
TECHNICAL SPECIFICATION
FOR
ADSS OPTICAL FIBER CABLE

WITH

- SINGLE MODE OPTICAL FIBER (ITU-T G.652D)
- LOOSE TUBE (JELLY-FILLED)
- DIELECTRIC CENTRAL MEMBER
- PK (PE+KEVLAR) SHEATH
- SLIM AND LOW WEIGHT (SUITABLE FOR URBAN AERIAL)

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1. GENERAL

1.1 Scope

This document specifies the single mode optical fiber cables for use at long wavelength, which are suitable for urban optical transmission system.

1.2 Application

The cable is slim and low weight, which is suitable for urban aerial installation.

1.3 Construction

1.3.1 The fibers are single mode type, which are having a loose secondary coating of high modulus plastic.

1.3.2 The center of the core contains a non-metallic center member. The non-metallic center member is optimized so as to limit the application of maximum recommended installation tension.

1.3.3 The tubes with fibers and fillers are stranded around the center member into a compact and circular cable core.

1.3.4 PE outer sheath+ Kevlar structure is applied. Figure 1 illustrates the cable construction.

2. DESIGN

2.1 Optical Fiber

2.1.1 The core and cladding of optical fiber shall mainly be made of fused silica glass.

2.1.2 The primary coating shall consist of a double layer UV-cured acrylate. The coating shall be easy to remove from the glass fiber.

2.1.3 The proof test level shall be ≥ 100 kpsi (0.69 Gpa).

2.2 Loose Tube

- 2.2.1 The jacket of each fiber shall be a tube of high modulus plastic (PBT).
- 2.2.2 Each tube shall be filled with a filling compound to prevent water ingress and to ensure low stress levels of the fiber.
- 2.2.3 The dimensions of which shall be such as to ensure that the fibers are subjected to no mechanical stresses or curvature that would cause any impairment in the transmission performance during or after the cable installation.
- 2.2.4 Fibers in the tube shall be individually color coded to facilitate their ready identification at either end of any cable length. A common fiber color sequence shall be in accordance with the Annex 1.

2.3 Center Member

- 2.3.1 The center of the core contains a non-metallic center member of FRP rod.
- 2.3.2 The center member may be coated by polyethylene and is compatible with other outside plant materials.

2.4 Stranding

- 2.4.1 The tubes and fillers are stranded around the non-metallic center member with S/Z direction to withstand the installation tensile strength.
- 2.4.2 In general, the identification of the tube shall be in accordance with the Annex 1 and 2. The color of PE fillers shall be natural.
- 2.4.3 The sequence of counting the tube and the filler shall be in clockwise direction, seen at the running end of the cable.

2.5 Filling Compound

- 2.5.1 The interstices between secondary coating, center member and core wrapping shall be filled with jelly to prevent axial and longitudinal flow of water throughout the cable.
- 2.5.2 The filling compound shall meet the requirements as below.

- a) The jelly compound shall not affect the performance, the color of fiber and the materials used in the cable.
- b) The jelly compound shall be free of hydrogen molecules and ions.
- c) The jelly compound shall be non-toxic and completely safe in contact with the skin and non-hazardous.
- d) When splicing the fibers, it shall be easy to remove the jelly compound from surface of coatings.
- e) The drop point of filling compound shall be at least 70°C.

2.6 Core Wrap Tape (Water blocking tape)

- 2.6.1 A core wrap tape shall be applied over the cable core with suitable waterproof, thermal and dielectric properties.

2.7 PK Sheath

- 2.7.1 PK Sheath (PE Outer+ Kevlar(Aramid yarns)) shall be applied.

2.7.2 PE Outer Sheath:

The sheath shall consist of a high molecular weight black polyethylene. The sheath shall be circular, free from pinholes, joints, mended places and other defects.

The nominal thickness of sheath shall be 1.6 mm.

- 2.7.3 Kevlar(Aramid yarns) : Aramid yarns having a function of a strength member and cushion layer shall be helically stranded over the cable core.
Aramid yarn shall be hydrophobic and non-wicking, continuous throughout a length of cable.

3. PROPERTIES

3.1 Optical Properties

The fibers in the cable shall maintain their properties as specified below provided the mechanical and environmental conditions specified in paragraph 3.2 have not been exceeded and the proper installation procedures have been followed.

The geometrical structures and optical characteristics shall be in accordance with Table 1 and the optical fibers shall meet ITU-T G.652D Recommendation.

Table 1. Optical Properties

Items of Properties		Value
Geometrical Characteristics	Mode field diameter @1310nm	$9.2 \pm 0.4 \mu\text{m}$
	Mode field concentricity error	$\leq 0.8 \mu\text{m}$
	Cladding diameter	$125 \pm 1 \mu\text{m}$
	Cladding non-circularity	$\leq 1.0 \%$
	Coating diameter (Excluding color coating)	$245 \pm 10 \mu\text{m}$
Optical Characteristics	Cutoff wavelength (λ_{cc})	$\leq 1260\text{nm}$
	Attenuation coefficient @1310nm (maximum) @1550nm (maximum)	$\leq 0.36 \text{ dB/km}$ $\leq 0.22 \text{ dB/km}$
	1550nm bending loss (60mm mandrel, 100 turns)	$\leq 0.05 \text{ dB}$
	Attenuation uniformity	$\leq 0.05 \text{ dB}$
	Chromatic dispersion coefficient @1285~ 1330nm @1550nm	$\leq 3.2 \text{ ps/nm.km}$ $\leq 18 \text{ ps/nm.km}$
	Zero dispersion wavelength	1302~ 1322nm
	Zero dispersion slope	$\leq 0.092 \text{ ps/nm}^2.\text{km}$
	PMD (IEC60794-3 Annex A)	$\leq 0.5 \text{ ps}/\sqrt{\text{km}}$

3.2 Mechanical and Environmental Properties

The optical fiber cable shall meet the mechanical and environmental properties in accordance with Table 2.

Table 2. Mechanical and Environmental Properties

Item	Test Method	Test Condition	Acceptance Criteria
Tensile strength	IEC 794-1-E1	-Tensile load: 4000N - Length under tension: at least 50m - Duration of tension: 30 min	Note 1), 2)
Crush	IEC 794-1-E3	-Load: 1500N/100mm -Duration of load: 5 min	Note 1), 2)
Impact	IEC 794-1-E4	-10N x 1m x 10 different points -Impact Diameter: 25.0 mm	Note 1), 2)
Repeated bending	IEC 794-1-E6	- Length under test: 1m - R = 20 × cable outer diameter - Load: 25kg - Number of cycles: 20	Note 1)
Torsion	IEC 794-1-E7	- Test length: 2m - Applied load: 50kg - Twist angle: ±180 degrees - Twist cycles: 10	Note 1), 2)
Temperature cycling	IEC 794-1-F1	- Sample length: at least 1,000m - Temperature change: +20°C→ -30°C→ +70°C→ +20°C - Duration time: 12 hrs each step	Note 3)
Water penetration	IEC 794-1-F5	- Length under test: 3m - Water height: 1m - Duration time: 24 hrs	No water leak

Note 1) Maximum average increase in attenuation shall not be greater than the noise level of 0.1dB

Note 2) No mechanical damage

Note 3) Attenuation variation shall not be greater than 0.1 dB/km each procedure and after test.

4. MARKING AND PACKING

4.1 Sheath Marking

4.1.1 The cable shall have the following information clearly marked on the sheath at regular intervals of one meter to use white pigment tape.

- Manufacturer's name :
- Year of manufacture : 2017
- Customer's name : OPNET (for example)
- Cable Type : ADSS
- Fiber counts & Type : 24 G.652D (for example)
- Length mark : XXXXM

In case of single mode 24C optical cable

0000M	OPNET	2017	OPNET	ADSS	24 G.652D	0001M
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Cable marking can be changed upon customer's request.

4.2 Packing

4.2.1 Each factory length of the cable shall be coiled on one suitable wooden drum to be protected from putrefaction.

4.2.2 The cable shall be reeled on the wooden drum in standard manufacturing length of 4km or special length will be provided in order.

4.2.3 After completion of the tests, thermo shrinkable end cap shall be installed on both ends of the cable.

4.2.4 The diameter of the barrel shall be not less than 30 times of the outer diameter of the cable.

4.2.5 Circumference shall be completely enclosed with battens; nails on both sides shall secure these battens.

5. QUALITY CONTROL

5.1 Incoming Inspection

All the raw materials that are used for optical fiber cable shall be inspected by the raw material testing methods that are specified by the manufacturer and that are based on 'ASTM'.

In some cases, suppliers' test report shall substitute for the raw material manufacturer's test.

Any materials that do not meet the manufacturer's raw material specification shall be rejected or scrapped, and the passed materials only shall be used in the process. Some raw material specifications and subsequent raw material test method may be changed without notice, if and only if the new specification and the new test method do not affect the quality of optical fiber cable.

5.2 In-Process Inspection

Semi-final goods shall be inspected in accordance with specified manufacturer's testing method. The testing method may be changed without notice, if it does not affect quality of optical fiber cable.

5.3 Final Cable Inspection

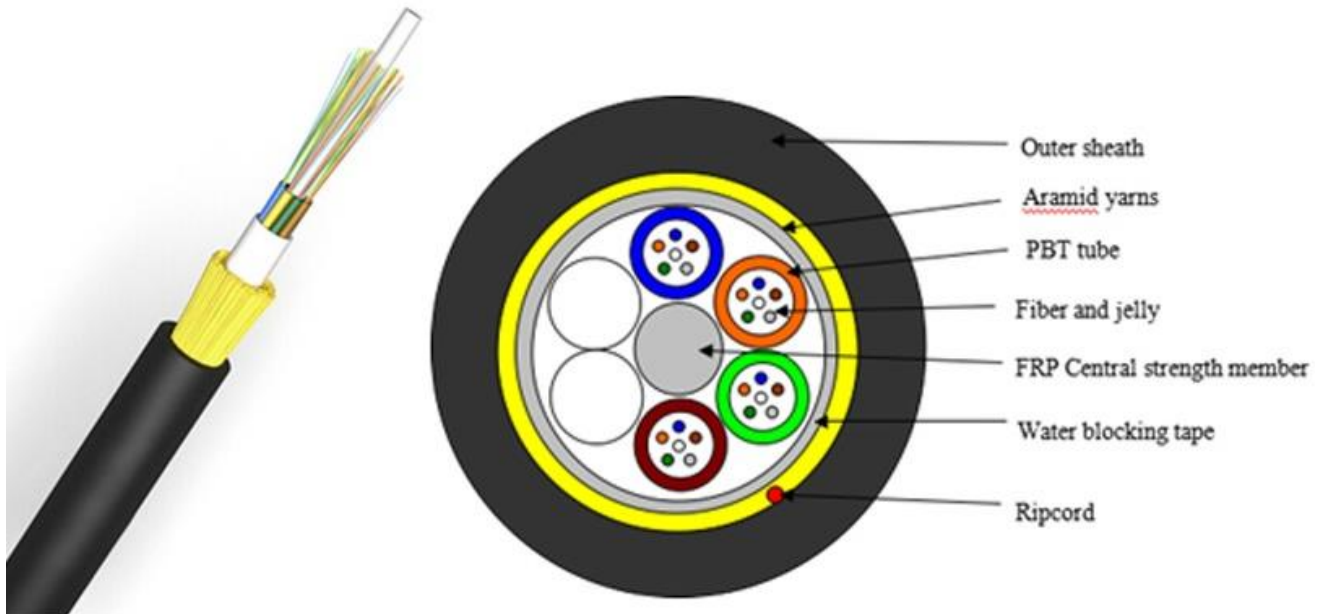
Following quality properties of finished cable shall be tested to assure the field performances.

- Construction / Material
- Mechanical characteristics
- Optical characteristics

5.4 Quality System

We applies ISO 9001:2008 to assure the conformance to specified requirements during our production.

Figure 1. Cable Structure



ADSS CABLE STRUCTURE

Fiber counts		6-48C, 60C, 72C, 96C			
Nominal cable diameter (mm)		9.5	10.2	10.6	11.5
Minimum bend radius (mm)	Operation	10 x OD			
	Installation	20 x OD			
Cable weight (kg/km)		95	105	108	120
Operation Tensile Load (N)		4000N			
Crush resistance(N/100MM)		1500N/100MM			
Temperature range (°C)		-25°C ~ +50°C (Installation/Transportation) -40°C ~ +70°C (Operation)			

Note: OD= Outer Diameter

Annex 1. Color Code of Optical Fiber and Loose Tube

1. Color Code of Optical Fiber (Comply with IEC-793-2 and TIA/EIA-598-A Standard)

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

Note) Color code may be changed upon customer's request.

2. Color Code of Loose Tube (Comply with IEC-793-2 and TIA/EIA-598-A Standard)

Tube No.	1	2	3	4	5	6	7	8
Color	Blue	Orange	Green	Brown	Grey	White	Red	Black

Note) Color code may be changed upon customer's request.

Annex 2. Unit Composition of Optical Fiber Cable

Cable Core	The count of optical fiber per loose tube and unit composition							
	U1	U2	U3	U4	U5	U6	U7	U8
6C	6	F	F	F	F	F		
12C	6	6	F	F	F	F		
24C	6	6	6	6	F	F		
48C	12	12	12	12	F	F		
96C	12	12	12	12	12	12	12	12

Note) .F: PE Filler (Natural Color)