



**Verizon NEBS™ Compliance: NEBS
Compliance Clarification Document**
Verizon Technical Purchasing Requirements
VZ.TPR.9305
Issue 6, November 2013



CHANGE CONTROL RECORD:

| Version | Date | Action* | Reason for Revision |
|-------------------------------------|-------------|----------------|---|
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| 3 | 11/18/2010 | Add | Clarification on flame spread testing |
| 4 | 5/3/2011 | Delete | Remove requirement for radiometers during flame spread testing |
| 5 | 8/21/12 | Change | Update for acceptance of GR-1089-CORE Issue 6 and GR-63-CORE Issue 4 |
| 6 | 11/19/13 | Change | Update for acceptance of GR-3108 Issue 3 & other editorial changes |
| * New, Add, Delete, Change, Reissue | | | |

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1.0 Purpose

The purpose of this Verizon Technical Purchasing Requirement document is to provide clarification to Verizon's interpretations of NEBS testing requirements and pass/fail criteria.

Vendors are required to perform NEBS testing in order to ensure that the equipment placed within the Verizon Network, whether in a Verizon Central Office, outside plant network or within a customer's premises, is safe, reliable and performs as intended. NEBS requirements not only ensure the safety of the network but also the safety of the personnel that come into contact with the equipment. NEBS testing helps to ensure that equipment placed within the Verizon network will function properly when external factors, including but not limited to temperature variations, vibration, airborne contaminants and electromagnetic interference are present in area of the deployed equipment.

2.0 Scope

This document provides clarification to NEBS test requirements for equipment being tested to GR-63-CORE, GR-1089-CORE, GR-487-CORE, GR-3108-CORE and FOC testing. This document shall be used by equipment suppliers and the Verizon-approved Independent Test Laboratory as guidance to create the NEBS test plan. In all instances of test planning and test execution, the most recent and accepted versions of the GR standards shall be used. Verizon reserves the right to modify all or any of its NEBS processes to meet the needs of the business.

3.0 References

| | |
|---------------------------------|---|
| GR-63-CORE | NEBS™ Requirements: Physical Protection |
| GR-78-CORE | Generic Requirements for the Physical Design and Manufacture of Telecommunications Products and Equipment |
| GR-487-CORE | Generic Requirements for Electronic Equipment Cabinets |
| GR-3108-CORE | Generic Requirements for Network Equipment in the Outside Plant (OSP) |
| GR-1089-CORE | Electromagnetic Compatibility and Electrical Safety – Generic Criteria for Network Telecommunications Equipment |
| SIT.NEBS.TE.NPI.2004.015 | Telecommunications Carrier Group NEBS Compliance Checklist |



4.0 Acronyms

| | |
|-------------|--------------------------------------|
| CO | Central Office |
| CLEC | Competitive Local Exchange Carrier |
| CPE | Customer Premises Equipment |
| DLC | Digital Loop Carrier |
| EFT | Electrical Fast Transient |
| EMI | Electromagnetic Interference |
| ESD | Electrostatic Discharge |
| EUT | Equipment Under Test |
| FOC | Fiber Optic Component |
| FTTP | Fiber To The Premises |
| GR | Generic Requirements |
| HOH | Horizontal Overhead Air-Distribution |
| ITL | Independent Test Laboratory |
| LBP | Line Burner Placement |
| OEM | Original Equipment Manufacturer |
| OSP | Outside Plant |
| VOH | Vertical Overhead Air-Distribution |

5.0 Verizon NEBS Requirements by Location

- 5.1 For network equipment to be acceptable for deployment in Verizon, it must meet the applicable NEBS criteria. Since NEBS tests are influenced by the deployment locations, Verizon has reviewed the different categories of deployment locations and detailed the different requirements applicable to those locations. For a list of Verizon requirements by location, please refer to [VZ.TPR.9203](#).

6.0 Verizon Lead-Free Requirements

- 6.1 For network equipment to be acceptable for deployment in Verizon, products containing lead-free solder must be further evaluated to ensure long term reliability. For a list of Verizon requirements for products constructed using lead-free solder, please refer to [VZ.TPR.9307](#).



7.0 Verizon Clarifications to NEBS Requirements

7.1 General

7.1.1 The following requirements represent specific areas of concern that, in Verizon's opinion, require additional clarification to 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 are intended to address common questions from suppliers and test labs.

7.2 Power Requirements

7.2.1 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.

7.2.2 AC powered equipment shall not be used in the Isolated Ground Plane.

7.2.3 Verizon does not want any AC convenience outlets in any equipment installed in the Isolated Ground Plane. GR-63, R3-21 [20] and R3-22 [21] do not require that outlets be provided; they merely stipulate how to provide outlets if ordered by Verizon.

7.2.4 Verizon requires that [VZ.TPR.9211](#) *Vendor Power and Grounding Questionnaire* be completed and provided with the NEBS Test Report submission

7.3 Spatial Requirements

7.3.1 Verizon requires that the supplier provide an accurate equipment width and depth. Depth measurements shall include space required for cabling. Equipment mounted in racks/cabinets shall be contained within the overall footprint of the rack/cabinet.

7.4 Thermal Requirements

7.4.1 Telcordia grouped certain risk and safety hazard data measurements into the thermal performance category. Verizon considers GR-63 items R4-28 [77], O4-29 [78], O4-32 [79] and R4-33 [159] to be risk and safety hazard requirements and requires testing for both Verizon and CLEC equipment.



7.4.2 Verizon requires that the supplier provide aisle facing surface temperature data (GR-63, O4-32 [79] and R4-33 [159]). Aisle facing surface temperature of equipment shall not exceed 48 degrees C (118 degrees F) at an ambient room temperature of 23 degrees C (73 degrees F) when the exposure time is categorized as prolonged use per GR-63-CORE, Issue 4.

7.4.3 **Verizon Equipment and Room Cooling Class Preferences.**

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

7.4.3.2 Verizon requires 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 and must have a baffle system available to direct air flow into an acceptable protocol.

7.4.4 Verizon requires that the supplier provide accurate heat release information as described in GR-63 Section 4.1.6, R4-28 [77], O4-29 [78], and Table 4-5. 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.

7.4.5 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.

7.5 **Altitude Requirements**

7.5.1 Verizon will accept any of the following three methods for demonstrating compliance to the NEBS Altitude Test criteria.

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

7.5.1.2 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.

7.5.1.3 The ITL shall test to Objective O4-10 [137], and if the EUT passes, it is considered to meet NEBS criteria R4-7 [74], R4-8 [136], and O4-11 [76]. 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 3 of the Operational Temperature and Humidity Test. Step 3 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.

7.5.2 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.

7.6 Fire Resistance Requirements

7.6.1 Verizon requires that supportive data be provided to warrant the pass/fail status of R4-39 [81] and R4-40 [162] for frame level equipment and R4-45 [86] and R4-46 [163] for shelf level equipment.

7.6.2 Tests are expected to identify any fire resistance, ability to self-extinguish, and fire-spread issues that must be corrected. Smoke analysis should be provided to indicate the particulate content and corrosivity.

7.6.3 Generic Guidelines for Fire Spread Testing

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

7.6.3.2 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.



- 7.6.3.3 A non-working sample may be used.
- 7.6.3.4 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.
- 7.6.3.5 Verizon considers fans off as a worst-case test scenario. If the fans or fan controlling circuitry is no longer working after a specific test run, the subsequent test runs shall be performed with the fans or fan controller circuitry no longer operational. If the vendor wants to do subsequent runs with the fans and fan controlling circuitry operational, then the entire system (chassis, backplane, PCBs, etc.) shall be replaced.
- 7.6.3.6 EUT must be pre-conditioned to 23°C and a RH 50% (ATIS-0600319.2008 Section 7.2).
- 7.6.3.7 **GR-63 – Test Setup**
 - 7.6.3.7.1 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.
 - 7.6.3.7.2 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.
 - 7.6.3.7.3 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.



- 7.6.3.7.4 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 faceplate to accommodate the line burner.
- 7.6.3.7.5 Follow the instructions in GR-63 Section 5.2.3 for Equipment Assembly Fire Spread Test. If a removable card is equal to or greater than 1” wide, leave the removable card in its slot and drill a hole through the bottom of the faceplate 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.
- 7.6.3.7.6 If the equipment has fans and they blow out the flame, follow the protocol of adjustments to the test variables of burner location and initial pilot flow. If the fans continue to blow out the line burner and the burner gas flow reaches the maximum flow for that board height, leave the fans off and continue the test at initial methane flow rates.
- 7.6.3.7.7 For flame tests involving vertically oriented circuit boards, the methane line burner shall remain lit for a minimum of 180 seconds from the start of the test. At 180 seconds, the methane flow is approximately ½ the maximum flow rate of the profile. If the methane burner does not remain lit during this time period, stop the test and restart the test from the beginning with the fans powered off for the duration of the test.
- 7.6.3.7.8 The following diagrams show the shelf and frame level set-ups for Verizon’s Fire Spread Test.

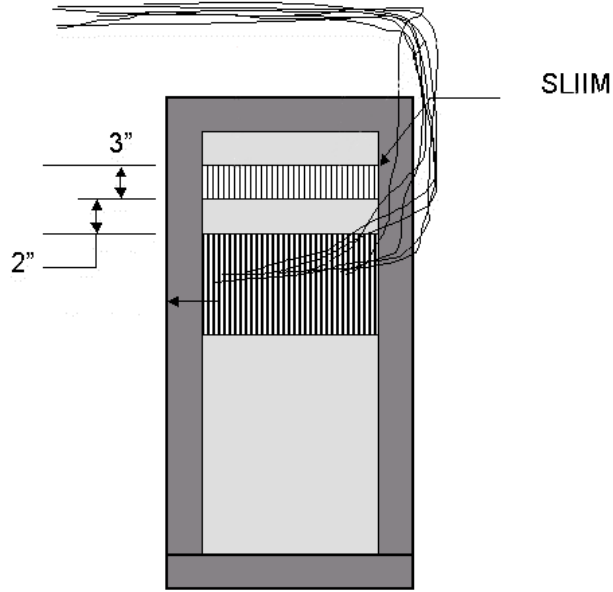


Figure 1 – ATIS-0600319.2008 Shelf-Level Fire Test Setup

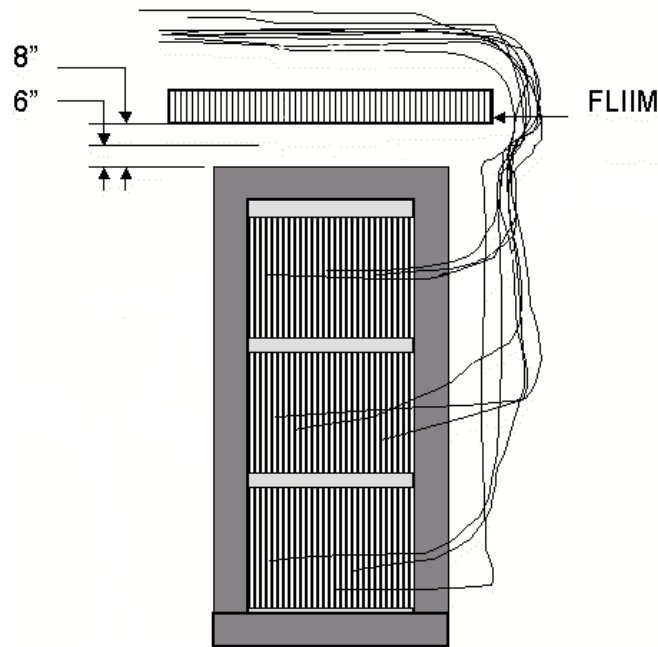


Figure 2 - ATIS-0600319.2008 Frame Fire Test Setup

7.6.3.7.9

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

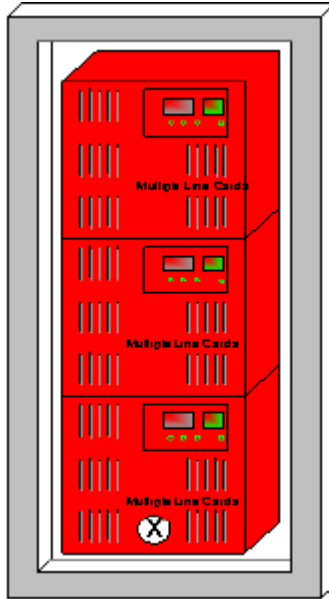


Figure 3 - Typical CO environment

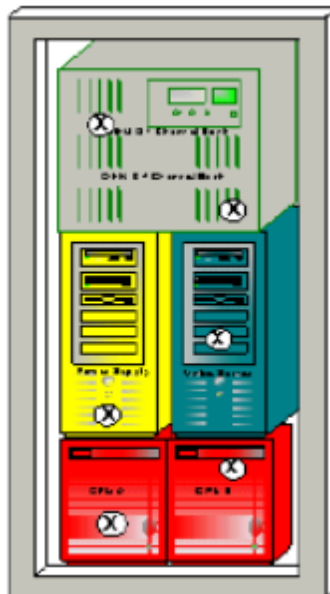


Figure 4 - Platform with dissimilar components and compartmentalized shelves



Figure 5 - Platform with dissimilar shelves and video monitor

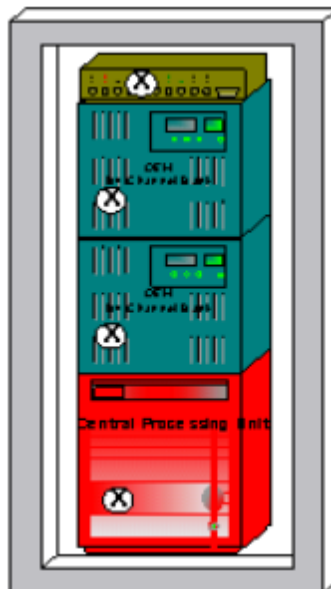


Figure 6 - Platform with Dissimilar Shelves

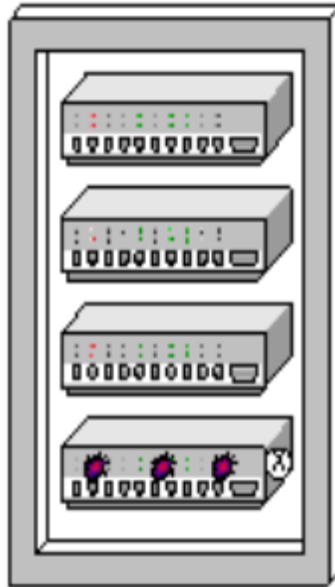


Figure 7 - Platform fire spread test of four eight-inch shelves

X – Insert line burner and rotate 90 degrees over top of circuit board

7.6.3.8 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 ATIS-0600319.2008, 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.



- 7.6.3.9 Verizon considers O4-54 [167] of GR-63-CORE a requirement. No more than minimal wisps of smoke are permitted after 15 minutes from the start of the test.
- 7.6.3.10 In addition to the pass/fail requirements stated in GR-63-CORE, Verizon considers any flames extending outside the confines of the equipment under test (top, bottom, sides, front and rear) for more than 30 seconds to be a failure.
- 7.6.3.11 Color video recordings (standard image) of all required Fire Spread Tests (GR-63-CORE, 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, including the thermocouples and circuit board samples above 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.
- 7.6.3.12 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.
- 7.6.3.13 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.



7.6.3.14 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.

Table 1 – Flammability Database

| 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 | |

7.6.4 ATIS-0600319.2008: Telecom Equipment Assemblies - Fire Propagation Risk Assessment Criteria. The following table lists Verizon’s clarifications for testing per ATIS-0600319.2008 Fire Propagation Test Standard.



Table 2 – ATIS-0600319.2008 Test Clarification

| 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 |



| Section | Description | Verizon Comment |
|-----------|---|---|
| | | 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 |
| 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 |



| Section | Description | Verizon Comment |
|---------|--|---|
| 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 | |
| 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. |
| 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 |



| Section | Description | Verizon Comment |
|---------|--|---|
| 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 | |
| 7.1 | General | ACCEPT - SEE SECTION 7.2.6.3.4 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 7.2.6.3.4 FOR ADDITIONAL NOTES ON FAN OPERATION DURING FIRE SPREAD TESTS. |
| 8.2.3 | Line burner placement | ACCEPT |
| | Burner placement, Number of tests required | ACCEPT |
| | Opening size for line burner insertion | ACCEPT |
| | Vertical circuit card testing | 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 7.2.6.5.3 FOR FURTHER CLARIFICATION. |
| | Fan cooled equipment with multiple circuit cards | |
| | Non fan cooled, horizontal PCB test | ACCEPT |



| Section | Description | Verizon Comment |
|---------|--|---|
| 8.2.3.1 | Airflow characteristics | ACCEPT |
| 8.2.3.2 | Chassis design | <p>MAY USE AIRFLOW MEASUREMENT RESULTS TO DETERMINE LINE BURNER PLACEMENT. HOWEVER, IF NO AIR FLOW MEASUREMENTS ARE AVAILABLE, THEN ALL QUADRANTS AND COMPARTMENTS MUST BE TESTED. AIRFLOW DATA SHALL BE SUBMITTED AS PART OF THE TEST REPORT.</p> <p>REFER TO ANSI T1.319-2002 ANNEX B AND SECTION 7.2.6.5.6 FOR LINE BURNER PLACEMENT.</p> |
| 8.2.4 | Start of test | <p>EQUIPMENT SHALL BE CONDITIONED AS PER GR-63-CORE.</p> <p>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.</p> |
| 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 7.2.6.7. |
| 8.2.6 | End of test | THE TEST DURATION SHALL BE FIFTEEN MINUTES OR UNTIL FLAMING AND SMOKE |



| Section | Description | Verizon Comment |
|---------|---------------------------|--|
| | | 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 CRITERIA IN SECTIONS 7.2.6.6 and 7.2.6.8. |
| 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 SECTIONS 7.2.6.6 and 7.2.6.8. |
| 11 | Report of risk assessment | THE REPORT SHALL INCLUDE THE THERMAL IMAGE OF THE EQUIPMENT, AS DESCRIBED IN SECTION 7.2.6.10. |

7.7 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 4-3 for detailed testing information. Earthquake videos should be provided with the test documentation.



- 7.8 **Airborne Contaminants.** Mixed Flowing Gas testing shall be performed for duration of 14 days.
- 7.9 **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 sound power is 78 dB (A) for equipment to be located in Telecommunications Room (attended).

7.10 ESD Immunity Requirements

- 7.10.1 Verizon requires that Severity Level 4 testing be done, as described in GR-1089 R2-1 [1], R2-2 [2], R2-3 [3] and R2-4 [4].
- 7.10.1 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.
- 7.10.2 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.
- 7.10.3 The lab test report shall list all points tested and provide a picture of the test setup.
- 7.10.4 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.
- 7.10.5 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.
- 7.10.6 ESD waveform verification shall be performed prior to testing and included as part of the NEBS reporting.



7.11 EMI Emission Requirements

- 7.11.1 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.
- 7.11.2 Testing must be done through 10 GHz.
- 7.11.3 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.
- 7.11.4 Lab test reports shall include the measured emissions at the highest frequency tested.
- 7.11.5 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, 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 in the test report.

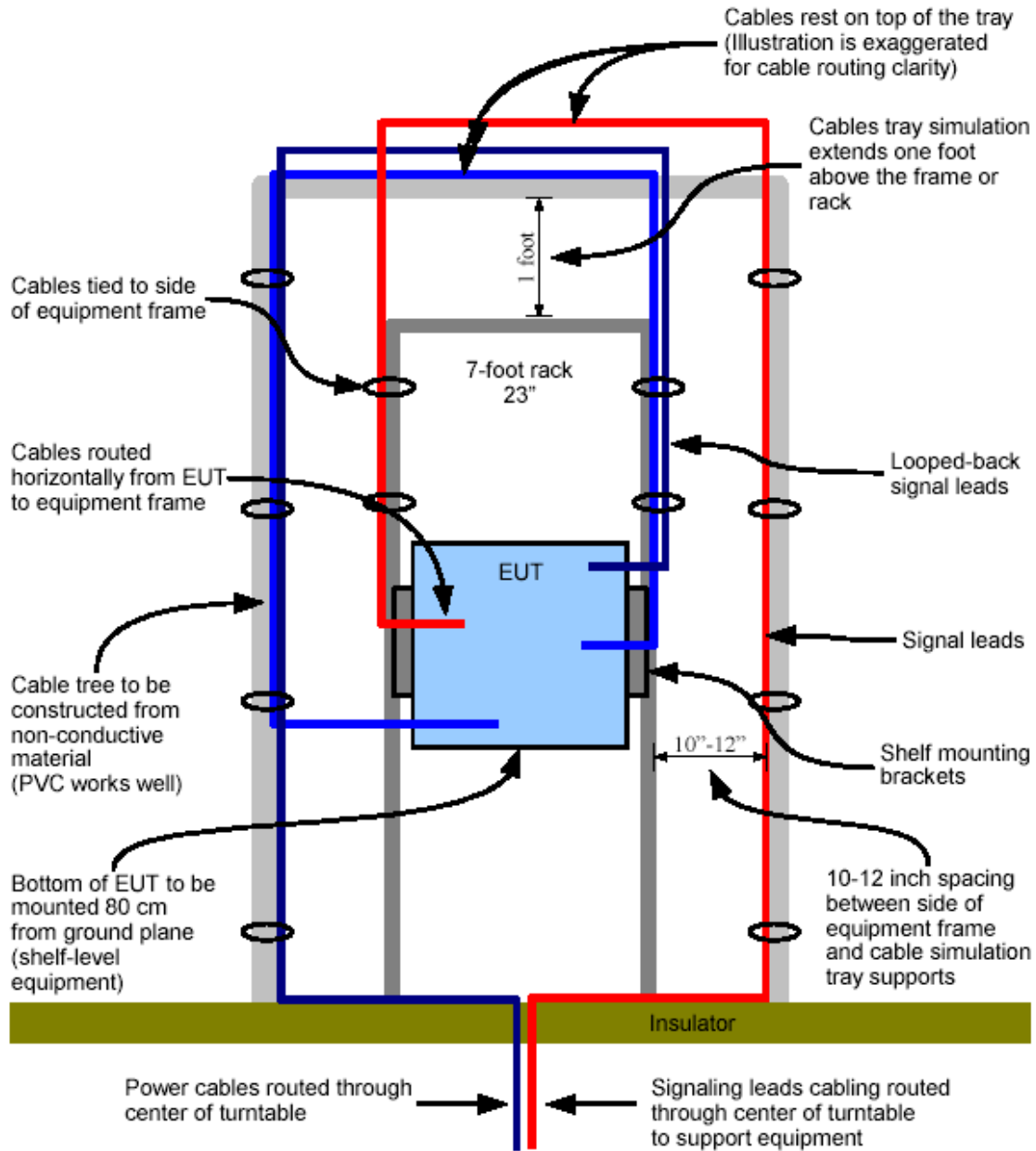


Figure 8 - EMI Emission Test Setup



7.12 EMI Immunity Requirements

- 7.12.1 Verizon requires that EMI testing be done with doors or covers, if equipped, open R3-16 [16] and R3-18 [18].
- 7.12.1 Cabling must use the same setup as 7.2.13.5. 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 in the test report.

7.13 Lightning Surge and AC Power Fault Test Connections

- 7.13.1 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.
- 7.13.2 AC power fault testing specified at 425 Vrms in Tables 4-4 and 4-5 shall be performed at the GR-1089-CORE Issue 5 levels of 600 Vrms.

7.14 Bonding and Grounding

- 7.14.1 To meet the Unit Bonding and Grounding safety connection requirements, GR-1089, R9-9 [79] 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.
- 7.14.2 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 listed two-hole compression type connector per GR-1089, R9-24 [89] and GR-295.



- 7.14.3 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.
- 7.14.4 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.
- 7.14.5 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.

8.0 Clarifications to Verizon Additional NEBS Requirements

8.1 GR-78 Requirements

- 8.1.1 General Requirements for all products.
- 8.1.1.1 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).
- 8.1.1.2 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.
- 8.1.1.3 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:
- Whisker Growth – Tin, Zinc or Cadmium.



- Fretting and Corrosion.
- Dissimilar metal finishes.
- Migrating silicon encapsulants near open contacts.
- Material migration e.g., Solder.

8.1.1.4 Self-Declaration of compliance to the requirements of GR-78-CORE can be found in the TCG Checklist. This section of the checklist shall be filled out by the vendor and provided with the NEBS test reports.

8.2 GR-487 Requirements

- 8.2.1 Verizon requires that GR-487 testing be performed on all equipment cabinet assemblies that are for outdoor installation.
- 8.2.2 Requirement R3-4 [4] statement ‘Conformance is to be determined by supplier attestation’ is not acceptable. Conformance shall be determined by Verizon based on supplier provided data.
- 8.2.3 Figure 3-2 provides examples of openings in the cabinet to prevent insect intrusion. Verizon’s preference is for Example 1(hex pattern) and Example 2 (triangle pattern).
- 8.2.4 GR-487 cabinets containing a full complement of electronics (functional system) shall be evaluated to all applicable requirements of both GR-487 and GR-3108.

8.3 GR-3108 Requirements

- 8.3.1 Verizon requires that GR-3108 testing be performed on all electronic equipment assemblies that are intended for outdoor installation.
- 8.3.2 If the class of environment is undefined at the time of testing, Verizon preference is to test to worst case conditions.

8.4 Passive Fiber Optic Component (FOC) Qualification Reporting

- 8.4.1 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.

- 8.4.2** 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.
- 8.4.3** 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.
- 8.4.4** Equipment suppliers are responsible for ensuring that all OEM (Original Equipment Manufacturer) devices and subassemblies also meet the FOC requirements.
- 8.4.5** The supplier or integrator of the final system provided to the carrier is responsible for attaining and maintaining FOC compliance.
- 8.4.6** 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.



- 8.4.7** 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.
- 8.4.8** 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.

Table 3 – 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 |
| | | | | | | |
| | | | | | | |

8.5 Active Fiber Optic Component (FOC) Qualification Testing and Reporting

- 8.5.1** 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.