Iowa Department of Transportation

SPECIAL PROVISIONS FOR ROADWAY LIGHTING AND TRAFFIC SIGNALIZATION

FOR

IA HWY 163 FROM FOUR-MILE CREEK TO NE 80TH STREET

Pleasant Hill

Project No.
JP-163-1(84)--3R-77

Effective Date
May 18, 2010

THE STANDARD SPECIFICATIONS, SERIES 2009, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

Section 2523.03 Highway Lighting – Construction

J. Poles and Mastarms *(add the following)*

12. Poles, bases, and arms shall have a black, electrostatically applied finish, with a zinc primer, over galvanized steel. Finish shall be capable of maintaining their color along a high speed roadway that is exposed to road salt and is resistant to rock chips.

K. Luminaires *(replace section with the following)*

1. Furnish and install one of the following luminaires:

    a. HADCO, Westbrooke – CF18
    b. Cooper Lighting, Streetworks – Epic Large, MEL with a Solid mid section and a bell shade.
    c. Architectural Area Lighting, Universe Collection – UCL with a Bell Hood
    d. Sternberg Lighting – 1531F
    e. Or approved equal

2. Luminaire fixtures shall have a black finish similar to the poles.

3. Luminaires shall have a 250 Watt, High Pressure Sodium lamp with Type II, Medium distribution and flat glass. No photocell required, circuits connect to existing control stations.

Section 2523.04 Highway Lighting – Method of Measurement *(add the following)*

F. Light Pole Footing
By count.

G. Luminaire Fixture
By count.

Section 2523.05 Highway Lighting – Basis of Payment

A. Lighting Poles *(replace the following)*

2. Payment is full compensation for materials, equipment, and installation of the pole, mastarm, base, and wiring within the pole, according to the contract documents.

F. Light Pole Footing *(add the following)*

1. Each.

2. Payment is full compensation for materials, equipment, excavation, and installation of the footing, ground rod, and conduit, according to the contract documents.

G. Luminaire Fixture *(add the following)*

1. Each.

2. Payment is full compensation for materials, equipment, and installation of the luminaire, according to the contract documents.

Section 2525.01 Traffic Signalization - Description

(add the following statement following the paragraph)

Complete and forward to the Engineer three (3) copies of a list of unit costs for each item listed on the Schedule of Unit Prices attached to the Special Provisions by the preconstruction meeting. The sum of the costs for each item shall equal the total Contract Lump Sum price for the traffic

signal installation bid item. Unit costs will be used to prepare progress payments to the Contractor. The unit costs will also be used to establish the total cost for any Extra Work Orders related to traffic signal installation work items unless otherwise negotiated.

Section 2525.02 Traffic Signalization - Materials

I. Fiber Optic Cable *(add the following)*

1. This work shall consist of furnishing and installing the fiber optic cable of the type, size, and number of fibers specified and all associated accessories.

2. The product provided shall meet the latest applicable standard specifications by American National Standards Institute (ANSI), Electronics Industries Association (EIA), and Telecommunications Industries Association (TIA) for the type mode cable of the size specified and the specifications herein.

3. Multimode Fiber - Grade Index

Core Diameter:	62.5 um ± 1.0 um
Cladding Diameter:	125.0 um ± 1.0 um
Core Concentricity:	± 1%
Max. Attenuation:	3.75 dB/km

4. Single-Mode Fiber

Typical Core Diameter:	8.3 um ± 1.0 um
Cladding Diameter:	125.0 ±1.0um
Core Concentricity:	± 1%
Attenuation Uniformity:	No point discontinuity greater than 0.1 um at either 1300nm or 1550nm
Max. Attenuation:	0.25 dB/km

5. The coating shall be a dual layer UV cured acrylate applied by the fiber manufacturer. The coating shall be mechanically or chemically strip-able without damage to the fiber.

6. The central member of the cable shall be a glass reinforced plastic rod designed to prevent the buckling of the cable. The cable core interstices shall be filled with water blocking tape to prevent water infiltration.

7. Dielectric fillers may be included in the cable core where needed to lend symmetry to the cable cross-section.

8. Buffer tubes shall be of dual layer construction with the inner layer made of polycarbonate and the outer layer made of polyester. Each buffer tube shall be filled with a water-swellable yarn or tape. Buffer tubes shall be stranded around the central member using reverse oscillation, or "SZ", stranding process.

9. The buffer tubes shall meet TIA/EIA-598A, "Color coding of fiber optic cables." The single mode cable shall include loose tubes with 12 fibers in each with a total number of tubes matching the number of fibers specified on the plans. The multi-mode cable shall include one loose tube with 12 fibers. The tube and fiber colors shall follow the industry color code (BL, OR, GR, BR, SL, WH, RD, BK, YL, VI, RS, AQ).

10. The cable tensile strength shall be provided by a high tensile strength aramid yarn and/or fiber glass.

11. All dielectric cables, without armoring, shall be sheathed with medium density polyethylene. The minimum nominal jacket thickness shall be 1.4 mm. Jacketing material shall be applied directly over the tensile strength members and flooding compound. The jacket or sheath shall be marked with the manufacturer's name and the words "Optical Cable", the year of

manufacture, and sequential meter marks or feet. The markings shall be repeated every meter. The actual length of the cable shall be within the range plus one percent of the length marked. The marking shall be in a contrasting color to the cable jacket. Additionally, the jacket marking shall have a durable weather proof label which shows the actual attenuation of each fiber expressed in dB/km.

12. The cable shall be fabricated to withstand a maximum pulling tension of 600 lbs during installation (Short term) and 135 lbs upon installation (Long term).

13. The shipping, storing, installing and operating temperature range of the cable shall be -40° C to + 70° C. The manufacturer shall test at the 100% level all fiber optic cable for the following tests:

14. Each fiber shall be proof tested at a minimum load of 50 kpsi (350 Mpa).

15. Each fiber shall be tested for attenuation and the reading shall be part of the cable labeling.

16. The cable shall meet the appropriate standard Fiber Optic Test Procedure for the following measurements:

    - Fluid Penetration
    - Compound Drip
    - Compressive Loading Resistance
    - Cyclic Flexing
    - Cyclic Impact
    - Tensile Loading and Bending

17. The cable ends shall be available for testing. The cable ends must be sealed to prevent moisture impregnation.

Section 2525.03 Traffic Signalization - Construction
E. Controllers, Cabinets and Associated Equipment
3. Actuated Signal Controllers

k. Cabinet *(add the following)*

12) Fiber Optic Connectors

a) Only ST type connectors of ceramic ferrule and Physical Contact end finish shall be used to terminate multi-mode fibers to equipment. ST or mechanical connectors shall not be used to splice cables. SC type connectors of ceramic ferrule and Physical Contact end finish shall be used to terminate single-mode fibers to equipment.

b) Maximum attenuation per connector shall be 0.75 dB.

13) Fiber Optic Jumpers/Patch Cords

a) All 12 fibers in each multi-mode fiber optic cable shall be terminated in the distribution unit with the traffic controller cabinet.

b) Duplex pigtail jumpers shall be used to branch traffic signal controller circuits from distribution panel in cabinet to controller FO OTR or to other communication equipment.

c) Length of pigtail jumpers will vary according distribution panel to NEMA controller FO OTR location. Length of jumper should provide for a minimum of 2 feet total slack between distribution panel and OTR connections.

d) Controller cabinet pigtail jumpers shall consist of factory-assembled patch cords, each of which shall contain two (2) multi-mode fibers. Each such fiber shall have an ST or SC compatible, Physical Contact connector with ceramic ferrule on one end (i.e., a total of four (4) STPC connectors per cord). Each patch cord shall have a dielectric strength member and a durable outer jacket designed to withstand handling.

14) Fiber Optic Breakout Kits

a) Breakout kits shall be provided for separation and protection of individual fibers with buffer tubing and jacketing materials suitable for termination of the fiber and fiber optic connector as specified.

Section 2525.03 Traffic Signalization – Construction

L. Fiber Optic Cable *(add the following)*

1. General
   a. Cable end shall be secured inside the controller cabinet so that no load is applied to the exposed fiber strands.

   b. Minimum bend radius for static storage shall not be less than ten times the diameter of the cable measuring the cable on the outside, or as recommended by the manufacturer.

   c. The minimum bend radius during installation shall not be less fifteen times the diameter of the cable measuring the cable on the outside, or as recommended by the manufacturer.

   d. Slack shall be left in each handhole at the top of any conduit riser, junction box, and controller. This slack cable requirement may be deleted where existing handholes or through points lack sufficient area to maintain the minimum bend requirements. Where slack has been deleted, extra slack equal to the amount that would have been distributed in the through points shall be equally divided between the two controller cabinets and shall be in addition to the slack mandated at the cabinets. Slack in each handhole type shall be provided as designated on the plans. Slack cable shall be coiled and the coils bound at three points around the coil perimeter and supported in their static storage position.

2. Cable Installation
   a. A suitable cable feeder guide shall be used between the cable reel and the face of the conduit. The cable feeder shall be designed to protect the cable and guide the cable directly into the conduit off the reel. During the installation, the cable jacket shall be carefully inspected for jacket defects. If defects are found, the Engineer shall be notified prior to any additional cable being installed. The Contractor shall take care in the pulling of the cable to insure that the cable does not become kinked, crushed, twisted, snapped, etc.

   b. A pulling eye shall be attached to the cable and be used to pull the cable through the conduit. A pulling swivel shall be used to preclude twisting of the cable. The cable shall be lubricated prior to entering the conduit with a lubricant recommended by the manufacturer. Dynamometers or break away pulling swing shall be used to insure that the pulling tension does not exceed the specified force of 600 lbs or the cable manufacturer's recommendations, whichever is less. The mechanical stress on the cable

shall not allow the cable to twist, stretch, become crushed, or forced around sharp turns which exceed the bend radius or scar or damage the jacket. The pulling of the cable shall be hand assisted at each pull point.

c. Cable shall not be pulled through any intermediate junction box, handhole, pull box, pole base or any other opening in the conduit unless specifically required by the Engineer in specific facilities. The necessary length of cable to be installed shall be pulled from one handhole or controller cabinet to the immediate next downstream handhole or cabinet. The remaining length of cable to be installed in the next conduit shall be carefully stored in a manner that is not hazardous to pedestrian or vehicular traffic yet ensures that no damage to the cable shall occur. The cable shall be stored in a manner that shall allow that length of cable to be safely pulled into the next conduit. The Engineer shall approve the storing methods to be used.

d. At each handhole the cable shall be visibly marked or tagged as "CITY FIBER OPTIC".

3. Testing
   a. Each fiber furnished and installed as part of the project shall be tested, both on-the-reel prior to installation and after installation using a high-resolution optical time domain reflectometer (OTDR).

   b. Single mode measurements shall be conducted at the 1310 ± 30 nanometer wavelength. Multi-mode measurements shall be conducted at 1300 ±30 nanometer wavelength.

   c. The Contractor shall record the identification, location, length, and attenuation measurements of each tested fiber and shall furnish all test reports to the Engineer prior to installation of the cables. All cable readings/measurements shall be compared to the maximum allowable deviations in the cable specification and the levels of acceptance recommended by the manufacturer in their printed documentation. Any cable having measurements outside the allowable range shall be replaced and shall not be acceptable for installation on this project.

4. On-Reel Testing
   a. Prior to the installation, the Contractor shall perform on-site, on-reel testing. This testing shall be for both attenuation and continuity.

   b. The testing shall be performed using an OTDR by means of a pigtail splice. All test results shall be within ± 3 percent of factory-supplied attenuation measurements.

   c. Testing shall be done in one direction only.

   d. Except for the access to and the test preparation of any one end of the newly furnished cable to be tested, the Contractor shall preserve the cable in its originally-shipped condition. If any fiber of the cable fails the on-reel attenuation test, the cable shall be rejected and shall not be used on this project. The rejected cable shall be replaced at the Contractor's expense.

5. Cable Segment Testing
   a. As each cable segment is terminated, the Contractor shall perform an end-to-end attenuation (power loss) test of each terminated fiber of each FO cable. This testing shall be performed using hand-held optical test sets and shall be tabulated and be included in the documentation package to be provided to the Engineer at the conclusion of the project.

   b. Overall loss for each link shall not exceed the cumulative specified maximum losses of the components. For example, at 850 nm, a one kilometer link with two splices and a connector on each end shall not exceed 4.9 dB:

1.0 km x 3.5 dB/km:	3.5 dB
0.2 dB per splice x 2:	0.4 dB
0.5 dB per connector x 2:	1.0 dB
Maximum allowable loss:	4.9 Db

c. The cable segment shall be rejected for use on this project if any terminated fiber of the cable segment fails the attenuation test. Rejected cables shall be repaired or replaced by the Contractor at the Contractor's expense. The Contractor shall retest all fibers of any repaired or replaced cable segment. The Contractor shall submit complete documentation of the cable segment attenuation tests. Such documentation shall be submitted in either hardcopy (written) form or in Engineer-approved electronic format on diskette.

6. Final System Testing
   a. After the complete fiber optic system is installed and terminated, but excluding the capping of unused fibers, an OTDR reading shall be performed on all cables to insure that each section is in compliance with the issued specification.

   b. A hard copy of OTDR signature traces for all fibers for all sections shall be provided to the Engineer. Fibers which have been terminated shall be indicated in the report. In addition to the OTDR test report, the Contractor shall provide the test results of an Attenuation Test for the installed fibers using the insertion loss test procedure and the Transmitter/Receiver Power Level Test and the Continuity Test.

7. Termination Panel in ICN Room, Library
   a. Install a 96-count termination panel on the existing Fiber Rack within the ICN Room inside the City of Pleasant Hill Library. Terminate all fibers. The photo shows the rack, estimated position of the panel, and access location to the Utility Room (entry point for fiber into the building).

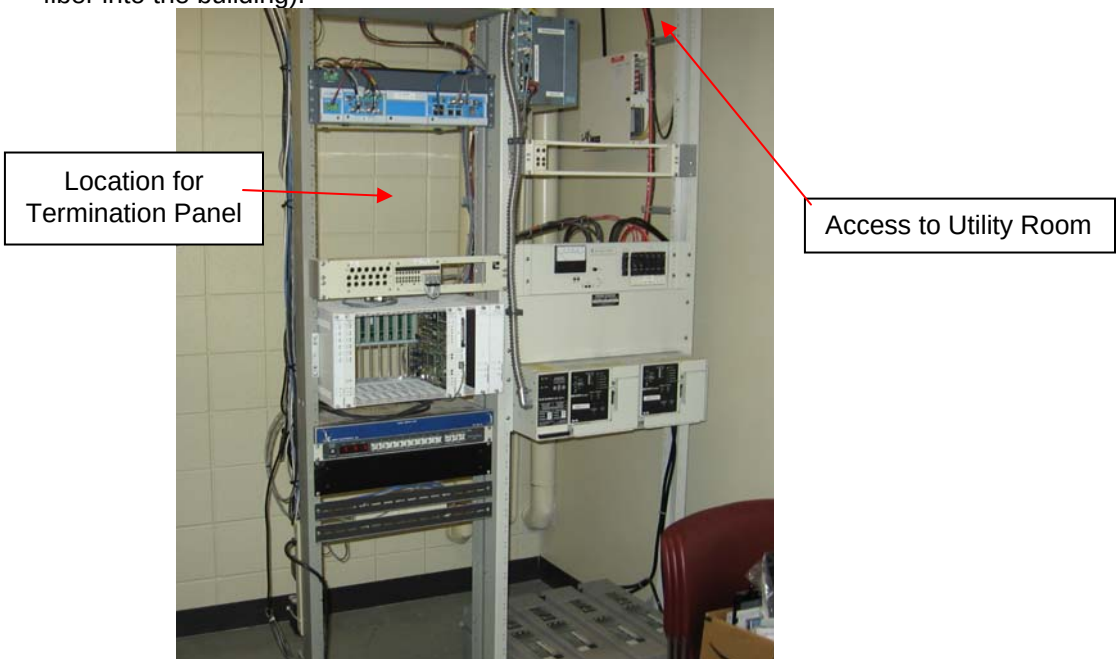

Figure 1: Existing Fiber Rack - ICN Room

SCHEDULE OF UNIT PRICES				
TRAFFIC SIGNALIZATION				
SIGNAL INTERCONNECT & STREET NAME SIGNS				
PLEASANT HILL, IA				
JP-163-1(84)--3B-77				
		TOTAL		TOTAL
ITEM	UNIT	QUANTITY	UNIT COST	EXTENSION
SPLICE TRAY, 12 COUNT, INSTALL IN EXISTING DSM CABINET	EACH	4		
TERMINATION PANEL, 96 TERMINATIONS, INSTALL IN LIBRARY	EACH	1		
PRE-CAST CONCRETE HANDHOLES, 18" DIAMETER	EACH	5		
TYPE II HANDHOLES	EACH	7		
FIBER OPTIC CABLE - 96 SINGLE-MODE	LIN FT	14580		
FIBER OPTIC CABLE - 24 SINGLE-MODE	LIN FT	290		
FIBER OPTIC CABLE - 12 MULTI-MODE	LIN FT	4580		
TRACER WIRE - 1c #10	LIN FT	6810		
2" RSC, BRIDGE MOUNTED	LIN FT	260		
2" PVC, TRENCHED/BORED	LIN FT	6480		
STREETNAME SIGN - 72" x 12", POST MOUNTED	EACH	4		
STREETNAME SIGN - 78" x 12", POST MOUNTED	EACH	2		
STREETNAME SIGN - 84" x 12", POST MOUNTED	EACH	2		
STREETNAME SIGN - 78" x 18", MAST-ARM MOUNTED	EACH	2		
STREETNAME SIGN - 90" x 18", MAST-ARM MOUNTED	EACH	12		
STREETNAME SIGN - 102" x 18", MAST-ARM MOUNTED	EACH	4		
STREETNAME SIGN - 108" x 18", MAST-ARM MOUNTED	EACH	17		
STREETNAME SIGN - 120" x 18", MAST-ARM MOUNTED	EACH	2		
WOOD POST, 4" x 6", 14' LENGTH	EACH	4		
NEW STREET NAME SIGN HORIZONTAL SUPPORT TUBE	EACH	22		

SCHEDULE OF UNIT PRICES

TRAFFIC SIGNALIZATION

SIGNAL INTERCONNECT & STREET NAME SIGNS

PLEASANT HILL, IA

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ITEM	UNIT	TOTAL QUANTITY	UNIT COST	TOTAL EXTENSION
NEW STREET NAME SIGN MOUNTING HARDWARE	EACH	15		
STREETNAME SIGN REMOVAL	LS	1		
SINGLE-MODE FIBER TERMINATION	EACH	96		
MULTI-MODE FIBER TERMINATION	EACH	36		
FUSION SPLICES - SM CABLE	EACH	312		
	TOTAL SIGNALIZATION COST			