SPECIAL PROVISIONS
FOR
ROADWAY LIGHTING AND ELECTRICAL

Cerro Gordo County
NHSX-122-1(18)--3H-17

Effective Date
December 19, 2017

THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Conductor System
   2. Conduit System
   3. Precast Light Bases
   4. Lighting Units
   5. Control Cabinet
   6. Concrete Control Cabinet Base
   7. Handhole
   8. Fiber Vaults
   9. Bollard

B. Method of Measurement
   1. Conductor System
      a. Measure by length in 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.
   2. Conduit System
      a. Measure by length in feet.
      b. Measure each type and diameter separately.
      c. Measure between end terminals along the centerline of the conduit.
   3. Precast Light Bases
      a. Measure as individual units.
      b. Measure each type and size separately.
   4. Lighting Units:
      a. Measure as individual units.

   b. Measure each type and size separately.
5. Control Cabinets:
   a. Measure as individual units.
6. Concrete Control Cabinet Base:
   a. Measure as individual units.
7. Handholes
   a. Measure as individual units.
8. Fiber Vaults
   a. Measure as individual units.
   b. Measure each type and size separately.
9. Bollard
   a. Measure as individual units.

C. Basis of Payment
   1. System Components
      a. Conductor item includes wire, cable, pulling, splicing, splicing equipment, connections, and accessories and testing as required to provide a complete installation.
      b. Conduit item includes conduit, fittings, fasteners, sealing, accessories, trenching, directional boring methods, backfill, jacking, augering, and restoration as required to provide a complete installation.
      c. Precast Light Base (concrete) item includes galvanized anchor bolts, nuts and washers, conduit stubs, reinforcing bars, ground rod and wire with exothermic weld, conduit duct seal, excavation and backfill, restoration and accessories as required to provide a complete unit.
      d. Lighting Unit item includes LED luminaire, arm, pole, breakaway transformer base, fusing, connections, and accessories as required, to provide a complete and operational unit.
      e. Control Cabinet item includes cabinet, circuit breakers, photo control, lighting contactors, selector switches, surge arrestor, wiring, conductors, ground rods with exothermic welds, conduit duct seal, and accessories as required to provide a complete installation.
      f. Concrete Control Cabinet Base unit item includes anchor bolts, nuts and washers, conduit stubs, concrete base, concrete form, ground rod, and bonding material, excavation and backfill, restoration and accessories as required to provide a complete unit.
      g. Handhole item includes handhole, cover with stainless steel bolts, ground rod with exothermic weld, excavation, pea gravel base, backfill, conduit duct seal, restoration, and accessories as required to provide a complete installation.
      h. Fiber Vault item includes vault, cover with bolts, excavation, gravel base, backfill, sealing, restoration, pull rope, and accessories as required to provide a complete installation.
      i. Bollard item includes galvanized steel post with cap, concrete base, concrete form, excavation, backfill, restoration, and accessories as required to provide a complete installation.
   2. Payment for the site electrical system components shall be at the contract unit price as listed on the Bid Form.

1.02 REFERENCES

A. 2017 National Electric Code

B. State and Local Electrical Code

C. Underwriters Laboratories, Inc. (UL)

D. National Electrical Manufacturers Association (NEMA)

1.03 SUBMITTALS

A. Shop Drawings
   1. Luminaires
   2. Standards
   3. Control Cabinets

4. Handholes
5. Fiber Vaults
6. Precast Light Base

B. Product Data
1. Conductors
2. Conduits & Couplings
3. Fuse Holders
4. Splicing Hardware

1.04 QUALITY ASSURANCE

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

1.05 PROJECT CONDITIONS

A. Painting
1. The Contractor shall repair any damage to the painted or galvanized finish of new equipment due to the shipping or installation.

B. Energy Supplier
1. Coordinate with the energy supplier for connection to the source.
Energy is supplied by Alliant Energy - Contact: Ryan Crooks 641.422.1763

C. Current Characteristics
1. 120/240 Volt, A.C.
2. 1 Phase
3. 60 Hertz
4. 3 Wire

1.06 SEQUENCING AND SCHEDULING

A. All items under this section shall be installed prior to final street, sidewalk and boulevard grading and/or restoration.

B. Contract unit prices shall reflect all construction costs. Extra construction costs associated with the installation of items under this section after the completion of new street surfaces; curb, boulevard, and sidewalks, shall be considered incidental.

PART 2 PRODUCTS

2.01 MANUFACTURED UNIT

A. Lighting Units
1. See the Equipment Schedule on the plans.

B. Control Cabinet
1. Manufactured weatherproof, NEMA 3R assembly with dimensions, components and construction as indicated in the “Control Cabinet” detail in the plans – 200 Amp.
2. One 24-space section and one 12-space section.
3. NEMA twist-lock photocell and receptacle behind Lexan window.
4. Hand-Off-Auto selector switch.
5. Surge protector.
6. 200A lighting contactor.

7. 20A WR-rated GFCI convenience receptacle mounted to deadfront.
8. Pedestal mounting base sized to accommodate cabinet dimensions.
9. Powder coated steel.
10. Completed assembly shall bear 'UL' label as "suitable for use as service entrance equipment."
11. Manufacturer:
    a. Milbank type CPB5211, minimum 24 inches(W) by 24 inches(D) by 60 inches(H). See details in plan.

C. Handholes
1. Designed to carry light vehicular traffic:
    a. Covers
        1) Bolt down type including two stainless steel bolts.
        2) Tier 15
        3) Mold the word "ELECTRIC" into cover.
    b. Handholes
        1) Sized per code. Minimum box size shall be 13 inches(W) by 24 inches(L) by 12 inches(D).
        2) Tier 22, open bottom
    c. Materials: Polymer Concrete
        1) Quazite, Style PG

D. Fiber Vaults
1. Designed to carry light vehicular traffic:
    a. Covers
        1) Bolt down type including two stainless steel bolts.
        2) Tier 15
        3) Mold the word "FIBER" into cover.
    b. Handholes
        1) Box size shall be 24 inches(W) by 36 inches(L) by 36 inches(D).
        2) Tier 22, open bottom
    c. Materials: Polymer Concrete
        1) Quazite, Style PG

E. Precast Light Base
1. 20 inch square with 3/4 inch to chamfer
2. 7 foot depth
3. Four 1 1/4 inch PVC conduit entries
4. One 3/4 inch conduit entry for ground wire
5. 7000 psi concrete with air-entrainment
6. See detail in plans.
    a. Iowa Base Inc.

2.02 COMPONENTS

A. Conductors
1. Standard copper with 600 volt insulation.
2. Insulation: Type THWN-2 for underground installation in conduit, and for aboveground installation within poles and service cabinets.
3. Size and type:
    a. As shown on drawing.

B. Conduit Systems
1. Nonmetallic Conduit (NMC) and Fittings:
    a. Polyvinyl Chloride, Schedule 40, UL Label.
    b. Extra heavy wall, rigid.
    c. Carlon PVC conduit Plus 40, 90°C or approved equal.
2. High Density Polyethylene (HDPE) and Fittings:

a. Schedule 40, UL Label, Comply with NEMA TC-7.
b. Extruded, nonmetallic, flexible conduit.
c. Carlon HDPE conduit schedule 40 or approved equal.

3. Rigid Metallic Conduit and Fittings:
   a. Hot dipped galvanized, UL Label.

C. Splicing Equipment
1. Above grade:
   a. Insulated splicing blocks
   b. Cold temperature rated to -40°C, 1000V
      1) Burndy Uni-Tap
      2) NSI
      3) ILSCO
      4) Polaris
2. Waterproof - Below grade within handholes:
   a. UL 486D Listed for direct-burial and submersible installations
      1) 3M Scotchcast spicing kits for multiple conductors

2.03 ACCESSORIES

A. Grounding Equipment
1. Grounding Conductors:
   a. Bare copper wire.
2. Ground Rods:
   a. 5/8 inch by 8 foot, copper clad, Copperweld, or equal.
   b. Exothermically welded to ground wire.
   c. Place two ground rods 6 inches apart at metered service location per Utility requirements.

B. Fuses
1. Fuses:
   a. 6 Amp, dual element fuse for luminaires.
2. Fuse Holder:
   a. 2 pole
   b. Ideal, 30-S2222D
      1) Or approved equal from Bussman

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 that are scheduled to remain in place.

3.03 INSTALLATION

A. General
1. Conform to the detail drawings and specifications
2. Install all equipment based on the locations and dimensions shown on the drawings unless utility or other conflicts require a new location for proposed lighting equipment.

3. Distribution:
    a. The lighting distribution circuits shall consist of two ungrounded conductors and one grounding conductor.
        1) The two ungrounded conductors shall constitute one 240 volt circuit.
    b. The signal cabinet and cabinet receptacle circuits shall consist of one ungrounded conductor, one grounded conductor, and one grounding conductor.
        1) The one ungrounded conductor and one grounded conductor shall constitute one 120 volt circuit.

B. Trenching and Backfill
1. Excavate trenches to a uniform depth 2 feet below the finished grade.
2. Maintain uniform alignment based on dimensions shown on the drawings.
3. Conduit shall be placed in a direct line between light foundations, as shown in plans.
4. Multiple conduits shall be placed in same trench where possible.
5. Use excavated trench materials for backfill. Salvage and reinstall existing Class V aggregate base. If existing Class V becomes contaminated, Contractor shall replace at his own expense.
6. Remove sod, roots, clod, debris and stones over 1 inch in diameter from the backfill material.
7. Compact backfill material in maximum 12 inch lifts. Finished compacted density for work in street sections shall match that of the density specified for street construction.
8. Dispose of surplus excavated materials on the site as directed by the Engineer.
9. Do not place backfill material on foundations frozen deeper than 3 inches.
10. See structural plans for conduit penetrations though footing walls

C. Precast Light Base
1. Furnish and install a Precast Light Base in accordance with the details in the plan, at the locations indicated in the plan or as directed by the Engineer. Anchor bolt size and circle shall accommodate pole manufacturer's requirements. Contractor to furnish pole manufacturer supplied hot-dipped galvanized anchor bolts to the precast base manufacturer.
2. Compact backfill material in maximum 12 inch lifts. Finished compacted density for shall match that of the density specified for street construction.
3. Install one ground rod next to each precast light base.

D. Lighting Units
1. Luminaires:
    a. Stainless steel mounting hardware shall be used to mount luminaires, and arms to poles.
    b. The Contractor shall apply an approved zinc-based anti-seize compound to all mounting hardware prior to assembly.
2. Poles:
    a. Poles shall be installed plumb and level.
    b. Stainless steel mounting hardware shall be used to secure access door and to mount luminaires to horizontal pole tenons.
    c. Handhole doors shall be oriented opposite of luminaire arm.
    d. The Contractor shall apply an approved zinc-based anti-seize compound to all mounting hardware prior to assembly.

E. Bollard
1. Furnish and install a Bollard in accordance with the details in the plan, at the location indicated in the plan or as directed by the Engineer.
2. Galvanized steel pipe shall be painted traffic yellow. Apply a 2 inch wide reflective adhesive decal around the top of bollard.

F. Control Cabinet
1. The cabinet type shall be as detailed in the Plans and Specifications. Cabinet shall be equipped with components as indicated. All materials including, photocell, conduit, fittings, clamps and hardware, and all labor, tools, equipment, incidentals, and coordination necessary to complete the contract work shall be incidental to the cabinet and installed as per details in the plans.

2. Install on concrete foundation as per detail and location indicated in plan.
3. Provide grounding per Utility requirements.

G. Concrete Control Cabinet Base
1. Furnish and install a concrete control cabinet base in accordance with the details in the Plan, at the location indicated in the Plan or as directed by the Engineer. The anchor bolt size and pattern shall be accommodate the cabinet manufacturer's requirements.
2. Provide a rigid template of the cabinet base including anchor bolt holes and a slot to hold in proper position and height the anchor bolts, ground rod and conduits during the concrete pouring. The template shall not be removed until the concrete has cured.
3. Anchor rods shall be hot dipped galvanized full length and shall be four in quantity for each cabinet. Each anchor rod shall be threaded a minimum of 4 inches and be provided with two hex-head galvanized nuts and one galvanized washer.
4. Maintain 4 inches of clearance from finished boulevard or sidewalk grade to top of foundation. The Contractor shall coordinate foundation installation with the Engineer, City, and General Contractor to ensure proper foundation elevation is maintained.

H. Wiring and Grounding
1. Type THWN-2 conductors shall be used for all underground conduit runs. Leave sufficient lengths of branch conductors to allow conductor splices to be extracted from pole base for maintenance.
2. Extend three No. 12 AWG Type THWN-2 feeder leads to the luminaires from the cables in the pole base.
    a. Install two/pole fuse holders on feeder leads. Leave sufficient lengths of feeder conductors to allow fuse holders and conductors to be extracted from pole base for maintenance.
3. Provide a No. 6 AWG bare copper wire connection to ground rods with ample length to allow connection to light standard grounding lug and system ground conductor.
4. Attach grounding conductor to the energy suppliers neutral at the service point.
5. Terminate grounding conductor with a 25 ohm ground at the service points and at the end of each distribution run.
6. Establish 25 ohm ground with driven ground rods.
7. Provide minimum 2 feet of cover over all wiring.
8. Provide two ground rods at the metered service per Utility requirements.

I. Splicing
1. Splicing shall be performed only within the pole bases and control cabinets. If identified on the plans, splicing may be performed within handholes and must use submersible splicing hardware installed per manufacturer's recommendations.
2. Apply two layers of protective vinyl electrical tape over the insulated wire splice connector blocks in the area where the conductors enter the block including the set screw access covers, and extend the wrap at least 1 inch over the incoming conductor insulation.
3. Wire-nuts are not an acceptable method of splicing within pole base.

J. Conductors
1. Install complete cable in conduit to each lighting unit as specified on the Plan.
2. Do not splice cable between connection points.
3. All conductors shall be color-coded. If multiple lighting circuits are to be installed within the same conduit, unique color codes or tracer colors shall be applied to conductor groups to identify respective circuits. The conductors shall be grouped and clearly labeled in the lighting service cabinet and each pole.
4. Use insulation of greater rating at the connection of two unlike types.

K. Conduit Systems
1. General:
    a. Install conduit in a direct line between lighting units cabinets and handholes (unless trees or other obstructions require an alternate location) to a depth of 24 inches; by direct bury method unless otherwise noted.

b. All conduits that are to be placed under parking areas, driveways, streets, medians and sidewalks that are not scheduled for removal shall be pneuma-gophered, directional bored, or another method approved by Engineer or City, which will not damage or disturb the integrity of the surface above.
c. Jack or auger conduit under permanent surfaces.
d. Grout all resultant voids from abandoned augering or jacking attempts.
e. Maintain conduit runs on grade to provide definite drain to low points in the system.
f. Temporarily cap conduit ends during construction.
g. Install ground conductor in all conduit.
h. End bells will be required at all conduit terminations in handholes, poles, and service cabinets.
i. Following installation of cables and conductors, seal the open ends of conduit entering cabinets, pole foundations, or handholes using duct seal compound NRTL classified under general use tapes.

2. Nonmetallic Conduit (PVC)
   a. Solvent weld all conduit and fittings in accordance with manufacturer's instructions.
   b. Shall be used for all underground conduit installations, in or beneath slabs under roads, sidewalks, parking lots, and driveways unless noted otherwise.
   c. End bells/bushings shall be installed on all conduit ends prior to pulling conductors.
3. Nonmetallic Conduit (HDPE)
   a. Except for under existing pavements, underground Continuous Type HDPE Conduit shall be placed by trenching, stitching, plowing, or other method approved by the Engineer. Under existing pavements, Continuous Type HDPE Non-Metallic Conduit shall be placed by directional boring.
   b. Appropriate couplings shall be used to connect HDPE conduit to PVC conduit if required in underground runs. PVC cement or epoxy shall not be used to bond HDPE conduit to PVC conduit.

L. Existing Conduit, Conductor and Handholes
1. Existing lighting conduit, conductor and handholes may be removed from the project as a result of sub-cutting associated with construction. Existing conduit and conductors not planned for reuse shall be disconnected from existing lighting units and service cabinets prior to removal. The removal of existing conduit, conductor and handholes not planned for reuse shall be incidental to the project. Removed lighting conduit, conductors and handholes shall become the property of the Contractor.

M. Handholes and Fiber Vaults
1. Install handholes as required to facilitate pulling of conductors.
2. Install a ground rod in each lighting handhole and bond to the grounding system with an exothermic weld.
3. Excavate minimum 24 inches below base depth and refill with pea gravel.

N. Lighting Control Cabinet
1. Install new lighting control cabinet at location indicated on plans. Coordinate location with proposed signal cabinet.
2. Install 2 inch conduit stub to a point outside of the control cabinet base to enable the Alliant Energy service connection. Coordinate with energy provider for connection.
3. Alliant Energy to provide service conduit and conductors and make final connection.

O. Labeling of Circuits
1. Label all conductors in conduit in new service cabinet and handholes indicating the next termination point. For example, in lighting service cabinet, the label would read "TO POLE A12"; in the handhole the label would read "TO LIGHTING SERVICE CABINET" or "TO POLE A11".
2. Provide labels that consist of white vinyl adhesive tape wrapped around the cable or conductors. Hand write the labeling on the vinyl adhesive tape or produce with a label maker. If label marking is handwritten, accomplish the labeling by using a black permanent marker, in such a manner, that the markings are legible to the satisfaction of the Engineer. Labels produced with a label maker shall be suitable for use in wet locations, and this label must wrap around the cable one complete revolution with some overlap.

P. Grounding

1. Ground all metallic conduits, supports, cabinets, non-current carrying equipment parts and the neutral conductor in accordance with the National Electrical Code.

Q. Rust Inhibitor:
   1. A thorough application of an approved rust inhibitor shall be used to grease or otherwise protect the threads of the anchor rod, prior to pouring the concrete foundation to ensure that the concrete does not mold to the threaded portion of the rod.
   2. 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.

3.04 FIELD QUALITY CONTROL

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

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

C. 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.

3.06 AS-BUILT DRAWINGS AND O & M MANUAL

A. Contractor shall supply accurate as-built drawings of the project to the Engineer and City. Drawings shall indicate location and setback of conduit, and pole locations within the project measured from a reliable location. Work must be completed under the direct supervision the Engineer.

B. The Contractor shall collect, gather and assemble into one book the installation details, instructions, schematics of actual equipment and operations directions supplied by the manufacturer with all equipment. Final acceptance of the work will be withheld until such data has been presented complete to the City. The manual shall be available for instruction of operations and maintenance of equipment and systems.