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LS Cable & System

TL 9000  
 ISO 9001  
 ISO 14001  
 OHSAS 18001



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Tender Title :	
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Document Title :

**Specification**  
**For**  
**Fiber Optic Cable**  
**Gel-Filled PP Loose Tube / Dry Core**  
**All-Dielectric / Self-Supporting**  
**Single Jacket**  
**(NESC Light / Span150m)**

Rev. No.	Date	Descriptions	Prepared By	Reviewed By	Approved By
01	Apr. 03, 2024	12~72F cable modified Color stripe optional added	Chang, Seungig	Lee, Mansu	Lee, YuHyoung
00	Jan. 09, 2024	Original Issue	Chang, Seungig	Lee, Mansu	Lee, YuHyoung

1. GENERAL

This specification covers the general requirements of all dielectric self-supporting cable for aerial application.

2. NORMATIVE REFERENCES

Unless otherwise specified, all cables shall be in accordance with all applicable section of the following Codes, Standards and Regulations, and their current amendments.

Table 1. Normative references

Normative	Designation
IEC 60793-1	Optical fibers, Generic specification
IEC 60793-2	Optical fibers, Product specification
TIA-598-D	Optical fiber cable color coding
ITU-T G.652	Characteristics of a single-mode optical fiber
ITU-T G.657	Characteristics of a bending-loss insensitive single-mode optical fibre and cable
IEC 60794-1-1	Optical fiber cables – Part 1 : Generic specification - General
IEC 60794-1-21	Optical fiber cables – Part 1-21 : Generic specification – Basic optical cable test procedures – Mechanical test methods
IEC 60794-1-22	Optical fiber cables – Part 1-22 : Generic specification – Basic optical cable test procedures – Environmental test methods
IEC 60794-4-20	Family specification for ADSS optical cables

3. OPTICAL FIBER

The optical, geometrical, mechanical and environmental performance of the optical fiber shall be in accordance with Table 2 to Table 3 below.

Table 2. Performance of the single mode fiber (ITU-T G.652D)

ITEMS	UNITS	SPECIFICATION
Attenuation at 1310/1383/1550 nm	dB/km	□ 0.35 / □ 0.35 / □ 0.22
Chromatic Dispersion at 1285~1330/1550 nm	ps/nm.km	□ 3.5 / □ 18
Zero Dispersion Wavelength	nm	1300 ~ 1324
Zero Dispersion Slope	ps/nm <sup>2</sup> .km	□ 0.092
Cable PMD (PMDQ)	ps/□km	□ 0.2 (20 section link)
Cut-off wavelength (□cc)	nm	□ 1260
Bending loss   R30mm x 1001	dB	□ 0.1 at 1625nm
MFD at 1310 / 1550nm	□m	9.2 □ 0.4 / 10.4 □ 1.0
Core/Cladding Concentricity Error	□m	□ 0.6
Cladding Diameter	□m	125 □ 0.7
Cladding Non-circularity	%	□ 1.0
Coating Diameter	□m	245 □ 10
Proof Test	GPa	□ 0.69

<sup>1</sup> 100 turns with radius 30mm

Table 3. Performance of the single mode fiber (ITU-T G.657A)

ITEMS	UNITS	SPECIFICATION	
		G.657A1	G.657A2
Attenuation at 1310/1383/1550nm	dB/km	□ 0.35 / □ 0.35 / □ 0.22	
Chromatic Dispersion at 1285~1330/1550nm	ps/nm.km	□ 3.5 / □ 18	
Zero Dispersion Wavelength	nm	1300 ~ 1324	
Zero Dispersion Slope	ps/nm <sup>2</sup> .km	□ 0.092	
Cable PMD (PMDQ)	ps/√km	□ 0.2 (20 section link)	
Cable PMD (PMDQ)	nm	□ 1260	
Cut-off wavelength (λ <sub>c</sub> )	nm	□ 0.25 / □ 1.0	□ 0.03 / □ 0.1
Attenuation at 1550/1625nm	R10mm x 1	□ 0.75 / □ 1.5	□ 0.1 / □ 0.2
	R7.5mm x 1	-	□ 0.5 / □ 1.0
MFD at 1310nm	μm	8.9 □ 0.4	8.6 □ 0.4
Core/Cladding Concentricity Error	μm	□ 0.5	
Cladding Diameter	μm	125 □ 0.7	
Cladding Non-circularity	%	□ 1.0	
Coating Diameter	μm	245 □ 10	
Proof Test	GPa	□ 0.69	

#### 4. FIBER AND LOOSE BUFFER TUBE IDENTIFICATION

Color code of the loose buffer tubes and the individual fibers within each loose buffer tube shall be in accordance with Table 4 below.

Table 4. Color code of the individual fibers and 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. CABLE CONSTRUCTION

The construction of the cable shall be in accordance with Table 5 below.

Table 5. Construction of the cable

ITEMS		DESCRIPTION	
Product categories		S-150M	
Number of fibers		12 ~ 72	96 144
No. of fibers per tube		12	
Loose buffer tube Filler	Material	PP (Polypropylene)	
	Filling compound	Low Density White Gel compound	
	Diameter	Nom. 2.4mm	
Central strength member		PE or PP rods (if necessary)	
Water blocking material		FRP (Fiber reinforced plastic) rod	
Core wrapping tape		Water blocking yarn	
Peripheral strength member		Water blocking tape	
Ripcord		Aramid yarns 2 ripcords	
Outer jacket	Material	Black PE	
	Thickness	Nom. 1.3mm	Nom. 1.5mm
	Stripe <sup>2</sup> (Optional)	One or Two color stripes	

## 6. PHYSICAL / MECHANICAL / ENVIRONMENTAL PERFORMANCE AND TESTS

### 6.1 Temperature Range

Table 6. The Temperature Range of Cable

Operation	Installation	Storage/Shipping
- 40°C to + 70°C	- 30°C to + 60°C	- 40°C to + 70°C

### 6.2 Mechanical and Environmental Performance of the Cable

The product shall be type tested for the qualifications according to Table 7 below. Unless otherwise specified, all attenuation measurements required in this section shall be performed at 1,550nm for SMF (single mode fiber).

Table 7. The Mechanical and Environmental Performance of the Cable

ITEMS	TEST METHOD AND ACCEPTANCE CRITERIA
Tensile Strength	<ul style="list-style-type: none"> <li>▪ Test method: IEC 60794-1-21 E1                             <ul style="list-style-type: none"> <li>- MAT<sup>3</sup> in Table 9 for 1 hour</li> </ul> </li> <li>▪ Acceptance criteria                             <ul style="list-style-type: none"> <li>- Fiber strain: Max. 0.33% during the test</li> <li>- Attenuation increment: □ 0.10 dB</li> </ul> </li> </ul>

<sup>2</sup> Color of stripe shall be based on customer requirement. For stripe position, please refer the cable drawing(section10).

<sup>3</sup> MAT (Max. Allowable Tension) : Maximum tensile load that may be applied to the cable without detriment to the performance requirements (optical performance, fiber durability) due to fiber strain

ITEMS	TEST METHOD AND ACCEPTANCE CRITERIA
Repeated Bending	<ul style="list-style-type: none"> <li>▪ Test method: IEC 60794-1-21 E6               <ul style="list-style-type: none"> <li>- Bending radius : 20D (D = cable diameter)</li> <li>- Number of cycles: 25 cycles</li> <li>- Bending speed: 30 cycles/minute</li> </ul> </li> <li>▪ Acceptance criteria               <ul style="list-style-type: none"> <li>- Attenuation increment: □ 0.05 dB after the test</li> <li>- No damage to the sheath or cable elements under visual examination without magnification</li> </ul> </li> </ul>
Impact	<ul style="list-style-type: none"> <li>▪ Test method: IEC 60794-1-21 E4               <ul style="list-style-type: none"> <li>- Impact energy : 10J (1kg X 1m)</li> <li>- Striking surface radius : 300mm</li> <li>- Number of impact : 3 in a different place (Min. 500mm apart)</li> </ul> </li> <li>▪ Acceptance criteria               <ul style="list-style-type: none"> <li>- Attenuation increment: □ 0.05 dB after the test</li> <li>- No damage to the sheath or cable elements under visual examination without magnification</li> </ul> </li> </ul>
Crush	<ul style="list-style-type: none"> <li>▪ Test method: IEC 60794-1-21 E3               <ul style="list-style-type: none"> <li>- Long term 1,100N/10cm for 10min</li> <li>- Short term 2,200N/10cm for 1min</li> <li>- Number of tests : 3 with interval 500mm</li> </ul> </li> <li>▪ Acceptance criteria               <ul style="list-style-type: none"> <li>- Attenuation increment                   <ul style="list-style-type: none"> <li>.For long term : □ 0.05 dB during the test</li> <li>.For short term : □ 0.05 dB after the test</li> </ul> </li> <li>- No damage to the sheath or cable elements under visual examination without magnification</li> </ul> </li> </ul>
Torsion	<ul style="list-style-type: none"> <li>▪ Test method: IEC 60794-1-21 E7</li> <li>▪ Cable length twisted: 2m</li> <li>▪ No. of twist cycles: 10 cycles               <ul style="list-style-type: none"> <li>- Twist angle: □180□</li> </ul> </li> <li>▪ Acceptance criteria               <ul style="list-style-type: none"> <li>- Attenuation increment: □ 0.05 dB after the test</li> <li>- No damage to the sheath or cable elements under visual examination without magnification</li> </ul> </li> </ul>

ITEMS	TEST METHOD AND ACCEPTANCE CRITERIA						
Temperature cycling	<ul style="list-style-type: none"> <li>▪ Test method: IEC 60794-1-22 Method F1</li> <li>- Temperature condition                             <table border="1" style="margin-left: 20px;"> <tr> <td>Low (A)</td> <td>TA1 : -30°C</td> <td>TA2 : -40°C</td> </tr> <tr> <td>High (B)</td> <td>TB1 : 60°C</td> <td>TB2 : 70°C</td> </tr> </table> </li> <li>- Temperature cycle sequence (2 cycles)                             <ul style="list-style-type: none"> <li>.1st cycle : TA2 → TB2</li> <li>.2nd cycle : TA1 → TA2 → TB1 → TB2 → 23°C</li> </ul> </li> <li>- Soak time at each temperature : ≥ 16 hours</li> <li>- Attenuation shall be measured at 23°C (reference attenuation) before the sequence and at the end of the soak time at each step (TA1, TA2, TB1, TB2) in the 2<sup>nd</sup> cycle</li> <li>▪ Acceptance criteria                             <ul style="list-style-type: none"> <li>- Max. 0.05dB/km for TA1 and TB1</li> <li>- Max. 0.15dB/km for TA2 and TB2</li> </ul> </li> </ul>	Low (A)	TA1 : -30°C	TA2 : -40°C	High (B)	TB1 : 60°C	TB2 : 70°C
Low (A)	TA1 : -30°C	TA2 : -40°C					
High (B)	TB1 : 60°C	TB2 : 70°C					
Water penetration	<ul style="list-style-type: none"> <li>▪ Test method: IEC 60794-1-22 F5B</li> <li>- Length of specimen: 3m</li> <li>- Height of pressure head: 1m</li> <li>- Test time: 24 hours</li> <li>▪ Acceptance criteria                             <ul style="list-style-type: none"> <li>- No water shall be detected at the unsealed end of the sample</li> </ul> </li> </ul>						

## 7. SAG/TENSION PARAMETERS AND TABLES

Table 8. Maximum Operating Condition (ESC Light)

ITEMS	Value
Temperature (°C)	-1
Wind Pressure (kg/m <sup>2</sup> )	43.9
Ice Thickness (mm)	No ice
Constant (kg/m)	0.0745

Table 9. MAT of Cables

Cable Type	S-150M		
Fiber count	12 ~ 72F	96F	144F
MAT (Max. Allowable Tension) (kgf)	287	360	495

\* Actual values may deviate from the calculated values given in the tables above.

Table 10. Sag/Tension Table

Type	No. of fiber	Max. Installation Tension			Max. Allowable Tension		
		Span (m)	Sag (%)	Tension (kgf)	Ver. Sag (m)	Hori. Sag (m)	Tension (kgf)
S-150M	12 ~ 72F	50	1.0	49	0.2	1.3	127
		60	1.0	59	0.3	1.7	145
		70	1.0	68	0.3	2.0	162
		80	1.0	78	0.4	2.4	179
		90	1.0	88	0.5	2.8	196
		100	1.0	98	0.5	3.2	211
		110	1.0	108	0.6	3.6	227
		120	1.0	117	0.7	4.0	242
		130	1.0	127	0.8	4.5	257
		140	1.0	137	0.8	4.9	272
		150	1.0	147	0.9	5.3	287
S-150M	96F	50	1.0	68	0.2	1.2	158
		60	1.0	81	0.3	1.6	181
		70	1.0	95	0.4	1.9	203
		80	1.0	109	0.4	2.2	224
		90	1.0	122	0.5	2.6	244
		100	1.0	136	0.6	3.0	264
		110	1.0	149	0.7	3.4	284
		120	1.0	163	0.7	3.7	303
		130	1.0	176	0.8	4.1	322
		140	1.0	190	0.9	4.5	341
		150	1.0	203	1.0	4.9	360
S-150M	144F	50	1.0	109	0.3	1.1	212
		60	1.0	130	0.4	1.4	243
		70	1.0	152	0.4	1.7	273
		80	1.0	174	0.5	2.0	303
		90	1.0	196	0.6	2.4	331
		100	1.0	217	0.7	2.7	360
		110	1.0	239	0.8	3.0	387
		120	1.0	261	0.8	3.4	415
		130	1.0	283	0.9	3.7	442
		140	1.0	304	1.0	4.1	468
		150	1.0	326	1.1	4.4	495

\* Actual values may deviate from the calculated values given in the tables above.

## 8. CABLE PACKING AND MARKING

### 8.1 Cable marking

The outer surface of the cable shall be marked with white characters at intervals of one meter with the following information. Other marking is also available upon request.

- 1) Cable type (ex, "ADSS S-150M" )
- 2) Fiber type and counts (ex, " G657A1 48F")
- 3) Name of the manufacturer (" LS Cable & System")
- 4) Year of manufacture
- 5) Length marking

Ex.1) For G657A1 48 fibers cable

0000M	ADSS S-150M	G657A1 48F LS Cable & System 2024	0001M...
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### 8.2 Cable packing

8.2.1 Standard length of the cable shall be 3,000m and 4,000m. Other cable length is also available if requested by customer.

8.2.2 Each length of the cable shall be wound on a separate wooden reel.

8.2.3 Both ends of the cable shall be sealed with suitable plastic caps to prevent the entry of moisture during shipping, handling and storage.

8.2.4 The cable ends shall be securely fastened to the reel to prevent the cable from becoming loose in transit or during placing operations.

8.2.5 Circumference battens or wood-fiber board shall be secured with steel bands to protect the cable during normal handling and shipping.

### 8.3 Cable reel

8.3.1 Details given below shall be distinctly marked with a weather proof materials on both outer

sides of the reel flange:

- 1) Purchaser's name
  - 2) Cable type and fiber counts
  - 3) Length of cable in meters
  - 4) Gross weight in kilograms
  - 5) Reel number
  - 6) Name of manufacturer
  - 7) Year of manufacture
  - 8) Arrow showing the direction drum shall be rolled
- \* Other shipping mark is also available upon request.

8.3.2 The cable shall be shipped on reels designed to prevent damage to the cable during shipment and installation.

8.3.3 The arbor holes provided in the reels shall be at least 75 mm and at most 110 mm in nominal diameter.



**9. HEALTH, SAFETY AND ENVIRONMENT**

**9.1 ROHS directive**

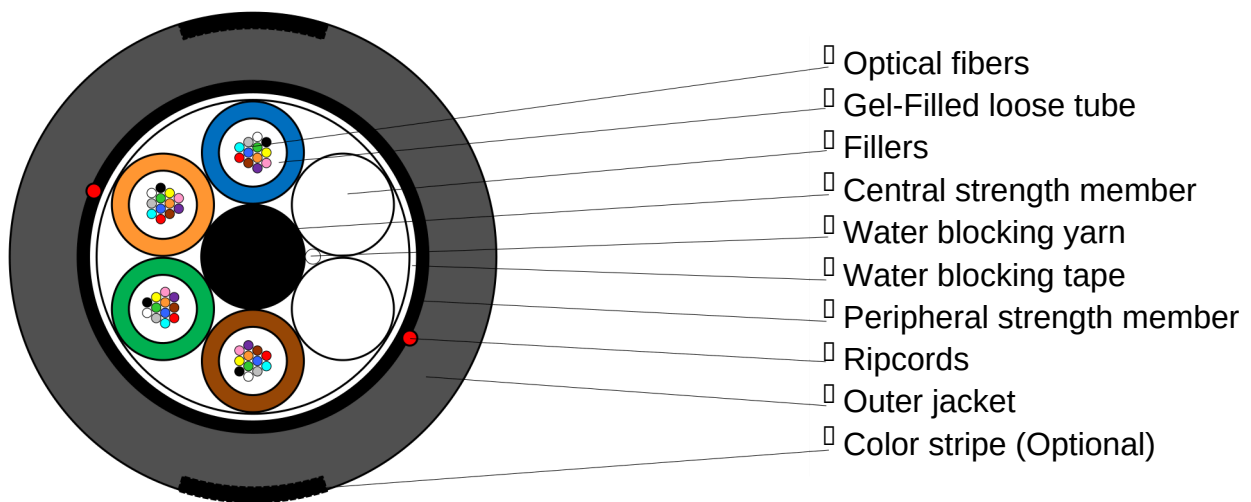
All cables and any associated packing and labeling materials shall meet RoHS (Restriction of the Use of certain Hazardous Substances) regulations as appropriate.

**9.2 ISPM 15**

All wooden packing materials shall meet ISPM (International Standards for Phytosanitary Measures) regulations as appropriate.

**10. CROSS-SECTIONAL DRAWING OF CABLE**

Ex) 48 fiber ADSS Cable



- Not to scale -

Table 11. Cable Dimensions and Minimum Bending Radius

Cable type	Fiber counts	Cable dia. (mm)	Approx. cable weight (kg/km)	Minimum bending radius (mm)	
				Under load	No load
S-150M	12 ~ 72F	10.5 ± 0.5	80	210	105
S-150M	96F	12.5 ± 0.5	108	250	125
S-150M	144F	15.9 ± 0.5	174	320	160

\* Actual values for cable weight and diameter may deviate from the calculated values given in the table above.