



# **Verizon NEBS™ Compliance: Qualification Requirements for Fire Suppression Systems used in Verizon Central Office and Battery Room Equipment Space**

Verizon Technical Purchasing Requirements  
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Issue 1	02/15/2011	Reissue	Incorporated comments received and made editorial tweaks.
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* New, Add, Delete, Change, Reissue			

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DuPont is a trademark of E. I. du Pont de Nemours and Company



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\*With much appreciated technical and business contributions, guidance and assistance from key Verizon users, suppliers and other industry stakeholders.



# Table of Contents

<b>1.0</b>	<b>PURPOSE</b> .....	<b>5</b>
<b>2.0</b>	<b>SCOPE</b> .....	<b>5</b>
<b>3.0</b>	<b>REFERENCES</b> .....	<b>5</b>
<b>4.0</b>	<b>ACRONYMS</b> .....	<b>6</b>
<b>5.0</b>	<b>DEFINITIONS</b> .....	<b>6</b>
<b>6.0</b>	<b>BACKGROUND</b> .....	<b>6</b>
<b>7.0</b>	<b>APPLICABILITY</b> .....	<b>7</b>
<b>8.0</b>	<b>SYSTEM BOUNDARIES</b> .....	<b>8</b>
<b>9.0</b>	<b>EXTINGUISHING AGENT AND PROPELLANT</b> .....	<b>9</b>
<b>10.0</b>	<b>QUALIFICATION REQUIREMENTS FOR FIRE SUPPRESSION SYSTEMS</b> ...	<b>10</b>



## 1.0 PURPOSE

The purpose of this Verizon document is to specify Qualification Requirements for Pre-Engineered, Dual Gel Agent, Dry Chemical, Automatic, and Modular Fire Suppression Systems. The goal is to help assure the products are acceptable for use in Verizon Central Office and Battery Room equipment space.

## 2.0 SCOPE

Because each fire suppression system is different, additional system-specific tests may have to be added to this qualification test plan to properly exercise the features, functions and performance of the specific system. The qualification tests and requirements contained herein shall be used by suppliers and their selected testing laboratories as the minimum set of requirements and tests for pre-engineered, dry chemical fire suppression system qualification. Additional manufacturer-specific tests may be added as needed to properly exercise the materials, technology, design and manufacturing processes used by the manufacturer. In all instances of test planning and test execution, the specified version of the referenced documents shall be used. Where no version is specified, the most recent and Verizon accepted version of the referenced document shall be used.

## 3.0 REFERENCES

<b>GR-63-CORE</b>	NEBS <sup>T M</sup> Requirements: Physical Protection Issue 3, March 2006
<b>GR-78-CORE</b>	Generic Physical Design Requirements for Telecommunications Products and Equipment Issue 1, September 1997
<b>GR-357-CORE</b>	Generic Requirements for Assuring the Reliability of Components Used in Telecommunications Equipment Issue 1, March 2001
<b>GR-1089-CORE</b>	Electromagnetic Compatibility and Electrical Safety, Generic Criteria for Network Telecommunications Equipment Issue 4, June 2006
<b>GR-1209-CORE</b>	Generic Requirements for Passive Optical Components, Issue 3, March 2001
<b>GR-1221-CORE</b>	Generic Reliability Assurance Requirements for Passive Optical Components, Issue 2, January 1999
<b>IP72202</b>	Network Equipment Installation Standards Issue 4, December 2009
<b>NFPA 17</b>	Standard for Dry Chemical Extinguishing Systems, 2002 Edition
<b>UL 1254</b>	Test Standard for Pre-Engineered Dry Chemical System Units
<b>ANSI/UL 1254-1999</b>	Pre-Engineered Dry Chemical Extinguishing System Units
<b>EPA SW-846</b>	Corrosivity Towards Steel, Method 1110
<b>EPA SW-846</b>	Specific Conductance, Method 9050



#### 4.0 ACRONYMS

<b>Class A</b>	Fuel – Ordinary Combustibles
<b>Class B</b>	Fuel – Flammable Liquids
<b>Class C</b>	Fuel – Electrical Equipment
<b>AHJ</b>	Authority Having Jurisdiction
<b>PSI</b>	Pounds Per Square Inch

#### 5.0 DEFINITIONS

**Approved:** Acceptable to the authority having jurisdiction.

**Authority Having Jurisdiction (AHJ):** The organization, office or individual responsible for approving equipment, materials, an installation or a procedure. This may include the insurance company, fire service and building management.

**Automatic Extinguisher Unit:** A unit that has no manual means of actuation, discharges extinguishing agent upon thermal actuation, is intended for use in a normally unoccupied space and is limited to a single protected area.

**Listed:** Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.

**Dry Chemical System:** A means of applying dry chemical that can be automatically or manually activated to discharge through a distribution system onto or into the protected hazard. The system includes auxiliary equipment.

**Engineered System:** Those requiring individual calculation and design to determine the flow rates, nozzle pressures, pipe size, area or volume protected by each nozzle, quantities of dry chemical, number and types of nozzles, and their placement in a specific system.

**Pre-Engineered Systems:** Those having pre-determined flow rates, nozzle pressures and quantities of dry chemical.

**Total Flooding Systems:** A supply of dry chemical permanently connected to fixed piping and nozzles that are arranged to discharge dry chemical into an enclosure surrounding the hazard.



## **6.0 BACKGROUND**

Pre-engineered dry chemical fire extinguishing systems generally consist of an extinguishing agent, expellant gas storage tank/s, manual or automatic controllers, piping or tubing to deliver the agent and nozzles to effectively disperse the agent onto the fire area. The installation requirements for a pre-engineered fire extinguishing system are specified by the manufacturer.

Construction specifications, including the quantity of extinguishing agent, pipe size and length limitations, maximum number and type of fittings, nozzle type and location are usually specified in the manufacturer's installation, operation and maintenance manual. Additional system design engineering is not normally necessary provided the system is installed in conformance with the limitations specified in the system manufacturer's manual.

Per-engineered dry chemical extinguishing systems utilize two basic methods to achieve fire suppression – total flooding and local application. With total flooding, the dry chemical is discharged into an enclosed space. This allows the build-up of the necessary concentration of dry chemical within a short period of time so that near instant extinguishment can be achieved.

## **7.0 APPLICABILITY**

The qualification tests specified in this document apply to Pre-Engineered, Dry Chemical, Dual Gel Agent, Automatic, Total Flooding or Local Application, Modular Fire Suppression Systems that are intended for installation at Verizon Central Offices and Battery Power Rooms.

## **8.0 SYSTEM BOUNDARIES**

Fire suppression systems addressed in this document are intended to protect Verizon Central Office and Battery Room enclosures from Class A, B and C fires. These room enclosures may typically have ceiling heights of between 8.0 and 20 feet with no more than 2.5 square feet of un-closable openings.

Specific room enclosure size constraints, suppression system location, installation and other system-specific requirements are detailed in the product specific qualification test conformance report. Suppression systems may be localized or may be networked or otherwise extended to increase the protected coverage area. Details of these arrangements are again detailed in the product specific qualification test conformance report.



## **9.0 EXTINGUISHING AGENT AND PROPELLANT**

Pre-Engineered fire suppression systems usually use proprietary mixtures of thixotropically gelled Mono Ammonium Phosphate ( $\text{NH}_4\text{PO}_4$  - MAP) salt in DuPont FE-227<sup>TM</sup> ( $\text{C}_3\text{HF}_7$ ) halocarbon gas as the extinguishing agent. They use gaseous nitrogen at a pressure of about 175 psi at 21°C as the expellant. Full details of the specific system are usually given in the NRTL listed supplier specifications and manuals.

## **10.0 QUALIFICATION REQUIREMENTS FOR FIRE SUPPRESSION SYSTEMS**

### **10.1 Execution of Tests**

Verizon requires that suppliers submit samples of their Pre-Engineered Fire Suppression System to a Verizon Certified Independent Test Laboratory (ITL) and/or other Verizon acceptable laboratory as appropriate to conduct qualification testing and verification of conformance to the test requirements specified in this document. All tests in Table 1 shall be executed by the manufacturer selected test laboratory. Reporting of the test results shall be done by the test laboratory and/or the product supplier as appropriate in a 'Product Specific Qualification Test Conformance Report'. Suppliers shall provide this report to Verizon for test result evaluation and determination of fire suppression system acceptability for use in the Verizon application.

The tests specified in Table 1 below are not exhaustive. They represent a reasonable set of the known state-of-the art tests that, in Verizon's view, would help assure the particular system will be acceptable for deployment in Verizon Central Office and Battery Room Equipment space. Additionally, but not in lieu of the requirements specified herein, suppliers shall provide their selected test laboratory with the tests results of any other tests they consider applicable to and necessary for properly exercising the materials, technology, design and manufacturing processes used for their Fire Suppression System. The test laboratory shall include these manufacturer-specific tests and test results as supplementary information in the 'Product Specific Qualification Test Conformance Report'.

### **10.2 Test References**

The test references cited in Table 1 are intended to outline the general test methods and procedures to be used to evaluate the applicable requirement. The test conditions and requirements specified in Table 1 shall be used, and where applicable, shall override those specified in the cited reference. Other test methods (IEC, ANSI, UL, etc.) may be acceptable alternatives to the cited references. However, use of alternative test methods, procedures sampling plans, etc. will require demonstration that the proposed procedure is equivalent to or is better (from a user's viewpoint) than the specified procedure.





### 10.3 Reporting of Test Results

Qualification Requirements for Pre-Engineered Fire Suppression Systems for use in Verizon Central Office and Battery Room environment applications are detailed below in Table 1 - Qualification Requirements for Per-Engineered Fire Suppression Systems. Table 1 is designed to not only provide the required tests and declarations but to also provide the required format for reporting the measured/declared values and summarizing their conformance to requirements. The supplier/laboratory completing the qualification report need only populate column 5 with the measured or declared value for the test item together with a reference to the test report or document (with number and date) where the full information is located. Column 6 shall be left blank for use by Verizon. In addition to populating column 5 with the measured or declared parametric value of each test item, the report shall also contain a section listing the manufacturer or sub-contractor used and the designated physical location where key processes from product design through to product disposal are executed. Finally, the report shall also include a tabular listing of the product description and the manufacturer's part number of all items covered by the qualification activity.

### 10.4 Qualification Requirements for Pre-Engineered Fire Suppression Systems

Fire suppression systems and their constituent parts shall be tested and shall conform to the applicable qualification requirements detailed in Table 1 below:

**Table 1 – Qualification Requirements for Pre-Engineered Fire Suppression Systems**

Item Ref. #	Parameter/Test Item	Item Source Ref. GR/SR/DS etc.	Requirement/ Required Value	Measured/Design/ Declared Value and Source Report Ref.	Conforms? Y/N/NA/ Acceptable
<b>General System Requirements</b>					
1.	Quality Management System Certification	This document	The system and sub-system manufacturers used shall be ISO 9001: 2008 Certified for the design, manufacture and distribution of the applicable product		
2.	Codes and Standards Conformance	This document	The system shall conform to all applicable - local, state and federal codes and standards - AHJ Requirements - Insurance company requirements		



Item Ref. #	Parameter/Test Item	Item Source Ref. GR/SR/DS etc.	Requirement/ Required Value	Measured/Design/ Declared Value and Source Report Ref.	Conforms? Y/N/NA/ Acceptable
3.	NFPA 17 Conformance	This document	The system shall be tested and shall conform to the requirements of NFPA 17 – Standard for Dry Chemical Extinguishing Systems		
4.	UL 1254 Conformance	This document	The system shall be tested and shall conform to the requirements of Underwriters Laboratory Standard for Safety – UL1254		
5.	NEC Safety Listing and Approval	This document	The system shall be approved and listed by an NRTL		
6.	Installation	This document	1. The system shall be installed as per the listed supplier Fire installation manual and other applicable supplier technical bulletins, addenda, etc by trained staff 2. The installation shall conform to the applicable requirements of Verizon Network Equipment Installation Standard IP72202		
7.	Periodic On-site Inspection after installation	This document	The system shall be periodically inspected by a trained and knowledgeable person to ensure the system is in good working order.		



Item Ref. #	Parameter/Test Item	Item Source Ref. GR/SR/DS etc.	Requirement/ Required Value	Measured/Design/ Declared Value and Source Report Ref.	Conforms? Y/N/NA/ Acceptable
<b>System Material Requirements</b>					
8.	T <sub>G</sub> : Glass transition temperature of all polymeric materials	TPR-9306 and GR-1221: R4-24	≥ 95°C		
9.	T <sub>HDT</sub> : Heat distortion temperature of all polymeric materials	TPR-9306 and This document	≥ 150°C		
10.	OIT: Oxidative Induction Time of all polymeric materials	TPR-9306 ASTM D 3895 and GR-20[138]	20 minutes minimum after aging at 90°C for 14 days		
11.	Melt Flow/Melt Volume Index of all polymeric materials	This document	Verify conformity to specification per ASTM D1238		
12.	Thermal Aging of all polymeric materials	GR-771: 6.4.1 and GR-771: R5-11[85]	90°C for 30 days; 1. No visible deterioration, deformation, melting or cracking. 2. < 20% degradation in mechanical properties.		
13.	Legend and marking inks, repair polymer and adhesive materials	This document	Shall withstand 85°C minimum.		
14.	Glass Transition temperature of Label Attach Adhesives T <sub>G</sub>	1221: R4-24	≥ 95°C		
<b>Component Requirements</b>					
15.	Valves, Caps and Closures	UL 1254 Section 9	Valves, Caps and Closures used shall conform to the requirements of Section 9 1. Fill ID = 3/4" min 2. No contact with gasket removed. 3. 4 full threads engaged with gasket in place 4. Valve cap withstand pressure = 525 psi min. 5. Pressure relief of other components		



Item Ref. #	Parameter/Test Item	Item Source Ref. GR/SR/DS etc.	Requirement/ Required Value	Measured/Design/ Declared Value and Source Report Ref.	Conforms? Y/N/NA/ Acceptable
16.	Pressure Vessels and Cylinders, Gaskets and O-Rings	UL 1254 Sections 10 and 11	Pressure Vessels and Cylinders used shall conform to the requirements of Section 10 to 11		
17.	Gas Cartridges, Pressure Regulators, Pressure Gauges, Puncturing Mechanisms, Siphon Tubes	UL 1254 Sections 12 to 16	Gas Cartridges, Pressure Regulators and Pressure Gauge Puncturing mechanisms and Siphon tubes if used shall conform to the requirements of Section 12 to 16		
18.	Puncturing Mechanisms, Siphon Tubes	UL 1254 Section 17	Puncturing Mechanisms used shall conform to the requirements of Section 17		
19.	Nitrogen and Air Expellant Gasses	UL 1254 Section 18	Nitrogen and Air Expellant Gasses used shall conform to the requirements of Section 18		
20.	Polymeric Materials and Nonmetallic Parts	UL 1254 Section 19	Polymeric Materials and Nonmetallic Parts used shall conform to the requirements of Section 19		
21.	Electrical Devices, Pressure Switches and Nozzles	UL 1254 Sections 22 to 24	Electrical Devices, Pressure Switches and Nozzles used shall conform to the requirements of Section 22 to 24		



Item Ref. #	Parameter/Test Item	Item Source Ref. GR/SR/DS etc.	Requirement/ Required Value	Measured/Design/ Declared Value and Source Report Ref.	Conforms? Y/N/NA/ Acceptable
<b>System Functional and Operational Performance Requirements</b>					
22.	Class A Fire Test – Manual Activation, Low Temperature	UL-1254 Section 26.2	Unit Temp: 0°C Unit Location: Ceiling Center Room Size (ft.): 8.2 x 8.2 x 12.2 Room Opening = 1% Pre-Burn: ≥2 minutes Discharge - Manual Extinguish time: 0.05 sec. max		
23.	Class B Fire Test – Manual Activation, Low Temperature	UL-1254 Section 26.3	Unit Temp: 0°C Unit Location: Ceiling Center Room Size (ft.): 8.2 x 8.2 x 12.2 Room Opening = 1% Pre-Burn: ≥ 20 sec. Discharge: Manual Extinguish time: 0.05 sec. max		
24.	Class B Fire Test – Automatic Activation, Low Temperature	UL-1254 Section 26.4	Unit Temp: 0°C Unit Location: Ceiling Center Room Size (ft.): 8.2 x 8.2 x 12.2 Room Opening = 5% Fuel: heptane Discharge: Auto. Pre-Burn: ≥20 sec. Extinguish time: ≤ 1 min. after fuel ignition		
25.	Class B Fire Test – Automatic Activation, High Temperature	UL-1254 Section 26.4	Unit Temp: 40°C Unit Location: Ceiling Center Room Size (ft.): 8.2 x 8.2 x 12.2 Room Opening = 5% Fuel: heptane Discharge: Auto. Pre-Burn: ≥20 sec. Extinguish time: ≤ 1 min. after fuel ignition		



Item Ref. #	Parameter/Test Item	Item Source Ref. GR/SR/DS etc.	Requirement/ Required Value	Measured/Design/ Declared Value and Source Report Ref.	Conforms? Y/N/NA/ Acceptable
26.	Flow Distribution Test	UL-1254 Section 32	Discharge Rate and minimum amount of dry chemical shall be $\geq$ the discharge rate and amount for the test nozzles used		
27.	Hydrostatic Pressure Test	UL-1254 Section 33	Pressure Vessels, Gas Cartridges and Other Pressurized Devices shall withstand 3x normal operating pressure @ 21°C minimum		
28.	30-Day Elevated Temperature Test	UL-1254 Section 34.1	$\geq$ 85% (by weight) of rated dry-chemical charge after 30 days at 40°C.		
29.		UL-1254 Section 34.2	$\geq$ 85% (by weight) of rated dry-chemical charge after 30 days at 85°C.		
30.	Temperature Cycling Test	UL-1254 Section 35	There shall be no visible sign of leakage after Temperature Cycling		
31.	Salt Spray Corrosion Test	UL-1254 Section 36	All exposed parts, including finishes nameplates and mounting fixtures, shall show no visible sign of system unit corrosion after 10 days exposure to 20% by weight of NaCl in distilled water solution.		
32.	500 Cycle Operation Test	UL-1254 Section 37	All operating valves and actuation devices shall operate as intended for 500 cycles and shall not leak at the operating pressure at 21°C.		



Item Ref. #	Parameter/Test Item	Item Source Ref. GR/SR/DS etc.	Requirement/ Required Value	Measured/Design/ Declared Value and Source Report Ref.	Conforms? Y/N/NA/ Acceptable
33.	One-Year Leakage Test	UL-1254 Section 38	1. Fully charged pressure vessels and actuating devices shall maintain $\geq$ minimum operating pressure for two years at room temperature 2. Expellant gas cartridges shall leak $\leq$ 3% of charge weight in 1 year at room temperature		
34.	Mounting Device Test	UL-1254 Section 39	Mounting devices for cylinder/valve assemblies shall withstand for 5 minutes five times the fully charged weight or at least 100 lbs.		
35.	Flexible Hose Assembly - Low Temperature Test	UL-1254 Section 40	There shall be no evidence of cracking after conditioning for 24 hours at minimum manufacturer specified bend radius at $-40^{\circ}\text{C}$		
36.	Flexible Hose Assembly - Cycling Test (Durability)	UL-1254 Section 40A	1. Initial: No leakage for 5 minutes at 2 times operating pressure at $21^{\circ}\text{C}$ 2. Shall withstand 25, 000 durability cycles. 3. Final: No leakage for 5 minutes at 2 times operating pressure at $21^{\circ}\text{C}$		
37.	Operational Test of Manual Actuators and Manual Pull Stations	UL-1254 Section 41	Agent shall release with: 1. $\leq$ 40 lbs. force and 2. $\leq$ 14 inches travel		



Item Ref. #	Parameter/Test Item	Item Source Ref. GR/SR/DS etc.	Requirement/ Required Value	Measured/Design/ Declared Value and Source Report Ref.	Conforms? Y/N/NA/ Acceptable
38.	Pneumatic Operation Test	UL-1254 Section 42	Shall operate as intended after pressurizing to operating pressure at 21°C, and conditioning for 16 hours at -40°C		
39.	Pressure Relief Tests	UL-1254 Section 43	1. Frangible Disks: Mean Bursting pressure plus 2 x standard deviation shall be $\leq$ proof pressure of cylinder. 2. A pressure relief device shall prevent the cylinder and valve assembly from exploding during the fire test.		
40.	Vibration Resistance Test	UL-1254 Section 44	10 to 60 to 10 Hz in 4 minutes; 0.060 inch peak-to peak amplitude; 4 hours in each of 3 axes 1. System unit shall remain functional 2. . System unit shall not require repair 3. System unit shall not fragment		
41.	Shock Resistance Test	UL-1254 Section 44	10g, 20-25 milliseconds duration; half sine wave shape; 1. System unit shall remain functional 2. . System unit shall not require repair 3. System unit shall not fragment		
42.	Elastomeric Parts Test	UL-1254 Section 45	Elastomeric parts for sealing shall conform to requirements detailed in Section 45.1 of UL Standard		





Item Ref. #	Parameter/Test Item	Item Source Ref. GR/SR/DS etc.	Requirement/ Required Value	Measured/Design/ Declared Value and Source Report Ref.	Conforms? Y/N/NA/ Acceptable
43.	10-Day Moist Ammonia Air Stress Cracking Test	UL-1254 Section 46	1. Materials that impact system operability shall not be susceptible to stress cracking. 2. Brass parts with $\geq 15\%$ zinc shall show no evidence of cracking at 25X lighted magnification		
44.	Aging Tests – Plastic Materials	UL-1254 Section 47.1	After 180 days at 100°C (except siphon tubes) there shall be: 1. No cracking of plastic parts or components. 2. Plastic pressure retaining devices and components shall remain functional 3 Siphon tubes are conditioned for 90 days – same criteria as above.		
45.	Exposure to Extinguishing Agent (see item #62)	UL-1254 Section 47.2	After 210 days exposure at 85° C there shall be $\leq 40\%$ reduction in tensile or crushing strength of plastics that are part of the system as well as the following battery case, cable jacket and copper bus-bar materials:  1. PPO + PS* 2. PC + ABS* 3. Polypropylene 4. Polycarbonate 5. PVC 6. HDPE 7. Metallic Copper 8. Ferrous Metals		



Item Ref. #	Parameter/Test Item	Item Source Ref. GR/SR/DS etc.	Requirement/ Required Value	Measured/Design/ Declared Value and Source Report Ref.	Conforms? Y/N/NA/ Acceptable
46.	Exposure to Light and Water	UL-1254 Section 47.3	After 720 hours exposure: 1. Plastics shall remain functional 2. Plastics shall conform to Section 47.2 requirements		
47.	Extinguishing Agent Tests	UL-1254 Section 48 and this document	Agent shall conform to requirements of: 1. Sec. 48.1: General 2. Sec. 48.2 Elevated Temperature tests 3. Sec. 48.3 Hygroscopicity Test 4. Dielectric Strength Test – 1000V dc for 1 minute 5. Electrical Conductivity – $\leq 0.1\mu\text{S}$ per cc		
48.	Calibration Test – Gauges and Indicators	UL-1254 Section 49	Shall conform to requirements detailed in Section 49 Accuracy shall be better than 4% over the operating temperature range		
49.	Burst Strength Test – Gauges and Indicators	UL-1254 Section 50	Shall conform to requirements detailed in Section 50 Items shall withstand 6 times operating pressure for 1 minute.		
50.	Overpressure Test - Gauges	UL-1254 Section 51	Shall conform to requirements detailed in Section 51  Accuracy shall be $\leq 4\%$ after pressurization for 3 hours at 110% of the gauge capacity		



Item Ref. #	Parameter/Test Item	Item Source Ref. GR/SR/DS etc.	Requirement/ Required Value	Measured/Design/ Declared Value and Source Report Ref.	Conforms? Y/N/NA/ Acceptable
51.	Impulse Test - Gauges	UL-1254 Section 52	Shall conform to requirements detailed in Section 52 Accuracy shall be $\leq 4\%$ after 1000 pressure impulses		
52.	Pressure Gauge Relief Test	UL-1254 Section 53	Shall conform to requirements detailed in Section 53  1. Gauge activated at 50 psig for 24 hours 2. Flow capacity greater than 1 liter per hour at 50 psig.		
	Water Resistance Test – Gauges and Indicators	UL-1254 Section 54	Shall conform to requirements detailed in Section 54  Shall remain watertight after immersion for 2 hours at 1 foot water head.		
53.	Nameplate Exposure Tests	UL-1254 Section 55.1	Shall conform to requirements detailed in Section 55.1		
54.	Nameplate Adhesion Test	UL-1254 Section 56	Shall conform to requirements detailed in Section 56		
55.	Nameplate Abrasion Test	UL-1254 Section 57	Shall conform to requirements detailed in Section 57		



Item Ref. #	Parameter/Test Item	Item Source Ref. GR/SR/DS etc.	Requirement/ Required Value	Measured/Design/ Declared Value and Source Report Ref.	Conforms? Y/N/NA/ Acceptable
56.	Packing for Shipment	UL-1254 Section 59	Shall conform to requirements detailed in Section 59 1. Each System unit shall be shipped fully charged with the intended quantities of dry chemical and expellant gas. 2. Caution tag shall be attached if shipped empty.		
57.	Markings	UL-1254 Section 60	Shall conform to requirements detailed in Section 60 1. All markings shall be permanent 2. Instructions for use shall be printed on label		
58.	Installation Instructions	UL-1254 Section 61	Shall conform to requirements detailed in Section 61		
59.	System Degradation and Operation in a Hydrogen Environment	This document	The system shall not degrade or become inoperable when installed in an environment containing hydrogen at a 1% by volume concentration in air.		
<b>Clean-Up Requirements after System Activation</b>					
60.	Agent Clean-up	This document	Clean-up procedures after activation, spill or leak shall be documented by the manufacturer and shall apply to: 1. Batteries 2. Cables 3. Busbars 4. Vents 5. Equipment Racks 6. Rectifiers		



Item Ref. #	Parameter/Test Item	Item Source Ref. GR/SR/DS etc.	Requirement/ Required Value	Measured/Design/ Declared Value and Source Report Ref.	Conforms? Y/N/NA/ Acceptable
<b>Special Tests</b>					
61.	Exposure to Extinguishing Agent (see item # 45) A.) Tensile Strength	This document	After 10 days of exposure to the extinguishing agent at 85°C and 85% RH, there shall be ≤ 40% reduction in the tensile strength of the following materials:  1. PPO + PS 2. PC + ABS 3. Polypropylene 4. Polycarbonate 5. PVC 6. HDPE 7. Copper 8. Lead		
62.	Exposure to Extinguishing Agent (see item # 44) B.) Corrosion Test	This document	After 10 days of exposure to the extinguishing agent at 85°C and 85% RH, there shall be no evidence of cracking or corrosion of the following materials:  1. PPO + PS 2. PC + ABS 3. Polypropylene 4. Polycarbonate 5. PVC 6. HDPE 7. Copper 8. Lead		
63.	Toxicity	GR-78: R3-4, R4-38 GR-357: R4-123	The manufacturer shall identify any toxic substance which it is known may be emitted or otherwise present a safety or health risk during normal or abnormal operation of the system.		



Item Ref. #	Parameter/Test Item	Item Source Ref. GR/SR/DS etc.	Requirement/ Required Value	Measured/Design/ Declared Value and Source Report Ref.	Conforms? Y/N/NA/ Acceptable
<b>Manufacturer, Manufacturing Location and Part Number Requirements</b>					
64.	System and Sub-system Identification	This document	The supplier shall provide a listing of the manufacturer, manufacturing location, description and part number for the system and all constituent parts		
<b>Other Qualification Tests/Declarations, if any, done by the supplier</b>					
65.	Please add if applicable				
66.	Please add if applicable				
<b>Other Verizon Tests and Requirements</b>					
<b>C = Controlled Equipment Environment (CO &amp; CEV) Requirements</b>					
67.	Ambient Operating Temperature Range	GR-1209: Section 3.7 & Table 3-1	+5°C to +40°C		
68.	Ambient Operating Humidity Range	GR-1209: Section 3.7 & Table 3-1	5% to 85% RH		
69.	Ambient Storage Temperature Range	GR-1209: Section 3.7 & Table 3-1	-40°C to +85°C		
<b>U = Un-Controlled Equipment Environment (OSP, RT &amp; Cabinets without Fans) Requirements</b>					
70.	Ambient Operating Temperature Range	GR-1209: Section 3.7 & Table 3-1	-40°C to +65°C		
71.	Ambient Operating Humidity Range	GR-1209: Section 3.7 & Table 3-1	5% to 85% RH		
72.	Ambient Storage Temperature Range	GR-1209: Section 3.7 & Table 3-1	-40°C to +85°C		
<b>NEC Listing Requirement</b>					
73.	NRTL Safety Listing Requirement	This document and GR-1089, Section 7	System shall be listed by an OSHA recognized test lab		
<b>State/Local Building and Fire Code Requirements</b>					
74.	State/Local Building and Fire Code Requirements	This document	System shall be 'Approved' by the State, Local Fire Marshall or AHJ where it is to be used		



Item Ref. #	Parameter/Test Item	Item Source Ref. GR/SR/DS etc.	Requirement/ Required Value	Measured/Design/ Declared Value and Source Report Ref.	Conforms? Y/N/NA/ Acceptable
<b><i>End of Life Processing, Recycling and Disposal/ Environmental, Health and Safety (EH&amp;S) Practices</i></b>					
75.	Environmental Stewardship	This document	1. Does your company have a Commitment to Environmental Stewardship Policy? 2. Does your company publicly report on it's EH&S Policies, Practices and Results? 3. Does your company have a return and recycling program for customer disposal of this product?		

**END OF DOCUMENT**