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OSP Access Network Testing

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Why the need for testing and requirements

The quality of network service is directly attributed to the quality of products deployed in the network

In the Field There Are

- Billions of Connectors
- Tens of thousands of Fiber Distribution Frames
- Hundreds of thousands of Splitters
- Hundreds of thousands of Fiber Distribution Terminals
- Millions of feet of cable

Testing of products is crucial to reliability and continued optimal customer service

Generic Requirements allow integration and compatibility among vendors

Assists in vendor selection



Its all about the customer experience

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■ CUSTOMERS CHOSE SERVICE NOT TECHNOLOGY

- How well does it work?
- How reliable is the service?
- What will the service do?
- Does it integrate with what I already have?
- How much will it cost?
- I don't want that ugly box near my house
- Why are those fans always running, that box is too noisy
- You want to put *want equipment* into my house?
- How long will the install take?
- Customer Service?
- Are the devices that I touch easy to use and cool?

I AM THE CUSTOMER AND I HAVE A CHOICE

I associate the quality of service from what I can see. Poor installations, rusty, faded, noisy equipment, etc. So if the equipment that supports a service providers branded service looks poor, I assume the service is poor.



Requirements

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- Organizations such as Telcordia, RUS and ATIS provide generic requirements. Providers have their own purchasing requirements such as the Verizon TPR's and AT&T TP7600.
- The purchaser of outside plant equipment determines requirements with the exception of those required by law and the AHJ.



ATT-TP-76200

Network Equipment and Power Grounding, Environmental, and Physical Design Requirements

To: Telecommunications Equipment Suppliers



Generic Reliability Assurance Requirements for Passive Optical Components

(A Module of RGSB, FR-798)
Telcordia Technologies Generic Requirements
GR-1221-CORE
Issue 3, September 2000
Comments Requested (See Preface)



Telcordia Technologies, Inc. - Organizational Requirements -
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Generic Requirements for Singlemode Optical Connectors and Jumper Assemblies

Telcordia Technologies Generic Requirements
GR-1221-CORE
Issue 3, February 2000
Comments Requested (See Preface)



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Verizon NEBS™ Compliance: Screening
Requirements for Optical Components
Verizon Technical Purchasing Requirements
VZ.TPR.9423
Issue 1, December 2007



Verizon Technical Purchasing Requirements
VZ.TPR.9423



Equipment Physical Design Standards ATT-TP-76200, Issue 16
AT&T Services, Inc. 10/14/2011

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ATT-TP-76200

**Network Equipment and Power Grounding, Environmental, and
Physical Design Requirements**

To: Telecommunications Equipment Suppliers

Effective Date: See paragraph 1.60.

Issue Date: October 2011

Expires On: N/A

Related Documents: Telcordia GR-63-CORE, GR-1089-CORE, GR-78CORE,
ANSI T1.307, T1.315, T1.319, and T1.329

Cancelled Documents: AT&T Services, Inc., ATT-TP-76200, Issue 15a,

Issuing Department: Network Staff, GES Common Systems

Business Unit: AT&T Services Incorporated

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Terms Used In Testing

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- **Verify** — Determine by a review of documentation that the information or accessories specified by the criteria were supplied or are available from the vendor.
- **Analyze** — Draw conclusions based on vendor-supplied product information, test data, and other information as to the conformance or nonconformance of the product to the criteria.
- **Inspect** — Visually inspect the product to determine conformance or nonconformance to the criteria.
- **Test** — Measure quantitatively product features or performance to determine conformance or nonconformance to the criteria.

NOTE:

— The **Verify** and **Analyze** reviews do not require a physical product sample.

— The **Inspect** and **Test** criteria require a product sample.

- **Damage** — Throughout documents the term “no damage” is used. Damage is considered to be any change in form, fit, or function as a result of applied stress. As a result of applied stress, there shall be no change to the product’s or component’s form, fit, or function. Furthermore, there shall be no damage that would compromise the mechanical, physical, or environmental performance of any test or generic requirement (e.g., safety, corrosion resistance, etc.). Major aesthetic damage is considered a nonconformance to parts that can be viewed by the public after installation. Any damage to the product or component that is considered only minor aesthetic damage shall also be reported, since a Service Provider may consider aesthetic damage as unacceptable.



The Outside Plant Can Be Severe

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.....➔ The Outside Plant Can Be Very Severe

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.....➔ But Customers Demand Service

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.....➔ Testing is Key to Finding Problems in the Labs Before Product Deployment

- **Testing of products is crucial to reliability and continued optimal customer service**
- **Its not only the cost of the product, but costs to repair and loss of service**

- **High focus testing items**
 - *Insertion Loss / Return Loss and Optimum dB Loss*
 - *Electrical Protection/NEC/NESC/IEEE*
 - *Environmental Compliance*
 - *Property Owner Requirements*
 - *MDU is OSP*



Requirements

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Requirements can be divided into several key areas

- Quality
- Reliability
- Craft Interaction
- Interoperability
- Safety
- Mechanical
- Environmental
- Performance



Quality

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To define quality is more difficult than it may appear

- fitness for intended use
- meeting or exceeding customer expectations

Then there are different aspects of quality

- quality assurance, quality control, quality management

The telecommunication industry uses TL 9000 Quality Management System developed by the QuEST Forum

- quality management system built on ISO 9001 and the eight quality principles
- designed specifically for the communications industry. The purpose of TL 9000 is to define the unique communications quality system requirements for design, development, production, delivery, and service.
- it specifies measurements for companies to help evaluate the effectiveness of quality implementation and improvement programs
- provides value and benefits across the total spectrum of disciplines (Buyers, Suppliers, Service Providers) by providing a consistent set of quality expectations that parallel rapid technology changes and customer expectations.

Don't forget product change notices (GR209)

**The Cost of Poor Quality in Telecom is
Estimated to Be Greater Than 10 Billion Dollars**



Reliability

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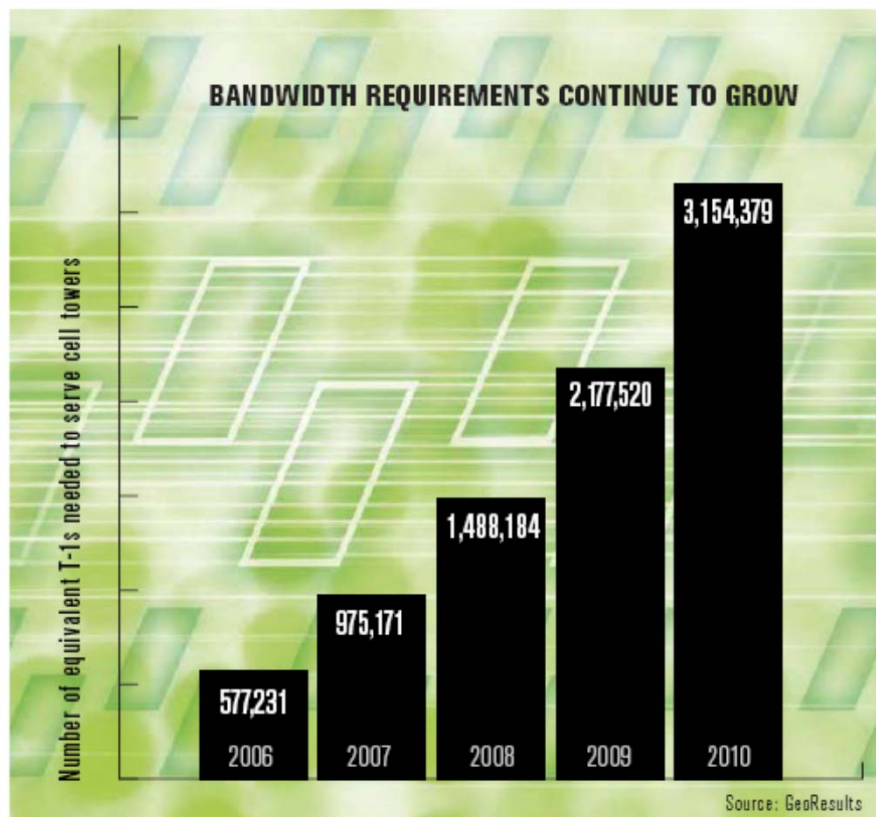
To accomplish service life and reliability requirements the philosophy used is that:

- Reliability must be designed in
- Reliability cannot be tested in
- Testing verifies the designed-in reliability
- Service Life Requirement is > 25 Years
- Network Reliability (Availability) Requirement range from 99.9% to 99.999% (3-nines to 5-nines).
- Reliability and testing analysis remove the weak links
- GR357 *Generic Requirements for Assuring the Reliability of Components Used in Telecommunications Equipment*
- GR1221 *Generic Reliability Assurance Requirements for Passive Optical Components*



Reliability - Use of 4G/LTE is straining backhaul networks

- Backhaul Reliability
- Over 60% of all dropped calls are due to backhaul

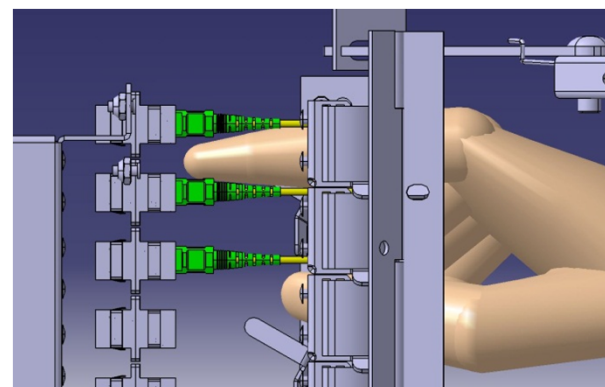
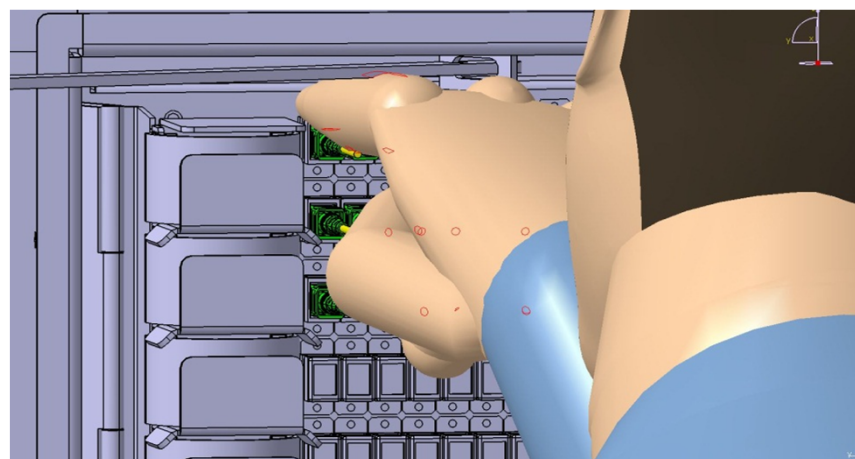
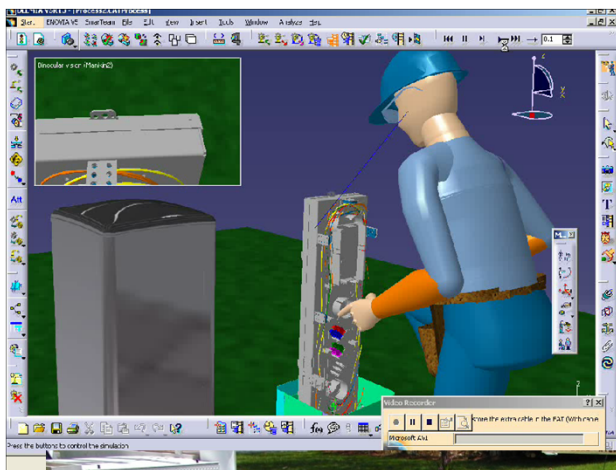




Craft Interaction

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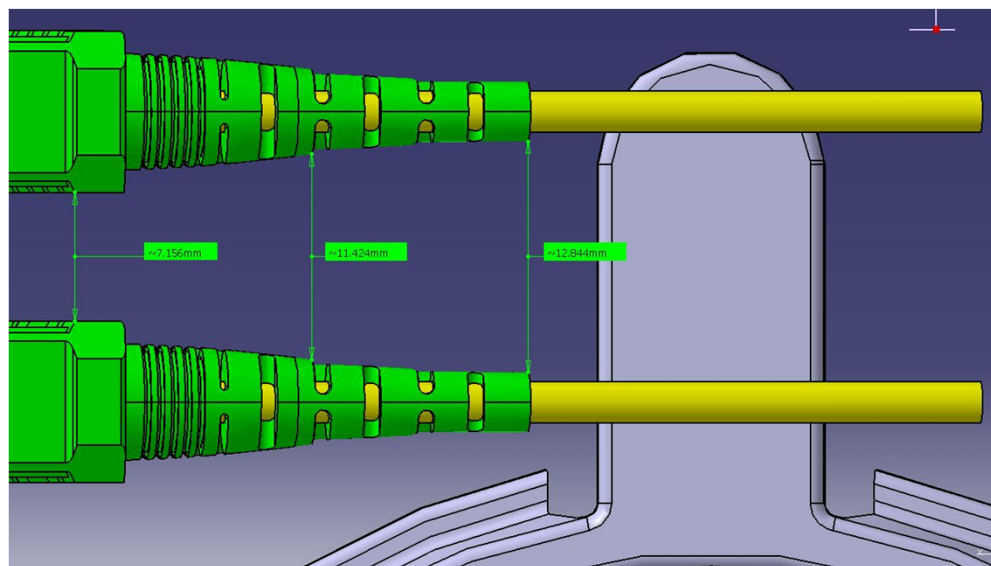
How do the craft use the products, are the tools and procedures available for the craft to safely and efficiently install, test, repair and maintain network elements





Craft Interaction - Testing Connector Spacing

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Interoperability

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Does the outside plant equipment fit within the outside plant environment and does it communicate with other network elements and the NOC.





Are the network elements safe for the craft and customers. Do they meet required fire and safety codes.

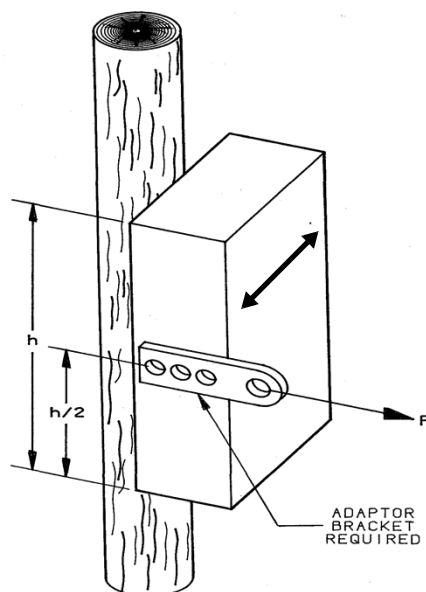
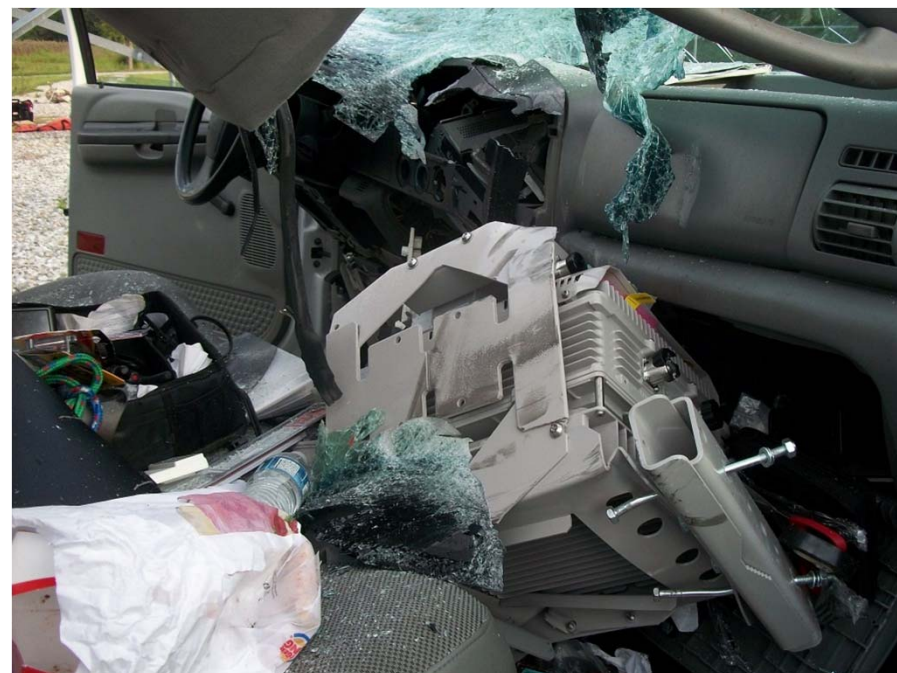
- NEBS
- NEC
- NESC
- FCC
- OSHA
- NFPA
- Listing

Do the network elements meet voluntary industry standards such as ASTM, ATIS, IEEE etc.



Safety – Pole Mounting

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Safety - Fire Testing

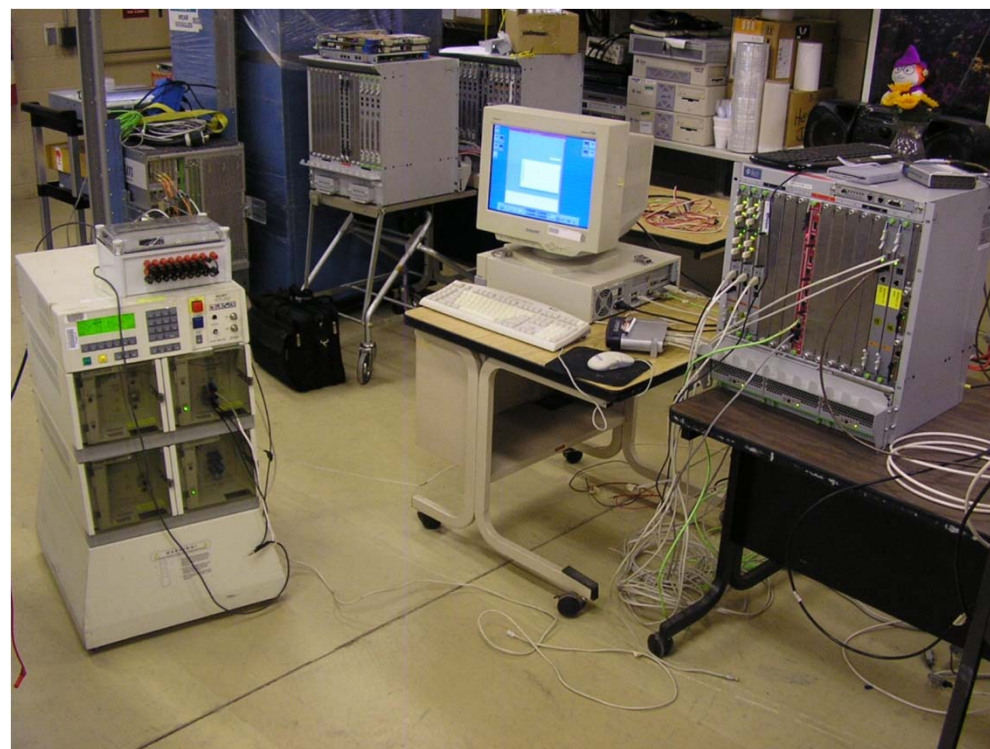
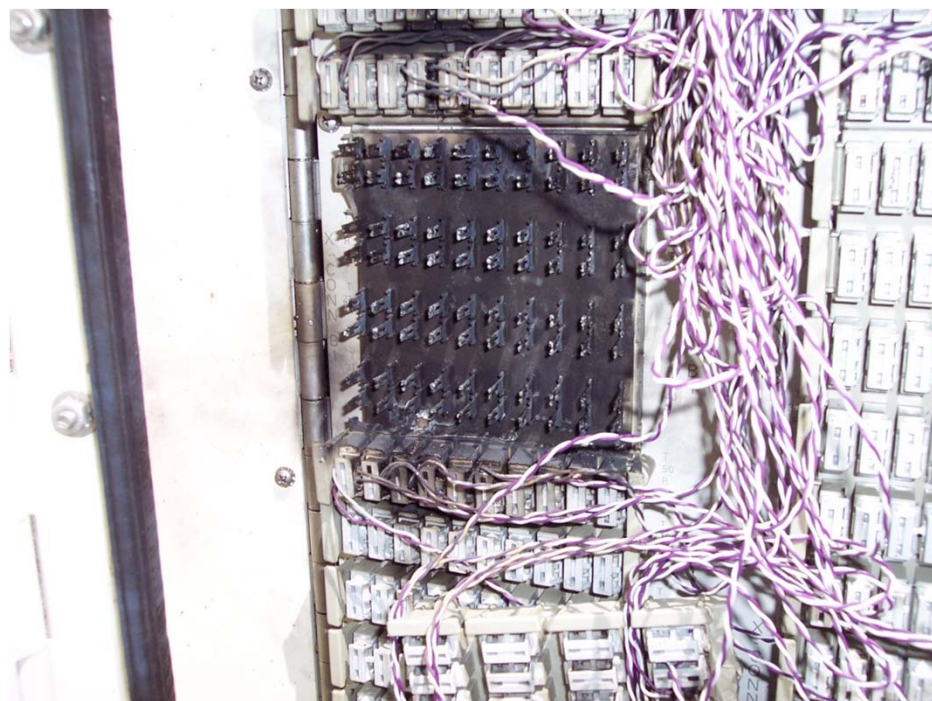
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Safety - Electrical Testing

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The products stand up to mechanical abuse in the outside plant.

- Impact
- Drop
- Shipping
- Installation



Mechanical Testing to simulate and accelerate field installations. Testing cabinet doors for wind damage





Mechanical - Cabinet Pole Testing

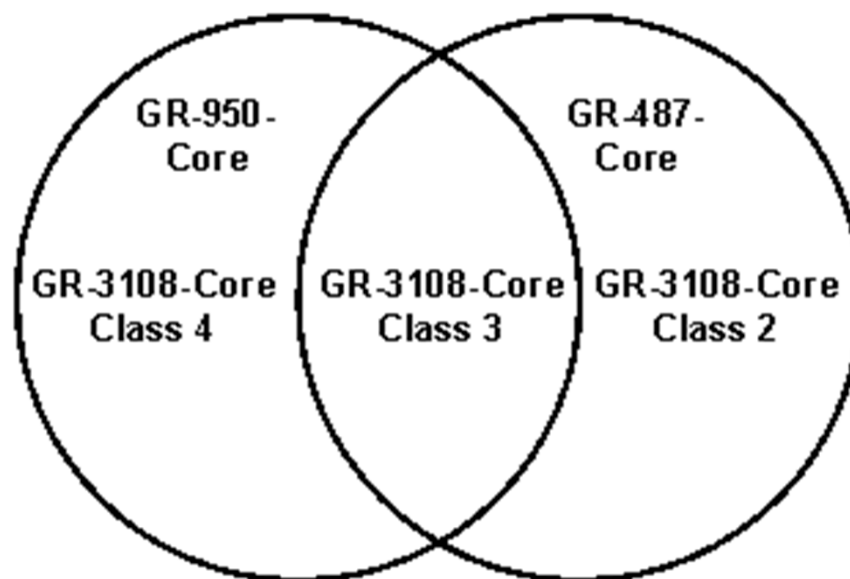
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Products in the outside plant need to withstand the following exposures:

- High Temperature
- High Humidity
- Temperature and Humidity
- Thermal Shock
- Ice and Snow
- Chemical Resistance
- Acoustics
- Fungus
- Dust
- Rain
- Flooding
- Insect Intrusion
- Salt Fog
- Environmental Vibration
- Earthquake





Environmental - Temperature and Humidity

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Controlled Environments (CO & CEV)

Ambient Operating Temperature Range: +5°C to +40°C

Ambient Operating Humidity Range: 5% to 85% RH

Ambient Storage Temperature Range: -40°C to +85°C

Un-Controlled Environments (OSP, RT & Cabinets without Fans)

Ambient Operating Temperature Range: -40°C to +65°C

Ambient Operating Humidity Range: 5% to 85% RH

Ambient Storage Temperature Range: -40°C to +85°C

Storage Humidity levels range from: $\leq 10\%$ to 100% RH



Environmental – Cabinet Testing

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.....→ Environmental Wind Driven Rain Testing

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Environmental -Bullet Resistance

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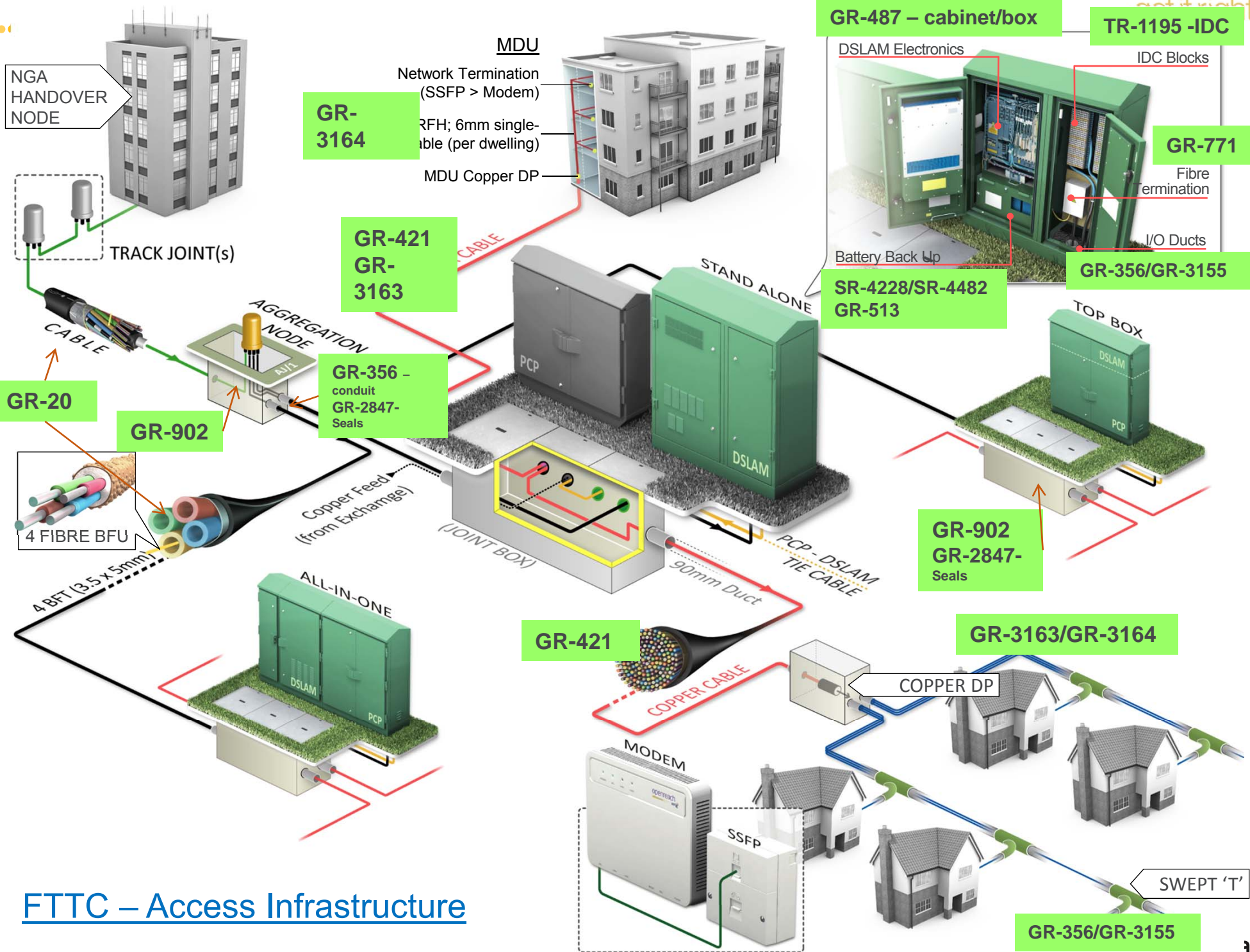




Does the product meet the manufacturers specifications, the service provider and the customer needs. Performance criteria must be met in some cases before, during and after mechanical and environmental conditioning

For fiber products we look at:

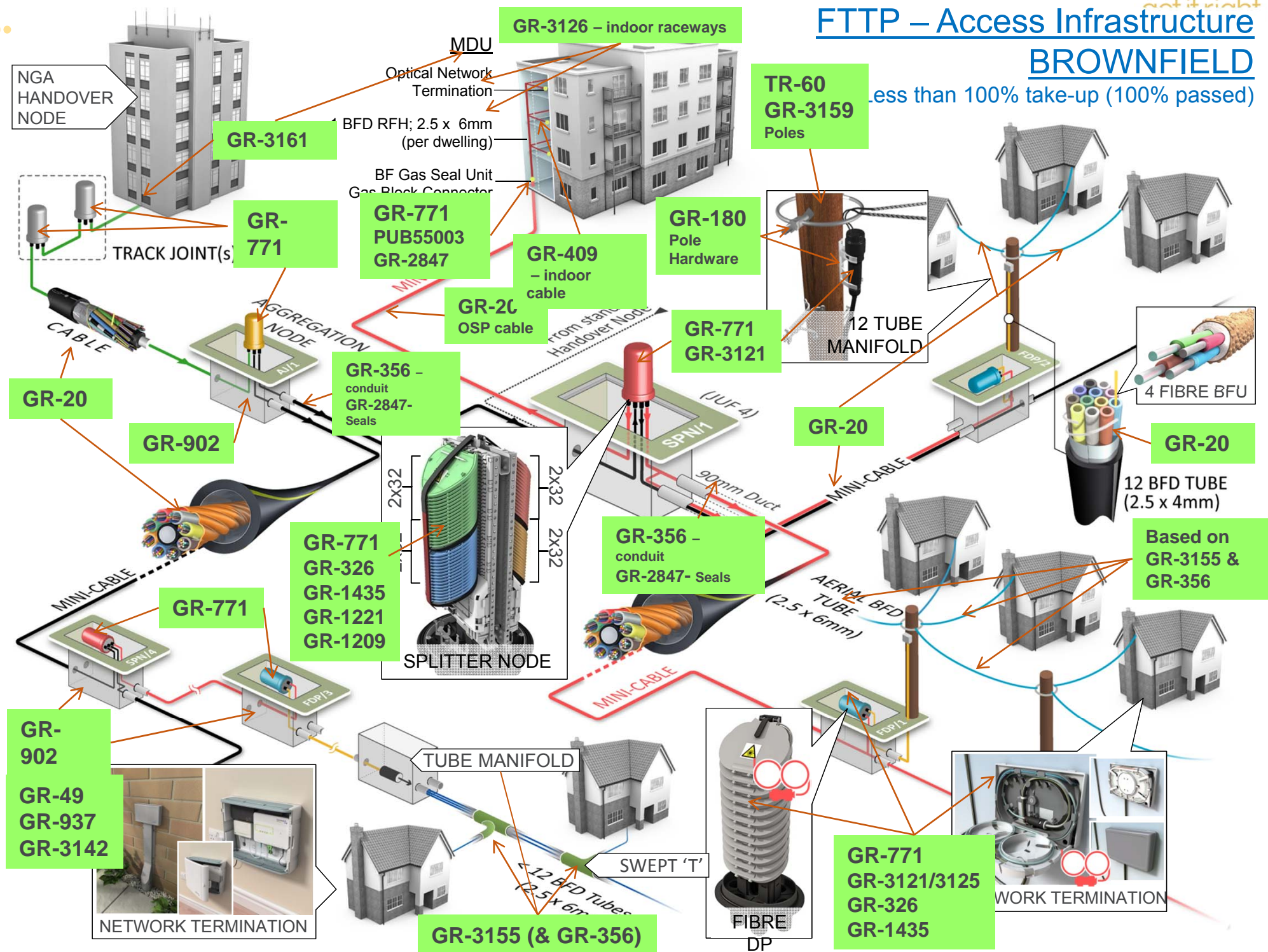
- Insertion Loss
- Reflectance
- Wavelength Dependent Loss



FTTC – Access Infrastructure

not it right

Less than 100% take-up (100% passed)





Summary

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- There are a host of requirements for equipment in the outside plant. The OSP is MDU
- These requirements continue to evolve with changes in the industry
- Requirements and testing fall within several key areas
- Consistent requirements and testing benefit the industry and consumers