

20001787 TL
20004748 QM
20001787 UM
20001787 BSOH



LS Cable & System

TL 9000
ISO 9001
ISO 14001
OHSAS 18001



Tender No.	:	Spec. No.	LSGS-20-OC0516-02		
User / Customer	:	Page No.	1	of	7
Tender Title	:				
Bidder	:	LS Cable & System Ltd.			
Document Title	:	<div style="text-align: center;"> <h1>Specification</h1> <h2>For</h2> <h3>Fiber Optic Cable</h3> <h3>Gel Free Flexible Loose Tube</h3> <h3>Dry Blocked Core / HDPE Single Jacket</h3> <h3>Single Armor with Corrugated Steel Tape</h3> </div>			

01	Oct. 14, 2022	Up to 288F cable added	Chang, Seungig	Lee, Mansu	Lee, Yuhyoung
00	Mar. 25, 2021	International Standard added (ANSI/ICEA S-87-640)	Chang, Seungig	Lee, Mansu	Lee, Yuhyoung
00	Oct. 29, 2020	Original Issue	Chang, Seungig	Lee, Mansu	Lee, Yuhyoung
Rev. No.	Date	Descriptions	Prepared By	Reviewed By	Approved By

1. SCOPE

This specification covers the general requirements of optical cable for duct and direct burial application conforming to Telcordia GR-20 and ANSI/ICEA S-87-640.

OPTICAL FIBER

2. _____

The optical geometrical and mechanical performance of the optical fiber shall be in accordance with Table 1 ~ Table 3 below.

Table 1. Performance of Single Mode Fiber (ITU-T G.652D)

ITEMS		UNITS	SPECIFICATION
Attenuation at 1310/1383/1550 nm		dB/km	≤ 0.35 / ≤ 0.35 / ≤ 0.25
Chromatic Dispersion at 1285~1330/1550 nm		ps/nm.km	≤ 3.5 / ≤ 18
Zero Dispersion Wavelength		nm	1300 ~ 1324
Zero Dispersion Slope		ps/nm ² .km	≤ 0.092
Cable PMD (PMDQ)		ps/√km	≤ 0.2 (20 section link)
Cut-off wavelength (λ _{cc})		nm	≤ 1260
Bending loss	R30mm x 1001	dB	≤ 0.1 at 1625nm
		μm	9.2 ≤ 0.4 / 10.4 ≤ 1.0
MFD at 1310 / 1550nm		μm	≤ 0.6
Core/Cladding Concentricity Error		μm	125 ≤ 0.7
Cladding Diameter		%	≤ 1.0
Cladding Non-circularity		μm	245 ≤ 10
Coating Diameter		GPa	≤ 0.69
Proof Test			

Table 2. Performance of 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 / □ 0.25	
Chromatic Dispersion at 1285~1330/1550 nm		ps/nm.km	□ 3.5 / □ 18	
Zero Dispersion Wavelength		nm	1300 ~ 1324	
Zero Dispersion Slope		ps/nm ² .km	□ 0.092	
Cable PMD (PMDQ)		ps/□km	□ 0.2 (20 section link)	
Cut-off wavelength (□cc)		nm	□ 1260	
Attenuation vs Bending at 1550/1625nm	R15mm x 10	dB	□ 0.25 / □ 1.0	□ 0.03 / □ 0.1 □ 0.1 / □ 0.2
	R10mm x 1	dB	□ 0.75 / □ 1.5	□ 0.5 / □ 1.0
	R7.5mm x 1	dB	-	8.6 □ 0.4
		□m	8.9 □ 0.4	
MFD at 1310nm		□m		
Core/Cladding Concentricity Error		□m	□ 0.5	
Cladding Diameter			125 □ 0.7	

¹ 100 turns with radius 30mm

Cladding Non-circularity	%	□ 1.0
Coating Diameter	□m	245 □ 10
Proof Test	GPa	□ 0.69

Table 3. Performance of Single Mode Fiber (ITU-T G.655D)

ITEMS		UNITS	SPECIFICATION
Attenuation at 1550/1625nm		dB/km	□ 0.24 / □ 0.26
Chromatic Dispersion		ps/nm.km	2.0 ~ 6.0 at 1530 ~ 1565nm 4.5 ~ 11.2 at 1565 ~ 1625nm
Dispersion Slope at 1550nm		ps/nm ² .km	□ 0.09
Cable PMD (PMDQ)		ps/□km	□ 0.20 (20 section link)
Cut-off wavelength (□cc)		nm	□ 1450
Bending loss	R30mm x 100	dB	□ 0.1 at 1625nm
Mode Field Diameter		□m	9.6 □ 0.5 at 1550nm
Core/Cladding Concentricity Error		□m	□ 0.6
Cladding Diameter		□m	125 □ 1
Cladding Non-circularity		%	□ 1
Coating Diameter		□m	245 □ 10
Proof Test Level		GPa	□ 0.69

3. CABLE CONSTRUCTION

The construction of the cable shall be in accordance with Table 4 below.

Table 4. Construction of the Cable

ITEMS		DESCRIPTION				
Number of fibers ²		12 ~ 60	72	96	144	288
No. of fibers per tube		12				
Loose buffer tube	Material	PP (Polypropylene)				
	Filling material	Water blocking yarn Nominal 2.5mm				
	Diameter					
	No. of tubes	Up to 5	6	8	12	9 + 15
Filler rod		PP or PE rods if necessary				
Central strength member		FRP (with PE Coating, if necessary)				
Water blocking material		Water blocking yarn around central strength member				
Core wrapping tape		Water blocking tape				
Outer Strength Member		Glass yarn (if necessary)				
Ripcord		2 ripcords				
Armor	Material	Corrugated steel tape with plastic coating Nominal 0.15mm (Steel tape)				
	Thickness	Nominal 0.05mm (Plastic coating on each side)				
Outer jacket	Material	Black HDPE				
	Thicknes	Nominal 1.3 mm			Nominal 1.5 mm	

² Hybrid cables are also available. For example, 60F cable with 48F G652D and 12F G655D.

Tube positions start with G652D, followed by 657A and G655D.

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 5 and Table 6 below.

Table 5. Color code of the individual fibers

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

Table 6. Color code of the individual loose tubes

No.	Color	No.	Color	No.	Color
1	Blue	9	Yellow	17	Gray/BK stripe
2	Orange	10	Violet	18	White/BK stripe
3	Green	11	Pink	19	Red/BK stripe
4	Brown	12	Aqua	20	Black/WH stripe
5	Gray	13	Blue/BK stripe	21	Yellow/BK stripe
6	White	14	Orange/BK stripe	22	Violet/BK stripe
7	Red	15	Green/BK stripe	23	Rose/BK stripe
8	Black	16	Brown/BK stripe	24	Aqua/BK stripe

For the cables covered by this specification, the following temperature ranges apply:

Operation : -40 °C to +70°C (-40°F to +158°F)
Installation : -30 °C to +60°C (-22°F to +140°F)
Storage/Shipping : -40 °C to +75°C (-40°F to +167°F)

5.2 Mechanical and Environmental Performance of the Cable

The mechanical and environmental performance of the cable shall be in accordance with Table 7 below. Unless otherwise specified, all attenuation measurements required in this section shall be performed at 1550nm.

Table 7. The Mechanical and Environmental Performance of the Cable

ITEMS	TEST METHOD AND ACCEPTANCE CRITERIA
Tensile Loading And Bending Test	<ul style="list-style-type: none"> Test method: TIA/EIA-455-33B, IEC 60794-1-21-E1 <ul style="list-style-type: none"> Mandrel diameter: 40D (D = cable diameter) Installation tensile load: 2,700N (600 lbf) for 1 hour Residual tensile load: 800 N (180 lbf) for 10 mins Acceptance Criteria <ul style="list-style-type: none"> Fiber strain: Less than 60% of the fiber proof strain for installation tensile load Attenuation increment: ≤ 0.05 dB for residual tensile load

ITEMS	TEST METHOD AND ACCEPTANCE CRITERIA
Compressive Loading Resistance Test	<ul style="list-style-type: none"> Test method: TIA/EIA-455-41A, IEC 60794-1-21-E3A <ul style="list-style-type: none"> Short term load: 220N/cm (125lbf/in) for 1min Long term load : 110N/cm (63lbf/in) for 10mins Acceptance Criteria <ul style="list-style-type: none"> Attenuation Increment: <ul style="list-style-type: none"> □ 0.05 dB after the short term load □ 0.05 dB during the long term load
Repeated Impact Test	<ul style="list-style-type: none"> Test method: TIA/EIA-455-25D, IEC 60794-1-21-E4 <ul style="list-style-type: none"> Impact Energy: 10J (1m×1kg) Impact: 2 impacts at 3 different points along the cable length Acceptance Criteria <ul style="list-style-type: none"> Attenuation Increment: □ 0.05 dB after the completion of the test No jacket cracking and fiber breakage
Temperature Cycling Test	<ul style="list-style-type: none"> Test method: TIA/EIA-455-3B, IEC 60794-1-22-F1 <ul style="list-style-type: none"> Temperature cycling schedule : 23□C → -40□C → 70□C → -40□C → 70□C Soak time at each temperature: 24hours Acceptance Criteria <ul style="list-style-type: none"> Attenuation increment: □ 0.10 dB/km
Water Penetration Test	<ul style="list-style-type: none"> Test method: TIA/EIA-455-82C, IEC 60794-1-22-F5B/C <ul style="list-style-type: none"> Orifice or Presoaking is available. Length of specimen: 3m Height of pressure head: 1m Test time: 24 hours Acceptance Criteria <ul style="list-style-type: none"> No leakage through the open cable end

6. PACKING AND MARKING

6.1 Cable and Length Marking

The jacket shall be marked with white characters at intervals of two feet(or one meter) with following information. The accuracy of length marking shall be □1%. Other marking is also available if requested by customer.

- 1) Purchaser name
- 2) Cable type and Fiber counts (ex, OPTICAL FIBER CABLE SJSA G.652D 12F)
- 3) Name of the manufacturer ("LS Cable & System")
- 4) Year of manufacture
- 5) Telephone Symbol
- 6) Length marking in feet or meters

Ex.1) For single mode G.652D 12-fiber cable

0000FT (Purchaser Name)OPTICAL FIBER CABLESJSA G.652D 12F LS Cable & System 2020 (Telephone Symbol) 0000

* Other marking is also available if requested by customer.

6.2 Cable Re-marking

The re-marking shall be marked, preferably with yellow characters, on the outer cable sheath. Any cable that contains two sets of cable markings shall be marked to indicate the color of the marking to be used.

6.3 Cable Packing

- 6.3.1 Standard length of cable shall be 4,000 m. Other cable length is also available if requested by customer.
- 6.3.2 Short length: up to 10% of the deliveries may be shorter than the standard length but never shorter than half of the standard length.
- 6.3.3 Each length of the cable shall be wound on a separate wooden reel.
- 6.3.4 Both ends of the cable shall be sealed with suitable plastic caps to prevent the entry of moisture during shipping, handling and storage.
- 6.3.5 The cable ends shall be securely fastened to the reel to prevent the cable from becoming loose in transit or during placing operations.
- 6.3.6 Circumference battens or fiber board shall be secured with bands to protect the cable during normal handling and shipping.

6.4 Cable Reel

6.4.1 Details given below shall be distinctly marked with a weather proof material on both outer sides of the reel flange or attached a label to a flange:

- 1) Length of cable in feet or meters
- 2) Number of fibers and size
- 3) Gross weight in pounds or kilograms
- 4) Reel number
- 5) Year of manufacture
- 6) Arrow showing the direction the drum shall be rolled

* Other shipping mark is also available if requested by customer.

- 6.4.2 The cable shall be shipped on reels designed to prevent damage to the cable during shipment and installation.
- 6.4.3 The arbor holes provided in the reels shall be at least 65 mm and at most 120 mm in diameter.

7. SAFETY

7.1 ROHS directive

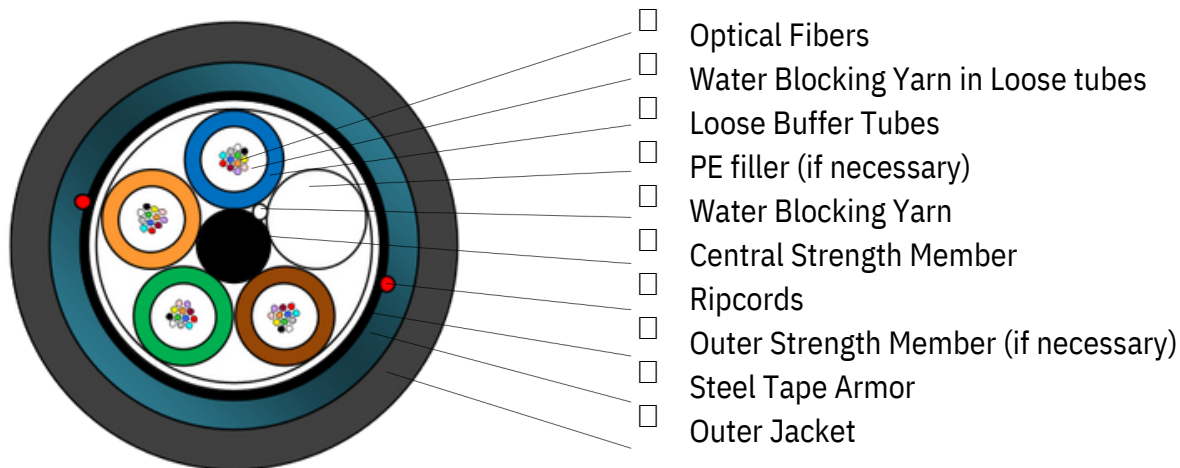
All cables and any associated packing and labeling materials shall meet RoHS (Restriction of the Use of certain Hazardous Substances) regulations as appropriate.

7.2 ISPM 15

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

8. CROSS-SECTIONAL DRAWING OF CABLE

Example) 48-Fiber Cable



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

No. of Fibers	Cable Diameter	Approx. Weight (kg/km)	Minimum Bending Radius (mm)	
			Under Load	No Load
12 ~ 60	11.8 ± 0.5	130	240	120
72	12.2 ± 0.5	135	250	125
96	14.1 ± 0.5	170	280	140
144	17.9 ± 0.5	260	360	180
288	20.7 ± 0.5	305	420	210

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

= End of Specification =