


Technical Specification

for

IOR (Indoor Outdoor Riser Cable) :

Distribution type 2~48C

0	2013.03.22	First Issue	<i>Y. J. Kwak</i>		<i>C. K. Lee</i>
Rev.	DATE	DESCRIPTION	Prepared by	Checked by	Approved by
Type designation : Telecommunication, Flame-retardant LSZH Buffer, LSZH Jacket and Sheath, Tight-buffer type, Indoor/Outdoor use, all dielectric applications, Single and Multimode Fibers					

1. SCOPE

This specification covers the requirements for the flame retardant optical cables in telecommunication applications.

2. STANDARDS AND REGULATIONS

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

Std./Reg.	Designation Title	Reference
International Electro technical Commission(IEC)	Optical fibers, Generic specification	IEC 60793-1
	Optical fibers, Product specification	IEC 60793-2
	Optical fiber cables, Generic specification	IEC 60794-1
	Optical fiber cables, Product specification	IEC 60794-2
	Tests on Optical fiber cables under fire conditions Part 1 : Test on a single vertical insulated cable	IEC 60332-1
	General Construction and Test requirements of low voltage shipboard power cables	IEC 60092-350
International Tele- communication Union	Characteristics of a multi-mode optical fiber	ITU-T G.651
	Characteristics of a single-mode optical fiber and cable	ITU-T G.652
	Characteristics of a bending-loss insensitive single-mode optical fiber and cable for the access network	ITU-T G.657
Underwriters Laboratories	Follow-up and Inspection of optical fiber cable	UL 1651

3. CABLE TYPE

The specification covers the general and construction requirements for the optical cables for the optical cables for indoor/outdoor telecommunication units.

The optical fiber shall be buffered fibers and surrounded with reinforcing aramid yarn and water blocking yarn . And the Jacket shall be extruded over the aramid yarn. The colored outer jacket shall be extruded over the cable core.

Table 1. Types of Cables

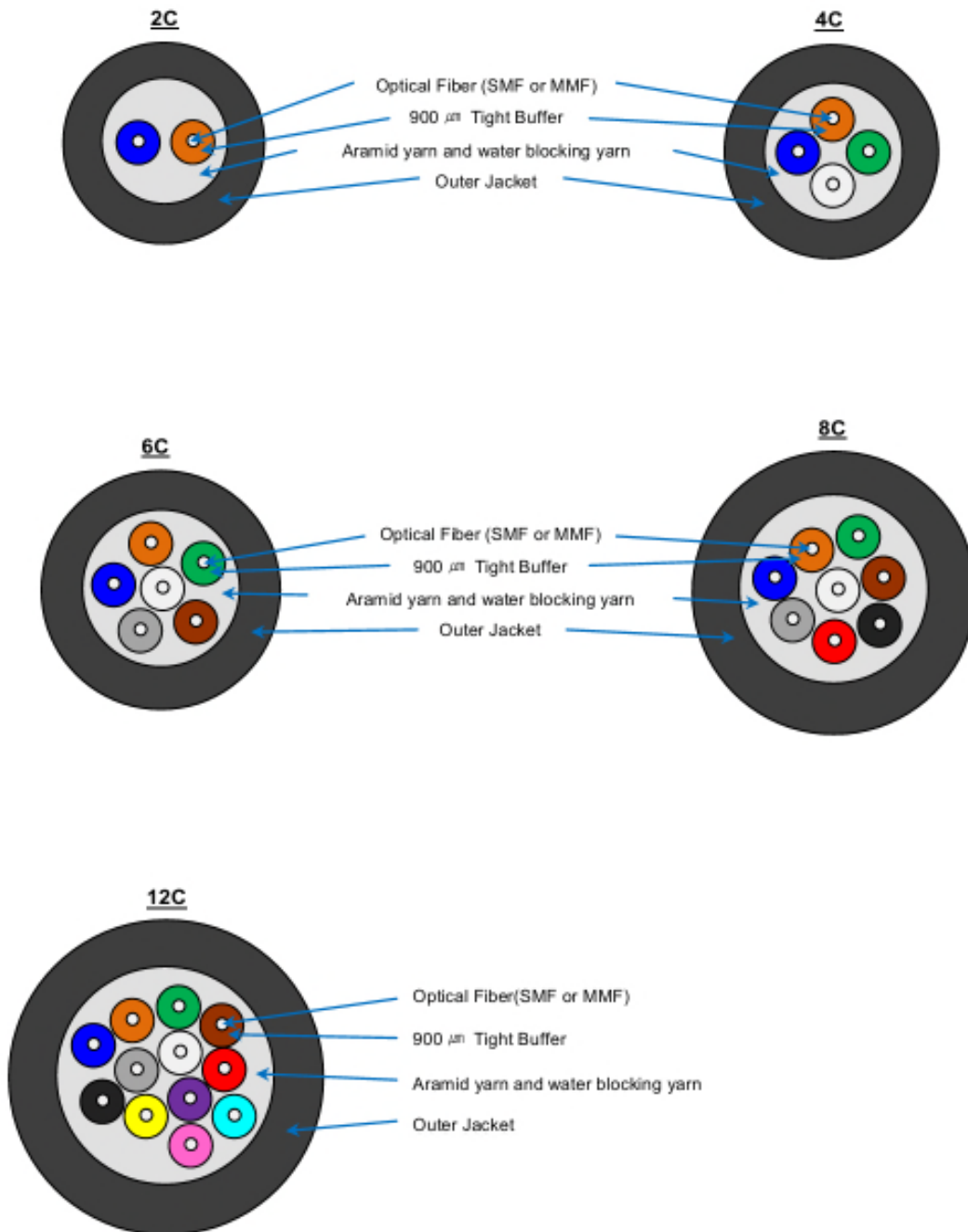
Cable Designation	Cable Type	Fiber Type	Number of Fibers	Buffer Type	Strength Member	Jacket
IOR (Distribution type)	Flame Retardant Cables	SMF (G.652D) (G.657A)	2 ~ 24 (Single unit)	Tight-buffer (LSZH)	Aramid yarn and water blocking yarn	Halogen free Polyolefin (Outdoor LSZH UV stabilized)
		& MMF (OM1) (OM2) (OM3) (OM4)	48 (Multi unit)			

Table 2. Diameter, Weight, Bending Radius and Tensile Load

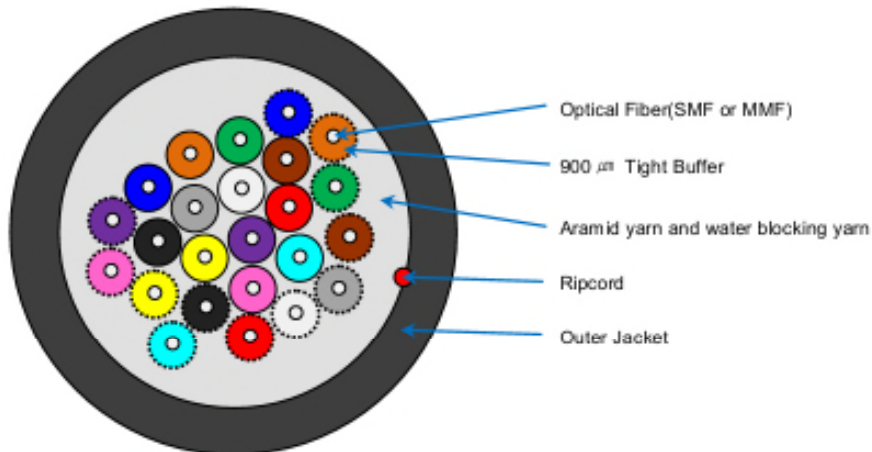
Fiber Count	Units	Tight Buffer Diameter (μm)	Cable Diameter (mm)	Approx. Cable Weight (kg/km)	Cable Bending Radius (mm)	Tensile Load	
						Installation (N)	Operation (N)
2	2F x 1U	900±50	4.3±0.3	18	450	450	250
4	4F x 1U		4.7±0.3	22	450	450	250
6	6F x 1U		5.5±0.3	28	450	450	250
8	8F x 1U		6.1±0.3	34	600	600	300
12	12F x 1U		6.5±0.3	41	600	600	300
24	24F x 1U		9.0±0.5	72	1000	1000	1000
48	12F x 4U	600±50	13.3±0.5	139	1200	1200	600

- F : number of fibers , - U : number of unit

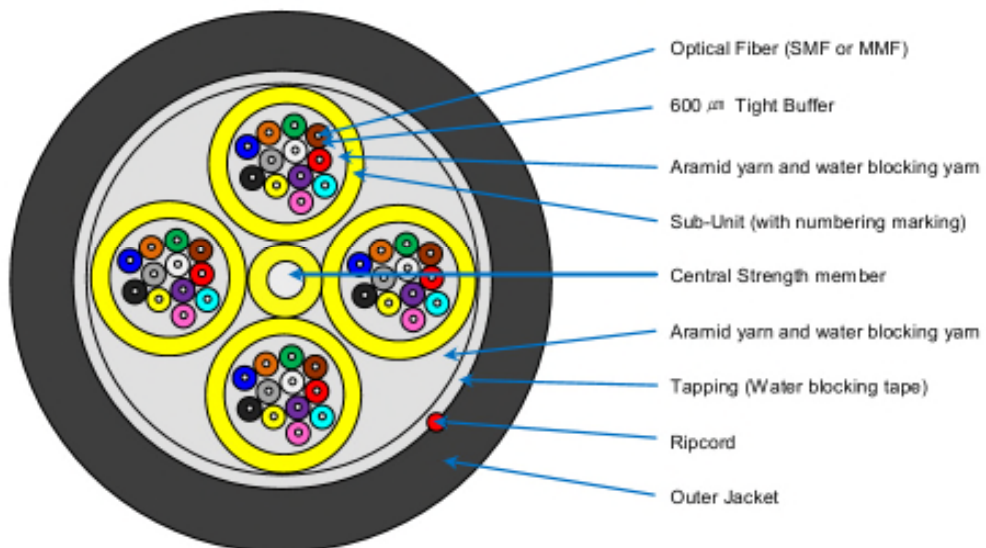
<Cable Cross-sectional Drawing>



24C



48C



4. CONSTRUCTION & IDENTIFICATION

4.1. OPTICAL FIBER

The optical fiber shall be a glass fiber that carries light along its length. It shall be composed of core, cladding and coating layer. Optical fibers shall meet the requirements of IEC 60793-1 and 60793-2.

Table 3. Optical fiber of Single Mode Fiber

Attribute	Detail	Unit	Specification	
			SM G.652D	SM G.657A
Attenuation Coefficient	at 1310nm	dB/km	≤ 0.40	≤ 0.40
	at 1550nm		≤ 0.30	≤ 0.30
Chromatic Dispersion	at 1290nm ~ 1330nm	ps/nm.km	≤ 2.8	≤ 2.8
	at 1550 nm		≤ 18	≤ 18
Zero Dispersion Wavelength		nm	1300 ~ 1322	1300 ~ 1322
Zero Dispersion Slope		ps/nm ² .km	≤ 0.095	≤ 0.095
PMD Coefficient		ps/√ km	≤ 0.4	≤ 0.4
Cut-off Wavelength		nm	≤ 1260	≤ 1260
Mode Field Diameter	at 1310nm	μm	9.2 ± 0.5	8.6 ± 0.5
Cladding Diameter		μm	125 ± 1	125 ± 1
Core/Clad concentricity error		μm	≤ 0.8	≤ 0.8
Cladding Non-circularity		%	≤ 1	≤ 1
Coating Diameter		μm	245 ± 15	245 ± 15

Table 4. Optical fiber of Multi Mode Fiber

Attribute	Detail	Unit	Specification			
			MM62.5 (OM1)	MM50 (OM2)	MM50 (OM3)	MM50 (OM4)
Attenuation Coefficient	at 850nm	dB/km	≤ 3.5	≤ 3.0	≤ 3.0	≤ 3.0
	at 1300nm		≤ 1.5	≤ 1.0	≤ 1.0	≤ 1.0
Bandwidth	at 850nm	MHz.km	≥ 200	≥ 500	≥ 1500	≥ 3500
	at 1300 nm		≥ 500	≥ 500	≥ 500	≥ 500
Numerical Aperture		-	0.275 ± 0.015	0.20 ± 0.015	0.20 ± 0.015	0.20 ± 0.015
Core Diameter		μm	62.5 ± 3.0	50 ± 3.0	50 ± 3.0	50 ± 3.0
Cladding Diameter		μm	125 ± 2.0	125 ± 2.0	125 ± 2.0	125 ± 2.0
Cladding Non-circularity		%	≤ 2.0	≤ 2.0	≤ 2.0	≤ 1.0
Core/Cladding Concentricity Error		μm	≤ 3.0	≤ 3.0	≤ 3.0	≤ 3.0
Coating Diameter		μm	245 ± 15	245 ± 15	245 ± 15	245 ± 15

4.2. TIGHT BUFFER

The tight buffer shall consist of an extruded layer of halogen free compound.

The color of tight buffer shall be follow the below table. Other color of buffer may be applicable when purchaser required.

Table 5. Color of Buffer (for Number 1 to 12 buffers)

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

Table 6. Color of Buffer with line or dot marking (for Number 13 to 24 buffers)

Fiber No.	No.13	No.14	No.15	No.16	No.17	No.18
Color	Blue	Orange	Green	Brown	Gray	White
Fiber No.	No.19	No.20	No.21	No.22	No.23	No.24
Color	Red	Black	Yellow	Violet	Aqua	Pink

4.3. STRENGTH MEMBER

Aramid Yarn, as a strength member applied under jacket for reinforcing.

This cable requires water penetration test, apply suitable water blocking materials (water blocking yarn)

4.4. SUB-UNIT (INNER JACKET)

The sheath shall be an extruded layer of halogen free compound.

The color of sub-units shall be "Yellow" in SMF, "Orange" in MMF. The other color of sheath may be applicable when purchaser required.

The method of classification numbering on the surface of sub-unit jacket is as below, Number marking interval is printed in every 20cm.

- Example 1> Unit 1: SM #1, Unit2: SM #2,.....Unit 4: SM #4
- Example 2> Unit 1: MM 62.5 #1, MM 62.5 #2,.....Unit 4: MM 62.5 #4
- Example 3> Unit 1: MM 50 #1, MM 50 #2,.....Unit 4: MM 50 #4

4.5. CABLING

A number of sub-units apply with suitable filler and reinforcements and suitable yarns to form a circular.

And, suitable tape(s) may be applied on the cabled core. This cable require water penetration test, apply suitable water blocking materials (Water blocking yarn and water blocking tape)

4.6. OUTER JACKET

The sheath shall be an extruded layer of halogen free compound.

The color of outer sheath shall be "Black". The other color of sheath may be applicable when purchaser required. All outer jacket for this cable is UV stabilized LSZH compound for outdoor

A ripcord may be applied for sheath removal under the outer sheath.

5. TEST

The following test shall be carried out in accordance with IEC 60794-1-2 and this specification.

5.1. ROUTINE TEST

Routine tests shall be carried out all cables manufactured and shall be in accordance with specified standards.

5.1.1. Measurement of thickness of sheath test per clause 13.2 of IEC 60092-350

5.1.2. Measurement of attenuation of optical cable per method C of IEC 60793-1-40

Properties	Wavelength	SMF (G.652D, G.657A)	MMF (OM1)	MMF (OM2, OM3, OM4)
Attenuation	850 nm	NA	Max 3.5 dB/km	Max 3.0 dB/km
	1300 nm	NA	Max 1.5 dB/km	Max 1.0 dB/km
	1310 nm	Max 0.4 dB/km	NA	NA
	1550 nm	Max 0.3 dB/km	NA	NA

5.2. TYPE TEST (Mechanical and Environmental properties)

The following type test shall be carried out in accordance with specified standards.

5.2.1. Tensile performance per IEC 60794-1-2-E1,

The test shall examine only the behavior of the attenuation for the cable on load.

Conditions	Test	SMF (at 1550 nm)	MMF(at 1300 nm)
Installation	Change in attenuation	≤ 0.2 dB	≤ 0.3 dB
Operation			

※ Applicable tensile load are followed by table 2.

5.2.2. Crush test per IEC 60794-1-2-E3

Conditions	Test	SMF (at 1550 nm)	MMF(at 1300 nm)
Load _{max} = 1,000N/10 cm 5min.	Change in attenuation	≤ 0.2 dB	≤ 0.3 dB

5.2.3. Impact test per IEC 60794-1-2-E4

Conditions	Test	SMF (at 1550 nm)	MMF(at 1300 nm)
10J, 1impact 3point	Change in attenuation	≤ 0.2 dB	≤ 0.3 dB

5.2.4. Torsion test per IEC 60794-1-2-E7

Conditions	Test	SMF (at 1550 nm)	MMF (at 1300 nm)
30N, $\pm 180^\circ$, 2m, 5cycles	Change in attenuation	≤ 0.2 dB	≤ 0.3 dB

5.2.5. Temperature cycling test per IEC 60794-1-2-F1

Conditions	Test	SMF (at 1550 nm)	MMF (at 1300 nm)
- Temperature cycle : +20°C \rightarrow -20°C \rightarrow +70°C \rightarrow +20°C - Number of cycle : 2 - Time per cycle : 8hours	Change in attenuation	≤ 0.2 dB/km	≤ 0.3 dB/km

5.2.6. Water Penetration test per IEC 60794-1-22-F5

Conditions	Test
3m length, 1m height, 24hr	No leakage of water

5.2.7. Weather(sunlight) resistance test per UL 1581

Conditions	Test
300hr, xenon-arc, 1cycle	85% of retention for tensile strength and elongation

5.2.8. Flame retardant test per IEC 60332-1