Verizon Communications

NEBS Compliance Clarification Document

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February 27, 2006

CHANGE CONTROL RECORD:

Version	Date	Action*	Reason for Revision
	September 1, 2004	New	New Document
1	*December 8, 2004*	Revised	Made minor reference corrections throughout document. Corrected GR-487 temperature range (sign).
2	*May 3, 2005*	Revised	Made minor reference corrections throughout document. Added statement to prohibit use of external ferrites.
3	*October 5, 2005*	Add	Include fiber optic component qualification reporting (section 4.6)
4	*October 13, 2005*	Add	Added sec 4.2.6.10
5	October 21, 2005	Change	Section 4.2.6
6	December 7, 2005	Change	Section 4.2.6
7	February 27, 2006	Change	Section 4.2.6, eliminated GR-468 testing at VZ-approved ITLs
* **New, Add, Delete, Change**			

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VERIZON

NEBS REQUIREMENTS

1.1. In order to simplify NEBS compliance for equipment manufactures and competitive local exchange carriers Verizon has joined with other telecommunications carriers to produce a The TCG NEBS Compliance Checklist. This document is intended to clarify Verizon's interpretations of NEBS testing requirements and pass/fail criteria.

1.2. The Verizon NEBS Compliance Clarifications is a compendium of what Verizon believes is best industry practice. It is intended to help Verizon's equipment suppliers and independent testing laboratories provide efficient and economic NEBS compliance testing.

1.3. Verizon Communications requires conformance to all portions of this document.

2. VERIZON NEBS REQUIREMENTS COMPARED TO COLLOCATION NEBS REQUIREMENTS

2.1. The following chart shows the relationship of the various elements of the NEBS requirements to reliability and risk. It should be noted that most of the NEBS requirements are intended to ensure that equipment being tested provides reliable, safe service during normal and abnormal or stress operating conditions.

2.2. Products intended for use in Verizon's network applications are required to conform to all applicable reliability ***and*** risk or safety hazard related NEBS elements.

2.3. Products intended for use in collocators' network applications are required to conform only to the risk or safety hazard related NEBS elements. See the left column in the table below and Section 3 for additional information.

2.4. Summary of NEBS Risk, Safety and Reliability Elements. See Sections 3 and 4 for details.

NEBS Element Intended to Protect:	
Minimal requirements for all equipment placed in Central Office environment: (Risk or Safety Hazard Related - "CLEC Level 1" Requirements)	**These requirements are in addition to the minimal requirements for equipment providing Verizon services**
GR-63 2.0 Spatial Requirements 4.1.4 Heat Release & Surface Temperature 4.2.2 Self-Extinguish/Fire Spread & Smoke Measurements 4.2.3 Fire Resistance 4.2.4 Smoke Corrosivity 4.4.1 Earthquake 4.4.2 Framework and Anchor Criteria 4.6 Acoustic Noise	GR-63 4.1 Thermal Operating Conditions 4.3 Handling/Transportation 4.4.3 Vibration 4.4.4 Transportation Vibration 4.5 Airborne Contamination 4.7 Illumination
GR-1089 3.2 EMI Emission (10KHz through 10GHz; Open Doors) 4.0 Lightning and AC Power Fault (2^{nd} Level) 7.0 Electrical Safety 9.0 Bonding and Grounding	GR-1089 2.0 ESD and EFT Immunity 3.3 EMI Immunity 4.0 Lightning and Power Fault (1^{st} Level) 5.0 Steady-State Power Induction 6.0 DC Potential Difference 8.0 Corrosion Requirements
GR-78	GR-78
Not Required	All Applicable Sections
GR-487	GR-487
Not Required	All Applicable Sections

Table 1.

3. VERIZON AND COLLOCATED EQUIPMENT BASIC NEBS REQUIREMENTS

3.1. APPLICABILITY

3.1.1. Section 3 requirements apply to all equipment, including stand-alone test equipment, to be deployed in Verizon network equipment space. Both the Verizon and collocated equipment are analyzed based on risk/safety/hazard related NEBS elements. Some tests may not be applicable depending on the exact equipment configuration and application. Please contact Verizon's NEBS Compliance with any questions about the applicability of specific tests.

3.1.2. GENERIC REQUIREMENTS FOR RISK, SAFETY AND HAZARD APPLICABLE FOR EQUIPMENT LOCATED IN VERIZON CENTRAL OFFICES.

GR-63 references:	
Spatial: -	Section 2
Heat Dissipation: -	Heat Release & Aisle Facing Surface Temp - Section 4.1, Sub-Section 4.1.4
Fire Resistance: -	Section 4.2; Sub-Sections 4.2.2, 4.2.3, 4.2.4
Earthquake: -	Earthquake zone requirements - Section 4.4, Sub-Sections 4.4.1.1, 4.4.1.2, & 4.4.2
Acoustic Noise: -	Section 4.6
GR-1089 references:	
Emission Criteria: -	Section 3.2; Sub-Sections 3.2.1 through 3.2.3
Lightning & AC Power Fault: - 2nd Level Surges	Section 4; Sub-Sections 4.2.1, 4.2.2, 4.5, 4.6.4, 4.6.5, 4.6.6, 4.6.8, 4.6.11 through 4.6.13, 4.7 (R4-25), Omit "2nd Level Surges" 4.8, 4.8.1, 4.8.2, 4.8.3 (4.8.3.2), 4.8.4.2
Electrical Safety: -	Section 7
Bonding & Grounding: -	Section 9, Sub-Sections 9.1 through 9.12

Table 2.

3.1.3. Additional requirements for Verizon owned equipment are detailed in Section 4.

3.1.4. The following *required* checklist items are applicable to all equipment.

3.1.4.1. The information items, including a complete list of shelves, modules and plug-in cards. Refer to Appendix C items A to F

3.1.4.2. Spatial Requirements. Framework, frames, racks, cabinets, etc. and non-powered or passive devices shall be considered equipment that must be tested. Refer to Appendix C item H.2.

3.1.4.3. Heat Release and Aisle Facing Surface Temperature requirement and objective tests are required; Verizon must provide a safe and comfortable environment for nearby personnel and equipment. Internal unit temperatures of 130 °F are not unusual and high surface temperatures pose a burn or safety hazard for personnel working in the vicinity. Ambient operation testing is not required for collocated equipment. Refer to Appendix C items E^1 through E^7 and H.2.

3.1.4.4. Fire Resistance: Refer to Appendix C item H.3.

3.1.4.5. Testing for NEBS Earthquake/Seismic requirements and objectives is required. Dislodged or loose parts, broken welds, etc. can pose safety hazards for personnel in the vicinity. Office Vibration testing is not required for collocated equipment. Refer to Appendix C item H.5.

3.1.4.6. Acoustic Noise Requirement: Refer to Appendix C, item H.7.

3.1.4.7. EMI Emission testing up to 10GHz with cabinet doors open, as would be required to do maintenance activities is required. Excessive emissions could impair the proper operation of other equipment in the vicinity. Refer to Appendix C item H.10.

3.1.4.8. **NOTE:** Verizon will accept test results/reports based on CLEC criteria ***only for collocation applications*** provided the specific risk and safety hazard data is supplied as described in Section 2.

3.2. VERIZON CLARIFICATIONS TO NEBS REQUIREMENTS

3.2.1. The following requirements represent specific areas of concern that, in Verizon's opinion, are not adequately addressed by the GR requirements. The requirements listed in this section are either *specific clarifications* to the testing requirements listed in GR-63, GR-1089 and other documents. These clarifications and are intended to address common questions from suppliers and test labs.

3.2.2. Power Requirements.

3.2.2.1. Equipment shall be powered by a -48 volt (nominal) DC power source and should be able to operate when between -40 and -57.5 volts DC is applied at the unit input power lugs for each individual power source feed.

3.2.2.2. The use of AC powered equipment should be avoided in all equipment configurations. AC powered equipment shall not be used in the Isolated Ground Plane.

3.2.2.3. Verizon DOES NOT WANT any AC convenience outlets in any equipment installed in the Isolated Ground Plane. GR-63, R2-20 and R2-21 do not require that outlets be provided; they merely stipulate how to provide outlets if ordered by Verizon.

3.2.3. Spatial Requirements.

3.2.3.1. Verizon requires that the supplier provide an accurate equipment width and depth. See GR-63 O2-4 and O2-14. Equipment mounted in racks/cabinets shall be contained within the overall footprint of the rack/cabinet**.**

3.2.4. Thermal Requirements – Appendix C item H.2

3.2.4.1. Telcordia grouped certain risk and safety hazard data measurements into the thermal performance category. Verizon considers GR-63 items R4-13, O4-14, and O4-15 to be risk and safety hazard requirements and requires testing for both Verizon and CLEC equipment.

3.2.4.2. Verizon requires that the supplier provide aisle facing surface temperature data (GR-63, O4-15). Aisle facing surface temperature of equipment shall never exceed 38 degrees C (100 degrees F) at an ambient room temperature of 26 degrees C (79 degrees F).

3.2.4.3. Verizon Equipment and room cooling class preferences.

3.2.4.3.1. Combinations of Vertical Overhead Air-Distribution (VOH) and Horizontal Overhead Air-Distribution (HOH) room classes will be most prevalent going forward.

3.2.4.3.2. The majority of equipment bays in Verizon buildings are capable of supporting an average heat release of between 10 and 40 watts per square foot.

3.2.4.3.3. Verizon has a strong preference for equipment with conforming heat release for the VOH and HOH room classes. There is a strong preference for equipment classes with the bottom front-to-top rear (EC-Class F1-R3) airflow protocol for equipment in the central office environment at both frame - and shelf - levels. Bottom front-to-top (EC-Class F1-T) and mid front-to-mid rear (EC-Class F2-R2) protocols are also acceptable. Protocols that exhaust air to the front, bottom, or side of the frame are strongly discouraged.

3.2.4.4. Verizon requires that the supplier provide accurate heat release information as described in GR-63 Section 4.4.1, R4-13, O4-14, and Table 4-6. Data shall clearly note if values are for a steady-state maximum configuration or if typical heat release varies with traffic load or specific configuration.

3.2.4.5. If heat dissipation/release varies with load (e.g., talk-battery for subscriber lines), data shall show values for typical CCS levels, 12 CCS, 18 CCS, 24 CCS, and 36 CCS. If applicable, the effect of loop length shall also be included in the values provided.

3.2.5. GR-63-CORE Issue 2, April, 2002 Section 4.1.3 - NEBS Altitude Test.

3.2.5.1. Verizon will accept test results using the temperature compensation method for products that have no mechanical sensitivities. Verizon will accept any of the following three methods for demonstrating compliance to the NEBS Altitude Test criteria.

3.2.5.1.1. The ITL shall follow Option 1 test sequences of Section 5.1.3, using a hypobaric chamber.

3.2.5.1.2. The ITL shall follow Option 1 test sequences in Section 5.1.3, using the temperature compensation method to simulate lower atmospheric pressures, according to the rule of +1° C per 1000 feet increase in altitude. For example, if a test temperature should be 50° C and test pressure should be 80 kPa, then the temperature compensation method would require exposing the EUT to 56° C.

3.2.5.1.3. The ITL shall test to Objective O4-11[137], and if the EUT passes, it is considered to meet NEBS criteria R4-8, R4-9, and O4-12. The chamber temperature shall be increased to 61° C (shelf equipment) or 56° C (frame equipment), at a ramp rate of 30° C/hour. After an eight-hour dwell at this temperature, the chamber temperature shall be decreased at a rate of 30° C/hour to ambient temperature. If using this abbreviated form of the Altitude Test, Verizon will accept the test running concurrently with the Operational Temperature and Humidity Test. To integrate these tests, the parameters for the shortened Altitude Test (61° /56° C for 8 hours) will be used during Step 8 of the Operational Temperature and Humidity Test (see Figure 5-4, GR-63 Issue 2). Step 8 must continue to maintain a minimum 12 hour dwell of at least 50°C and no more than 32% RH. However, functional degradation of the EUT during the high temperature extreme will be considered a failure of both tests.

3.2.5.2. The EUT shall continue to be functional throughout the Altitude Test, regardless of the test method used. Option 2 of section 5.1.3 remains unacceptable to Verizon for altitude testing, as it does not demonstrate conformance to objective criteria..

3.2.6. Fire Resistance Requirements – Appendix C item H.3

3.2.6.1. Verizon requires that supportive data be provided to warrant the pass/fail status of ***each*** of the sub-criteria elements listed for R4-17 and R4-22 fire spread criteria.

3.2.6.2. Tests are expected to identify any fire resistance, self-extinguishability, and fire-spread issues that MUST be corrected. Smoke analysis should be provided to indicate the particulate content and corrosivity.

3.2.6.3. Generic Guidelines for Fire Spread Testing

3.2.6.3.1. The equipment assembly must be configured as it will be configured for installation in a Central Office/Outside Plant environment for all NEBS tests.

3.2.6.3.2. A rack/shelf must be fully assembled with all components/shelves, cables, hardware, cable trays etc. All cables shall be dressed along the vertical uprights of the frame.

3.2.6.3.3. A non-working sample may be used.

3.2.6.3.4. The fans must be operational at the beginning of the fire test. The fans should be powered through their normal control circuitry, if possible; otherwise they must be powered from an external power source.

3.2.6.3.5. EUT must be pre-conditioned to 20ºC to 27ºC and a RH 50% (GR-63 Section 5.2.1).

3.2.6.4. GR-63 Test Configurations

3.2.6.4.1. GR-63 covers typical configurations for line burner placement. GR-63 does not address platform and many switch-based designs. Multiple fire-spread tests will most likely be necessary.

3.2.6.5. GR63 - Test Setup

3.2.6.5.1. Fire test setup critical elements: GR-63 Test Configurations cover line burner placement (LBP) for typical switch configurations and do not address platform and some switch based designs. Most equipment will probably require multiple fire-spread tests.

3.2.6.5.2. Equipment test plan: The test plan should consider the fuel load of each card and compartmentalization within the equipment shelves and racks. All compartments must be tested unless the compartments are identically configured or contain little or no fuel. Multiple tests may sometimes be required in the same compartment depending on its size and fuel load. Control panels and fuse bays must be tested and raceways may not be removed. Testing should start from the lower-most section of the equipment and work vertically up the unit for each test. Follow GR-63 for the flame profile for each test.

3.2.6.5.3. The width of a removable card as described in these sections is the distance between the 2 remaining circuit cards. Measure this distance between the two remaining printed circuit boards to determine if it is greater than or equal to the one-inch requirement. The objective of these guidelines is to model a fully configured product that has the maximum number of circuit cards but still allows adequate circulation around the line burner.

3.2.6.5.3.1. Line burner placement: If the width of a removable card is less than 1" remove the card and attach a blank face plate, without a card attached to the face plate. Drill a hole through the bottom of the face plate to accommodate the line burner.

3.2.6.5.3.2. Follow the instructions in GR-63 Section 5.2.3 for Equipment Assembly Fire Spread Test. If a removable card is greater than 1" wide, leave the removable card in its slot and drill a hole through the bottom of the face plate to accommodate the line burner so that the burner exposes the flames to the components. If the line burner cannot clear the board, drill the hole below the card.

3.2.6.5.4. If the equipment has fans and they blow out the flame, follow the profile in GR-63 for Equipment Assembly Fire Spread Test. If the fans continue to blow out the line burner and the burner gas flow of step 8 of section 5.2.3 test procedure reaches 9 liters/min., leave the fans off and continue the test.

3.2.6.5.5. The following diagrams show the shelf and frame level setups for ANSI T1.319-2002 Fire Tests.

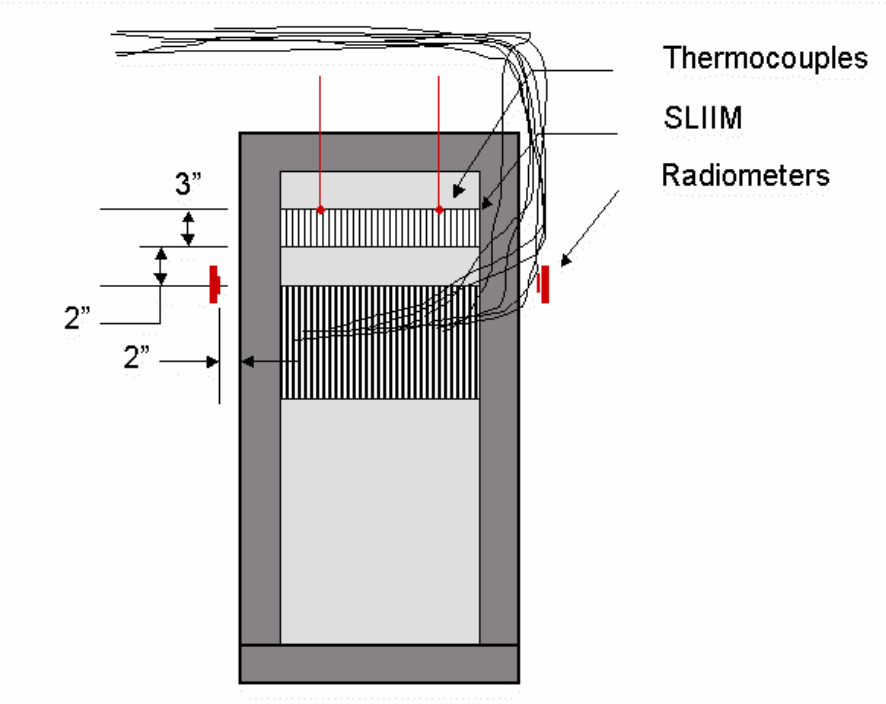

Figure 1 - ANSI T1.319-2002 Shelf-Level Fire Test Setup.

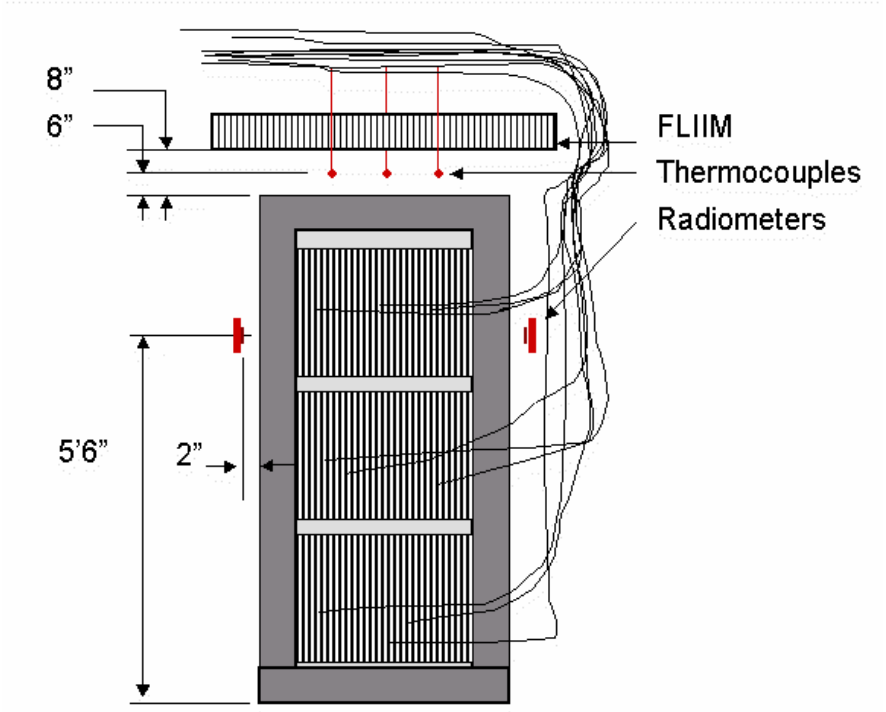

Figure 2 - ANSI T1.319-2002 Frame Fire Test Setup.

3.2.6.5.6. The following diagrams show typical test point selections, indicated by the X, for common configurations.

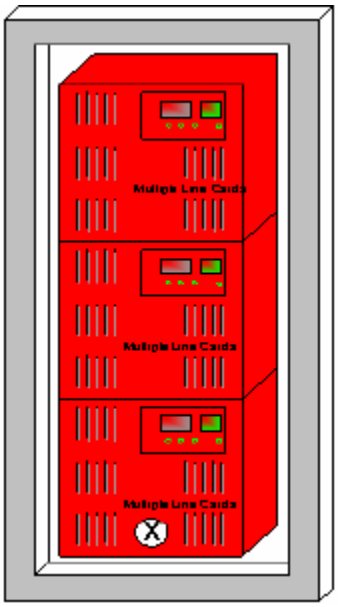

Figure 3 - Typical CO environment.
X – Indicates line burner insertion.

Figure 4 - Platform with dissimilar components and compartmentalized shelves.
X – Indicates line burner insertion.

Figure 5 - Platform with dissimilar shelves and video monitor.
X – Indicates line burner insertion.

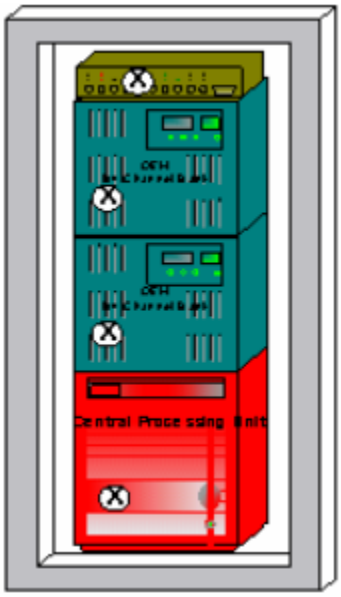

Figure 6 - Platform with Dissimilar Shelves.
X – Indicates line burner insertion.

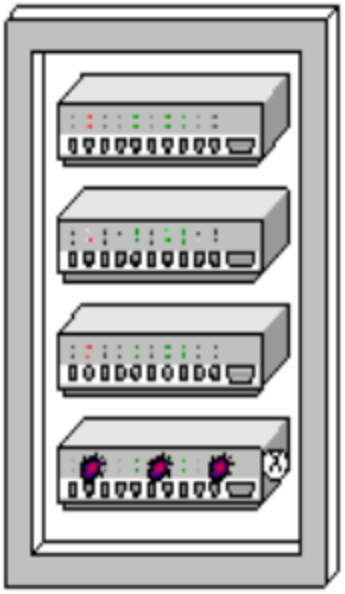

Figure 7 - Platform fire spread test of four eight-inch shelves.
X – Insert line burner and rotate 90 degrees over top of circuit board.

3.2.6.6. Verizon uses the following smoke and self-extinguishing (fire) objective observation criteria to help minimize smoke hazards and fire spread from fires in equipment located in Central Office equipment spaces. Equipment assembly fire tests shall be done in accordance with ANSI T1.319 2002, or any supplemental test configuration criteria that may be specific to Verizon on a case-by-case basis for certain equipment tests. ALL of the following specific criteria shall be included in all shelf and frame level equipment assembly tests:

- After the conclusion of the methane ignition line burn, the components in the equipment assembly should show evidence of beginning to self-extinguish.
- At 10 minutes into the test, there should be a significant flame reduction (or extinguished) and a visible reduction in the smoke from the equipment assembly.
- At 15 minutes into the test, flames shall be extinguished, and there shall be only minimal wisps of smoke from the equipment assembly as determined from Verizon review.
- If the smoke density measurements show any increase after the ignition burner is turned off, the length of time shall be measured until the smoke is completely eliminated.
- If the heat release measurements show any increase after the ignition burner is turned off, the length of time shall be measured until the equipment reaches ambient temperature.
- If during the initial ignition period of the Fire Spread Test, it is not possible to sustain a flame in the ignition line burner due to airflow from the fans extinguishing the flame, the fans shall be turned off.

3.2.6.7. Color video recordings (standard image) of all required Fire Spread Tests (GR-63-CORE Issue 2, Section 4.2) shall be included in the report documentation. The standard image recordings shall include at least two perspectives: one view facing the side of the EUT from which the line burner is inserted, called the 'front' view, and another view facing the side of the EUT opposite the line burner entry, called the 'rear' view. (Note: In situations requiring unusual burner placement, for example burner placement parallel to the plane of the framework, consult the carrier to review the proposed camera locations.) The

standard image shall display the full perspective of the EUT, the thermocouples and circuit board samples above the EUT and the radiometers on both sides of the EUT. Standard video images must display at least two inches of ground in front of frame-level EUT and at least four inches below a shelf-level EUT. The height of all camera mountings shall be between the center and top of the EUT and approximately perpendicular to its front or rear surface. The resolution of the standard images must be sharp enough to identify the EUT and test setup. Zooming and panning the camera to identify the EUT and test setup before the start of the test is permitted.

3.2.6.8. Thermal imaging offers a fire spread test diagnostic tool to help identify and correct observed thermal anomalies. A thermal image video camera shall record the test from the front view and be aligned closely to the line-of-sight of the front color video camera. The thermal image must display the entire front view EUT surface, plus at least two inches of clearance around the EUT. Resolution of the thermal image video must be sharp enough to display fire and heat propagation within the EUT.

3.2.6.9. The fire spread test videos shall record all fire spread test burn trials in chronological order and shall match the descriptive text in the written report. The final videos delivered to the carrier shall include a split screen display of the front view standard image and the thermal image and a separate recording of the rear view video. It is not acceptable for more than two views to be displayed in split screen on the same video. A live timer display showing minutes and seconds from the time the burner is inserted into the EUT shall be provided in all views of each test and must not obscure the fire test.

3.2.6.10. For a Fire Risk Analysis, the equipment supplier shall provide, upon request by Verizon, a database detailing the flammability characteristics of all equipment, materials, components, and wire and cable per GR-63-CORE. An estimate of the maximum possible fuel load of polymeric materials in the fully equipped frame or subassembly should be documented (e.g., structural materials, electronic and electrical components, and associated wire and cable provided or specified by the equipment supplier). This estimate should identify, in tabular format, the constituent items. The estimate shall account for at least 95% of the maximum possible fuel load. The remaining 5% should be described qualitatively in terms of types of polymers present. A typical database should follow the format in the sample below. The Module/Part Number heading should identify constituent items such as shelves, circuit boards, back planes, etc. Integrated circuits, resistors, capacitors, LEDs, wiring, etc. should each have their own row with their part number and component description provided; column 7 should be totaled by component rating and for the complete module at the end of the table

Module/Part Number: XYZ123

Item #	Part Number	Component Description	Qty	Component Rating: UL-94 V0, V1	Oxygen Index If >28%	Total Polymeric weight in grams	Comments
1	WXY	LED	1	V0		0.016	
1	XYZ	Carbon Resistor	1	HB		0.006	
					>28%	0.008	
Totals				V0		0.016	
				HB		0.006	
					>28%	0.008	

Table 3.

3.2.7. ANSI T1.319-2002: Telecom Equipment Assemblies - Fire Propagation Risk Assessment Criteria. The following table lists Verizon's clarifications for testing per ANSI T1.319-2002 Fire Propagation Test Standard.

Section	Description	Verizon Comment
4	Fire propagation hazard objectives	
	Fire propagation hazard assessment criteria	
4.1	General	
4.2	Materials, components, cables, and wires	ACCEPT
4.3	Constructional assessment criteria	DO NOT ACCEPT - ALL ENERGIZABLE AND PASSIVE EQUIPMENT SHALL BE TESTED AS PER GR-63-CORE
4.3.1	Limited power and passive equipment	DO NOT ACCEPT - ALL ENERGIZABLE AND PASSIVE EQUIPMENT SHALL BE TESTED AS PER GR-63-CORE
4.3.2	Physical construction	DO NOT ACCEPT - ALL ENERGIZABLE AND PASSIVE EQUIPMENT SHALL BE TESTED
4.3.3	Equipment or compartments containing horizontally oriented printed circuit boards	DO NOT ACCEPT - ALL ENERGIZABLE AND PASSIVE EQUIPMENT SHALL BE TESTED.
4.4	Equipment subjected to fire propagation test	ACCEPT
5	Fire propagation hazard test apparatus and calibration	
5.1	Test apparatus	
5.1.1	Test building	ACCEPT
5.1.2	Collection hood and exhaust duct	ACCEPT
5.1.2.1	Collection hood	ACCEPT
5.1.2.2	Exhaust duct	ACCEPT
5.1.3	Instrumentation	TEST INSTRUMENTATION SHALL INCLUDE MEASUREMENTS OF HEAT RELEASE, SMOKE, AND EVOLVED GASES AS DESCRIBED IN GR-63-CORE SEC. 5.2.2.
5.1.3.1	Flow rate	ACCEPT
5.1.3.2	Gas sampling equipment	ACCEPT

Section	Description	Verizon Comment
5.1.3.3	Oxygen analyzer	ACCEPT
5.1.3.4	Data acquisition	ACCEPT
5.1.3.5	Video recording equipment	MUST PROVIDE THERMAL IMAGING VIDEO RECORDINGS OF THE EUT PER VERIZON CLARIFICARTIONS.
5.1.3.6	Line burner	ACCEPT
5.1.4	Methane flow control system	ACCEPT
5.1.4.1	Automated mass flow control system	ACCEPT
5.1.4.2	Manual mass flow control	ACCEPT
5.1.4.3	Methane Gas Flow	ACCEPT FOR HORIZONTALLY ORIENTED BOARDS, LINE BURNER SHALL BE ROTATED 90^0 OVER TOP OF CIRCUIT BOARD.
5.1.5	Ignition indicators – Shelf Level (SLIIM) and Frame Level (FLIIM)	
5.1.5.1	SLIIM ignition indicator construction details	ACCEPT
5.1.5.1.2	Ignition Modules:	ACCEPT
5.1.5.2	FLIIM ignition indicator construction details:	ACCEPT
5.2	Calibration of equipment	
5.2.1	Heat release rate calibration	ACCEPT
5.2.2	Pretest instrument calibration	ACCEPT
5.2.3	Line burner calibration	
5.2.3.1	Calibration using a cone calorimeter	ACCEPT
5.2.3.2	Calibration of the methane mass flow controller	ACCEPT
5.2.4	Qualification of ignition indicator modules for use as ignition indicators	ACCEPT
6	Test setups	

Section	Description	Verizon Comment
6.1	Frame level equipment tests	FRAME-LEVEL SETUP SHALL INCLUDE THE SETUP REQUIREMENTS IN GR-63-CORE SEC. 5.2.3 ITEM 2.
6.2	Shelf level equipment tests	SHELF-LEVEL SETUP SHALL INCLUDE THE SETUP REQUIREMENTS IN GR-63-CORE SEC. 5.2.3 ITEM 3. THERMOCOUPLES SHALL BE PLACED ON THE IGNITION INDICATOR MODULES THAT ARE LOCATED APPROXIMATELY 2" EITHER SIDE OF THE PLANE OF THE IGNITION BURNER. RADIOMETERS SHALL BE PLACED AS SPECIFIED IN GR-63-CORE, AT A DISTANCE OF 2" FROM THE SIDE OF THE EUT AT A HEIGHT EQUAL TO THE TOP SURFACE OF THE EUT. THE IGNITION MODULE SHALL BE PLACED AT A DISTANCE OF 2.5" FROM THE OUTSIDE OF THE FRAMEWORK AND VERTICALLY ALIGNED WITH THE AIR EXHAUST MIDPOINT.
6.3	Sub-assembly tests	DO NOT ACCEPT - ALL ENERGIZABLE AND PASSIVE EQUIPMENT SHALL BE TESTED AS PER GR-63-CORE
6.3.2	Sub-assembly tests - forced air cooling	DO NOT ACCEPT - ALL ENERGIZABLE AND PASSIVE EQUIPMENT SHALL BE TESTED AS PER GR-63-CORE
6.3.3	Sub-assembly tests utilizing a horizontal baffle	DO NOT ACCEPT - ALL ENERGIZABLE AND PASSIVE EQUIPMENT SHALL BE TESTED AS PER GR-63-CORE
6.3.4	Sub-assemblies mounted in a cabinet	DO NOT ACCEPT - ALL ENERGIZABLE AND PASSIVE EQUIPMENT SHALL BE TESTED AS PER GR-63-CORE
7	Test specimens	

Section	Description	Verizon Comment
7.1	General	ACCEPT - SEE SECTION 3.2.6 ADDITIONAL NOTES ON FAN OPERATION DURING FIRE SPREAD TESTS
7.2	Conditioning	ACCEPT
8	Test procedure	ACCEPT
8.2	Procedure	ACCEPT
8.2.1	Subassembly Tests	DO NOT ACCEPT - ALL ENERGIZABLE AND PASSIVE EQUIPMENT SHALL BE TESTED AS PER GR-63-CORE
8.2.2	Frame and shelf level tests	ACCEPT – SEE SECTION 3.2.6 FOR ADDITIONAL NOTES ON FAN OPERATION DURING FIRE SPREAD TESTS.
8.2.3	Line burner placement Burner placement, Number of tests required Opening size for line burner insertion Vertical circuit card testing Fan cooled equipment with multiple circuit cards Non fan cooled, horizontal PCB test	ACCEPT ACCEPT ACCEPT CIRCUIT CARD TO BE REMOVED ONLY IF WIDTH IS <1". IF WIDTH IS >1", THEN CIRCUIT CARD SHALL BE LEFT IN PLACE AND THE LINE BURNER INSERTED ADJACENT TO THE COMPONENT SIDE OF THE PACK OR UNDERNEATH THE PACK. SEE SECTION 3.2.6 FOR FURTHER CLARIFICATION. ACCEPT
8.2.3.1	Airflow characteristics	ACCEPT
8.2.3.2	Chassis design	MAY USE AIRFLOW MEASUREMENT RESULTS TO DETERMINE LINE BURNER PLACEMENT. HOWEVER, IF NO AIR FLOW MEASUREMENTS ARE AVAILABLE, THEN ALL QUADRANTS AND COMPARTMENTS MUST

Section	Description	Verizon Comment
		BE TESTED. AIRFLOW DATA SHALL BE SUBMITTED AS PART OF THE TEST REPORT. REFER TO ANSI T1.319-2002 ANNEX B AND SECTION 3.2.6 FOR LINE BURNER PLACEMENT.
8.2.4	Start of test	EQUIPMENT SHALL BE CONDITIONED AS PER GR-63-CORE. PROCEDURE IS ACCEPTABLE WITH THE FOLLOWING EXCEPTION: IF IGNITION OF THE LINE BURNER IS NOT SUSTAINED BY THE PROCEDURE OUTLINED FOR THE START OF TEST, THEN THE FANS SHALL BE TURNED OFF, AND THE FIRE TEST SHALL BE PERFORMED STARTING WITH THE INITIAL FLOW RATE AS SPECIFIED IN SECTION 5.1.4.3.
8.2.5	Data collection and observations during test	THE EVENT SHALL BE VIDEO TAPED WITH THE SPLIT SCREEN IMAGE INCLUDING THE THERMAL IMAGE AS DESCRIBED IN SECTION 3.2.6.
8.2.6	End of test	THE TEST DURATION SHALL BE FIFTEEN MINUTES OR UNTIL FLAMING AND SMOKE HAS COMPLETELY CEASED, WHICHEVER IS LONGER.
9	Calculations	
9.1	Heat release rate	ACCEPT
10	Performance Criteria	
10.1	Shelf Level	IN ADDITION TO THESE PERFORMANCE CRITERIA, THE EQUIPMENT SHALL ALSO MEET THE FRAME OR SHELF-LEVEL FIRE-RESISTANCE CRITERIA IN GR-63-CORE, SECTION 4.2.2, AS WELL AS THE ADDITIONAL VERIZON

Section	Description	Verizon Comment
		CRITERIA IN SECTION 3.2.6.
10.2	Frame Level	IN ADDITION TO THESE PERFORMANCE CRITERIA, THE EQUIPMENT SHALL ALSO MEET THE FRAME OR SHELF-LEVEL FIRE-RESISTANCE CRITERIA in GR-63-CORE, SECTION 4.2.2, AS WELL AS THE ADDITIONAL VERIZON CRITERIA IN SECTION 3.2.6.
11	Report of risk assessment	THE REPORT SHALL INCLUDE THE THERMAL IMAGE OF THE EQUIPMENT, AS DESCRIBED IN SECTION 3.2.6.

Table 4.

3.2.8. Earthquake Requirements. Compliance to NEBS Earthquake standards is required for all Verizon Central Office equipment, ironworks, frames and frame extenders. Verizon requires Central Office equipment to be tested to the minimal specification of the Earthquake Zone where the product will be installed. See GR-63 section 4.4.1 and GR-63 Figure 4-2 for detailed testing information. Earthquake videos should be provided with the test documentation.

3.2.9. Acoustic Noise. The equipment shall not independently, or as a part within a larger system, generate sufficient sound power as to violate OSHA requirements. Further, the sound power shall be low enough that a Hearing Conservation Program is not mandated. The time-weighted average sound power, measured using the OSHA measurement techniques, must be below 85 dB (A) over an 8-hour worst-case exposure and no sound of over 115 dB (A) shall be permitted. For a shelf-level system the maximum permissible system sound power is 65 dB (A).

3.2.10. EMI Emission Requirements – Appendix C item H.10

3.2.10.1. Verizon does not accept the use of externally mounted ferrites on cable interfaces for the purpose of EMI compliance. If used, ferrites shall form part of the products, not the cable, and shall be placed within the chassis enclosure.

3.2.10.2. Testing must be done through 10 GHz.

3.2.10.3. Frequency plots shall clearly show all emissions. Background emission evaluation and analysis is only required in the event the test results exceed the emission requirements or objectives.

3.2.10.4. Lab test reports shall include the measured emissions at the highest frequency tested.

3.2.10.5. In order to simulate normal operation, all cabling shall be connected and run in a vertical position, and dressed as shown in the diagram below. Once placed as shown below, no cable movement or rearrangement in an attempt to maximize emissions should be made. An original picture and description of the test setup shall be included.

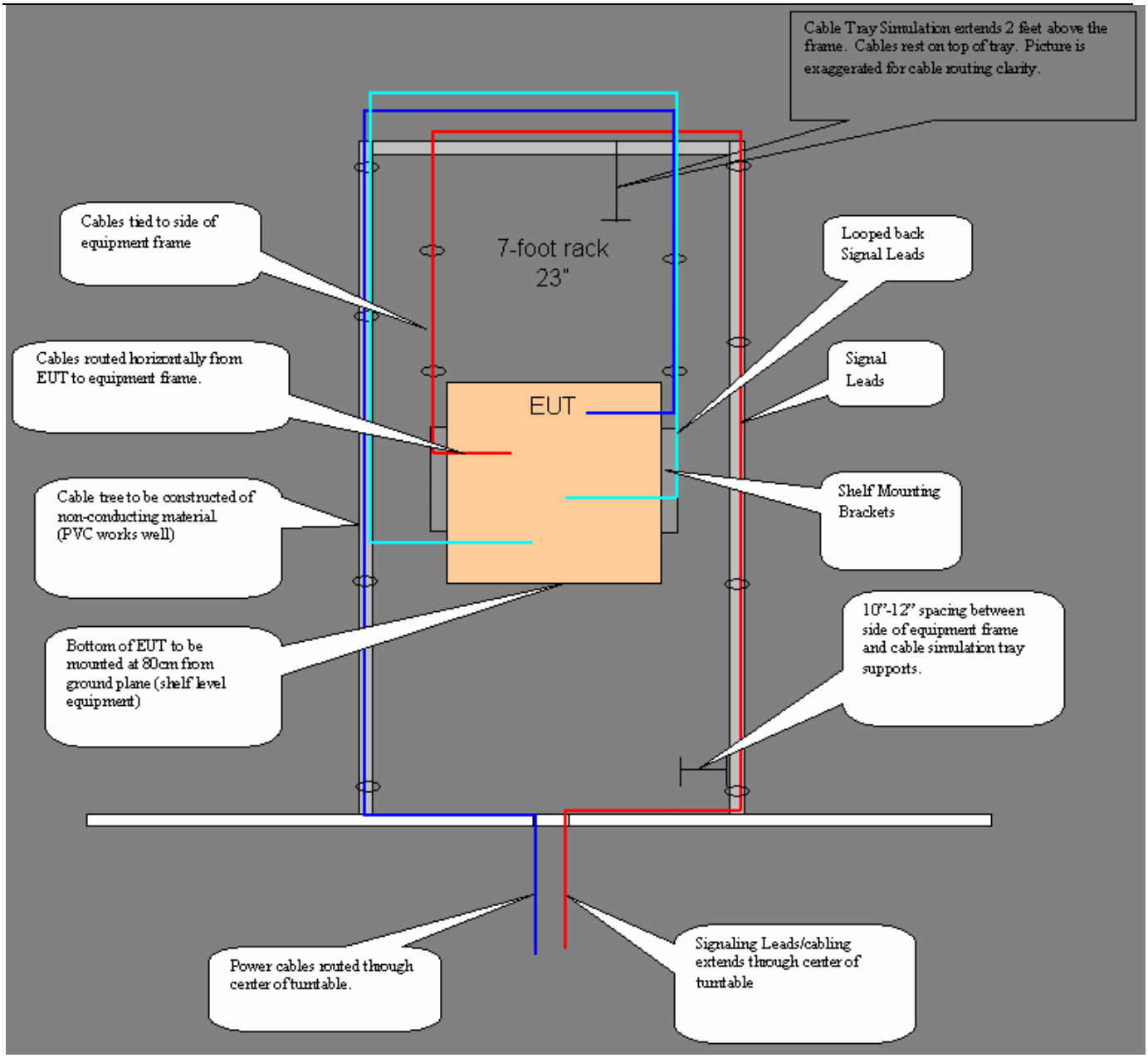

Figure 8.

3.2.11. GR-1089-CORE Issue 3 - Lightning Surge and AC Power Fault Test Connections (Telecommunications Port) and ILR Issue 1A. The following criteria will not be required by Verizon:

3.2.11.1. The Table 4-1 A4 test condition for four-wire interfaces should become an objective effective January 1, 2005 and obsolete on January 1, 2006.

3.2.11.2. The Table 4-1 A4 test condition for four-wire interfaces shall become a requirement effective January 1, 2006.

3.2.12. Equipment type dependent sections – Appendix C item H.12 through H.16.

3.2.12.1. GR-1089-CORE Appendix B - Application Guidelines Definitions categorizes equipment into four groupings or "Types."

3.2.12.2. The supplier shall first determine which "Type" applies to the equipment to be tested.

3.2.12.3. The supplier shall then use GR-1089 Table B-1 to determine the GR-1089 requirements that apply. Requirements that are not applicable shall be referenced in the TCG Checklist Appendix C item H.12 through H.16 with the appropriate "Type."

3.2.13. Bonding and Grounding

3.2.13.1. To meet the Unit Bonding and Grounding safety connection requirements, GR-1089, R9-9 proposes two acceptable methods.

- Separate conductor(s) between the unit's chassis and the framework.
- Thread-forming mounting screws with paint piercing washers that establish metal-to-metal contact. This is Verizon's preferred method.

3.2.13.2. The correct use of separate conductors requires that the conductor be sized to handle any fault current up to the limit of the circuit protection device feeding power to the equipment bay. Any conductor, that is #6 AWG or larger ***must*** be connected using a 2-hole crimp type connector per GR-1089, R9-17 and TR-295.

3.2.13.3. Thread forming screws *are not necessarily self-tapping or sheet metal screws*. Thread-forming screws are tri-lobular and establish threads by the plastic displacement of metal, instead of cutting threads, without creating metal chips or curls that could drop into other equipment.

3.2.13.4. Verizon's preferred grounding method, thread-forming screws when used in lieu of a separate Grounding Conductor, must be used at all mounting positions and shall have an external tooth paint piercing lock washer between the head of the screw and the equipment unit. No lock washers shall be used between the equipment unit and the framework. Thread-forming screws shall also be used to attach any adapter/mounting brackets to the equipment unit.

3.2.13.5. The supplier shall provide installation instructions, with equipment shipments and with ITL NEBS test reports, that explain the purpose of the specific material provided and the correct use and installation.

4. VERIZON OWNED EQUIPMENT ADDITIONAL NEBS REQUIREMENTS

4.1. APPLICABILITY

4.1.1. This section provides clarification for some of the requirements, in addition to those described in Section 3, that apply to all Verizon owned equipment, including stand-alone test equipment, to be deployed in Verizon network equipment space. Some tests may not be applicable depending on the exact equipment configuration and application. Please contact Verizon NEBS Compliance organization with any questions about the applicability of specific tests.

4.2. CLARIFICATIONS TO VERIZON ADDITIONAL NEBS REQUIREMENTS

4.2.1. GR-78-CORE Requirements.

4.2.1.1. General Requirements for all products:

4.2.1.1.1. All piece parts, components, wire, and cable shall, where practical, be marked to be traceable to their original manufacturer; this requirement does not apply to structural metalwork and machined hardware such as screws. On a temporary basis, part markings that fail to withstand assembly processing may be remarked with the original component markings. This does not apply to markings identifying program-related information for programmable devices such as Erasable Programmable read-only Memories (E-PROMs).

4.2.1.1.2. The electrical and mechanical integrity and the reliability of all components and assemblies shall be retained after exposure to all processes employed during manufacture and assembly (e.g., handling, fluxing, soldering, and cleaning). It is the responsibility of the equipment supplier to demonstrate that each assembly and generic component type meets this requirement. Proof of the electrical and mechanical integrity of both components and assemblies shall be made available to Verizon.

4.2.1.2. Material and Finish Requirements:

4.2.1.2.1. Unless otherwise specified in GR-78-CORE or supporting documents, materials and finishes shall meet approved industry standards such that product integrity is not compromised for:

4.2.1.2.2. Whisker Growth – Tin, Zinc or Cadmium.

4.2.1.2.3. Fretting and Corrosion.

4.2.1.2.4. Dissimilar metal finishes.

4.2.1.2.5. Migrating silicon encapsulants near open contacts.

4.2.1.2.6. Material migration e.g., Solder.

4.2.2. ESD Immunity Requirements.

4.2.2.1. Verizon requires that Severity Level 4 testing be done, as described in GR-1089 R2-1, R2-2, R2-3 and O2-4.

4.2.2.2. Wrist strap ground jacks must be external to any doors or removable covers to permit the wrist strap ground lead to be connected before any doors or covers are opened.

4.2.2.3. The lab test report shall list all components included in the test unit/system and shall specifically list or identify any functional abnormalities encountered during the sequence of test discharges. ESD testing must be done on a fully configured functioning unit.

4.2.2.4. The lab test report shall list all points tested and provide a picture of the test setup.

4.2.2.5. Test points used shall be representative of areas or points commonly expected to be exposed to manual handling during installation, setup, adjustment, circuit pack replacement, etc.

4.2.2.6. Verizon supports and encourages the use of wrist straps to minimize ESD. Verizon does not support, endorse, or permit the use of floor mats as abatement for ESD.

4.2.3. EMI Immunity Requirements.

4.2.3.1. Verizon requires that EMI testing be done with doors or covers, if equipped, open (R3-11, R3-13). CR3-12 and CR3-14 shall be considered Objectives, all failures must be analyzed and risk assessments performed.

4.2.3.2. Cabling must use the same setup as 3.2.10.5. In order to simulate normal operation, all cabling shall be connected and run in a vertical position, and dressed as shown in Figure 8. Once placed as shown in Figure 8, no cable movement or rearrangement in an attempt to maximize emissions should be made. An original picture and description of the test setup shall be included.

4.2.4. GR-1089-CORE Issue 3 - Lightning Surge and AC Power Fault Test Connections (Telecommunications Port) and ILR Issue 1A. The following criteria will not be required by Verizon:

4.2.4.1. Verizon has revised its long standing installation practices and now allows shielded cables to be grounded at both ends when in the common bonding network. Therefore, the GR-1089 Intra-building Lightning Surge Tests (Telecommunications Port) statement that "these tests do not apply if intra-building wiring (cabling) is shielded and the manufacturer’s documentation states that both ends of the shield must be grounded" is now applicable for equipment that will be installed in the CBN..

4.2.5. GR-487 Requirements

4.2.5.1. Verizon requires that GR-487 testing be performed on all equipment and cabinets assemblies that are for outdoor installation.

4.2.5.2. The current version of GR-487-CORE does not provide a detailed test methodology for performing Operating Temperature/Relative Humidity of cabinets with installed electronic equipment. This omission in the Generic Requirement document causes independent test laboratories (ITLs) and equipment providers to interpret the test methodology (duration/profile) differently. Inconsistently applied test methods become the source of unreliable product testing.

4.2.5.3. Verizon requires the test methodology specified in GR-63 be used with the temperature, humidity, and dwell time criteria of GR-487-CORE Section 3.26. In order to apply the OSP equipment standards to the central office test methods, note the following:

4.2.5.3.1. Replace the CO temperature limits in GR-63-CORE with the ambient temperature limits of GR-487, -40 °C to +46 °C, with solar loading applied only at +46 °C or +65 °C for DLC enclosures without solar loading, as specified in GR-487 section 3.26 requirements. ITLs will report results by including a pictorial representation of the temperature profile.

4.2.5.3.2. The equipment, in a configuration representing planned deployment, will operate under the above conditions for two consecutive failure-free cycles. ITLs will report results by including how many cycles were run for the equipment to pass.

4.2.5.4. GR-487 Section 3.26 provides requirements for the Operating Temperature/Relative Humidity requirement of the electronic equipment installed in outdoor cabinets. Verizon does not require specific modifications or additional testing for outdoor cabinets.

4.2.5.4.1. Verizon and the equipment vendor will decide whether the solar loading or non-solar loading version of the test will be performed.

4.2.5.4.2. For tests with solar loading, the solar load is defined per GR-487-CORE specification, Section 3.26. Auxiliary heaters must be used to simulate solar load and are turned on at the elevated temperature +46°C cycle level only.

4.2.5.4.3. For tests without solar loading, the chamber ambient temperature range shall be varied using the extended temperature range of -40°C to +65°C. Ramp up and ramp down rates of the GR-63-CORE Figure 5-4, profile shall remain the same and the ramp up and ramp down times shall be extended until the indicated temperature is reached. A successful test requires that the equipment be operated in a typical configuration for two full, consecutive failure-free GR-63-CORE Figure 5-4, profile test cycles.

4.2.6. Passive Fiber Optic Component (FOC) Qualification Reporting.

4.2.6.1. Passive Fiber Optic Components (FOC) are embedded within many products that provide service to customers. These optical components can be found in network equipment that may be installed in traditional central offices, data and video centers, as well in the outside plant or at customer premises. With the deployment of new fiber optic initiatives such as Fiber-to-the-Premises (FTTP), it has become necessary to evaluate all passive fiber optic components that are embedded in equipment deployed in both controlled and uncontrolled environments. Examples of these passive optical components include, but are not limited to, separable optical connectors, cables, and splitters. The FOC requirements allow a carrier to use a single, uniform set of rules to evaluate fairly and impartially fiber optic components to be placed in the carrier's service network, whether these components are embedded in equipment that is owned by Verizon or which is placed in leased space by other companies. When a supplier utilizes an optical component within its equipment, that optical component must have been qualified or tested to the appropriate GR standard. It is not necessary to retest the individual optical components as part of the system evaluation if the components were previously tested and passed the applicable qualification tests executed by an approved Verizon FOC ITL.

4.2.6.2 Carriers do not waive FOC requirements. All applicable requirements shall be tested. No test facility, supplier, or consultant may decide what requirements or objectives may be altered or omitted unless the carrier's compliance organization is consulted with in advance.

4.2.6.3 Carriers reserve the right to determine which requirements or objectives may or may not be required. Certain FOC requirements may not be applicable for the components under certain conditions. A detailed explanation of the reason why the requirement is not applicable shall be provided. The carrier's compliance organization shall determine the suitability of such explanations. The final determination of all issues regarding applicability, pass/fail requirements or intent shall be decided by the carrier's compliance organization. All components that are being evaluated for FOC compliance for use by the carrier shall meet the current FOC requirements that are in effect at the time the component is being evaluated for deployment, not the time the equipment was tested.

4.2.6.4 Equipment suppliers are responsible for ensuring that all OEM (Original Equipment Manufacturer) devices and subassemblies also meet the FOC requirements.

4.2.6.5 The supplier or integrator of the final system provided to the carrier is responsible for attaining and maintaining FOC compliance.

4.2.6.6 The supplier or integrator of the final system provided to the carrier may provide the OEM's test data if authorized by the OEM and tested by a Verizon-approved FOC ITL. However, if the OEM component is integrated in a configuration with other components, the entire configuration shall be tested.

4.2.6.7 A table similar to one below, showing the optical component and manufacturer, laboratory organization, test report number and date, and GR standard(s) used to qualify the fiber optic component shall be supplied as an attachment to the NEBS Telecommunication Carrier Group test report.

4.2.6.8 It is the responsibility of the Independent Testing Laboratory (ITL) to inform its clients (suppliers) of the Fiber Optic Component testing requirements. It is also the supplier's responsibility to complete the required fiber optic testing at a Verizon certified FOC lab. Additionally, the ITL shall compile and provide the Fiber Optic Component Declaration Matrix (ref. Table 5) as an attachment to the TCG NEBS test report. The ITL shall clearly note in the Executive Summary section of the NEBS test report that it verified the Fiber Optic Component qualification information. The Fiber Optic Component test reports shall be provided with all other NEBS test reports to Verizon in both hard and soft copy format.

Fiber Optic Component Declaration Matrix

Examples Optical Device Manufacturer	Examples of Optical Device Descriptions & Part Numbers	FOC Tested and Passed? (Y/N)	Independent Test Laboratory Used	FOC Report Number	Report Date	GR/s Used
ABC Corp.	**Splitter Module P/N: SPL459**	**Y**	**ABC Labs**	**PW1245**	**12/25/04**	GR-1209 GR-1221
DEF Inc.	**Optical Connector P/N: CX003-2**	**Y**	**XYZ Labs**	**FT309-3**	**1/4/05**	GR-326

Table 5

4.2.7. Active Fiber Optic Component (FOC) Qualification Testing and Reporting

4.2.7.1. Verizon recommends that all fiber optic component OEMs, suppliers, and integrators test their respective active fiber optic components to meet GR-468-CORE. These tests can be performed at the OEM, supplier, or integrator's own test facility. Verizon does not require that the GR-468 tests be conducted by a Verizon-approved FOC ITL, or witnessed when testing is performed at the OEM,

supplier, or integrator's own test facility. Verizon reserves the right to review test data from the GR-468 testing performed at FOC suppliers' facilities.