

Specification

LA-CA-007

**Loose Tube / Gel-Free / Compact
Single Jacket Single Armored Optical Fiber Cable
Maximum Flexibility**

[LAC code: OPP-CA-007]
[Optical Fiber based on SM]

1. Scope

1.1 Application

This specification covers the general requirements for outdoor optical fiber 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).

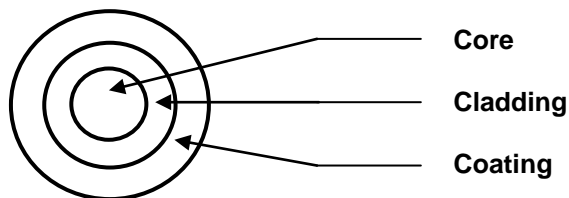
Single Jacket Single Armored

The cable structure is reinforced by the application of a core wrapping tape and a corrugated steel tape covered by an outer jacket.

The combination of the less number of tubes, an ECCS steel tape armoring and an LDPE jacket allow the maximum flexibility in handling and stroing the cable, making this cable outstanding among the light armored cables.

2. Optical Fiber

2.1 Construction of the fibers



2.2 The operating wavelength region of single mode is 1310 & 1550nm.

2.3 Fiber Material

The fiber is made from high grade silica glasses coated by a UV curable acrylate material. A protective UV cured acrylate coating is applied over the fiber cladding and it can 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 158 °F (- 30 to 70 °C)
- Storage : - 40 to 158 °F (- 40 to 70 °C)

2.5 The optical, geometrical and mechanical performance of the optical fiber is reflected in Table 1 (below).

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

Items	Unit	Specification		
		G.652D	G.657A1	G.657A2
Type of Fiber		G.652D	G.657A1	G.657A2
Mode Field Diameter @1310nm	μm	9.2 ± 0.4	8.9 ± 0.4	8.6 ± 0.4
Mode Field Concentricity Error	μm	≤ 0.8		
Cladding Diameter	μm	125 ± 1.0		
Cladding Non-circularity	%	≤ 1.0		
Coating Diameter	μm	245 ± 15		
Transmission wavelength	nm	1310, 1550		
Attenuation	dB/km	≤ 0.35 @ 1310 nm ≤ 0.25 @ 1550 nm		
Zero Dispersion Wavelength	nm	1300 ~ 1324		
Chromatic Dispersion	ps/nm.km	≤ 3.2 @ 1290 ~ 1330 nm ≤ 18 @ 1550 nm		
Zero Dispersion Slope	ps/nm ² /km	≤ 0.092		
PMD Coefficient (PMDQ) (M=20, Q=0.01)	ps/km ^{1/2}	≤ 0.2		
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. Construction of the cable

Items	Description
Fiber Type	See Table 1
No. of Fibers	Max. 60C
Loose Buffer Tube	Made of PBTP (Polybutylene Terephthalate) or PP (Polypropylene)
No. of Loose Tube	Max. 5
No. of Fiber per Tube	Max. 12
Filler	Natural color PE rod(s). The PE filler(s) for circular-section core(s) if necessary (for better core configuration).
Central Strength Member	FRP (PE coating if necessary)
Water blocking material	Water blocking yarn(s) or tape (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 wrapping tape	Water blocking tape
Rip Cord	Two ripcords (for easy cable entry)
Armor Tape	A corrugated steel tape (ECCS: Electrolytic Chrome Coated Steel) coated with polymer on both sides. The tape is securely bonded with outer jacket. <ul style="list-style-type: none"> • Tape thickness: Nom. 0.15mm • Coating thickness on one-side: Nom. 0.05mm
Outer Jacket	Black colored LDPE

4. Fiber & Loose tube Identification

4.1 The loose tubes and the individual fibers are color coded as reflected in Table 3 (below).

Table 3-1. 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 is in accordance with Table 4 (below). Unless otherwise specified, all attenuation measurements required in this section are performed at 1550 nm for single mode and at 1300 nm for multi mode fiber. The measurement equipment error will be no more than 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: 30D (D: cable diameter) - Applied Tensile load: 2,700N - Duration of loading: 60 min. ● Acceptance criteria <ul style="list-style-type: none"> - Attenuation increment: ≤ 0.15 dB
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: 2,200N - No of points: 1 point - Plate size: 100mm x 100mm - Duration of loading: 10min. ● Acceptance criteria <ul style="list-style-type: none"> - Attenuation increment: ≤ 0.15 dB
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: 9.8 N.M - No. of impact per point: 1 time @ 3 point ● Acceptance criteria <ul style="list-style-type: none"> - Attenuation increment: ≤ 0.15 dB
Cable Bend	<ul style="list-style-type: none"> ● Test method: IEC 60794-1-2 Method E11A <ul style="list-style-type: none"> - Mandrel diameter: 20D (D: cable dia.) - No. of bend cycles: 4 cycles - Bend angle: ± 180 degree ● Acceptance criteria <ul style="list-style-type: none"> - Attenuation increment: ≤ 0.15 dB

<p>Torsion</p>	<ul style="list-style-type: none"> ● Test method: IEC 60794-1-2 Method E7 <ul style="list-style-type: none"> - Cable twisted length: 2 m - No. of twist cycles: 10 cycles - Twist angle: ± 180 degree ● Acceptance criteria <ul style="list-style-type: none"> - Attenuation increment: ≤ 0.15 dB
<p>Water Penetration</p>	<ul style="list-style-type: none"> ● Test method: IEC 60794-1-2 Method F5 <ul style="list-style-type: none"> - Length of specimen: 3 m - Height of pressure head: 1 m - Test time: 24 h ● Acceptance criteria <ul style="list-style-type: none"> - No leakage through the open cable end
<p>Temperature Cycling</p>	<ul style="list-style-type: none"> ● Test method: IEC 60794-1-2 Method F1 <ul style="list-style-type: none"> - Cable length: $\geq 1,000$m - Test condition: ≥ 2 fibers shall be spliced - Temperature cycling schedule <ul style="list-style-type: none"> : $+23^{\circ}\text{C} \rightarrow -40^{\circ}\text{C} \rightarrow +70^{\circ}\text{C} \rightarrow +23^{\circ}\text{C}$ - Soak time at each temperature : 16 h - No. of cycles: 2 ● Acceptance criteria <ul style="list-style-type: none"> - Attenuation increment: ≤ 0.15 dB/km

6. Packing and marking

6.1 Cable marking

The jacket is marked every two feet or one meter 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 60 fiber cable

00002FT SJSA-CA-007 SM 60C LEXINGTON AMES YYYY NNNNN 00004FT

1.1 Cable packing

- 1.1.1 Standard length of cable is in accordance with Appendix 2. Other cable lengths are available per customer demand.
- 1.1.2 Each length of the cable is wound on a separate wooden reel.
- 1.1.3 Both ends of the cable are sealed with a suitable plastic cap to prevent the entry of moisture during shipping, handling and storage.
- 1.1.4 The cable ends are securely fastened to the reel to prevent the cable from becoming loose in transit or during placing operations.
- 1.1.5 The inner end of the cable is housed into a slot on the side of the reel without extra cable length for testing.
- 1.1.6 The reels must have a minimum of 50mm of free space between the upper layer and the edge of the flanges.
- 1.1.7 Circumference battens or Wood-fiber board is secured with a steel band to protect the cable during normal handling and storage.

1.2 Cable reel

1.2.1 The following details are indicated on the 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

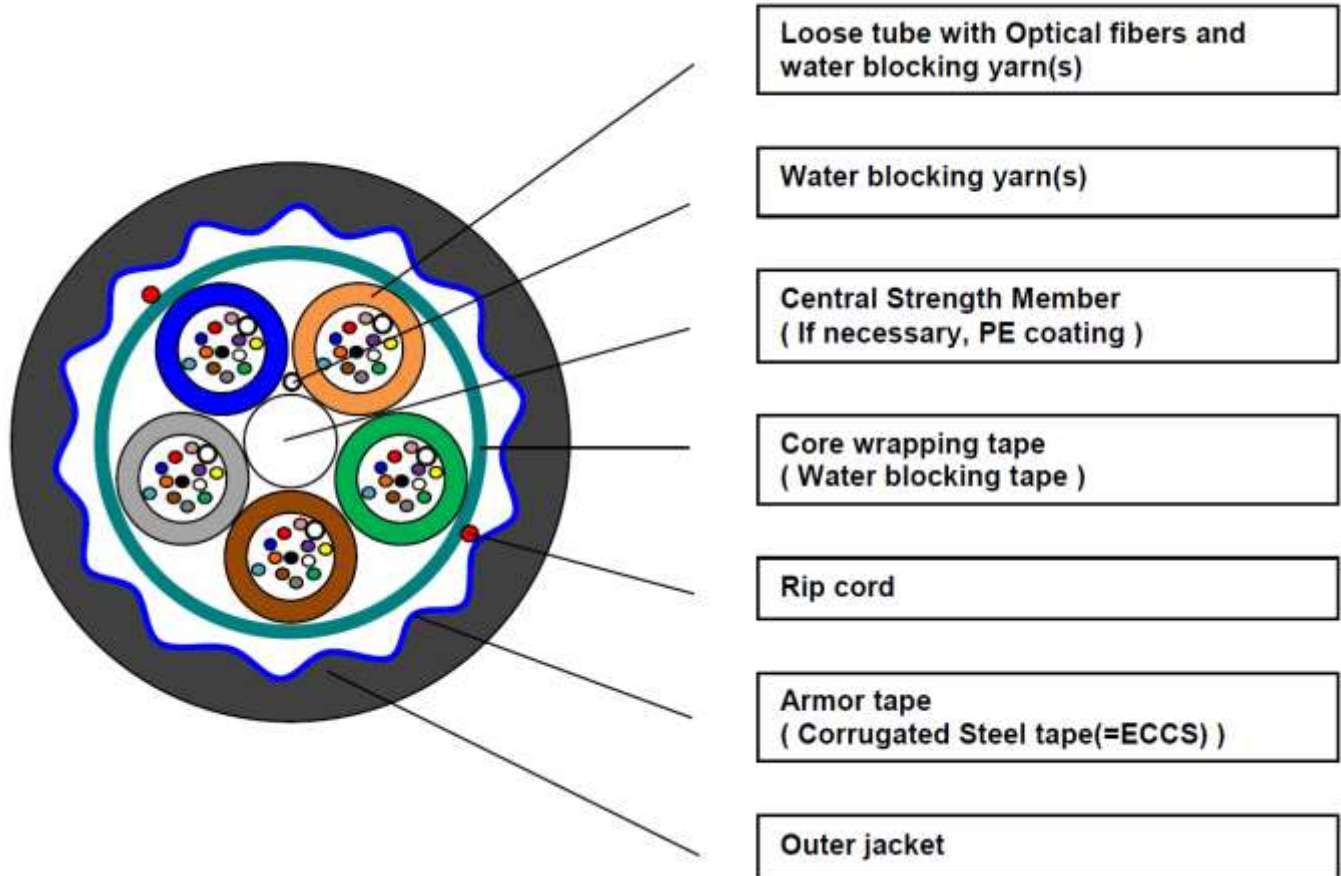
1.2.2 The cable is wound on the reel specifically to prevent damage during shipment and installation.

1.2.3 The minimum barrel diameter of the cable drums will be at least 30 times the overall cable diameter.

1.2.4 The arbor holes provided in the reels shall be 75 ~ 125 mm in diameter. The arbor hole on each flange is reinforced with a bearing plate.

Appendix 1

(Cable Cross-Sectional, drawing not to scale, 72 Fiber)



"The illustration on this page is subject to change or modification without any prior notice"

Appendix 2

Diameter, Weight & Min. Bending radius

No. of fiber	No. of Loose Tube Positon	Nom. Cable Diameter (inch)	Nom. Cable Weight (lbs/kft)		Min. Bending Radius (mm)	
			PBT Tube	PP tube	No Load	Under Load
~ 60	5	0.453 (11.5mm)	81 (120kg/km)	77 (115kg/km)	10 D	20 D