

Specification

LA-MIRO-001

**Loose Tube / Dry Core / Single Jacket
Air Blown Optical Fiber Cable (Microduct Cable)**

[LAC code: OJFPP-LT-MINIABC]
[Optical Fiber based on SM]

LEXINGTON AMES LLC

1. Scope

1.1 Application

This specification covers the general requirements for the optical fiber telecom. The cable intended for outdoor applications.

1.2 Cable Description

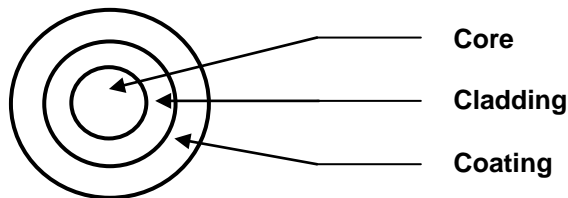
The cable core consists of color coded fibers, dry water swellable material, color coded loose tubes, PE filler (if necessary), SZ-stranded around the dielectric central strength member with water blocking yarn(s).

Non-Armor / Single Jacket

The cable structure is completed by the application of a core binder yarn(s), which with the core, are covered by an outer PE jacket.

2. Optical Fiber

2.1 Construction of the fibers



2.2 The operating wavelength region of single-mode is 1310, 1383, and 1550nm.

2.3 Material of the Fibers

The fiber shall be made from high grade silica glasses and the coating shall be made from UV curable acrylate material. A protective UV cured acrylate coating shall be applied over the fiber cladding and it shall be able to be removed mechanically or chemically.

- Core : Silica (SiO₂) Doped with Germanium Dioxide (GeO₂)
- Cladding : Silica (SiO₂)
- Coating : Dual Layers of UV curable acrylate (or equivalent)

2.4 Environmental conditions; up to 100 % non-condensing humidity

- Operation : - 40 to 158 °F (- 40 to 70 °C)
- Installation : - 22 to 140 °F (- 10 to 60 °C)
- Storage : - 40 to 158 °F (- 40 to 70 °C)

2.5 The optical, geometrical and mechanical performance of the optical fiber shall be in accordance with Table 1 (below).

Table 1-1. Characteristics for Single mode ITU-T G.652D Type fiber
(The optical, geometrical, and mechanical performance)

Items	Unit	Specification	
		G.652D	G.657A1
Type of Fiber		G.652D	G.657A1
Mode Field Diameter @1310nm	μm	9.2 ± 0.4	8.9 ± 0.4
Cladding Diameter	μm	125 ± 1.0	
Cladding Non-circularity	%	≤ 1.0	
Attenuation	dB/km	≤ 0.35 @ 1310 nm ≤ 0.35 @ 1383 nm ≤ 0.25 @ 1550 nm	
Zero Dispersion Wavelength	nm	1300 ~ 1324	
Chromatic Dispersion	ps/nm.km	≤ 3.5 @ 1285 ~ 1330 nm ≤ 18 @ 1550 nm	
Zero Dispersion Slope	ps/nm ² /km	≤ 0.092	
Cut-off Wavelength (λ _{cc} , cabled fiber)	μm	≤ 1260	
Mode Field Concentricity Error	μm	≤ 0.6	
Coated Diameter	μm	250 ± 15	
Proof Test (Nom.)	kpsi	100	

3. Cable Construction

3.1 The construction of the cable shall be in accordance with Table 2 (below).

Table 2-1. Construction of the cable

Items	Description
Fiber Type	See Table 1
No. of Fibers	Max. 144C
Loose Buffer Tube	Made of PBTP (Polybutylene Terephthalate)
Type of Inner Jelly	Thixotropic type jelly compound (in loose tube)
Filler	Natural color PE rod(s). If necessary, the PE filler(s) shall be used for circular-section core(s) (for better core configuration).
Central Strength Member	FRP (PE coating if necessary)
Water Blocking Material	Water blocking yarn(s) around the CSM (to prevent the ingress of water)
S-Z Stranding (Cable Core)	The required numbers of loose tube and filler rod are S-Z stranded tightly around the CSM.
Core Binder Yarn	Water blocking core binder yarn(s)
Rip Cord	Two ripcords (for easy cable entry)
Outer Jacket	Black colored PE

4. Fiber & Loose tube Identification

4.1 The color code of the loose tubes and the individual fibers within each loose tube shall be accordance with Table 3 (below).

Table 3. Color code of the fibers & the loose buffer tubes

No	Color	No	Color
1	Blue	7	Red
2	Orange	8	Black
3	Green	9	Yellow
4	Brown	10	Violet
5	Gray	11	Pink
6	White	12	Aqua

5. Mechanical / Environmental Performance & Tests

5.1 The mechanical & environmental performance of the cable shall be in accordance with Table 4 (below). Unless otherwise specified, all attenuation measurements required in this section shall be performed at 1550 nm for single mode and at 1300 nm for multi mode fiber. The measurement equipment error can be occurred in range of 0.02dB.

Table 4. Mechanical & Environmental Performance of the cable

Items	Description
Tensile Strength	<ul style="list-style-type: none"> ● Test method: IEC 60794-1-2 Method E1 <ul style="list-style-type: none"> -. Mandrel diameter: 40D (D: cable diameter) -. Length under tension: ≥ 50m -. Applied Tensile load: 1W (W: cable weight) -. Duration of loading: 60 min. ● Acceptance criteria <ul style="list-style-type: none"> -. Attenuation increment: reversible
Crush Resistance (Compressive loading)	<ul style="list-style-type: none"> ● Test method: IEC 60794-1-2 Method E3 <ul style="list-style-type: none"> -. Applied load: 500N -. No of points: 1 point -. Plate size: 100mm x 100mm -. Duration of loading: 1min. ● Acceptance criteria <ul style="list-style-type: none"> -. Attenuation increment: reversible
Impact Resistance	<ul style="list-style-type: none"> ● Test method: IEC 60794-1-2 Method E4 <ul style="list-style-type: none"> -. Drop hammer mass: 1J -. Striking surface radius: 300mm -. No. of impact per point: 3 point (500mm interval) ● Acceptance criteria <ul style="list-style-type: none"> -. Attenuation increment: ≤0.1 dB
Repeated Bend	<ul style="list-style-type: none"> ● Test method: IEC 60794-1-2 Method E6 <ul style="list-style-type: none"> -. Mandrel diameter: 20D (D: cable diameter) -. Applied load: 50N -. No. of bend cycles: 25 cycles

	<ul style="list-style-type: none"> - Bend angle: ± 90 degree ● Acceptance criteria - No damage to the sheath and the cable elements
Torsion	<ul style="list-style-type: none"> ● Test method: IEC 60794-1-2 Method E7 - Cable twisted length: 2 m - No. of twist cycles: 10 cycles - Applied load: 50N - Twist angle: ± 180 degree ● Acceptance criteria - Attenuation increment: reversible
Kink	<ul style="list-style-type: none"> ● Test method: IEC 60794-1-2 Method E10 - Mandrel diameter: 40D (D: cable diameter) ● Acceptance criteria: No kink
Cable Bend	<ul style="list-style-type: none"> ● Test method: IEC 60794-1-2 Method E11A - Bend radius: 20D (D: cable diameter) - Bend angle: ± 180 degree - No. of turns: 4 turns - No. of cycles: 3 cycles ● Acceptance criteria - Attenuation increment: reversible
Water Penetration	<ul style="list-style-type: none"> ● Test method: IEC 60794-1-2 Method F5 - Length of specimen: 3 m - Height of pressure head: 1 m - Test time: 24 h ● Acceptance criteria - No leakage through the open cable end
Temperature Cycling	<ul style="list-style-type: none"> ● Test method: IEC 60794-1-2 Method F1 - Cable length: $\geq 1,000$m - Test condition: ≥ 2 fibers shall be spliced - Temperature cycling schedule (step 1) : $+23^{\circ}\text{C} \rightarrow -15^{\circ}\text{C} \rightarrow +30^{\circ}\text{C} \rightarrow +60^{\circ}\text{C} \rightarrow +23^{\circ}\text{C}$ (Soak time: 12 h) - Temperature cycling schedule (step 2) : $+23^{\circ}\text{C} \rightarrow -15^{\circ}\text{C} \rightarrow -30^{\circ}\text{C} \rightarrow -40^{\circ}\text{C} \rightarrow +30^{\circ}\text{C} \rightarrow +60^{\circ}\text{C} \rightarrow +70^{\circ}\text{C} \rightarrow +23^{\circ}\text{C}$ (Soak time: 8 h) - No. of cycles: 2 ● Acceptance criteria - Attenuation increment: reversible (step 1 & 2) ≤ 0.15 dB/km (step 2)

6. Packing and marking

6.1 Cable marking

The jacket shall be marked every two feet with following information.

- 1) Cable type & counts
- 2) Name of the manufacturer
- 3) Year of manufacture (YYYY)
- 4) Serial number (NNNNN)
- 5) Length marking (FT)

- Ex) For SM 144 fiber cable

00002FT OJFPP-MINIABC SM 144C LAC YYYY NNNNN 00004FT

6.2 Cable packing

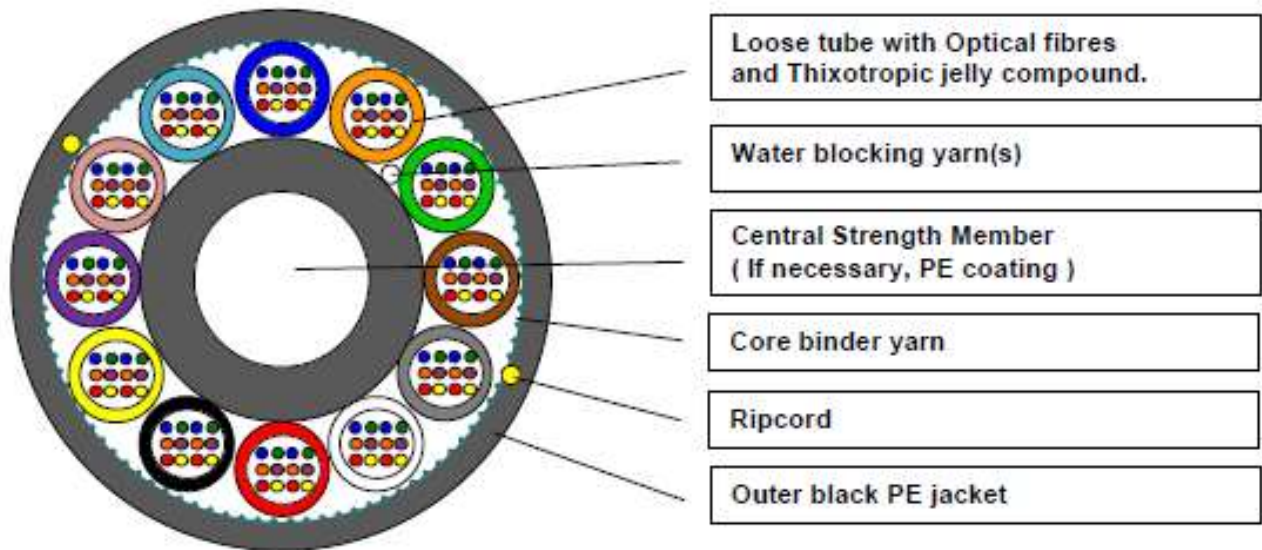
- 6.2.1 Standard length of cable shall be 14,000FT. Other reel lengths are available.
- 6.2.2 Each length of the cable shall be wound on a separate wooden reel.
- 6.2.3 Both ends of the cable shall be sealed with a suitable plastic cap to prevent the entry of moisture during shipping, handling, and storage.
- 6.2.4 The cable ends shall be securely fastened to the reel to prevent the cable from becoming loose in transit or during placing operations.
- 6.2.5 The inner end of the cable is housed into a slot on the side of the reel without extra cable length for testing.
- 6.2.6 The reels must have a number of rotations that there is a min. free space of 50mm between the upper layer and the edge of the flanges.
- 6.2.7 Circumference battens or Wood-fiber board shall be secured with steel band to protect the cable during normal handling and storage.

6.3 Cable reel

- 6.3.1 Details given below shall be distinctly marked on a weather proof material on both outer sides of the reel flange;
 - 1) Customer's name
 - 2) Contract Number
 - 3) Type & fiber counts of cable
 - 4) Length of cable in meter/feet
 - 5) Drum number & Gross & Net weight in kilograms/pounds
 - 6) Year of manufacture and the manufacturer
 - 7) Arrow showing the direction the drum shall be rolled* Other shipping mark is also available if required by customer.
- 6.3.2 The cable shall be wound on the reel designed to prevent damages during shipment and installation.
- 6.3.3 The minimum barrel diameter of the cable drums shall be at least 30 times the overall cable diameter.
- 6.3.4 The arbor holes provided in the reels shall be 75 ~ 125 mm in diameter. The arbor hole on each flange shall be reinforced with a bearing plate.

Appendix 1

(Cable Cross-Sectional, drawing not to scale, 144 Fiber)



"The drawing appearing on this page may be subject to change or modification without any prior notice"

Appendix 2

Diameter, Weight & Min. Bending radius

No. of Fiber	Tube Position	No. of Fiber per Tube	Max. Cable Diameter (mm)	Approx. Cable Weight (kg/km)	Min. Bending Radius (mm)	
					No Load	Under Load
~72	6	Max. 12	5.5 (0.217 inch)	25 (0.016 lbs/ft)	10 D	20 D
96	8	12	6.5 (0.256 inch)	35 (0.025 lbs/ft)	10 D	20 D
144	12	12	8.0 (0.315 inch)	55 (0.037 lbs/ft)	10 D	20 D