

Table of Contents

1 Introduction

| | |
|--|------|
| 1.1 Purpose and Scope | 1-1 |
| 1.2 Organization | 1-1 |
| 1.3 Reasons for GR-950-CORE Re-Issues | 1-2 |
| 1.3.1 Reasons for GR-950-CORE, Issue 3 | 1-2 |
| 1.3.2 Reasons for GR-950-CORE, Issue 2 | 1-5 |
| 1.4 Target Audience | 1-6 |
| 1.5 Requirements Terminology | 1-6 |
| 1.6 Requirement Labeling Conventions | 1-7 |
| 1.6.1 Numbering of Requirement and Related Objects | 1-7 |
| 1.6.2 Requirement, Conditional Requirement, and Objective Identification | 1-7 |
| 1.6.3 Requirement Conformance | 1-7 |
| 1.7 Products Covered | 1-14 |
| 1.7.1 Optical Network Unit (ONU) Definition | 1-15 |

2 General Information

| | |
|---|------|
| 2.1 Other Relevant Documents | 2-1 |
| 2.2 Fiber In The Loop (FITL) System Reference Model | 2-2 |
| 2.3 ONU System Description | 2-5 |
| 2.4 Closure Configurations | 2-7 |
| 2.5 Installation and Operating Environment | 2-8 |
| 2.5.1 General Installation Information | 2-8 |
| 2.5.2 Test Conditions/Temperatures | 2-8 |
| 2.5.2.1 Installation Tests | 2-9 |
| 2.5.2.2 Operating Tests | 2-9 |
| 2.6 Telecommunications Equipment | 2-9 |
| 2.7 Test Environmental Criteria | 2-10 |
| 2.7.1 Ambient Laboratory Conditions | 2-10 |
| 2.7.2 Environmental Chamber Capabilities Requirement | 2-10 |
| 2.7.3 Thermal Soak Time | 2-11 |
| 2.8 Safety Precautions | 2-11 |
| 2.9 Measurements | 2-11 |
| 2.10 Laboratory Conditions | 2-11 |
| 2.11 Sample Preparation | 2-12 |
| 2.12 Test Sequence | 2-12 |
| 2.13 Calibration | 2-12 |
| 2.14 Component Matrix | 2-12 |
| 2.15 Coordination With GR-3108-CORE, Generic Requirements for Network Equipment in the Outside Plant (OSP) | 2-13 |
| 2.15.1 GR-3108-CORE Class References | 2-14 |
| 2.15.1.1 GR-3108 Class 1: Controlled Protected Environments | 2-14 |
| 2.15.1.2 GR-3108 Class 2: Protected Environments | 2-15 |
| 2.15.1.3 GR-3108 Class 3: Protected Equipment in Severe Outside Environments | 2-16 |
| 2.15.1.4 GR-3108 Class 4: Products in an Unprotected Environment | 2-17 |

3 Detailed Requirements

| | | |
|---------|--|-----|
| 3.1 | Documentation | 3-1 |
| 3.1.1 | Practices | 3-1 |
| 3.1.2 | Audio-Visual Training Package | 3-1 |
| 3.2 | Markings, Packaging, and Shipping | 3-2 |
| 3.2.1 | Identification | 3-2 |
| 3.2.2 | Shipping Container and Packaging Arrangement | 3-2 |
| 3.2.3 | Package Label | 3-3 |
| 3.2.4 | Consumable Materials | 3-4 |
| 3.3 | Product Samples | 3-4 |
| 3.4 | Product Changes | 3-4 |
| 3.5 | Quality | 3-4 |
| 3.6 | Safety and Reliability Considerations | 3-5 |
| 3.6.1 | Restriction of Hazardous Substances (RoHS) Compliance | 3-7 |
| 3.6.2 | Listing | 3-7 |
| 3.6.3 | Surface Temperature Requirements | 3-7 |
| 3.6.3.1 | Test Conditions for Surface Temperature Measurements for ONU Systems and Closures Placed in a Class 4 Environment | 3-9 |

4 External Interfaces

| | | |
|---------|---|------|
| 4.1 | General Features | 4-1 |
| 4.1.1 | Deployment Configurations | 4-1 |
| 4.1.2 | Mounting Hardware | 4-1 |
| 4.1.3 | Components | 4-2 |
| 4.1.4 | Installation Size and Weight | 4-2 |
| 4.1.5 | Maintenance | 4-2 |
| 4.1.6 | Tools | 4-2 |
| 4.1.7 | Safety | 4-3 |
| 4.1.8 | Security | 4-3 |
| 4.2 | Cable Management — Integrated ONU Closures | 4-3 |
| 4.2.1 | Termination Compartment(s) | 4-3 |
| 4.2.2 | Cable Compatibility | 4-4 |
| 4.2.2.1 | Fiber Distribution Cable | 4-4 |
| 4.2.2.2 | Telephone Support Cable (TSC) | 4-5 |
| 4.2.2.3 | Service Wire Cables | 4-5 |
| 4.2.3 | Cable Capacity | 4-6 |
| 4.2.3.1 | Fiber Distribution Cable | 4-6 |
| 4.2.3.2 | Telephone Support Cable (TSC) | 4-6 |
| 4.2.3.3 | Service Wire Cable(s) | 4-7 |
| 4.2.4 | Cable Termination Hardware | 4-7 |
| 4.2.5 | Fiber Splice Capacity and Organization | 4-8 |
| 4.2.6 | Fiber Protection | 4-8 |
| 4.2.7 | ONU Fiber and Splice Closure Storage Capacity | 4-9 |
| 4.2.8 | ONU Fiber and Splice Closure Protection | 4-9 |
| 4.3 | Cable Management — Stubbed ONU Systems | 4-10 |
| 4.3.1 | Fiber Stub Cable | 4-10 |
| 4.3.2 | Power Stub Cable | 4-11 |
| 4.3.3 | Service Wire Stub Cable | 4-11 |
| 4.4 | Power Interface | 4-11 |

| | |
|---|------|
| 4.4.1 DC Power Interface Connection | 4-12 |
| 4.4.2 AC Power Interface Connection | 4-12 |
| 4.4.3 Back-Up Power Source Environment | 4-13 |
| 4.5 Electromagnetic Compatibility (EMC) | 4-13 |
| 4.5.1 Electrical Safety | 4-13 |
| 4.5.2 Bonding and Grounding | 4-14 |
| 4.5.3 Telecommunications Surge Protection | 4-16 |

5 Global Product Requirements

| | |
|--|------|
| 5.1 Application-Specific Requirements | 5-1 |
| 5.2 Test Program | 5-1 |
| 5.2.1 Test Sequence | 5-3 |
| 5.2.1.1 Sample Preparation | 5-8 |
| 5.2.1.2 Test Conditions/Temperatures | 5-8 |
| 5.2.1.3 Optical Fiber Attenuation Threshold | 5-9 |
| 5.2.1.4 Re-Testing | 5-9 |
| 5.2.1.5 Failure Testing Matrix | 5-9 |
| 5.3 Closure Surface Criteria (Surface Coating/Paint Tests) | 5-10 |
| 5.3.1 Appearance | 5-10 |
| 5.3.2 Color and Surface Gloss | 5-10 |
| 5.3.3 Coating Defects | 5-11 |
| 5.3.4 Paint Adhesion | 5-14 |
| 5.3.5 Flexibility | 5-15 |
| 5.3.6 Secondary Finish Protection | 5-15 |
| 5.3.7 Paint Adhesion After Exposure | 5-16 |
| 5.3.8 Ultraviolet Resistance | 5-16 |
| 5.3.9 Ozone Exposure | 5-17 |
| 5.3.10 Wall-Mounted Equipment | 5-17 |
| 5.4 Electrical Criteria | 5-18 |
| 5.4.1 Bond Clamp Retention | 5-18 |
| 5.4.2 AC Fault Test | 5-19 |
| 5.5 Mechanical Criteria | 5-22 |
| 5.5.1 Cable Clamping | 5-24 |
| 5.5.2 Sheath Retention | 5-25 |
| 5.5.3 Cable Flexing | 5-27 |
| 5.5.4 Cable Torsion | 5-30 |
| 5.5.5 Vertical Drop | 5-32 |
| 5.5.6 Compression | 5-33 |
| 5.5.7 Impact | 5-35 |
| 5.5.8 Central Member (CM) Protrusion | 5-36 |
| 5.6 Environmental Criteria | 5-41 |
| 5.6.1 Exposure to High Temperature | 5-41 |
| 5.6.2 Accelerated Thermal Aging | 5-50 |
| 5.6.3 Field Assembly | 5-51 |
| 5.6.4 Temperature and Humidity | 5-51 |
| 5.6.5 Freeze/Thaw | 5-53 |
| 5.6.6 Weathertightness | 5-57 |
| 5.6.6.1 Weathertightness – Dust | 5-57 |
| 5.6.6.2 Weathertightness – Water Resistance | 5-58 |
| 5.6.6.2.1 Water Resistance Test Procedure | 5-59 |

- 5.6.6.2.2 Water Immersion Test Procedure 5-60
- 5.6.6.2.3 Wind-Driven Rain Test Procedure 5-61
- 5.6.6.2.4 Water-Spray Test Procedure 5-62
- 5.6.6.2.5 Lawn Sprinklers 5-62
- 5.6.7 Corrosion Resistance 5-63
 - 5.6.7.1 Test Procedure (A) - Corrosive Ground Water 5-64
 - 5.6.7.2 Test Procedure (B) - Salt Fog Test 5-65
- 5.6.8 Chemical Resistance 5-65
 - 5.6.8.1 Material Degradation 5-66
 - 5.6.8.2 Chemical Immersion 5-66
 - 5.6.8.3 Chemical Resistance Tests 5-66
- 5.6.9 Insect Resistance 5-70
- 5.6.10 Ultraviolet Resistance 5-72
- 5.6.11 Fungus Resistance 5-73
- 5.6.12 Rodent Resistance 5-74
- 5.6.13 Fire Resistance (Brush Fire) 5-74
- 5.6.14 Power Cross Ignition 5-76
- 5.7 Shock and Vibration 5-76
 - 5.7.1 Installation Shock 5-76
 - 5.7.2 Environmentally Induced Vibration 5-77
 - 5.7.3 Earthquake Resistance 5-77
- 5.8 Package Quality 5-78
 - 5.8.1 Transportation Shock (Rail) 5-78
- 5.9 Bullet Resistance 5-79
- 5.10 Conditional Requirements 5-81
 - 5.10.1 Cable Core Blocking Ability 5-81
 - 5.10.2 Steam Resistance 5-82
 - 5.10.3 Building Fire Resistance 5-82
 - 5.10.3.1 Horizontal and Vertical Fire Test 5-83

Appendix A: Observational Standard

Appendix B: Suggested Wind-Driven Rain Calibration Procedure

Appendix C: Optical Measurements

- C.1 Apparatus C-1
- C.2 Transmission Measurement Facility C-1
- C.3 Backscatter Measurement Facility (OTDR) C-2

Appendix D: References

- D.1 Telcordia Reference Notes D-5
 - D.1.1 Contact Telcordia D-5
 - D.1.2 Order Documents Online From the Telcordia Information SuperStore D-5
 - D.1.3 Telcordia Web Sites for Generic Requirements Information D-6
 - D.1.4 Telcordia Licensing Agreements D-6

Appendix E: Acronyms

Requirement-Object Index

List of Figures

| | | |
|-------------|---|------|
| Figure 1-1 | Other Referenced GR Documents | 1-14 |
| Figure 1-2 | Product Application Location | 1-15 |
| Figure 2-1 | Generic FITL System | 2-3 |
| Figure 2-2 | Integrated ONU Closure System | 2-6 |
| Figure 2-3 | Stubbed ONU Closure System | 2-6 |
| Figure 2-4 | ONU Deployment Configurations | 2-7 |
| Figure 5-1 | Paint Defect Test on Flat Specimens With Cut Edges | 5-13 |
| Figure 5-2 | Paint Defect Test on Curved Specimen With Cut Edges | 5-14 |
| Figure 5-3 | Test Circuit for Paint Defect Test | 5-14 |
| Figure 5-4 | AC Fault Test | 5-22 |
| Figure 5-5 | Splicing Assignment for Ribbon Fiber | 5-23 |
| Figure 5-6 | Sheath Retention Test | 5-26 |
| Figure 5-7 | Cable Flex Test | 5-29 |
| Figure 5-8 | Cable Torsion Test | 5-31 |
| Figure 5-9 | Compression Test | 5-34 |
| Figure 5-10 | Central Member Test Fixture | 5-37 |
| Figure 5-11 | Central Member Protrusion Test | 5-37 |
| Figure 5-12 | Jacket Clamped With Central Member Free to Move | 5-38 |
| Figure 5-13 | Central Member Moves Out of the Cable End as the Jacket Shrinks | 5-39 |
| Figure 5-14 | Central Member Clamped With Jacket Free to Move | 5-39 |
| Figure 5-15 | Jacket Shrinks Back Relative to the Central Member | 5-40 |
| Figure 5-16 | Force Arising From Jacket Shrinkage in a Clamped Situation | 5-40 |
| Figure 5-17 | Temperature Cycle | 5-53 |
| Figure 5-18 | Freeze/Thaw Test | 5-54 |
| Figure 5-19 | Location of Thermocouples | 5-56 |
| Figure 5-20 | Water Immersion Tank | 5-61 |
| Figure 5-21 | Three-Point Test Fixture | 5-68 |
| Figure 5-22 | Test Bar Samples | 5-70 |
| Figure 5-23 | Insect Intrusion | 5-71 |
| Figure 5-24 | Firearm Resistance Test Setup | 5-80 |
| Figure 5-25 | Cable Core Blocking Test | 5-82 |
| Figure 5-26 | Vertical Test Rack | 5-85 |
| Figure 5-27 | Burner Arrangement (Front View and Top View Shown) | 5-86 |
| Figure 5-28 | Horizontal Test Equipment | 5-88 |
| Figure 5-29 | Sample Placement — Horizontal Test | 5-89 |
| Figure A-1 | Telcordia Observational Standard for Evaluating Dust Accumulation | A-1 |
| Figure B-1 | Wind Speed and Rainfall Verification Fixture | B-1 |
| Figure B-2 | Reduction of Water Collection Aperture With an Inclined Rain Gauge During Wind-Driven Rain Testing | B-2 |
| Figure C-1 | Transmission Measurement Test Facility | C-2 |
| Figure C-2 | OTDR Measurement Test Facility | C-2 |

List of Tables

| | | |
|------------|---|------|
| Table 1-1 | Detailed Summary of Criteria | 1-9 |
| Table 2-1 | Installation Test Temperatures | 2-9 |
| Table 2-2 | Operating Test Temperatures | 2-9 |
| Table 3-1 | Limits for Equipment | 3-8 |
| Table 4-1 | ONU Line Capacity | 4-7 |
| Table 4-2 | Estimated Minimum Splice Capacity of ONU System | 4-9 |
| Table 5-1 | Performance Test Sequence | 5-5 |
| Table 5-2 | Materials for Coating Defects Test | 5-12 |
| Table 5-3 | Ultraviolet Resistance Sources | 5-17 |
| Table 5-4 | Sheath Retention Criteria Levels | 5-25 |
| Table 5-5 | Compression Test Loading | 5-33 |
| Table 5-6 | Impact Criteria Levels | 5-35 |
| Table 5-7 | Solar Load Categories | 5-42 |
| Table 5-8 | Spectral Distribution of Solar Simulator | 5-47 |
| Table 5-9 | Freeze/Thaw Criteria | 5-54 |
| Table 5-10 | Water-Resistance Criteria Levels | 5-59 |
| Table 5-11 | Corrosion Resistance Criteria Levels | 5-63 |
| Table 5-12 | Chemical Test Solution | 5-64 |
| Table 5-13 | Immersion Test Fluids | 5-69 |
| Table 5-14 | Ultraviolet Resistance Sources | 5-72 |