1584 Hadley Avenue N | Oakdale, MN 55128
651-739-5086 | www.ci.oakdale.mn.us

ELECTRICAL LIGHTING SYSTEMS
(OAKDALE 2545)

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Install Lighting Units
   2. Conductors
   3. Conduit Systems
   4. Feed Points

B. Method of Measurement:
   1. Install Lighting Unit
      a. Measure as a unit for installing lighting units furnished by Owner.
      b. Includes furnishing all connectors, lamps, and other material necessary to install units and connect to power supply system.
   2. Install Lighting Fixture
      a. Measure as a unit for installing lighting luminaire fixtures furnished by Owner.
      b. Includes furnishing all connectors, lamps, and other material necessary to salvage and replace existing fixtures with new LED fixtures.
   3. Conductors:
      a. Measure by length in linear feet.
      b. Measure each type and size separately.
      c. Measure between terminal point centers along the centerline of the conductor.
      d. Add 5 feet at each terminal point for connections.
   4. Conduit Systems:
      a. Conduit:
         1) Measure by length in linear feet.
         2) Measure each type and diameter separately.
         3) Measure between end terminals along the centerline of the conduit.
         4) Includes jacking/augering or directional boring.
      b. Handholes:
         1) Measure as individual units.
         2) Measure each type separately.
   5. Feed Points:
      a. Measure as individual units.
      b. Measure each type separately.

C. Basis of Payment:
   1. System Components:
      a. Install lighting unit item includes assembling and installing City furnished lighting units, mounting accessories, excavation, backfill and compaction, fusing, internal wiring, and accessories as required to provide a complete unit.

b. Conductor item includes wire, cable, trenching, backfill, pulling, splicing, connections, accessories and testing as required to provide a complete installation.
c. Conduit item includes conduit, trenching, backfill, jacking, directional boring, fittings, drainage tees, sealing, and accessories as required to provide a complete installation.
d. Handhole item includes handhole, cover, excavation, backfill, sealing and accessories as required to provide a complete installation.
e. Feed point item includes feed point service cabinet, weatherhead, meter socket, conduit extensions between weatherhead and feed point service cabinet, concrete foundation, anchor bolts, service conductors, conduit, wiring, excavation, backfill and accessories as required to provide a complete installation.

2. Payment for the electric lighting system shall be at the Contract Unit Price as listed on the Bid Form. All associated Work items will be considered incidental.

1.02 REFERENCES

A. National Electrical Code

B. State and Local Electrical Code

C. NECA – Standards of Installation

D. Underwriters Laboratories, Inc. (UL)

E. NEMA

F. MnDOT 2545 – Electric Lighting Systems

1.03 SUBMITTALS

A. Shop Drawings:
1. Handholes
2. Feed Points

B. Product Data:
1. Conductors
2. Conduits

1.04 QUALITY ASSURANCE

A. Regulatory Requirements:
1. Obtain approval of completed system from state of local electrical inspector.
2. Provide all necessary permit and inspection fees.

1.05 PROJECT CONDITIONS

A. Energy Supplier:
1. Coordinate with the energy supplier for connections to the source.
2. Energy will be supplied by Xcel Energy and the City of North St. Paul.

B. Current Characteristics:
1. 120/240 Volt, A.C.

2. 1 Phase
3. 60 Hertz
4. 3 Wire

C. Drawings do not purport to show actual field dimensions, but are intended only to establish location and scope of Work. Field-verify dimensions and assume full responsibility for their accuracy.

1.06 SEQUENCING AND SCHEDULING

A. Do not perform excavation or trenching under this section until final boulevard grading is completed.

B. Install all items under this section prior to final boulevard restoration.

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

A. Luminaire – Type A (Furnished by Owner):
1. Weatherproof
2. Lamp: LED
3. Driver: 120 – 277 volt for operation to -20 degrees F
4. Cast aluminum capital
5. Solid spun aluminum top with finial
6. Factory Finish:
   a. Powder coat finish
   b. Factory finish
   c. Color: Black
7. All integral parts to be readily accessible
8. Enclose LED array in globe housing.
9. Include refractor to provide an IES Type III distribution pattern.
10. Provide easy twist lock refractor removal.
11. Mount driver with quick disconnect wiring.
12. Shall accommodate a 3” O.D. tenon
13. Acceptable Units:
    a. King – K424R-B2AR-III-60(SSL)-1042-120:277-K10-SST-BLK

B. Luminaire – Type B (Furnished by Owner):
1. Weatherproof
2. Lamp: 135-watt LED
3. 4000 K color temperature
4. Driver: 120 – 277 volt for operation to -20 degrees F
5. Factory Finish:
   a. Powder coat finish
   b. Color: Black
6. All integral parts to be readily accessible.
7. Enclose LED array in pendant housing.
8. Include reflector to provide an IES Type III-cutoff distribution pattern.
9. Toolless access.
10. Mount driver with quick disconnect wiring.
11. Acceptable Units:

a. Lumec Domus – 135W80LED4KES-LE3F-BKTX

C. Standards – Type A (Furnished by Owner):
1. Length: 13-foot 1-inch shaft length.
2. Material: Prestressed concrete.
3. Finish: Exposed aggregate.
4. Color:
   a. Stresscrete E40 Pearl Gray
   b. Apply anti-graffiti sealer at factory to prevent against graffiti, salt intrusion and freeze/thaw cycles.
5. Direct embedded pole.
6. 3” O.D. tenon
7. Design for 100 mph wind loading (including luminaire, ice and all mounting devices).
8. Include handhole in base with Teflon screws for access plate.
9. Acceptable Units:
   a. Stresscrete KD13-G-T-E40

D. Standards – Type B (Furnished by Owner):
1. Length: 25 feet.
2. Anchor-base mounted.
3. Material: Aluminum.
4. Color: Black.
5. Design for 100 mph wind loading (including luminaire, ice and all mounting devices).
6. Handhole in base.
7. Decorative truss style 6-foot aluminum arm.
8. Color: Black.
9. Acceptable Units:
   a. Pole: Hapco - SKTB04161A (31949P1)
   b. Arm: Lumec – VR-6 BKTX

E. Feed Point:
1. Manufactured weatherproof, NEMA 4 assembly with dimensions, construction, and components as indicated on “Lighting Service Cabinet” standard drawing in the Plan.
2. Install concrete base as detailed in the Plan.
3. Completed assembly shall bear ‘UL’ label and shall be labeled as “Suitable for use as service entrance equipment”.
4. Manufacturer:
   a. States Electric Manufacturing
   b. American Midwest Power
   c. Electro-Mechanical Industries
   d. Povolny Specialties Inc.
   e. Or approved equal.
5. 60 Ampere 2-pole main circuit breaker
6. 60 Ampere 2-pole contactor
7. 30 Ampere 2-pole branch circuit breakers as required
8. 15 Ampere 1-pole control circuit breaker
9. NEMA twist-lock photocontrol and socket
10. Surge protector – Square D SDSA1175
11. Mounted and prewired components
12. Meter socket
13. Cabinet:
   a. Weatherproof, NEMA IV

b. Pedestal type
c. .125-inch sheet aluminum
d. Freestanding
e. 1-hour clear anodizing
f. 1/4-inch mounting flange
g. Lockable
h. Non-corroding hardware
i. Neoprene gasketed door openings and base

14. Install on concrete base
15. Permanently attach “Danger – High Voltage” sign to cabinet face.

2.02 COMPONENTS

A. Conductors:
1. Branch conductors:
a. Standard copper with 600 volt insulation
b. Insulation (for use within conduit): Type XHHW-2, NO. 6 AWG
2. Service conductors:
a. Insulation (for direct bury or in conduit): Type USE-2 or UF cross linked polyethylene, or equal
b. Size as required.

B. Conduit Systems: Conduit shall have markings indicating the manufacturer’s name, size, type, UL listing and any other markings required by the N.E.C.
1. Polyvinyl Chloride Nonmetallic Conduit and Fittings:
a. Polyvinyl Chloride, Schedule 40, UL Label.
b. Type II, heavy wall, rigid
c. Conform to MnDOT 3803
d. Carlon PV DUIT 40 Plus, 90 C or approved equal.
2. Continuous length (HDPE)
a. Conduit shall be red in color
b. Fittings shall be appropriate for use with HDPE conduit.
3. Bell end bushings required at all conduit terminations.

C. Handholes:
1. Designed to carry light vehicular traffic.
2. Covers:
a. Bolt down type
b. Mold the word “Street Lighting” into cover
c. Design to carry light traffic
3. Provide drain opening in the bottom.
4. Materials: Plastic or Cast Iron:
a. Plastic
1) Conform to ASTM D635.
2) Self-extinguishing material.
3) Test to -50 degrees F.
4) No change in physical properties due to weather exposure.
5) Color: Gray.
6) Top dimensions shall not exceed bottom dimensions by more than 25 mm 1 inch.
7) Extensions shall be of same material.
8) Carlon no. PC 1324N, or equal.
b. Cast Iron:

1) OZ, Type YR, or equal

2.03 ACCESSORIES

A. Lighting Unit:
   1. Fuses: Bussman Type FNM, 5 amp, dual element fuse.
   2. Fuse Holders: Bussman Type HEX, two-pole, in-line, waterproof.

B. Concrete:
   1. Concrete foundations: MnDOT 2461, Type 3 (air entrained), Grade A (3900 psi).

C. Splices:
   1. Above Grade Splices:
      a. Burndy Unitaps.
      b. Wire nuts are not acceptable within the pole base.
   2. Handhole Splices (Waterproof):
      a. Split-bolt with Scotch Linerless Rubber Splicing Tape, Scotch Super 33+ Vinyl Electrical Tape and Scotchkote Electrical Coating.
      b. Approved waterproof equal.

D. Conduit Systems:
   1. Grounding Lugs: OZ Type BLG, or equal.

E. Grounding Equipment:
   1. Grounding Conductors: Bare copper wire.
   2. Ground Rods: 5/8 inch by 10 foot, copper clad, Copperweld, or equal.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify rules and procedures of the energy supplier for connection to the existing system.

B. Verify locations for making connections to existing facilities.

C. Verify location of existing underground facilities prior to installation.

3.02 PROTECTION

A. Protect all existing surface and underground facilities which are scheduled to remain inplace.

3.03 INSTALLATION

A. General:
   1. Conform to NECA “Standards of Installation” except as modified herein.
   2. Install all equipment based on the locations and dimensions shown on the drawings.
   3. The distribution circuits shall consist of two ungrounded conductors and one grounding conductor.
   4. The two ungrounded conductors shall constitute one 240-volt circuit.
   5. Conduit shall be directionally bored when behind the curb.

B. Excavation, Trenching and Backfill:
   1. Excavate trenches to a uniform depth below the finished grade.
   2. Maintain uniform alignment based on dimensions shown on the drawings.
   3. Use excavated trench materials for backfill.
   4. Remove sod, roots, clod, debris and stones over 1 inch in diameter from the backfill material.
   5. Compact backfill material in maximum 12 inch lifts.
   6. Continue compaction until there is not further evidence of consolidation.
   7. Dispose of surplus excavated materials on the site as directed by the Engineer.
   8. Do not place backfill material on foundations frozen deeper than 3 inches.

C. Lighting Units:
   1. Direct Embed Lighting Units:
      a. Perform excavation, backfill and compaction in accordance with manufacturer's and Engineers recommendations.
      b. Lighting standards shall be installed plumb and level.
   2. Anchor-base Mounted Lighting Units:
      a. Lighting standards shall be installed plumb and level.
   3. Luminaire and Pole Assembly:
      a. All threaded stainless steel hardware and dissimilar metal, threaded hardware shall be coated with an approved zinc-based anti-seize compound by the Contractor prior to assembly.
   4. Wiring and Grounding:
      a. Extend two No. 12 Type XHHW feeder and one No. 12 XHHW ground conductors to the luminaires from the cables in the standard base.
         1) Adequate length of conductors shall be made available to enable the removal splices and fuse holders from pole access hole, and the luminaires from the pole top or arm without disassembly.
         2) For Type A lighting units, provide a 1 foot long wiring harness length from the luminaire to a quick disconnect, and a 16 foot long wiring harness length from this disconnect to the lighting pole base access hole.
      b. Install one in-line two-pole fuse holder and fuses on the feeder leads.
      c. Connect grounding conductor to each standard at the grounding lug or grounding strap.
      d. Connect grounding lug and foundation ground rod with a No. 6 AWG bare copper wire.
      e. Attach grounding conductor to the energy suppliers neutral at the service point.
      f. Terminate the grounding conductor to a ground rod where indicated on the plan and at the end of each distribution run.
      g. Provide minimum 2 feet of cover over all wiring.
      h. Install electrical line identification tape in trench approximately 6 inches above conductors.
      i. Butt splices within poles, bases or handholes are not acceptable.
      j. Splicing shall be performed within pole bases when possible.

D. Feed Points:
   1. Install on concrete foundation as detailed in the Plans
      a. Provide forms to a minimum depth of 6 inch below the finished surface.
      b. Allow 7 days cure time for concrete base before placing cabinet.
      c. Cast on ground rod into each foundation.
      d. Set anchor bolts plumb and level.

2. Install and adequate length of service conductors and conduit from the feed point to reach energy source.
3. Energy supplier will make the final connection to the power source.
4. Terminate grounding conductor with a 25-ohm ground at the service points
    a. Establish 25-ohm ground with multiple driven ground rods as required.

E. Conductors:
1. Install cable in conduit as shown on the drawings.
2. Install complete cable (3 conductors) to each lighting unit.
3. Do not splice cable between connection points.
4. At lighting unit access hole or hand holes, provisions shall be made for convenient sectionalizing of the circuits. This shall be done by providing ample length (18 to 24 inches) of conductor ends and securing the splices above grade with Burndy Unitap hardware.

F. Conduit Systems:
1. General:
    a. Install conduit by directional bore method in unsurfaced areas.
    b. Conduit may be installed by direct bury method within roadways prior to installation of permanent surfaces.
    c. Provide minimum 2-foot cover over conduit.
    d. Jack or auger rigid under existing permanent surfaces.
    e. Grout all resultant voids from abandoned augering or jacking attempts.
    f. Maintain conduit runs on grade to provide definite low points in the system.
    g. Temporarily cap conduit ends during construction.
2. Rigid Steel Conduit:
    a. Joints: Cut square, threaded, reamed smooth and drawn up tight.
    b. Bends and Offsets: Standard Ells, field bends made with an approved bender; hub type conduit bodies.
    c. Terminate conduit at cabinet and boxes with locknuts and insulated bushings with grounding lugs.
    d. Install insulating bushing on all conduits 1-1/4 inch and larger.
3. Nonmetallic Conduit:
    a. Solvent weld all PVC conduit and fittings in accordance with manufacturer’s instructions.
    b. Weld or use mechanical fittings for HDPE conduit.
    c. Install ground conductor in all nonmetallic conduit.
4. Handholes:
    a. Install handholes in raceway runs as required to facilitate pulling of conductors.
    b. Excavate minimum 24 inches below base depth and refill with pea gravel.
    c. Secure boxes in place with grout after alignment and raceway installation.
    d. Seal all conduit ends with duct seal.
5. Drain Tees:
    a. Install drain tees at low points of the system.
    b. Excavate under drain tees 12 inches by 6 inches 12 inches by 24 inches deep and refill with gravel.

G. Grounding:
1. Ground all metallic conduits, supports, cabinets, non-current carrying equipment parts and the neutral conductor in accordance with the National Electrical Code.
2. Provide continuous unspliced grounding conductor from neutral conductor connection to the grounding electrode.

3.04 FIELD QUALITY CONTROL

A. Testing:
   1. Test completed system for unwanted grounds in accordance with MnDOT 2545.3.J.
   2. Conduct megohm meter test (at 500 volts D.C.) indicating resistance of each circuit.
   3. Allowable Results:
      a. Phase Conductor Insulation Resistance: Not less than 100 megohms.
      b. Neutral Conductor Insulation Resistance: Not less than 5 megohms.
      c. Circuit Insulation Resistance: Not less than 5 megohms.
   4. Provide necessary corrections and retest.

B. Demonstration:
   1. Demonstrate proper operation of completed system.

C. Manufacturers Field Service:
   1. Provide full instruction and demonstration in the adjustment, operation and maintenance of all components of the system.
   2. Provide instruction and demonstration to the Owner's employees during regular working hours.

3.05 PAINTING

A. Paint all exposed metal surfaces or areas damaged during construction.

B. Match original paint type and color.

END OF SECTION