



GAON CABLE CO., LTD.
CERTIFIED TO ISO 9001:2015
200001098 TLR6



GAON CABLE CO., LTD.
CERTIFIED TO ISO 14001:2015
200001098 UM15

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Specification

GF AD-018

For

**Loose Tube / Dry core / Single Jacket /
All Dielectric Self Supporting Optical Fiber Cable (ADSS) /
Short span**

[GAON code : OJFPKP-LT]
[Optical Fiber based on SM]

Rev.	Date	Prepared	Checked	Approved	Remark
00	Apr. 28, 2020	B.S. Jang	C.S. Kim	Y.C. Park	Issue
01	Sep. 03, 2020	B.S. Jang	C.S. Kim	Y.C. Park	Sag recalculated
02	Sep. 21, 2020	B.S. Jang	C.S. Kim	Y.C. Park	Updated
03	Nov. 06, 2020	B.S. Jang	C.S. Kim	Y.C. Park	Add 288C, Change test description
04	Dec. 28, 2020	B.S. Jang	C.S. Kim	Y.C. Park	Remove PP tube option

1. Scope

1.1 Application

This specification covers the general requirements for the optical fiber telecom. Cable intended for outdoor applications.

1.2 Cable Description

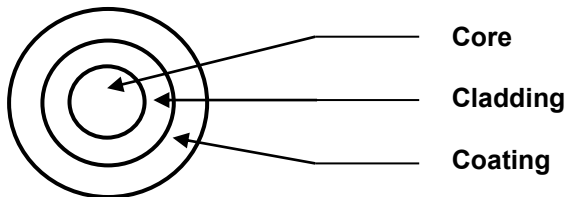
The cable core consist of color coded fibers, thixotropic jelly filled, color coded loose tubes, PE filler(if necessary), SZ-stranded around the dielectric central strength member with water blocking yarn(s).

All Dielectric / Single Jacket

The cable structure is completed by the application of a core wrapping tape, aramid yarn, which with the core, are covered by an outer PE jacket.

2. Optical Fiber

2.1 Construction of the fibers



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

2.3 Material of the Fibers

The fiber shall be made from high grade silica glasses and the coating shall be made from UV curable acrylate material. A protective UV cured acrylate coating shall be applied over the fiber cladding and it shall be able to 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 shall be in accordance with Table 1 (below).

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

Items	Unit	Specification
Type of fiber		ITU-T G.652D
Mode field diameter (@1310nm)	μm	9.2 ± 0.4
Mode field concentricity error	μm	≤ 1.0
Cladding diameter	μm	125 ± 1.0
Cladding non-circularity	%	≤ 1.0
Coating diameter	μm	245 ± 15
Attenuation	dB/km	≤ 0.35 @ 1310 nm ≤ 0.25 @ 1550 nm
Chromatic dispersion	ps/nm.km	≤ 3.5 @ 1285 ~ 1330 nm ≤ 18 @ 1550 nm
Cable cut-off wavelength	nm	≤ 1260
Zero dispersion wavelength	nm	1300 ~ 1324
Zero Dispersion Slope	ps/nm ² .km	≤ 0.092
Proof test	kpsi	Nom. 100

3. Cable Construction

3.1 The construction of the cable shall be in accordance with Table 2 (below).

Table 2-1 Construction of the cable

Items	Description
Fiber yype	See Table 1
No. of fibers	Max. 288C
No. of fibers per tube	12C
Loose buffer tube	PBTP (Polybutylene Terephthalate)
Type of inner Jelly	Thixotropic type Jelly Compound (in L/T)
Filler	Natural color PE rod(s) If necessary, the PE filler use for a circular-section core. (To make good core configuration)
Central strength member	FRP (If necessary, PE coating)
Water blocking material	Water blocking yarn(s) or tape around the CSM (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 shall be applied. (To provide heat barrier & water tightness)
Auxiliary strength member	Aramid yarn
Rip cord	One ripcord (To provide easy cable entry)
Outer Jacket	Black colored MDPE

Table 2-2 NESC Light Load

No. of fibers	Max. Span (ft)	Installation		Loaded		
		Initial sag (%)	Tension (lbs)	Horizontal sag (%)	Vertical sag (%)	Tension (lbs)
72	656 (200m)	1.0	525 (238kgf)	3.5	0.7	887 (402kgf)
96	600 (182m)	1.0	653 (296kgf)	3.1	0.7	1,020 (462kgf)
144	500 (152m)	1.0	851 (386kgf)	2.7	0.8	1,218 (552kgf)
288	500 (152m)	1.0	1,128 (511kgf)	2.5	0.8	1,534 (695kgf)

Table 2-3 NESC Medium Load

No. of fibers	Max. Span (ft)	Installation		Loaded		
		Initial sag (%)	Tension (lbs)	Horizontal sag (%)	Vertical sag (%)	Tension (lbs)
72	500 (152m)	1.0	400 (181kgf)	3.2	2.8	921 (418kgf)
96	500 (152m)	1.0	544 (246kgf)	2.7	2.8	1,085 (492kgf)
144	400 (121m)	1.0	680 (308kgf)	2.2	2.4	1,180 (535kgf)
288	400 (121m)	1.0	905 (410kgf)	1.9	2.2	1,441 (653kgf)

Table 2-4 NESC Heavy Load

No. of fibers	Max. Span (ft)	Installation		Loaded		
		Initial sag (%)	Tension (lbs)	Horizontal sag (%)	Vertical sag (%)	Tension (lbs)
72	300 (91m)	1.0	240 (108kgf)	2.8	3.8	891 (404kgf)
96	300 (91m)	1.0	326 (147kgf)	2.5	3.5	1,022 (463kgf)
144	300 (91m)	1.0	510 (231kgf)	2.1	3.3	1,259 (571kgf)
288	300 (91m)	1.0	679 (307kgf)	1.9	3.1	1,493 (677kgf)

4. Fiber & Loose tube Identification

4.1 The color code of the loose tubes and the individual fibers within each loose tube shall be accordance with Table 3 (below).

Table 3-1 Color code of the Fibers

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

Table 3-2 Color code of the loose buffer tubes

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

* : It is possible to be replaced by Yellow color longitudinal stripe.

5. Mechanical / Environmental Performance & Tests

5.1 The mechanical & environmental performance of the cable shall be in accordance with Table 4 (below). Unless otherwise specified, all attenuation measurements required in this section shall be performed at 1550 nm for single mode. The measurement equipment error can be occurred in range of 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 : 40D (D : cable dia.) - Length under tension : ≥ 50 m - Applied Tensile load : 2,700N - Duration of loading : 1h ● Acceptance criteria <ul style="list-style-type: none"> - Attenuation increment : ≤ 0.1 dB, after test
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 : ≤ 0.1 dB, after test
Impact resistance	<ul style="list-style-type: none"> ● Test method : IEC 60794-1-2 Method E4 <ul style="list-style-type: none"> - Height of impact : 1000 mm - Drop hammer mass : 9.8 N - No. of impact per point : 1 time @ 3 different points ● Acceptance criteria <ul style="list-style-type: none"> - Attenuation increment : ≤ 0.1 dB, after test
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 turns : 4 - Bend angle : ± 180 degree ● Acceptance criteria <ul style="list-style-type: none"> - Attenuation increment : ≤ 0.1 dB, after test
Torsion	<ul style="list-style-type: none"> ● Test method : IEC 60794-1-2 Method E7 <ul style="list-style-type: none"> - Cable twisted length : 2000 mm - No. of twist cycles : 10 cycles - Twist angle : ± 180 degree - Twist rate : 12 sec per cycle - Twist weight : 55N (5.5kgf) ● Acceptance criteria <ul style="list-style-type: none"> - Attenuation increment : ≤ 0.1 dB, after test

<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 : $\geq 1000\text{m}$ - Test condition : ≥ 2 fibers shall be spliced - Temperature cycling schedule : $+23^{\circ}\text{C}$ \rightarrow -40°C \rightarrow $+70^{\circ}\text{C}$ \rightarrow $+23^{\circ}\text{C}$ - Soak time at each temperature : 12h - No. of cycles : 2 ● Acceptance criteria <ul style="list-style-type: none"> - Attenuation increment : ≤ 0.15 dB/km, after test

6. Packing and marking

6.1 Cable marking

The jacket shall be marked every two feet or one meter with following information.

- 1) Cable type & counts
- 2) Name of the manufacturer
- 3) Year of manufacture (****)
- 4) Serial number (#####, 4 or 5 digits)
- 5) Length marking (FEET or m)

- Ex) For SM 72 fiber cable

=00002FT OJFPKP-LT SM 72C GAON ** ##### =00004FT**

6.2 Cable packing

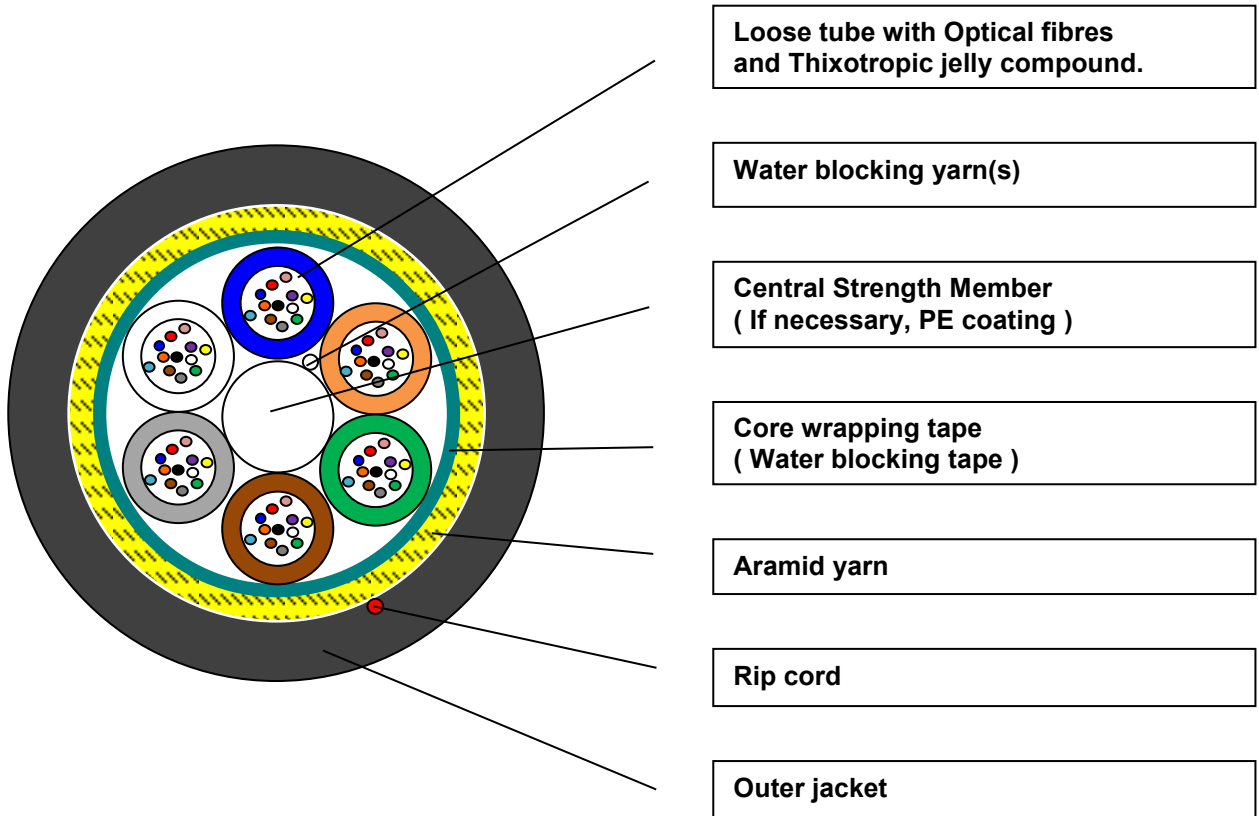
- 6.2.1 Standard length of cable shall be 4,000m(13,120ft). Other cable length is also available if required by customer.
- 6.2.2 Each length of the cable shall be wound on a separate wooden reel.
- 6.2.3 Both ends of the cable shall be sealed with a suitable plastic cap to prevent the entry of moisture during shipping, handling and storage.
- 6.2.4 The cable ends shall be securely fastened to the reel to prevent the cable from becoming loose in transit or during placing operations.
- 6.2.5 The inner end of the cable is housed into a slot on the side of the reel without extra cable length for testing.
- 6.2.6 The reels must have a number of rotations that there is a min. free space of 50mm between the upper layer and the edge of the flanges.
- 6.2.7 Circumference battens or Wood-fiber board shall be secured with steel band to protect the cable during normal handling and storage.

6.3 Cable reel

- 6.3.1 Details given below shall be distinctly marked on a weather proof materials on both 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
 - 5) Drum number
 - 6) Gross & Net weight in kilograms
 - 7) Year of manufacture
 - 8) Name of the manufacturer
 - 9) Arrow showing the direction the drum shall be rolled* Other shipping mark is also available if required by customer.
- 6.3.2 The cable shall be wound on the reel designed to prevent damages during shipment and installation.
- 6.3.3 The minimum barrel diameter of the cable drums shall be at least 40 times the overall cable diameter.
- 6.3.4 The arbor holes provided in the reels shall be 75 ~ 125 mm in diameter. The arbor hole on each flange shall be reinforced with a bearing plate.

Appendix 1

(Cable Cross-Sectional)
 (Drawing not to scale)
 (OJFPKP-LT Type 72 Fiber)



"The drawing appearing on this page may be 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)	
				No Load	Under Load
~ 72	6	0.436 (11.0mm)	62 (90kg/km)	10 D	20 D
96	8	0.491 (12.5mm)	82 (125kg/km)	10 D	20 D
144	12	0.633 (16.0mm)	132 (195kg/km)	10 D	20 D
288	24 (9+15)	0.748 (19.0mm)	176 (260kg/km)	10 D	20 D

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