Verizon NEBS™ Compliance: Premises Fiber Optic Cable

Verizon Technical Purchasing Requirements

VZ.TPR.9437

Issue 2, April 2008

CHANGE CONTROL RECORD:

Version	Date	Action*	Reason for Revision
1	*10/15/2007*	New	New Document.
2	*4/21/2008*	Change	4.1.2 Geometrical : Changed to 15 @ 2 Meters 6.3.1 Ref. changed to VZ.TPR.9413 6.3.2 High/Low Temp Bend changed to 1 sample 6.3.4 Impact Resistance – changed to visual examination, no magnification req. 6.3.5 Comp. Strength – changed to visual examination, no magnification req. 6.3.6 Tensile Strength – changed to 1 sample 6.6.1 Temp Cycling – change to 1 sample 6.6.2 Cable Aging – changed to 1 sample
* **New, Add, Delete, Change, Reissue**			

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Table of Contents

1.0 PURPOSE

The purpose of this Verizon Technical Purchasing Requirement (VZ.TPR) document is to provide additional and/or overriding FOC testing requirements to those specified in GR-409-CORE: Generic Requirements for Premises Fiber Optic Cable.

2.0 SCOPE

Premises Fiber Optic Cable

3.0 REFERENCES

FOC Memo #30 Rev#2, December 05, 2006	GR-20 - Optical Fiber and Optical Fiber Cable - Gel Free Ribbon Clarification and Test Requirements
FOC Memo # 36, June 22 2006	Applicable to GR-409 sample sizes
GR-409-CORE, Issue 3, September 1999	Generic Requirements for Premises Fiber Optic Cable
GR-20-CORE, Issue 2, July 1998	Generic Requirements for Optical Fiber and Optical Fiber Cables

4.0 ACRONYMS

FOC	Fiber Optic Components
ITL	Independent Test Laboratory

5.0 TEST REQUIREMENTS FOR PREMISES FIBER OPTIC CABLE

Verizon purchases Premises Fiber Optic Cables for various applications in the network. Premises Fiber Optic Cables shall meet the requirements specified in the following tables, the requirements specified in the following tables, which are based on to the requirements specified in Telcordia document GR-409-CORE, Generic Requirements for Premises Fiber Optic Cable, Issue 1 May 1994. All the testing must be completed by a Verizon approved ITL to the guidelines on the following pages.

FOC Test Plan for Premises Fiber Optic Cable – based on GR-409				
Task	**Reference Spec.**	**Samples**	**Optical Monitor**	**Comments**
3.0 Product Qualification Requirements				
3.1 Optical Fiber Product Qualification				
3.1.1 Single- Mode Optical Fiber Product Qualification	R3-1			Per GR-409
3.1.2 Multimode Optical Fiber Product Qualification	R3-2			Per GR-409
3.2 Fiber ribbon Product Qualification	R3-3			Per GR-409
3.3 Optical Cable Product Qualification	R3-4 R3-5 R3-6 R3-7 R3-8 R3-9 R3-10 R3-11			• Product qualified prior to product offering, requalification periodically • If a change to form, fit or function of the product is made, it must be requallified to the applicable sections of the standard. • Do not ship any cable, which has gone through testing to a customer. • Qualification testing performed per Table 1 of GR-409 • Sample size - Section 6.3: no less than 1 per cable design family. Min 10 fibers (or all if less then 10) per cable measured for attenuation change • Sample size - Section 6.6: no less than 1 per cable design family. Min 10 fibers (or all if less then 10) per cable measured for attenuation change • Product qualification to be performed on cables loaded with the minimum and maximum fiber count per cable diameter. • Per GR-409
4.0 Requirements and Test Procedures for Optical Fiber				
4.1 Requirements for Single-Mode Fiber				Requirements of GR-20, Section 4 shall be meet with the exceptions, additions and modifications described in Section 4.1 of this document
4.1.1 Cutoff Wavelength	R4-1	2@500 meters		See GR-409, section 4.1.1

FOC Test Plan for Premises Fiber Optic Cable – based on GR-409				
Task	**Reference Spec.**	**Samples**	**Optical Monitor**	**Comments**
4.1.2 Geometrical Requirements	R4-2	15@2 meters		Nominal O.D. of buffered fiber - 900µm
	R4.3	15@2 meters		Nominal O.D. tolerance ± 50µm
4.2 Requirements for Multimode Fiber				
4.2.1 Attenuation Coefficient	R4-4	2@500 meters		Attenuation coefficient shall be less that 6 dB/km between 800 nm and 900 nm, and less that 2 dB/km between 1250 nm and 1350 nm
4.2.2 Point Discontinuities	R4-5	2@500 meters		No discontinuities greater then 0.2 dB
4.2.3 Multimode Fiber Bandwidth	R4-6	2@500 meters		Min bandwidth - 50/125 - 400Mhz-km @ 850 nm and 1300 nm Max bandwidth 62.5/125 - 160 Mhz-km @ 850 nm and 500 Mhz-km @ 1300 nm
4.2.4 Geometrical Requirements for Multimode Fiber	R4-7 R4-8 R4-9 R4-10 R4-11 R4-12 R4-13 R4-14 R4-15			• Cladding O.D. 125.0µm ± 2.0µm (measure per GR-409) • Nominal Core Diameter - either 50.0µm or 62.5µm (measure per GR-409) • Nominal core diameter tolerance not to exceed ± 3.0µm (measure per GR-409) • Cladding Noncircularity shall not exceed 2.0 % (measure per GR-409) • Core Noncircularity shall not exceed 6.0 % (measure per GR-409) • Offset between the center of the core and the center of the cladding shall not exceed 3.0µm (measure per GR-409) • Nominal numerical aperture (NA) shall be: 50/125: 0.20≤NA≤0.23 62.5/125: 0.27≤NA≤0.29 (measure per GR-409) • Deviation from the nominal NA value shall be less ≤ ± 0.02 (measure per GR-409) • GR-20, Section 4.3 Geometrical Requirements shall be met for colored fiber outside diameter (measure per GR-409)

FOC Test Plan for Premises Fiber Optic Cable – based on GR-409				
Task	**Reference Spec.**	**Samples**	**Optical Monitor**	**Comments**
	R4-16 R4-17			• Nominal outside diameter of buffered fiber shall be 900µm (measure per GR-409) • Nominal outside diameter tolerance not to exceed ± 50µm (measure per GR-409)
4.2.5 Fiber Macrobend	R4-18			Multimode fibers - attenuation per 100 turns of fiber 75mm in diameter shall not exceed 0.5 dB at 850 and 1300 nm, including intrinsic attenuation of the 23.6 meters of fiber.
4.3 Mechanical Requirements for Single-Mode and Multimode Fiber	R4-19			Requirements of GR-20, Section 4.4 shall be meet with the exceptions, additions and modifications described in Section 4.3 of this document
4.3.1 Coating Strip Force	R4-20 R4-21 O4-22 R4-23 O4-24 R4-25	10@ 12"-18" based on app.		• 250µm colored fiber shall meet the coating strip force requirements of GR-20 • Fiber strip force: < 1.3N, >13.3N; remove 15mm ±1.5mm of 900µm coating • Fiber strip force: < 1.3N, >13.3N; remove 30mm ±1.5mm of 900µm coating • Fiber strip force:>13.3N; remove 15mm ±1.5mm of 900µm coating (while leaving the fiber coating intact) • Fiber strip force:>13.3N; remove 30mm ±1.5mm of 900µm coating (while leaving the fiber coating intact) • Fiber strip force:>13.3N; remove 30mm ±1.5mm of 900µm coating (while leaving the fiber coating intact) in one stripping operation
5.0 Requirements and Test Procedure for Fiber Ribbons				
	R5-1	Per-GR-409		Requirements of GR-20, Section 5 shall be meet with the exceptions, additions and modifications described in Section 3.2 of this document
6.0 Requirements and Test Procedures for Optical Cables				

FOC Test Plan for Premises Fiber Optic Cable – based on GR-409				
Task	**Reference Spec.**	**Samples**	**Optical Monitor**	**Comments**
6.1 Cable Construction				
6.1.1 Cable Core	R6-1			Cable core shall be dielectric
6.1.2 Number of Fibers per Cable	R6-2 R6-3			• Cable shall contain 1, 2, 4, 6, 8, 12, 18, 24, 30, 36, 48, 60, 72, 84, 96, 108, 120, 132, 144, 156, 168, 18, 192, 204, 216, 228 or 240 fibers • No Spare Fibers
6.1.3 Number of Fibers Per Unit	R6-4 R6-5			• Unit - tube bundle of 1, 2, 4, 6, or 12 fibers • Identified per 6.2.5
6.1.4 Sheath Removal	R6-6 R6-7			• Easily removed with available tools • Cables with 6 or more fibers shall use ripcords
6.2 Cable Marking, Packaging and Shipping				
6.2.1 Cable Marking	R6-8 R6-9 R6-10 R6-11			• Cable markings printed outer jacket with contrasting color to jacket • Insoluble in water • Character height and spacing per standard commercial practices • Printed @ no more than two feed for cables marked in feet and one meter for cable marked in meters.
6.2.2 Cable Re-marking	R6-12 R6-13			Per GR-409
6.2.3 Identification Marking	R6-14 R6-15			• Manufacturer, Month/year, trade name and Optical Cable code per SR-NWT-002014 • NEC marking
6.2.4 Cable Length and Length Markings	R6-16 R6-17 R6-18			• Cable length +1, -0% of length markings • Sequential cable length markings along cable, not reset along length of cable (interconnect cables excluded) • Cable length markings verified at 10-foot increments with NIST traceable device.
6.2.5 Fiber and Unit Identification	R6-19 R6-20 O6-21			• Individual fiber color per TIA/EIA-598 • Centriod Dolor and tolerances for unbuffered and buffered fibers • Measure with Colorimeter - centroid colors

FOC Test Plan for Premises Fiber Optic Cable – based on GR-409				
Task	**Reference Spec.**	**Samples**	**Optical Monitor**	**Comments**
	O6-22			• Lot-to-lot variations controlled such that ΔE ≤5
6.26 Packaging	R6-23 - R6-41			Per GR-409
6.2.7 Shipping	R6-42 - R6-43			Per GR-410
6.3 Mechanical Requirements				
6.3.1 Optical Measurement Equipment	R6-44 - R6-45			Per VZ.TPR.9413 and GR-409
6.3.2 Cable Testing	R6-46 - R6-47			Per GR-409
6.3.3 Low and High Temperature Cable Bend	R6-48 - R6-49	1 @ min 10 meters		Per GR-409: use appropriate mandrel size
6.3.4 Impact Resistance	R6-50 R6-51	2 @ min 4 meters		• Attenuation not greater that specified in 6.3.2 • No evidence of cracking or splitting of cable
6.3.5 Compressive Strength	R6-52 R6-53	2 @ min 4 meters		• Attenuation not greater that specified in 6.3.2, compressive load per table in section 6.3.5 • No evidence of cracking or splitting of cable
6.3.6 Tensile Strength of Cable	R6-54 R6-55 R6-56	1- config. Per FOTP		• Self Supporting Riser cable - vertically self supporting 152 meters, attenuation increase < 0.05dB • Per GR-409 • Per GR-409
6.3.7 Cable Twist	R6-57 R6-58	2@ min 2 meters		• Mechanical Twist w/attenuation increase < specified in Section 6.3.2 • No evidence of cracking or splitting of cable under X5 magnification
6.3.8 Cable Cyclic Flexing	R6-59 R6-60	2@ min 6 meters		• Mechanical Flex w/attenuation increase < specified in Section 6.3.2 • No evidence of cracking or splitting of cable under X5 magnification
6.4 Cable Materials	O6-61			Plastic compounds should not contain lead-based stabilizers or cadmium-based materials
6.5 Cable Jacket Requirements				
6.5.1 Outside Jacket Material	R6-62 - R6-63			Per GR-409
6.5.2 Cable Jacket Tensile Strength and Ultimate Elongation	R6-64 - R6-65			Min Tensile: 13.8 Mpa; After aging, min elongation at bread greater than 100%
6.5.3 Cable Outer Jacket Shrinkage	R6-66			Max cable jacket shrinkback w/wo cable core shall be < 5%

FOC Test Plan for Premises Fiber Optic Cable – based on GR-409				
Task	**Reference Spec.**	**Samples**	**Optical Monitor**	**Comments**
6.5.4 Cable Jacket Thickness	R6-67 R6-68 R6-69			Avg thickness at cross section ≥ 75% ≤ 125% • Max jacket thickness - min thickness at any cross section ≤ 40% • Non-circular cable measured for min jacket thickness only
6.6 environment Requirements				
6.6.1 Temperature Cycling	R6-70 R6-71	1@ min 500 meters		• Per GR-409 • Change in Attenuation (from baseline) shall not be greater then: SM - 0.30dB MM - 0.60dB
6.6.2 Cable Aging	R6-72	1@ min 500 meters		Change in Attenuation (from baseline) shall not be greater then: SM - 0.60dB MM - 1.20dB
6.6.3 Color Permanence	R6-73 R6-74 O6-75			• Markings shall remain legible after aging • Unbuffered and buffered fibers surface color and units coloring and/or marking shall meet TIA/EIA-598 • Cable markings should remain legible to normal vision after test
6.7 Flammability Listing of Premises Cables				
6.7.1 Plenum Cable	R6-76			• Plenum cable shall be type OFNP, UL 910 tested
6.7.2 Riser Cable	R6-77			• Riser cable shall be type OFNR, UL 1666 tested
6.7.3 General Purpose Cable	R6-78 O6-79			• General purpose cables installed on single floor shall be type OFN, UL 1581 tested • General-purpose cables installed on one or two building levels should be type OFNG, UL 1651 tested.

Optical Measurements
Attenuation Testing performed@ (1310, 1490, 1550 and 1625nm)
Optical Requirements as specified in the above test plan. If none specified, utilize GR-409

Samples
Sample configuration shall be as specified in the above test plan. If none specified, utilize GR-409

Notes:
Fiber needs to be GR-20 compliant.