



**Verizon NEBS™ Compliance:  
Requirements for Blown Optical Fiber, Optical  
Fiber Cables and Fiber Units**

Verizon Technical Purchasing Requirements  
VZ.TPR.9462  
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### 1.0 PURPOSE

The purpose of this Verizon Technical Purchasing Requirement (VZTPR) document is to provide the FOC testing requirements for Blown fiber, blown fiber optic cables and blown fiber unit cables.

### 2.0 SCOPE

Blown Fiber Units, Blown Fiber Cable, and Blown fiber.

### 3.0 REFERENCES

<b>ASTM D3895</b>	ASTM D3895-07 Standard Test Method for Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry
<b>ASTM D4565</b>	Standard Test Methods for Physical and Environmental Performance Properties of Insulations and Jackets for Telecommunications Wire and Cable
<b>ASTM G21</b>	Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi
<b>GR-20-CORE, Issue 2, July 1998.</b>	Generic Requirements for Optical Fiber and Optical Fiber Cable
<b>GR-409-CORE, Issue 1, May 1994</b>	Generic Requirements for Premises Fiber Optic Cable
<b>VZ.TPR.9405</b>	Generic Reliability Assurance Requirements for Passive Optical Components
<b>VZ.TPR.9430</b>	Optical Fiber and Optical Fiber Cable
<b>VZ.TPR.9437</b>	Premises Fiber Optic Cable
<b>VZ.TPR.9441</b>	Test Requirements for Improved Bend Performance Fibers



#### 4.0 ACRONYMS

<b>A</b>	After
<b>B</b>	Before
<b>CIR</b>	Change in Reflectance
<b>CIT</b>	Change in Transmittance
<b>D</b>	During
<b>FOC</b>	Fiber Optic Components
<b>IL</b>	Insertion Loss
<b>ITL</b>	Independent Test Laboratory
<b>“O”</b>	Requirement
<b>“R”</b>	Objective
<b>TPR</b>	Technical Purchasing Requirement

#### 5.0 TEST REQUIREMENTS FOR BLOWN FIBER PRODUCTS

Blown Fiber Products shall meet the requirements specified in the following tables. All the testing must be completed by a Verizon approved ITL.

The following is a list of criteria for blown fiber applications. It is based on the criteria from IEC-60794-5 and includes criteria for microduct. However, microduct criteria are defined in TPR.9442 and will not be included in the TPR for blown fiber.

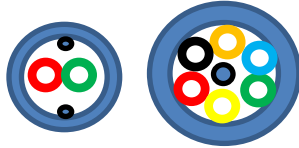
##### **Test Criteria for Microduct, Microduct Fiber Optical Cables, and Microduct Fiber Optic Units**

##### **Definitions:**

1. **Microduct** - A microduct is a small, flexible lightweight tube with an outer diameter typically less than 16 mm<sup>1</sup>. Criteria for microducts are presently specified in TPR.9442.
2. **Protected Microduct** - A protected microduct is one or more microducts, surrounded by a protective sheath and/or protected by a duct. Criteria for protected microducts are presently specified in TPR.9442.
3. **Microduct Optical Fiber Cables** - This is an optical fiber cable that is suitable for installation by blowing into a microduct. Micro cables can contain a number of fibers, e.g., 2-72. The cables typically have strength members, water blocking material, and a sheath and may contain ripcords.

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<sup>1</sup> As defined in IEC 60794-5. Please note that there is no specific limit on the size of the microduct. GR-3155 defines microducts as having an outside diameter of 12.7 mm or less.



**4. Microduct Fiber Unit Cables** - A fiber unit is suitable for installation by blowing into a microduct. A “Microduct Fiber Unit Cable” differs from “Microduct Optical Fiber Cables” in that the Fiber Unit Cable provides less protection to the fibers that they contain. Fiber units may have fiber counts ranging from 2 to 12 fibers and may typically have an outside diameter of 1.0 to 1.5 millimeters. Outside covering may be acrylic, polyolefin or similar material. Some may be either gel filled or contain dry methods for providing water blocking. Either water blocking method (gel or dry type) is acceptable as long as it meets the performance criteria.

5. The following table contains criteria that are applicable to specific blown fiber products as indicated. The table contains criteria for Blown Micro Cable, Blown Fiber Units, and Microduct.



**Test Criteria for Microducts, Microduct Fiber Optical Cables, and Microduct Fiber Optic Units**

Criteria	Blown Fiber Attributes	Test method	Criteria	Additional Test Criteria Comments
				Sample sizes are as per the referenced specification unless otherwise noted
1.	Fiber Requirements Coated Fiber Nominal 250 um	Section 4.3 Geometrical requirements specified in GR-20, Issue 2.	Criteria in GR-20 Issue 2 Section 4.3 Geometrical Requirements, R4--22, R4-23, R4-24, R4-25, R4-26, R4-27	
2.	Fiber Optical Characteristics	Non-BIF – TPR.9430 (GR-20) Section 4  BIF/UBIF-TPR.9441	Non-BIF – TPR.9430 (GR-20) Section 4  BIF/UBIF-TPR.9441	
3.	Fiber Ribbons	TPR.9430, GR-20-CORE, Section 5	TPR.9430 (GR-20), R5-1, R5-2, R5-3, R5-4, R5-5, R5-6, R5-7, R5-8, R5-9	Applicable to Fiber Ribbons that are part of the microcable or fiber unit.
4.	Dimensions	Applicable to microcables and fiber units	Follow Manufacturer’s Spec. Microduct Fiber Unit Cable, Microduct Optical Fiber Cable  For microduct dimension, see TPR.9442	
	Microcable/Fiber Unit Construction			
5.	Cable Core	TPR.9437, GR-409, Section 6.1.1.	TPR.9437, GR-409, Section 6.1.1., R6-1	
6.	Number of Fibers per Cable	TPR.9437, GR-409, Section 6.1.2.	TPR.9437, GR-409, Section 6.1.2. R6-2, R6-3	
7.	Number of Fibers per Unit	TPR.9437, GR-409, Section 6.1.3.	TPR.9437, GR-409, Section 6.1.3., R6-4, R6-5	





Criteria	Blown Fiber Attributes	Test method	Criteria	Additional Test Criteria Comments
				Sample sizes are as per the referenced specification unless otherwise noted
8.	Sheath Removal	TPR.9437, GR-409, Section 6.1.4.	TPR.9437, GR-409, Section 6.1.4., R6-6, R6-7	For some fiber units and microcable designs that employ thin covers, a ripcord may not be required.
	Microcable/Fiber Unit Marking, Packaging, and Shipping			
9.	Cable Marking	TPR.9437, GR-409, Section 6.2.1.	TPR.9437, GR-409, Section 6.2.1., R6-8, R6-9, R6-10, R6-11.	
10.	Cable Re-marking	TPR.9437, GR-409, Section 6.2.2.	TPR.9437, GR-409, Section 6.2.2., R6-12, R6-13	
11.	Identification Marking	TPR.9437, GR-409, Section 6.2.3.	TPR.9437, GR-409, Section 6.2.3., R6-14, R6-15	Specific requirements for fiber unit and microcable identification marking will be specified in the RFQ.
12.	Cable Length and Length Markings	TPR.9437, GR-409, Section 6.2.4.	TPR.9437, GR-409, Section 6.2.4., R6-16, R6-17, R6-18	
13.	Fiber and Unit Identification	TPR.9437, GR-409, Section 6.2.5.	TPR.9437, GR-409, Section 6.2.5., R6-19, R6-20, O6-21, O6-22	For some blown fiber products the identification criteria will be product specific.
14.	Packaging	TPR.9437, GR-409, Section 6.2.6.	TPR.9437, GR-409, Section 6.2.6., R6-23, R6-24, R6-25, R6-26, R6-27, R6-28, R6-29, R6-30, R6-31, R6-32	



Criteria	Blown Fiber Attributes	Test method	Criteria	Additional Test Criteria Comments
				Sample sizes are as per the referenced specification unless otherwise noted
15.	Shipping	TPR.9437, GR-409, Section 6.2.7.	TPR.9437, GR-409, Section 6.2.7., R6-42, R6-43.	
	Mechanical Criteria			
16.	Fiber Transmission Performance (During Environmental and Mechanical Tests)	Transmission Per GR-20-CORE EIA/TIA-455-20-B	Change In attenuation per R6-46 and R6-47 GR-409-CORE, unless otherwise stated.	
17.	Tensile Performance	FOTP-33 and FOTP38	Under rated tensile load the fiber strain shall not exceed 60% of the fiber proof strain. After removal of load, there shall be no change in attenuation <sup>2</sup> . Under visual examination without magnification there shall be no damage to the sheath or to the cable (unit) elements.	Applicable to Microduct Fiber Unit Cables and Microduct Optical fiber cables,  Max applied force – 20N.
18.	Crush	FOTP 41 Test Method Applied Force = 100 N  Anvil shall be per FOTP-41 (Anvil Length is 87.3 mm, including end radius). Force is 5.0	No degradation of optical transmittance, per R6-46 and R6-47 TPR.9437/GR-409-CORE or physical damage to the cable.	

<sup>2</sup> See R6-46 and R6-47 TPR.9437. For single-mode fibers, the magnitude of the attenuation change shall be no greater than 0.2 dB for 90% of the test fibers with no test fibers measuring a change greater than 0.3 dB.



Criteria	Blown Fiber Attributes	Test method	Criteria	Additional Test Criteria Comments
				Sample sizes are as per the referenced specification unless otherwise noted
		N/cm or 100 N, Test at three (3) points separated by a minimum of 0.5 meters.		
19.	Impact	FOTP 25 The ROC of the drop hammer shall be 12.5 mm per FOTP-25. Impact 1.0 NM.  Impact energy = (2.0) NM.	No physical damage to the cable.  The increase in attenuation shall be Per R6-46 and R6-47 TPR.9437/GR-409-CORE.	
20.	Repeated Bending (Cyclic Flexing)	Test Method/Apparatus FOTP-104  Bend Mandrel - 20 x cable diameter or 30 mm whichever is greater.  Tension – sufficient to allow full contact with mandrel.  Number of bends = 25.  Cycle Duration approx. 2 sec.	Under visual examination with 20X magnification there shall be no damage to the sheath and to the cable elements.  The increase in attenuation shall be Per R6-46 and R6-47 TPR.9437/GR-409-CORE.	
21.	Torsion	IEC 60794-1-2 Method E7	Diameter of mandrel: ≤ 40 x cable diameter or 30 mm whichever	



Criteria	Blown Fiber Attributes	Test method	Criteria	Additional Test Criteria Comments
				Sample sizes are as per the referenced specification unless otherwise noted
			<p>is greater</p> <p>Number of cycles: 3</p> <p>Under visual examination with 20X magnification there shall be no damage to the sheath and to the cable elements.</p> <p>The increase in attenuation shall be Per R6-46 and R6-47 TPR.9437/GR-409-CORE.</p>	
22.	Kink <sup>3</sup>	IEC 60794-1-2 Method E10	<p>The test shall be performed at temperatures of 40 C, 23C, and -18C.</p> <p>Kinking shall not occur with the loop diameter greater than 20 x Diameter of the cable under test.</p> <p>If kinking does not occur with diameter Greater than 10 x diameter of the cable under test.</p>	If kinking occurs with loop diameter greater than 20 x diameter of the cable test, then the product does not comply.

<sup>3</sup> A kink is defined to have occurred when the pulling force (when pulled at a constant rate) is observed to have declined and/or when there is a sudden change in the radius of the bend loop.



Criteria	Blown Fiber Attributes	Test method	Criteria	Additional Test Criteria Comments
				Sample sizes are as per the referenced specification unless otherwise noted
			If kinking occurs between 20 and 10 x diameter of the cable under tests, Verizon will determine acceptability.	
23.	Bend	IEC 60794-1-2 Method E11	<p>Diameter of mandrel: <math>\leq 40 \times</math> cable diameter or 30 mm whichever is greater</p> <p>Number of cycles: 3</p> <p>Under visual examination with 20X magnification there shall be no damage to the sheath and to the cable elements.</p> <p>The increase in attenuation shall be Per R6-46 and R6-47 TPR.9437/GR-409-CORE.</p>	
Environmental Criteria				
24.	Environmental Criteria for Indoor Applications	IEC 60794-1-2 Method F1	<p>Temperature Cycling, GR-409, Section 6.6.1.</p> <p>Cable Aging, GR-409, Section 6.6.2.</p>	



Criteria	Blown Fiber Attributes	Test method	Criteria	Additional Test Criteria Comments
				Sample sizes are as per the referenced specification unless otherwise noted
			Color Performance, GR-409, Section 6.6.3.	
25.	Environmental Criteria, (Outdoor Applications)	Temperature Cycling GR-20, Section 6.6.3. Cable Aging GR-20, Section 6.6.4. Color Performance GR-20, Section 6.6.6.	Temperature Cycling GR-20, Section 6.6.3. Cable Aging GR-20, Section 6.6.4. Color Performance GR-20, Section 6.6.6.	
26.	Ribbon Pullout Test Procedure	TPR.9430 Gel free ribbon cable test.	TPR.9430 Gel free ribbon cable test.	Applicable only to dry blocking ribbon cables
27.	Water penetration	IEC 60794-1-2 Method F5	TPR.9430 6.6.1 Water Penetration of GR-20-CORE and 2.0 Ionic Water Penetration of 9430.	
28.	Cable internal Freezing Test	TPR.9430 Cable internal Freezing Test.	TPR.9430 Cable internal Freezing Test.	Applicable only to dry blocking ribbon cables
29.	Fire Performance (Indoor Applications) (Microduct) (Microduct Cable) (Microduct Fiber Unit)	Plenum Cable, GR-409, Section 6.7.1. Riser Cable, GR-409, Section 6.7.2. General Purpose Cable, GR-409, Section 6.7.3.	Indoor cable must be listed for the application.	
	Microduct Criteria			
30.	Pressure (Microduct)	See TPR.9442	Covered by TPR.9442.	
31.	Inner Surface Roughness (Microduct)	See TPR.9442	Covered by TPR.9442.	



Criteria	Blown Fiber Attributes	Test method	Criteria	Additional Test Criteria Comments
				Sample sizes are as per the referenced specification unless otherwise noted
32.	Coefficient of Friction	See TPR.9442	Covered by TPR.9442.	
33.	Operating Temperature Range	See TPR.9442	Covered by TPR.9442.	
34.	Heat Aging/Environmental	See TPR.9442	Covered by TPR.9442.	
35.	Water Immersion (Microduct)	See TPR.9442	Covered by TPR.9442.	
36.	Breakout and Strippability for Fiber Access		Shall be able to break out up to 1 meter without breaking any of the fibers. Either simple sheath opening tool or ripcord.  Fiber strippability covered in section 2.0 of this document.	
37.	Flexibility	To Be Determined	No current requirement	
38.	Stiffness	IEC 60794-1-2 Method E17C	a) separation factor (s) = 20;  b) Duration of test; Apply force at 5" per min. Hold for 5 sec.  c) length of sample; $\pi \times 20 \times D$  d) Number of samples tested; 5.	
39.	Blowing Performance (QA Test for Cabling System)		Covered by TPR.9442.	