnished to the project or to the location noted on the plans. Payment for this item shall be at the contract unit price per each. Payment shall be full compensation for required materials, labor, equipment, and incidentals.

Install: Measurement shall be by actual count of photocell control boxes installed. Payment for this item shall be at the contract unit price per each. Payment shall be full compensation for required materials, labor, equipment, and incidentals.

Y. Junction Boxes:

Furnish: Measurement shall be by actual count of the various types and sizes of junction boxes furnished to the project or to the location noted on the plans. Payment for this item shall be at the contract unit price per each. Payment shall be full compensation for required materials, labor, equipment, and incidentals.

Install: Measurement shall be by actual count of the various types and sizes of junction boxes installed. Payment for this item shall be at the contract unit price per each. Payment shall be full compensation for required materials, labor, equipment, and incidentals.

Z. Junction Boxes for Residential Street:

Furnish: Measurement shall be by actual count of the various types and sizes of junction boxes furnished to the project or to the location noted on the plans. Payment for this item shall be at the contract unit price per each. Payment shall be full compensation for required materials, labor, equipment, and incidentals.

Install: Measurement shall be by actual count of the various types and sizes of junction boxes installed. Payment for this item shall be at the contract unit price per each. Payment shall be full compensation for required materials, labor, equipment, and incidentals.

AA. Surface Mounted Junction Box:

Furnish: Measurement shall be by actual count of surface mounted junction boxes furnished to the project or to the location noted on the plans. Payment for this item shall be at the contract unit price per each. Payment shall be full compensation for required materials, labor, equipment, and incidentals.

Install: Measurement shall be by actual count of surface mounted junction boxes installed. Payment for this item shall be at the contract unit price per each. Payment shall be full compensation for required materials, labor, equipment, and incidentals.