

STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
KANSAS	87 N-0720-01	2023	351	517

MICRO-FIBER SPECIFICATIONS

1.0 GENERAL

These specifications are intended to be supplemental to the KDOT ITS Fiber Specifications. Micro-fiber used shall adhere to the KDOT ITS Fiber Specifications unless otherwise noted on this page. Cable shall be 8.1-8.3/125 um single-mode, bend insensitive optical fiber cable containing glass of type Corning SMF-28 Ultra, AFL SR-15e, or approved equal, and that meets the following specifications:

ITU- T G652.D/G657.A1
IEC Specification 60793-2-50
TIA/EIA 492-CAAB
Telecordia GR-20

The micro-fiber shall be fully backwards compatible with legacy G.652 compliant fiber types. Micro-fiber shall be single-mode and consist of fibers arranged in binderless loose color-coded buffer tubes of 12 individually color-coded fibers. The micro-fiber shall be optimized for air-assisted installation in micro-duct and installation distances greater than 6,560 ft.

2.0 MECHANICAL AND PERFORMANCE REQUIREMENTS

The cable shall be a rugged all dielectric outdoor cable containing color coded buffer tubes / binders with 12 single mode color-coded fibers per binder, dual window (1310 nm and 1550 nm) fibers with UV acrylate coating in color coded, buffer tubes or binders with the maximum outer diameter between 7 mm - 10.5 mm.

The buffer tubes / binders shall be stranded around an all-dielectric center strength element using a reverse oscillation lay, wrapped by water blocking core separator or functional equivalent. The maximum allowable attenuation of the fiber is 0.35dB/km for 1310nm and 0.25dB/km for 1550nm. No water blocking yarns are permitted to avoid accidentally cutting fibers. The water blocking elements shall be non-nutritive to fungus, electrically non-conductive, and homogeneous; it shall also be free from dirt or foreign matter. This water blocking element will preclude the need for other water-blocking material. The cables shall include GR-20 compliant water-blocked cable core and buffer tubes / binders. The cable components shall be non-nutritive to fungus, electrically non-conductive, and homogenous. It shall also be free from dirt and foreign matter. The cable manufacturer shall be TL 9000 registered. The optical fiber cable shall withstand water penetration when tested with a one-meter static head or equivalent continuous pressure applied at one end of a one-meter length of filled cable for one hour. No water shall leak through the open cable end. Perform testing in accordance with EIA-455-82B.

2.1 OUTER JACKET

Cables shall be all dielectric cable (with no armoring) and shall be jacketed (sheathed) with Polybutylene Terephthalate or High-Density Polyethylene. Jacketing material shall be applied directly over the tensile strength members to provide mechanical protection, and to serve as the primary moisture barrier. This cable sheath shall be designed to meet or exceed the tensile criteria defined in EIA-455- 89a. Each jacketed fiber shall have a tensile strength in excess of 50 lbs. The jacketing shall contain carbon black to provide ultra-violet light protection, and it shall not promote the growth of fungus. The jacket or sheath shall be free of any holes, splits, or blisters. The cable jacket shall contain no metal elements and shall be of a consistent thickness. The cable shall contain at least one ripcord under the sheath for easy sheath removal.

2.2 CRUSH RESISTANCE

The non-armored optical fiber cables shall withstand a compressive load of 220 N/cm applied uniformly over the length of the cable. The average increase in attenuation for the fibers shall be < /= 0.10 db at 1550 nm for a cable subjected to this load. The cable shall not exhibit any measurable increase in attenuation after load removal. Perform testing in accordance with EIA-455-41, "compressive loading resistance of fiber optic cable," except that the load shall be applied at the rate of 3 mm to 20 mm per

2.3 CYCLIC FLEXING

The cable shall be capable of withstanding 25 cycles of mechanical flexing at a rate of 30 +/- 1 cycles/minute. The average increase in attenuation for the fibers shall be less than or equal to 0.10dB at 1550 nm at the completion of the test. Outer cable jacket cracking or splitting observed under 10x magnification shall constitute failure. Conduct the test in accordance with EIA-455-104, except that the sheave diameter shall be a maximum diameter of 20 times the cable outer diameter (O.D.). Test the cable in accordance with test conditions I and III of EIA-455-104. The cable shall withstand 25 impact cycles. The average increase in attenuation for the fibers shall be 0.20dB at 1550 nm (single-mode). The cable jacket shall not exhibit evidence of cracking or splitting. The test shall be conducted in

2.4 TENSILE STRENGTH

Tensile strength shall be provided by high tensile strength aramid yarns and fiberglass, which shall be helically stranded evenly around the cable core. The cable shall withstand a tensile load of 1334 Newtons (N) [300 lbs.] without exhibiting an average increase in attenuation of greater than 0.10dB. Apply the load for one hour in test condition II of EIA-455-33A. The optical fiber cable shall withstand a maximum pulling tension of 1334N (300 lbs.) during installation (short term) with no damage and 400N

2.5 TEMPERATURE

The shipping, storage, installation, and operating temperature range of the cable shall meet or exceed 14 °F to +140 °F (-10°C to +60°C).

2.6 BEND-INSENSITIVE

Single-mode fibers shall be contained in color-coded binders. The configuration shall be dimensionally sized to minimize local stresses and microbend losses. The optical fiber cable shall be an approved product of the U.S. Department of Agriculture, Rural Electrification Administration in accordance with the requirements of REA-PE-90, or as otherwise indicated, and shall conform to EIA/TIA-598. Each optical fiber shall consist of a doped silica core surrounded by a concentric silica cladding. The central anti-buckling member shall consist of a glass reinforced plastic rod; the purpose of the central member is to prevent buckling of the cable.

3.0 INSTALLATION, CONSTRUCTION, AND TESTING REQUIREMENTS

The micro-fiber shall be optimized for air-assisted installation in micro-duct by using an approved micro cable blowing machine. The fiber shall be capable of installation distances greater than 6,560 ft at speeds up to 490 ft/min. Micro-fibers shall be blown in following the

push force, air pressure, and installation distance and speed be exceeded. All fiber optic installation shall be performed by a Contractor certified by the manufacturer for installation of micro-fiber in micro-duct. Splicing shall be completed using a core alignment splicer. Fiber optic cable shall meet or exceed the requirements measured in accordance with the methods of the individual requirements or the following methods as defined in EIA-455-A:

1. Fiber dimensions
2. Attenuation
3. Numerical aperture
4. Fiber proof test
5. Crush resistance
6. Cable bending
7. Tensile load
8. Impact resistance
9. Attenuation vs. Temperature

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