Iowa Department of Transportation

SPECIAL PROVISIONS
FOR
FIBER OPTIC NETWORK

Polk County
STP-A-141-7(46)--86-77

Effective Date
February 16, 2016

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.

150049.01 CONSTRUCTION.

A. Fiber Optic Cable and Accessories.

1. General.

The cable shall meet the latest applicable standard specifications by American National Standards Institute, 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 3 mm 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 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. Glass shall be Corning SMF28E.

f. Single-mode, dispersion-unshifted fiber meeting ITUT G.652D requirements, manufactured by Corning, SMF28E.

g. 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.

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

i. 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.

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

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

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

m. 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, fiber count, and fiber type. The actual length of the cable shall be within 0 to +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 0.1 inch.

n. The maximum pulling tension shall be 600 pound-force during installation (short term) and 200 pound-force long term installed.

o. 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.

3. Fusion Splices.

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

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

c. 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.

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

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

f. 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.

4. Fiber Optic Cable Acceptance Testing.

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

b. Post installation, 100% of the new cables' fiber count shall be tested bidirectionally 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.

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

d. 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 .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.

e. OTDR testing shall use launch and receiving cables minimum 3280 feet or greater than the dead zone for the OTDR used for this test.

f. 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.