

CORNING OPTICAL COMMUNICATIONS GENERIC SPECIFICATION FOR TIGHT BUFFER OPTICAL FIBER CABLES FOR INTER- AND INTRABUILDING APPLICATIONS

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Revision 11

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

Master Format 27 13 23 Communications Optical Fiber Backbone Cabling

1.0 General Considerations

- 1.1 The cable must meet the requirements of the National Electrical Code[®] (NEC)[®] Section 770 for the intended application space:
 - 1.1.1 Plenum Applications - Applicable Flame Test: NFPA 262. Cables shall be listed OFNP (OFCP).
 - 1.1.2 Non-Plenum Applications - Applicable Flame Test: UL-1666. Cables shall be listed OFNR (OFCR).
- 1.2 Finished cables shall conform to the applicable performance requirements of the Insulated Cable Engineers Association, Inc. (ICEA) *Standard for Fiber Optic Premises Distribution Cable* (ICEA S-104-696).

2.0 Fiber Specifications

- 2.1 Detailed information on the cabled performance of the fiber types available for this cable design can be found in the following documents:
 - 2.1.1 Dispersion Un-shifted Single-mode Fiber: Generic Specification F3, "Generic Specification for Single-mode Optical Fiber in Tight Buffer Cables."
 - 2.1.2 50/125 μm and 62.5/125 μm Multimode Fiber: Generic Specification F4, "Generic Specification for Multimode Optical Fiber in Tight Buffer Cables."

3.0 Cable Construction

- 3.1 The coated fiber shall have a low friction slip layer placed between the acrylate coating of the optical fiber and the thermoplastic buffer. The diameter of the thermoplastic buffer coating shall be $900 \pm 50 \mu\text{m}$.
- 3.2 The fiber coating and buffer shall each be removable with commercially available stripping tools in a single pass for connector termination or splicing.

- 3.3 The individual 900 μm buffered fibers shall be color coded for identification. The optical fiber color coding shall be in accordance with EIA/TIA-598, "Optical Fiber Cable Color Coding." The coloring material shall be stable over the temperature range of the cable, shall not be susceptible to migration, and shall not affect the transmission characteristics of the optical fibers. Color-coded buffered fibers shall not adhere to one another.
- 3.4 The fibers shall be stranded around a dielectric strength element consisting of aramid strength yarns. The purpose of the central member is to provide tensile strength.
- 3.5 Water-blocking, strength yarns shall serve as the tensile strength members of the cable. The strength members shall be a high modulus aramid yarn and shall be water swellable to prevent the migration of water throughout the cable. The water-blocking aramid yarns shall be non-nutritive to fungus, electrically non-conductive and homogeneous.
- 3.6 The aramid yarns shall be helically stranded around the 900 μm buffered fibers. Non-toxic, non-irritant talc shall be applied to the yarns to allow them to be easily separated from the fibers and the outer jacket.
- 3.7 Outer Cable Jacket:
- 3.7.1 The jacket shall be continuous, free from pinholes, splits, blisters, or other imperfections. The jacket shall have a consistent, uniform thickness; pressure extruded jackets are not acceptable. The jacket shall be smooth, as is consistent with the best commercial practice. The jacket shall provide the cable with a tough, flexible, protective coating, able to withstand the stresses expected in normal installation and service. The jacket shall not promote the growth of fungus.
- 3.7.2 The OFNP cable jacket shall be a flame retardant Polyvinyl Chloride (PVC) containing carbon black or a UV stabilized colored compound, resistant to prolonged ultraviolet light exposure. For cables with 2 to 12 fibers the nominal thickness of the cable jacket shall be 0.8 mm, and for the 18 or 24-fiber cable the nominal thickness of the cable jacket shall be 1.0 mm.
- 3.7.3 The OFNR cable jacket shall be a flame retardant Polyvinyl Chloride (PVC) containing carbon black or a UV stabilized colored compound, resistant to prolonged ultraviolet light exposure. For cables with 2 to 12 fibers the nominal thickness of the cable jacket shall be 0.9 mm, and for the 18 or 24-fiber cable the nominal thickness of the cable jacket shall be 1.0 mm.
- 3.7.4 Cable jackets shall be capable of being colored any of the 12 colors identified in EIA/TIA-598, "Optical Fiber Cable Color Coding", if

requested to enhance cable identification. Colored jackets shall contain UV stabilizers to provide ultraviolet light protection.

- 3.8 The cable shall be all-dielectric except as noted in section 3.8 below.
- 3.9 The cables specified herein shall be available with an optional aluminum interlocking armor. The interlocking armor shall be covered with a flame retardant PVC outer jacket for OFNP and OFNR cables. The armor and outer jacket shall be comparable to liquid tight flexible metal conduit.

4.0 Cable Identification

- 4.1 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 - SO### - SR##### - 2 MM50 PRETIUM 300 ULTRA-BEND 7.5 – TB2 - OFNR FT4 c(ETL)us XXXXX FEET"). The marking shall be in contrasting color to the cable jacket.

5.0 Cable Performance Specifications

- 5.1 Temperature Range.

The storage temperature range for the cable on the original shipping reel shall be -40 °C to +70 °C. The installation temperature range for the cable shall be 0 °C to +60 °C for plenum cables and -10 °C to +60 °C for riser cables . The operating temperature range for the cable shall be -40 °C to +70 °C. Testing shall be in accordance with FOTP-3.

- 5.2 Tensile Loading and Fiber Strain

When tested in accordance with FOTP-33, "Fiber Optic Cable Tensile Loading and Bending Test," and FOTP-38, "Measurement of Fiber Strain in Cables Under Tensile Load," a length of cable shall be tested to the rated tensile load. For cables \leq 18f the rated tensile load is 660 N (148 lbf) and for 24f cables the rated tensile load is 1320 N (297 lbf). While under the rated tensile load, the fiber shall not experience a measured fiber strain greater than 60% of the fiber proof test level. After being held at the residual load (30% of the rated tensile load) the fiber shall not experience a measured fiber strain greater than 20% of the fiber proof test level nor an attenuation change greater than 0.40 dB at 1550 nm (single-mode) or greater than 0.60 dB at 1300 nm (multimode). After the tensile load is removed, the fibers shall not experience an attenuation change greater than 0.40 dB at 1550 nm (single-mode) or greater than 0.60 dB at 1300 nm (multimode).

- 5.3 Compressive Loading Test

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 0.40 dB at 1550 nm for single-mode fibers and 0.60 dB at 1300 nm for multimode fiber.

5.4 Cyclic Flexing Test

When tested in accordance with FOTP-104, "Fiber Optic Cable Cyclic Flexing Test," the cable shall withstand 25 mechanical flexing cycles at a rate of 30 ± 1 cycles per minute. The fiber shall not experience an attenuation change greater than 0.40 dB at 1550 nm (single-mode) or greater than 0.60 dB at 1300 nm (multimode). No cracks, splits, tears or other opening shall be present on the inner or outer surface of the jacket. No visible cracks greater than 5 mm in the armor, if present, shall be present.

5.5 Twist Test

When tested in accordance with FOTP-85, "Fiber Optic Cable Twist Test," a length of cable no greater than 2 meters will withstand 10 cycles of mechanical twisting. The fiber shall not experience an attenuation change greater than 0.40 dB at 1550 nm (single-mode) or greater than 0.60 dB at 1300 nm (multimode). No cracks or splits in the jacket shall be present when inspected under 5X magnification.

5.6 Low Temperature Bend

When tested in accordance with FOTP-37, "Fiber Optic Cable Bend Test," the cable shall withstand four full turns around a mandrel at test temperatures of 0 °C. The fibers shall not experience an attenuation change greater than 0.40 dB at 1550 nm (single-mode) or greater than 0.60 dB at 1300 nm (multimode).

5.7 Impact Resistance

When tested in accordance with FOTP-25, "Repeated Impact Testing of Fiber Optic Cables and Cable Assemblies," the cable shall withstand a minimum of 2 impact cycles at 3 locations separated by at least 150 mm. The impact energy shall be 4.4 N•m. The fibers shall not experience an attenuation change

greater than 0.40 dB at 1550 nm (single-mode) or greater than 0.60 dB at 1300 nm (multimode). The presence of visible cracks, splits, tears, or other openings on the outer surface of the jacket constitute a failure.

5.8 Temperature Cycling

When tested in accordance with FOTP-3, "Procedure to Measure Temperature Cycling Effects on Optical Fiber, Optical Cable, and Other Passive Fiber Optic Components," the change in attenuation after 2 cycles at the low and high operational temperatures (-40 °C to +70 °C) shall not exceed 0.40 dB/km at 1550 nm (single-mode) or 0.60 dB/km at 1300 nm (multimode). The change in attenuation is measured with respect to the baseline values measured at room temperature before temperature cycling after the last low and last high temperature.

5.9 Water Penetration

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. Retesting using a 3 meter length of cable shall not be permitted.

5.10 Cold Impact Test

When tested in accordance with FOTP-25, "Repeated Impact Testing of Fiber Optic Cables and Cable Assemblies," the cable shall withstand a minimum of 2 impact cycles at 3 locations separated by at least 150 mm. The impact energy shall be 2.9 N•m. The cable shall be conditioned for at least 4 hours at the minimum installation temperature (10°C for plenum and -10 °C for riser). The presence of visible cracks on either the inner or outer surface of the jacket constitutes a failure. No optical measurements are required.

6.0 Packing and Shipping

- 6.1 Each package shall contain only one continuous length of cable. The packaging shall be constructed so as to prevent damage to the cable during shipping and handling.
- 6.2 The completed cable shall be packaged for shipment on a wooden reel and shall be covered with a three layer laminated protective material. The outer end of the cable shall be securely fastened to the reel head so as to prevent the cable from becoming loose in transit. The inner end of the cable shall project into a slot in the side of the reel or into a housing on the inner slot of the drum, in such a manner and with sufficient length to make it available for testing.

6.3 Test tails shall be at least two meters long. The inner end shall be fastened so as to prevent the cable from becoming loose during shipping and installation. Both ends of the cable shall be sealed to prevent the ingress of moisture.

6.4 Reel Marking and Labeling. Every cable shall come with the following information:

6.4.1 Reel Label:

Part number
Reel number
Length (ft/m)
Marking (ft/m) top and bottom
Date of manufacture
Listing information

6.4.2 Bar Code Label:

Package ID
Reel number
Quantity
Customer ID
Package count
Factory order number
Release part number
Length (ft)
"Ship to:" address
"Attention to:"

6.4.3 Stenciling:

Manufacturer's name and address
Direction of rotation
Reel size
"DO NOT LAY REEL ON SIDE"

7.0 Quality Assurance Provisions

7.1 All optical fibers in cables lengths of 300 m or greater shall be 100 % attenuation tested. The attenuation shall be measured at 850 nm and 1300 nm for multimode fibers. The attenuation shall be measured at 1310 nm and 1550 nm for single-mode fibers. The manufacturer shall store these values for a minimum of 5 years. These values shall be available upon request.

7.2 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 #61 Revision History

Revision #	Date	Reason for Change
1	17 Oct 03	Correction to Temperature Ranges, Cold Impact Temperature and removed references for OFNR cables because of lag in development of OFNR construction
2	29 Dec 03	Remove references to fiber counts greater than 12 in sections 3.3 and 5.2. Added word "requirements" to 1.2. Added word "each" to 3.2.
3	27 Aug 04	Revised for reintroduction of 24F design and other corrections as needed: <ul style="list-style-type: none"> • Corrected CM description in 3.3 for all fiber counts. • Revised 3.6.2 for reintroduction of 24F cable design. • Corrected order of print statement in 4.2. • Added installation temperature range for plenum cable in 5.1. • Added Cold Impact conditioning temperature for riser cable in 5.10.
4	15 Oct 04	Added section 1.1.2 for OFNR (OFCR) and added (OFCP) to section 1.1.1.
5	20 Dec 05	– Updated jacket section to stipulate PVDF for ONFP jackets and PVC for OFNR jackets.
6	01 Jan 06	DKH – Deleted option of bare interlocking armor and made editorial changes to language revised on 20 Dec 05.
7	06 Sep 06	Updated jacket printing
8	27 Sep 09	In section 4.2, change to new print statement, "CORNING CABLE SYSTEMS OPTICAL CABLE - MM/YY - SO### - SR##### - 2 MM50 PRETIUM 300 ULTRA-BEND 7.5 – TB2 - OFNR FT4 c(ETL)us XXXXX FEET". Also added reference to new shop order number and optional SOC Code
9	18 Aug 11	Make revisions reflecting the design change to plenum and riser versions. Changes include: <ul style="list-style-type: none"> • Removal of GRP strength element • Change in wall thickness for both riser and plenum versions • Change in tensile strength • Change in cold impact conditioning temperature for

		plenum
10	April 12	Added information on colored jackets
11	Sept 17	Reformatted, added Master Format number.