

**CORNING OPTICAL COMMUNICATIONS GENERIC SPECIFICATION
FOR FIGURE-8 SELF-SUPPORTING LOOSE TUBE OPTICAL FIBER CABLES
FOR OUTDOOR APPLICATIONS**

**November 2023
PGS033
Revision 13**

Corning Optical Communications reserves the right to update this specification without prior notification.

Master Format 33 83 00 Communications Distribution

1.0 General Considerations

- 1.1 The cable shall meet all requirements stated in this specification. The cable shall be an accepted product of the United States Department of Agriculture Rural Utilities Service (RUS) 7 CFR 1755.902 (PE-90) and meet the requirements of ANSI/ICEA Standard for Fiber Optic Outside Plant Communications Cable, ANSI/ICEA S-87-640-2006.

2.0 Fiber Specifications

- 2.1 Detailed information on the fiber types available for this cable design can be found in the following documents:

Dispersion Un-shifted and Non-zero Dispersion Shifted Single-mode Fiber: Generic Specification F1, "Generic Specification for Single-mode Optical Fiber in Loose Tube and Ribbon Cables."

50/125 μm and 62.5/125 μm Multimode Fiber: Generic Specification F2, "Generic Specification for Multimode Optical Fiber in Loose Tube and Ribbon Cables."

3.0 Cable Construction

- 3.1 Optical fibers shall be placed inside a loose buffer tube. The nominal outer diameter of the buffer tube shall be either 2.5mm or 3.0 mm.
- 3.2 Each buffer tube shall contain up to 12 fibers.
- 3.3 The fibers shall not adhere to the inside of the buffer tube.
- 3.4 Each fiber shall be distinguishable by means of color coding in accordance with TIA/EIA-598-B, "Optical Fiber Cable Color Coding."
- 3.5 The fibers shall be colored with ultraviolet (UV) curable inks.
- 3.6 Buffer tubes containing fibers shall be color coded with distinct and recognizable colors in accordance with TIA/EIA-598-B, "Optical Fiber Cable Color Coding."

- 3.6.1 Buffer tube colored stripes shall be inlaid in the tube by means of co-extrusion when required. The nominal stripe width shall be 1 mm.
- 3.7 For cables containing more than 12 buffer tubes, standard colors are used for tubes 1 through 12 and stripes are used to denote tubes 13 through 24. The color sequence applies to tubes containing fibers only, and shall begin with the first tube. If fillers are required, they shall be placed in the inner layer of the cable. The tube color sequence shall start from the inside layer and progress outward.
- 3.8 In buffer tubes containing multiple fibers, the colors shall be stable across the specified storage and operating temperature range and not subject to fading or smearing onto each other or into the gel filling material. Colors shall not cause fibers to stick together.
- 3.9 The buffer tubes shall be resistant to external forces and shall meet the buffer tube cold bend and shrinkback requirements of 7 CFR 1755.902.
- 3.10 Fillers may be included in the cable core to lend symmetry to the cable cross-section where needed. Fillers shall be placed so that they do not interrupt the consecutive positioning of the buffer tubes. In dual layer cables, any fillers shall be placed in the inner layer. Fillers shall be nominally 2.5mm or 3.0 mm in outer diameter.
- 3.11 The central member shall consist of a dielectric, glass reinforced plastic (GRP) rod. The purpose of the central member is to provide tensile strength and prevent buckling. The central member shall be overcoated with a thermoplastic when required to achieve dimensional sizing to accommodate buffer tubes/fillers.
- 3.12 Each buffer tube shall be filled with a non-hygroscopic, non-nutritive to fungus, electrically non-conductive, homogenous gel. The gel shall be free from dirt and foreign matter. The gel shall be readily removable with conventional nontoxic solvents.
- 3.13 Buffer tubes shall be stranded around the dielectric central member using the reverse oscillation, or "S-Z", stranding process. Water swellable yarn(s) shall be applied longitudinally along the central member during stranding.
- 3.14 Two polyester yarn binders shall be applied contrahelically with sufficient tension to secure each buffer tube layer to dielectric central member without crushing the buffer tubes. The binders shall be non-hygroscopic, non-wicking, and dielectric with low shrinkage.
- 3.15 For single layer cables, a water swellable tape shall be applied longitudinally around the outside of the stranded tubes/fillers. The water swellable tape shall

- be non-nutritive to fungus, electrically non-conductive, and homogenous. It shall also be free from dirt and foreign matter.
- 3.16 For dual layer cables, a second (outer) layer of buffer tubes shall be stranded over the original core to form a two-layer core. A water swellable tape shall be applied longitudinally over both the inner and outer layer. The water swellable tape shall be non-nutritive to fungus, electrically non-conductive, and homogenous. It shall also be free from dirt and foreign matter.
 - 3.17 Non-armored cables shall contain at least one ripcord under the sheath for easy sheath removal. Armored cables shall contain at least one ripcord under the inner sheath and at least one ripcord under the steel armor for easy sheath removal.
 - 3.18 An internal steel messenger shall be incorporated into the cable jacket. The messenger shall be a nominal 6.4 mm (0.25 inch) in diameter, extra high strength (EHS), 7 strand, Class A galvanized steel conforming to ASTM A 640. The messenger shall be galvanized for corrosion resistance and asphalt flooded to prevent the ingress of moisture. The minimum rated breaking strength of the messenger shall be 29.58 kN (6,650 lbs)
 - 3.19 Tensile strength for the optical cable shall be provided by the steel messenger, central member and dielectric yarns.
 - 3.20 The high tensile strength dielectric yarns shall be helically stranded evenly around the cable core.
 - 3.21 The optical cable and steel messenger shall be sheathed in polyethylene (PE) with a PE web between the messenger and the optical cable. The web will couple the cable to the messenger. The nominal thickness of the messenger sheath shall be 1.50 mm (0.06 inches). The web shall have a nominal height of 2.29 mm (0.09 inches) and a nominal thickness of 1.52 mm (0.06 inches).
 - 3.22 Figure-8 (non-armored) cable shall be sheathed with PE. The minimum nominal jacket thickness around the cable core shall be 1.4 mm for cables with 3.0mm buffer tubes and 1.3mm for cables with 2.5mm buffer tubes. Jacketing material shall be applied directly over the tensile strength yarns and water swellable tape. The polyethylene shall contain carbon black to provide ultraviolet light protection and shall not promote the growth of fungus. See Figure 1.

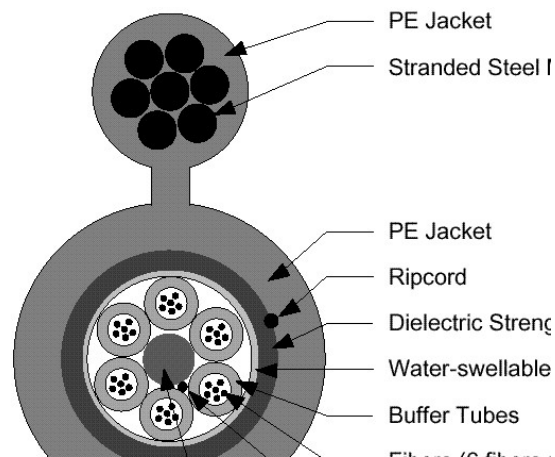


Figure 1

- 3.23 Figure-8 armored cables shall have an inner sheath of PE. The minimum nominal jacket thickness of the inner sheath around the cable core shall be 1.0 mm for cables with 3.0mm buffer tubes and 0.8mm for cables with 2.5mm buffer tubes. The inner jacket shall be applied directly over the tensile strength yarns and water swellable tape. A water swellable tape shall be applied longitudinally around the outside of the inner jacket. The armor shall be a corrugated steel tape, plastic-coated on both sides for corrosion resistance, and shall be applied around the outside of the water swellable tape with an overlapping seam with the corrugations in register. The outer jacket shall be applied over the corrugated steel tape armor. The outer jacket around the cable core shall be an PE with a minimum nominal jacket thickness of 1.4 mm for cables with 3.0mm buffer tubes and 1.3mm for cables with 2.5mm buffer tubes. The polyethylene shall provide ultraviolet light protection and shall not promote the growth of fungus. See Figure 2.

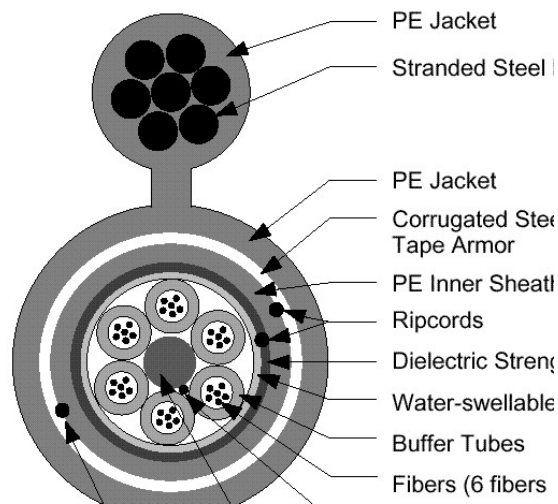


Figure 2

- 3.24 The jacket material shall be Type M for type, class, category, and grade as described in ICEA S-87-640.
- 3.25 The jacket or sheath shall be free of holes, splits, and blisters.
- 3.26 The cable jacket shall contain no metal elements and shall be of a consistent thickness.
- 3.27 Cable jackets shall be marked with the manufacturer's name, month and year of manufacture, sequential meter or foot markings, a telecommunication handset symbol as required by Section 350G of the National Electrical Safety Code® (NESC®), fiber count, and fiber type. The actual length of the cable shall be within -0/+1% of the length markings. The print color shall be white, with the exception that cable jackets containing one or more coextruded white stripes, which shall be printed in light blue. The height of the marking shall be approximately 2.5 mm.
- 3.28 If the initial marking fails to meet the specified requirements (i.e., improper text statement, color, legibility, or print interval), the cable may be remarked using a contrasting alternate color. The numbering sequence will differ from the previous numbering sequence, and a tag will be attached to both the outside end of the cable and to the reel to indicate the sequence of remarking. The preferred remarking color will be yellow, with the secondary choice being blue.
- 3.29 The maximum pulling tension of the optical cable portion with the messenger removed shall be 2000 N (450 lbf) during installation (short term) and 660 N (150 lbf) long term installed.

- 3.30 The shipping, storage, and operating temperature range of the cable shall be -40°C to +70°C. The installation temperature range of the cable shall be -30°C to +70°C.

4.0 Cable Identification

- 4.2 The outer cable jacket shall be marked with the manufacturer's name or ETL file number, date of manufacture, shop order number, optional SOC code (SR#####), fiber count, fiber type, flame rating, listing symbol, and sequential length markings every two feet (e.g., "CORNING OPTICAL COMMUNICATIONS OPTICAL CABLE - MM/YY. XXXXX (feet or meters). The marking shall be in contrasting color to the cable jacket.

5.0 Cable Performance Specifications

For mechanical and environmental testing, it is acceptable to remove the messenger from the optical cable. Tensile testing as stated in paragraph 5.7 document has been conducted with the messenger attached to the optical cable.

- 5.1 When tested in accordance with FOTP-3, "Procedure to Measure Temperature Cycling Effects on Optical Fibers, Optical Cable, and Other Passive Fiber Optic Components," the change in attenuation at extreme operational temperatures (-40°C and +70°C) shall not exceed 0.15 dB/km at 1550 nm for single-mode fiber and 0.3 dB/km at 1300 nm for multimode fiber.
- 5.2 When tested in accordance with FOTP-82, "Fluid Penetration Test for Fluid-Blocked Fiber Optic Cable," a one meter length of unaged cable shall withstand a one meter static head or equivalent continuous pressure of water for one hour without leakage through the open cable end.
- 5.3 When tested in accordance with FOTP-81, "Compound Flow (Drip) Test for Filled Fiber Optic Cable," the cable shall exhibit no flow (drip or leak) of filling and/or flooding material at 70°C.
- 5.4 When tested in accordance with FOTP-41, "Compressive Loading Resistance of Fiber Optic Cables," the cable shall withstand a minimum compressive load of 220 N/cm (125 lbf/in) applied uniformly over the length of the sample. The 220 N/cm (125 lbf/in) load shall be applied at a rate of 2.5 mm (0.1 in) per minute. The load shall be maintained for a period of 1 minute. The load shall then be decreased to 110 N/cm (63 lbf/in). Alternatively, it is acceptable to remove the 220 N/cm (125 lbf/in) load entirely and apply the 110 N/cm (63 lbf/in) load within five minutes at a rate of 2.5 mm (0.1 in) per minute. The 110 N/cm (63 lbf/in) load shall be maintained for a period of 10 minutes. Attenuation

measurements shall be performed before release of the 110 N/cm (63 lbf/in) load. The change in attenuation shall not exceed 0.15 dB during loading at 1550 nm for single-mode fibers and 0.3 dB during loading at 1300 nm for multimode fiber.

- 5.5 When tested in accordance with FOTP-104, "Fiber Optic Cable Cyclic Flexing Test," the cable shall withstand 25 mechanical flexing cycles around a sheave diameter not greater than 20 times the cable diameter. The change in attenuation shall not exceed 0.15 dB at 1550 nm for single-mode fiber and 0.3 dB at 1300 nm for multimode fiber.
- 5.6 When tested in accordance with FOTP-25, "Repeated Impact Testing of Fiber Optic Cables and Cable Assemblies," except that the number of cycles shall be two at three locations along a one meter cable length and the impact energy shall be at least 4.4 Nm (in accordance with ICEA S-87-640)", the change in attenuation shall not exceed 0.15 dB at 1550 nm for single-mode fiber and 0.3 dB at 1300 nm for multimode fiber.
- 5.7 When tested in accordance with FOTP-33, "Fiber Optic Cable Tensile Loading and Bending Test," using a maximum mandrel and sheave diameter of 560 mm, the cable shall withstand a rated tensile load of 2670 N (600 lbf) and residual load of 30% of the rated installation load. The axial fiber strain shall be $\leq 60\%$ of the fiber proof level after completion of 60 minute conditioning and while the cable is under the rated installation load. The axial fiber strain shall be $\leq 20\%$ of the fiber proof level after completion of 10 minute conditioning and while the cable is under the residual load. The change in attenuation at residual load and after load removal shall not exceed 0.15 dB at 1550 nm for single mode fiber and 0.3 dB at 1300 nm for multimode fiber.
- 5.8 When tested in accordance with FOTP-85, "Fiber Optic Cable Twist Test," a length of cable no greater than 2 meters shall withstand 10 cycles of mechanical twisting. The change in attenuation shall not exceed 0.15 dB at 1550 nm for single-mode fiber and 0.3 dB at 1300 nm for multimode fiber.
- 5.9 When tested in accordance with FOTP-181, "Lightning Damage Susceptibility Test for Optic Cables with Metallic Components," the cable shall withstand a simulated lightning strike with a peak value of the current pulse equal to 105 kA without loss of fiber continuity. A damped oscillatory test current shall be used with a maximum time-to-peak value of 15 μ s (which corresponds to a minimum frequency of 16.7 kHz) and a maximum frequency of 30 kHz. The time to half-value of the waveform envelope shall be from 40 - 70 μ s.
- 5.10 When tested in accordance with FOTP-37, "Low or High Temperature Bend Test for Fiber Optic Cable," the cable shall withstand four full turns around a mandrel of ≤ 20 times the cable diameter after conditioning for four hours at test

temperatures of -30°C and +60°C. Neither the inner or outer surfaces of the jacket shall exhibit visible cracks, splits, tears, or other openings. The change in attenuation shall not exceed 0.3 dB at 1550 nm for single mode fiber and 0.5 dB at 1300 nm for multimode fiber.

- 5.11 Typical installed sag and tension values for cables with 3.0mm buffer tubes are given in the table below. The cable manufacturer shall provide sag and tension calculations for other span lengths, fiber counts, and environmental conditions as required.

Fiber Count	Cable Type	Span 45 m (150 ft) Tension 800 lbs	Span 45 m (150 ft) Tension 1000 lbs	Span 45 m (150 ft) Tension 1200 lbs
2 - 60	Non-Armored	0.23 m (0.75 ft)	0.19 m (0.63 ft)	0.16 m (0.53 ft)
	Armored	0.31 m (1.02 ft)	0.26 m (0.86 ft)	0.22 m (0.72 ft)
133 - 144	Non-Armored	0.31 m (1.01 ft)	0.25 m (0.81 ft)	0.20 m (0.67 ft)
	Armored	0.43 m (1.40 ft)	0.34 m (1.12 ft)	0.28 m (0.93 ft)
276 - 288	Non-Armored	0.39 m (1.27 ft)	0.31 m (1.01 ft)	0.26 m (0.85 ft)
	Armored	0.53 m (1.74 ft)	0.43 m (1.40 ft)	0.35 m (1.16 ft)

(1) Installation tensions are at 23°C.

(2) Sag values reflect initial installed sag without ice or wind loading.

The maximum rated tensile load during installation for all Figure-8 cables shall be 2700 N (600 lbf).

6.0 Packing and Shipping

- 6.1 The completed cable shall be packaged for shipment on non-returnable wooden reels. Required cable lengths shall be stated in the purchase order.
- 6.2 Top and bottom ends of the cable shall be available for testing.
- 6.3 Both ends of the cable shall be sealed to prevent the ingress of moisture.
- 6.4 Each reel shall have a weather resistant reel tag attached identifying the reel and cable.

The reel tag shall include the following information:

Cable Number	Gross Weight
Shipped Cable Length in Meters	Job Order Number
Corning Product Number	Customer Order Number

Date Cable was Tested	Corning Order Number
Cable Length Markings	Item Number
a: Top (inside end of cable)	
b: Bottom (outside end of cable)	

The reel (one flange) marking shall include:

- "Corning Optical Communications"
- Country of origin (e.g., USA)
- An arrow indicating proper direction of roll when handling
- Fork lift handling illustration
- "DO NOT SHIP REEL ON SIDE"
- or "DO NOT LAY REEL ON ITS SIDE"

6.5 Each cable shall be accompanied by a cable data sheet.

The cable data sheet shall include the following information:

Corning Cable Number	Corning Product Number
Corning Factory Order Number	Customer Name
Alternate Customer	Customer Cable Number
Customer Purchase Order Number	Alternate Code
Mark for Information	Ordered Length
Maximum Billable Length	Actual Shipped Length
Measured Attenuation of Each Fiber (for lengths > 1000 m)	Bandwidth Specification (where applicable)

7.0 Quality Assurance Provisions

- 6.1 All cabled optical fibers > 1000 meters in length shall be 100% attenuation tested. The attenuation of each fiber shall be provided with each cable reel.
- 6.2 The cable manufacturer shall be TL 9000 registered

8.0 Miscellaneous

- 8.1 At the request of the customer, the cable manufacturer shall provide installation procedures and technical support concerning the items contained in this specification.

Gen Spec PGS033 Revision History

Revision #	Date	Reason for Change
9	10/14/02	Gen Spec updated to reflect latest revision of TIA-598 (B)
10	12/18/03	Gen Spec updated due to an error on conversion between pounds and KN for the minimum rated breaking strength of the messenger, on 3.18
11	6/3/09	Gen Spec updated to reflect 2.5mm buffer tubes. Also leave in references to 3.0mm buffer tubes since they are still available
12	9/6/17	Reformatted and added Identification section.