SP-157077
(New)

SPECIAL PROVISIONS
FOR
FIBER OPTIC NETWORK

Webster County
STP-A-2690(632)--22-94

Effective Date
May 15, 2018

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.

157077.01 DESCRIPTION.

Furnish all work, apparatus, and materials to construct, install, and place in operation, to the Engineer's satisfaction, a complete fiber optic network as shown in the contract documents. Materials and Construction not referenced in this Special Provision shall refer to Materials and Construction methods identified in Section 2525 of the Standard Specifications. Provide submittals for materials as identified in Section 2525 of the Standard Specifications.

157077.02 MATERIALS.

A. Traffic Signal Controller.

1. One new signal controller (master) shall communicate to the existing Siemens M50 series and new Siemens M60 series controllers via IP network (Ethernet/single mode fiber optic). Communication shall include at minimum the following: monitoring current operational performance, updating internal controller clock automatically, and manually adjusting local controller settings (including base and coordination timings). This master controller shall have the ability to control the local intersection operations. Locate master at the 5th Ave S & S 30th St intersection.

2. New local controllers shall be Siemens M60 series controllers capable of communicating to the new master controller over the IP (Ethernet/single mode fiber optic) network.

3. All new controllers shall include NTCIP communications and the ability to communicate over the same Ethernet/single mode network to a management software at a time in the future.

4. Existing signal cabinets are a mix of NEMA TS 1 and TS 2 cabinets. Verify the cabinet type, if needed, prior to ordering new controllers for proper equipment connections.

B. Video Detection System.

1. Detection Camera.

a. A single camera shall be capable of viewing all four approaches of an intersection.
b. The camera shall produce a useable video image under all roadway lighting conditions, regardless of time of day.
c. The field of view shall be capable of viewing entire intersection, with the ability to view and detect vehicles 210 feet in advance of the stop line locations (up to 320 feet from camera location).
d. The camera shall be housed in a heated weather-tight enclosure.
e. The output power of the heater shall vary with temperature, to assure proper operation of the lens at low temperatures and prevent moisture condensation on the optical dome of the enclosure.
f. The camera shall operate satisfactorily in a temperature range from -25°F to +160°F and a humidity range from 0% RH to 95%RH.
g. Utilize manufacturer's recommendation for connection cable(s) to signal cabinet. Cable(s) shall be continuous from camera to termination in cabinet.
h. Provide all necessary mounting hardware to attach the camera to the signal pole.

2. System Software.

a. The detection system shall be managed via a client application running on a furnished tablet (8-inch minimum screen size) or laptop computer, capable of interfacing with video processor. Include initial setup of software and programming of detection. Approximate detection zone locations are shown on the plans.
b. The software shall facilitate placement of detection zones and setting of zone parameters or to configure system parameters.
c. The system shall default to a safe condition, such as constant call on each active detection channel, in the event of unacceptable interference, low visibility or loss of video signal.
d. The system shall automatically revert to normal detection mode when the problem condition no longer exists.
e. When a vehicle is detected within a detection zone, a visual indication of the detection shall activate on the video overlay display to confirm the detection of the vehicle for the zone.
f. The system shall have the ability to show controller phase status (green, yellow or red) for up to eight phases.

3. Video Processor.

a. The system shall operate satisfactorily in a temperature range from -25° F to +160° F and a humidity range from 0%RH to 95% RH, non-condensing as set forth in NEMA specifications.
b. The Processor shall utilize non-volatile memory technology to store on-board firmware and operational data.
c. An Ethernet communications interface shall allow the user to remotely configure the system and to extract stored vehicle/roadway information.
d. The Processor shall provide an SDLC connection to the controller with an option of TS2 type 1 outputs to the controller.
e. The Processor shall provide turning movement count data, in 15 minute intervals, for a 7 day period, stored internally, readily available for downloading to the System Software.

4. Warranty.

a. The supplier shall provide a 3 year warranty from the date of signal activation on the single camera video detection system components included in the specification.

b. During the warranty period, technical support shall be available from the supplier via telephone within 4 hours of the time a call is made by a user and this support shall be available from factory-certified personnel or factory-certified installers.

c. During the warranty period, updates to software and firmware shall be available from the supplier without charge.

d. Supplier shall be responsible for all repairs, including parts, labor and shipping during this warranty period.

e. One copy of the warranty shall be furnished with the catalog cut submission.

5. Training.

Provide necessary training to City staff to monitor and modify detection system and download count data at the implementation of the system. This is anticipated to include up to 8 hours.

C. Fiber Optic Cable and Accessories.

1. General.

The cable shall meet the latest applicable standard specifications by American National Standards Institute (ANSI), Electronic Industries Association (EIA) and Telecommunications Industries Association (TIA) for the single-mode fiber cable of the size specified per the Plans.

2. Single-mode Fiber Optic OSP Cable – Dielectric Loose Tube.

a. Fiber optic, single-mode, graded loose tube dielectric cable constructed with industry standard 3mm buffer tubes stranded around a central strength member.

b. The buffer tubes shall be compatible with standard hardware and shall have 12 fibers per tube, the fibers shall not adhere to the inside of the buffer tube, each fiber shall be distinguishable by means of color coding in accordance with TIA/EIA-598-B and be colored with ultraviolet (UV) curable ink.

c. The cable core shall be water blocked with dry water blocking materials to improve access and handling of individual tubes.

d. The cables shall be designed for point-to-point applications as well as mid-span access, and provide a high-level of protection for fiber installed in the outside plant environment.

e. The fiber shall be fully capable of handling existing and legacy single-mode applications which traditionally operate in the 1310 nm and 1550 nm regions and shall also be designed to operate the full-spectrum from 1260 nm to 1625 nm for optical transmission.

f. The fiber shall be designed to provide optimum performance from 1260 nm to 1625 nm intended for 16 channel Course Wavelength Division Multiplexing applications.

g. Cables shall be sheathed with medium density polyethylene (MDPE). The minimum nominal jacket thickness shall be 1.3 mm. Jacketing material shall be applied directly over cable core and water swellable tape. The polyethylene shall contain carbon black to provide ultraviolet light protection and shall not promote the growth of fungus.

h. The MDPE jacket material shall be as defined by ASTM D1248, Type II, Class C, Category 4 and Grades J4, E7 and E8.

i. The jacket or sheath shall be free of holes, splits, and blisters.

j. The cable jacket shall contain no metal elements and shall be of a consistent thickness.

k. Cable jackets shall be marked with the manufacturer's name, month and year of manufacturer, sequential meter or foot markings, a telecommunication handset symbol as required by Section 350G of the National Electrical Safety Code (NESC), fiber count, and fiber type. The actual length of the cable shall be within -0/+1% of the length markings. The print color shall be white, with the exception that cable jackets containing one or more coextruded white stripes, which shall be printed in light blue. The height of the marking shall be approximately 2.5 mm.

l. The shipping, storage, and operating temperature range of the cable shall be -40°F to +158°F. The installation temperature range of the cable shall be –22°F to +158°F.

157077.03 CONSTRUCTION.

A. Installation.
See Article 2525.03, A, 3, i of the Standard Specifications.

B. Fusion Splices.

1. Fusion splices shall be used to splice all continuous fiber runs in splice closures.

2. Splices shall be allowed only in the splice closures as shown on the plans.

3. Maximum attenuation per splice as estimated by the fusion splicer shall not exceed 0.08 dB. Any splice exceeding 0.08 dB at the time of splicing shall be re-spliced.

4. Splice shall provide three axis core alignment using light injection and loss measurement techniques.

5. No mechanical splices of fiber cable will be allowed.

6. All fusion splice equipment shall be factory certified within the last year. The Contractor shall provide copies of the certification 10 calendar days prior to splicing.

C. Fiber Optic Cable Acceptance Testing.

1. The Contractor shall perform all testing with the presence of the Engineer or the Engineer's representative(s).

2. Post installation, 100% of the new cables' fiber count shall be tested bi-directionally with an Optical Time Domain Reflectometer (OTDR) at 1310 nm and 1550 nm; in addition, an Optical Loss Test Set (OLTS) shall be used to test all fibers at both wavelengths. Existing fibers that are spliced to or re-spliced as part of this contract shall also be tested in both directions and at both wavelengths. The Contractor shall provide the Engineer with up to five copies of any software required for viewing electronic files of the OLTS and OTDR traces. Use test equipment equal to EXFO FTB-500 OTDR meter, and Fluke DTX-CLT OLTS meter.

3. All test equipment shall be factory certified within the last year. The Contractor shall provide copies of the certification 10 days prior to testing.

4. Test results will be recorded on a form supplied by the Contractor, with data compiled in .PDF format through the meter manufacturer's software. No additional alteration using software from the Contractor beyond the meter manufacturer's software will be allowed. The Contractor shall submit test results in a format approved by the Engineer. Completed test forms on each fiber shall be handed over to the Engineer. Contractor shall also provide native test (electronic version) with no alterations and meter software for viewing of fiber traces. At a minimum, test results shall show the following:

- Cable and fiber identification (as approved by Engineer)
- Operator name
- Date and Time
- Setup and test parameters including wavelength, pulse width, range, scale and ambient temperature.

- Test results for OTDR test in both directions for total fiber trace, splice loss/gain (dB), connector loss (dB), all events greater than 0.05 dB, measured length from cable markings and total length from OTDR.
- Test results for attenuation test including measured cable length (cable marking), total length (from OTDR test), number of splices (from as-built) and total link end-to-end attenuation in each direction and the bidirectional average.

5. OTDR testing shall use launch and receiving cables minimum 3300 feet or greater than the dead zone for the OTDR used for this test.

6. All fiber connectors shall be cleaned and checked for dirt, scratches or chips before installed in adapters and testing. All dust covers shall be installed after testing is complete.

- The fiber optic cable shall have a maximum attenuation of 0.4 dB/km at 1310 nm and 0.3 dB/km at 1550 nm when measured with an OLTS.
- Each connector shall have an averaged loss value of 0.25 dB or less when measured bi-directionally with an OTDR at 1310 nm and 1550 nm.
- Each splice shall have an averaged loss value of 0.08 dB or less when measured bi-directionally with an OTDR at 1310 nm and 1550 nm.

157077.04 METHOD OF MEASUREMENT.

Method of Measurement for the quantities of the various items involved in the construction of the fiber optic network will be as follows:

A. Fusion Splices.
By quantity shown in contract documents.

B. Hub Cabinet.
By count.

C. Handholes.
By count.

D. Terminations.
By quantity shown in contract documents.

E. Traffic Signal Cabinet Modifications.
By quantity shown in contract documents.

F. Traffic Signal Controller Replacement.
By quantity shown in contract documents.

G. Video Detection System.
By quantity shown in contract documents.

H. Conduit.
Linear feet shown in contract documents.

I. Pull Rope.
Linear feet shown in contract documents.

J. Fiber Optic Cable.
Linear feet shown in contract documents.

K. Tracer Wire.
Linear feet shown in contract documents.

L. Building Connection.
None.

157077.05 BASIS OF PAYMENT.

A. Fusion Splices.

1. Each.

2. Payment is for all materials, equipment, and installation of complete Fusion Splices meeting specifications.

B. Hub Cabinet.

1. Each.

2. Payment is for all materials, equipment, and installation of fully functional Hub Cabinet.

C. Handholes.

1. Each.

2. Payment is for all materials, equipment, excavation, and installation of the Handhole.

D. Terminations.

1. Each.

2. Payment is for all materials, equipment, and installation of complete Terminations meeting specifications.

E. Traffic Signal Cabinet Modifications.

1. Each.

2. Payment is for all materials, equipment, and modifications to the Cabinet.

F. Traffic Signal Controller Replacement.

1. Each.

2. Payment is for all materials, equipment, and replacement of the fully functioning Controller.

G. Video Detection System.

1. Each.

2. Payment is for all materials, equipment, and installation of the fully functioning Detection.

H. Conduit.

1. Per Linear Foot.

2. Payment is for all materials, equipment, excavation, and installation of the Conduit.

I. Pull Rope.

1. Per Linear Foot.

2. Payment is for all materials, equipment, and installation of the Pull Rope.

J. Fiber Optic Cable.

1. Per Linear Foot.

2. Payment is for all materials, equipment, and installation of the Fiber Optic Cable.

K. Tracer Wire.

1. Per Linear Foot.

2. Payment is for all materials, equipment, and installation of the Tracer Wire.

L. Building Connection.

1. Lump Sum.

2. Payment is for all materials, equipment, and installation of the Building Connection at the completion of work.