

# CORNING CABLE SYSTEMS GENERIC SPECIFICATION FOR TIGHT BUFFER OPTICAL FIBER CABLES FOR INDOOR DISTRIBUTION APPLICATIONS

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Revision 23

*Corning Cable Systems reserves the right to update this specification without prior notification.*

## 1.0 General Considerations

The cable must meet the requirements of the National Electrical Code® (NEC)® Section 770.

- 1.1 Non-Plenum Applications - Applicable Flame Tests: UL 1666. Cables shall be listed OFNR (OFCR).
- 1.2 Plenum Applications - Applicable Flame Test: NFPA 262. Cables shall be listed OFNP (OFCP).
- 1.3 Finished cables shall conform to the applicable performance of the Insulated Cable Engineers Association, Inc. (ICEA) *Standard for Fiber Optic Premises Distribution Cable* (ICEA S-83-596).

## 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:

Dispersion Un-shifted Single-mode Fiber: Generic Specification F3, "Generic Specification for Single-mode Optical Fiber in Tight Buffer Cables."

50/125  $\mu\text{m}$  and 62.5/125  $\mu\text{m}$  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 be removable with commercially available stripping tools in a single pass for connectorization or splicing.
- 3.3 Cables with 2 to 24 Fibers

- 3.3.1 Layered strength yarns shall serve as the tensile strength member of the cable.
- 3.3.2 A ripcord may be applied between the strength yarns and the outer jacket to facilitate jacket removal.
- 3.3.3 The outer jacket shall be extruded over the strength yarns for physical and environmental protection. The jacket shall be continuous, free from pinholes, splits, blisters, or other imperfections. The jacket shall have a consistent, uniform thickness. The jacket shall be smooth, as is consistent with the best commercial practice.
- 3.3.4 Riser and Plenum
  - 3.3.4.1 For riser rated cables, the fibers shall be stranded around a dielectric strength yarn for all fiber counts except 8 fibers. For cables containing 8 fibers, the fibers shall be stranded around a jacketed glass reinforced plastic central member. For cables containing 12-24 fibers, the fibers shall be arranged in two layers.
  - 3.3.4.2 For plenum rated cables, the fibers shall be stranded around a dielectric strength yarn for all fiber counts except 8 fibers. For cables containing 8 fibers, the central dielectric strength yarn shall be overcoated with a thermoplastic, when required, to achieve dimensional sizing to accommodate and support the 900  $\mu$ m buffered fibers. For cables containing 12-24 fibers, the fibers shall be arranged in two layers.
- 3.3.5 Riser and Plenum Cable Minimum Bend Radius
  - 3.3.5.1 For riser and plenum rated cables, the minimum bend radius of the cable in its installed configuration shall be 5X the cable outer diameter except for cables containing 8, 18 or 24 fibers. For cables containing 8, 18 or 24 fibers, the minimum bend radius of the cable in its installed configuration shall be 10X the cable outer diameter. The minimum bend radius of the cable shall be 15X the cable outer diameter when under load.
- 3.4 Cables with 24 to 54 Fibers: Unitized Riser and Plenum Constructions
  - 3.4.1 The buffered fibers shall be grouped in 6-fiber subunits.
  - 3.4.2 The fibers shall be stranded around a dielectric strength yarn in the subunit.

- 3.4.3 Layered strength yarns shall serve as the tensile strength member of the subunit.
  - 3.4.4 A ripcord may be applied between the strength yarns and the subunit jacket to facilitate jacket removal.
  - 3.4.5 The subunit jacket shall be extruded over the strength yarns for physical and environmental protection. The jacket shall be continuous, free from pinholes, splits, blisters, or other imperfections. The jacket shall have a consistent, uniform thickness. The jacket shall be smooth, as is consistent with the best commercial practice.
  - 3.4.6. The subunits shall be stranded around a dielectric central member. A ripcord shall be inserted beneath the outer jacket to facilitate jacket removal. The outer jacket shall be extruded around the subunits.
- 3.5 Cables with 60 Fibers or more: Unitized Riser and Plenum Constructions
- 3.5.1 The buffered fibers shall be grouped in 12-fiber subunits.
  - 3.5.2 The fibers shall be stranded around a dielectric strength yarn. The fibers shall be arranged in two layers.
  - 3.5.3 Layered strength yarns shall serve as the tensile strength member of the subunit.
  - 3.5.4 A ripcord may be applied between the strength yarns and the subunit jacket to facilitate jacket removal.
  - 3.5.5 The subunit jacket shall be extruded over the strength yarns for physical and environmental protection. The jacket shall be continuous, free from pinholes, splits, blisters, or other imperfections. The jacket shall have a consistent, uniform thickness. The jacket shall be smooth, as is consistent with the best commercial practice.
  - 3.5.6. The subunits may be stranded around a dielectric central member. Cables may contain filler subunits to provide symmetry to the cable design. A ripcord shall be inserted beneath the outer jacket to facilitate jacket removal. The outer jacket shall be extruded around the subunits.
- 3.6 The strength members shall be of a high modulus strength yarn. The strength yarns shall be helically stranded around the 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 subunit 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; jackets extruded under high pressure 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.

3.7.2 The nominal thickness of the cable outer jacket shall be sufficient to provide adequate cable protection while meeting the mechanical, flammability, and environmental test requirements of this document over the life of the cable.

3.7.3 The cable jacket color shall be orange for cables containing multimode fiber except for cables containing 50/125  $\mu\text{m}$  Laser Optimized Fiber, which shall have an aqua colored jacket. The cable jacket color shall be yellow for cables containing single-mode fiber.

3.8 The cable shall be all dielectric except as noted in section 3.9 below.

3.9 The indoor distribution cable specified herein shall be available with an optional interlocking armor made of aluminum. The interlocking armor for riser cables may be left uncoated or may have a PVC jacket. The interlocking armor for plenum cables shall have a PVC jacket. The color of the armor jacket (if specified for riser cables), shall match the jacket color of the optical fiber cable located inside of the armor. The armor for these cables shall be comparable to liquid tight flexible metal conduit if jacketed, or flexible metal conduit if not. The interlocking armor and jacket option will be specified on the purchase order. Cables with interlocking armor shall be available in fiber counts up to 72 fibers.

**4.0 Identification**

4.1 The individual 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.

- 4.2 When buffered fibers are grouped into individual subunits, each subunit jacket shall be numbered for identification, with the exception of filler subunits where used. The number shall be repeated at regular intervals. The subunit jacket color shall be orange for subunits containing multimode fibers except for subunits containing 50/125  $\mu\text{m}$  Laser Optimized Fiber, which shall have an aqua colored subunit jacket, yellow for subunits containing single-mode fibers, and white for filler subunits.
- 4.3 The outer jacket for all dielectric cable 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 CABLE SYSTEMS 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.
- 4.4 Cables with a PVC jacket over interlocking armor 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 CABLE SYSTEMS OPTICAL CABLE - MM/YY - SO### - SR##### - 2 MM50 PRETIUM 300 ULTRA-BEND 7.5 – TB2 - OFNR FT4 c(ETL)us XXXXX FEET"). The cable jacket color shall match the color of the core optical fiber cable.

## **5.0 Cable Specifications**

- 5.1 Temperature Range.
- 5.1.1 Non-Plenum Applications. The storage temperature range for the cable on the original shipping reel shall be  $-40\text{ }^{\circ}\text{C}$  to  $+70\text{ }^{\circ}\text{C}$ . The installation temperature range for riser cables shall be  $-10\text{ }^{\circ}\text{C}$  to  $+60\text{ }^{\circ}\text{C}$ . The operational temperature range for riser cables shall be  $-20\text{ }^{\circ}\text{C}$  to  $+70\text{ }^{\circ}\text{C}$ . Testing shall be in accordance with FOTP-3.
- 5.1.2 Plenum Applications. The storage temperature range for the cable on the original shipping reel shall be  $-40\text{ }^{\circ}\text{C}$  to  $+70\text{ }^{\circ}\text{C}$ . The installation temperature range for plenum cables shall be  $0\text{ }^{\circ}\text{C}$  to  $+60\text{ }^{\circ}\text{C}$ . The operational temperature range for riser cables shall be  $0\text{ }^{\circ}\text{C}$  to  $+70\text{ }^{\circ}\text{C}$ . Testing shall be in accordance with FOTP-3.
- 5.2 Crush Resistance
- 5.2.1 When tested in accordance with FOTP-41, "Compressive Loading Resistance of Fiber Optic Cables," the cable shall withstand a minimum compressive load of 100 N/cm (57 lbf/in) applied uniformly over the

length of the compression plate. While under compressive load, 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).

5.2.2 For cables with 2-24 fibers, crush performance may be specified at twice the above limits.

### 5.3 Cyclic Flexing

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  $30 \pm 1$  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). The jacket shall not crack, split, or tear.

### 5.4 High and Low Temperature Bend

When tested in accordance with FOTP-37, "Fiber Optic Cable Bend Test, Low and High Temperature," the cable shall withstand four full turns around a mandrel at low temperatures of  $-10\text{ }^{\circ}\text{C}$  for riser cables and  $0\text{ }^{\circ}\text{C}$  for plenum cables. The cable shall also withstand four full turns at a high temperature of  $+60\text{ }^{\circ}\text{C}$  for both riser and plenum cables. The mandrel diameter shall be the greater of 20 times the cable OD or 150 mm. 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).

### 5.5 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 spaced a minimum distance of 150 mm. The impact energy shall be 2.94 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 jacket shall not crack, split or tear.

**5.6 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 the second cycle at the extreme operational temperatures 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.

**5.7 Twist-Bend**

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 and bending. The fibers shall not experience an attenuation change greater than 0.40 dB at 1550 nm (single-mode) or 0.60 dB at 1300 nm (multimode).

**5.8 Tensile 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 riser cables  $\leq 12f$  the rated tensile load is 660 N (148 lbf) and for riser cables  $> 12f$  the rated tensile load is 1320 N (297 lbf). For plenum cables  $\leq 12f$  the rated tensile load is 440 N (99 lbf) and for plenum cables  $> 12f$  the rated tensile load is 660 N (148 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).

**6.0 Packing and Shipping**

6.1 The cable shall be packaged in cartons and/or wound on spools. 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 When the length of an order requires a wooden reel the cable 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.

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 ISO 9001 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.