

# Table of Contents

## 1 Introduction

1.1 Purpose and Scope . . . . .	1-1
1.2 Telecommunications Service Provider (TSP) Role . . . . .	1-1
1.2.1 Effective Date . . . . .	1-1
1.3 Equipment Manufacturer Role . . . . .	1-2
1.4 Application Guidelines . . . . .	1-3
1.4.1 Central Offices (COs) and Similar Facilities . . . . .	1-3
1.4.2 Commercial Buildings . . . . .	1-3
1.4.3 Non-Environmentally Controlled Locations . . . . .	1-3
1.4.4 Other Locations . . . . .	1-3
1.5 Reasons for GR-63, Issue 5 . . . . .	1-4
1.6 Structure and Use of This Document . . . . .	1-4
1.7 Related Documents . . . . .	1-5
1.7.1 NEBS Family of Documents . . . . .	1-5
1.7.2 GR-3108-CORE Requirements . . . . .	1-6
1.7.3 Battery Performance Generic Requirements Documents . . . . .	1-6
1.8 Requirements Terminology . . . . .	1-7
1.9 Requirement Labeling Conventions . . . . .	1-7
1.9.1 Numbering of Requirement and Related Objects . . . . .	1-7
1.9.2 Requirement, Conditional Requirement, and Objective Identification . . . . .	1-8
1.10 Supplier-Provided Documentation . . . . .	1-8

## 2 Facility and Space Planning Requirements

2.1 Equipment Frames and Lineup Conformity . . . . .	2-1
2.2 Floor Plans . . . . .	2-2
2.3 Vertical Space Allocation . . . . .	2-5
2.3.1 Equipment Frame Dimensions – Special Cases . . . . .	2-6
2.3.2 Equipment Frame Floor Loading . . . . .	2-7
2.4 Space Planning for Distributing Frames (DFs) . . . . .	2-7
2.5 Space Planning for Centralized DC Power Plant Equipment . . . . .	2-8
2.6 Cable Distribution Systems (CDSs) . . . . .	2-10
2.6.1 CDS Requirements . . . . .	2-10
2.6.1.1 General . . . . .	2-10
2.6.1.2 Overhead Cable Distribution . . . . .	2-10
2.6.1.3 Cable Distribution Under Raised Floor . . . . .	2-11
2.6.2 Cable Pathways Over Equipment Frame Areas . . . . .	2-11
2.6.2.1 Elements of Allocation Plan . . . . .	2-11
2.6.2.2 System Cable Racks . . . . .	2-13
2.6.2.3 Via Cable Racks . . . . .	2-13
2.6.2.4 Lights . . . . .	2-13
2.6.3 Cable Pathways Over Distributing Frame (DF) Areas . . . . .	2-13
2.6.4 CDS Floor Load and Support . . . . .	2-13
2.7 Operations Support Systems (OSSs) . . . . .	2-14
2.8 Cable Entrance Facility (CEF) . . . . .	2-15
2.8.1 CEF Spatial Requirements . . . . .	2-15
2.8.2 CEF Loading Requirements . . . . .	2-15

2.9	Summary of Equipment Allocations . . . . .	2-16
2.10	Equipment Room Cooling Systems . . . . .	2-16
2.10.1	Central Cooling Systems . . . . .	2-17
2.10.2	Distributed Cooling Systems . . . . .	2-17
2.10.3	Hot Aisles and Cold Aisles . . . . .	2-18
2.11	Airborne Contaminants within the Equipment Room . . . . .	2-18
2.11.1	Contamination Classes . . . . .	2-21
2.11.2	Gaseous Contamination Levels . . . . .	2-21
2.11.3	Measurement of Contaminant Levels . . . . .	2-21
2.12	Illumination of Equipment Spaces . . . . .	2-22
2.12.1	Illumination Criteria for Central Office (CO) Lighting Systems . . . . .	2-22
2.12.1.1	Quantity of Light . . . . .	2-22
2.12.1.2	Luminance Ratios . . . . .	2-24
2.12.1.3	Color of Light . . . . .	2-24
2.12.2	Illumination Test Method for Central Office (CO) Lighting Systems . . . . .	2-24
2.12.2.1	Test 1 – Console Illumination, Readability, and Glare Tests . . . . .	2-25
2.12.2.2	Test 2 – Lighting System Tests . . . . .	2-27

### 3 Equipment Spatial Design Requirements for Frames and Chassis

3.1	Equipment Frame Nomenclature . . . . .	3-1
3.2	Equipment Frame Floor Mounting . . . . .	3-3
3.3	Equipment Frame Junctioning . . . . .	3-5
3.4	Equipment Frame Dimensions . . . . .	3-5
3.4.1	Equipment Frame Dimensions – Open-Style Racks . . . . .	3-5
3.4.2	Equipment Frame Dimensions – Other Rack Styles . . . . .	3-6
3.4.3	Equipment Frame Dimensions – Shipping . . . . .	3-6
3.4.4	Equipment Frame End Guards . . . . .	3-7
3.4.5	Equipment Frame Dimensions – Special Cases . . . . .	3-7
3.5	Equipment Frame Cable Management Provisions . . . . .	3-7
3.5.1	Equipment Frame Interface with Cable Rack . . . . .	3-7
3.6	Equipment Frame Weight . . . . .	3-9
3.7	Equipment Frame Support of CDS and Lights . . . . .	3-9
3.8	AC Convenience Outlets Within Equipment Frames . . . . .	3-9
3.9	Other Frame Types – Distributing and Interconnecting Frames (DFs and IFs) . . . . .	3-10
3.9.1	Distributing Frames (DFs) . . . . .	3-10
3.9.2	Interconnecting Frames (IFs) . . . . .	3-10
3.10	DC Power Plant Equipment Frames . . . . .	3-11
3.11	Equipment-Chassis Mounting Requirements . . . . .	3-12

### 4 Network Equipment – Environmental Criteria

4.1	Temperature, Humidity, and Altitude Criteria . . . . .	4-1
4.1.1	Transportation and Storage Environmental Criteria . . . . .	4-2
4.1.1.1	Low-Temperature Exposure and Thermal Shock . . . . .	4-2
4.1.1.2	High Relative-Humidity Exposure . . . . .	4-2
4.1.1.3	High-Temperature Exposure and Thermal Shock . . . . .	4-3
4.1.2	Operating Temperature and Humidity Criteria . . . . .	4-3
4.1.3	Altitude . . . . .	4-5
4.1.4	Temperature Margin Evaluation . . . . .	4-6
4.1.5	Fan-Cooled Equipment Criteria . . . . .	4-7

- 4.1.5.1 Equipment Fan Performance Criteria . . . . . 4-7
- 4.1.5.2 Equipment Fan-Filter Criteria . . . . . 4-7
- 4.1.6 Heat Dissipation and Energy Efficiency . . . . . 4-9
- 4.1.7 Surface Temperature . . . . . 4-11
- 4.1.8 Equipment Airflow . . . . . 4-13
- 4.2 Fire Resistance . . . . . 4-14
  - 4.2.1 Fire Resistance Rationale . . . . . 4-14
  - 4.2.2 Equipment Assembly Fire Tests . . . . . 4-14
    - 4.2.2.1 Frame-Level Fire-Resistance Criteria . . . . . 4-16
    - 4.2.2.2 Shelf-Level Fire-Resistance Criteria . . . . . 4-17
    - 4.2.2.3 Smoke and Self-Extinguishment Criteria . . . . . 4-18
  - 4.2.3 Use of Fire-Resistant Materials, Components, Wire, and Cable . . . . . 4-19
    - 4.2.3.1 Materials, Components, Wire, and Cable Fire-Resistance Criteria . . . . . 4-19
    - 4.2.3.2 Wire and Cable Between Frames . . . . . 4-20
    - 4.2.3.3 Optical Fiber Cable Trays and Raceways . . . . . 4-22
    - 4.2.3.4 Ignitability Requirements for Ancillary Materials . . . . . 4-22
  - 4.2.4 Use of Fire-Resistant Materials for Battery Systems . . . . . 4-23
- 4.3 Equipment Handling Criteria . . . . . 4-24
  - 4.3.1 Packaged Equipment Shock Criteria . . . . . 4-24
    - 4.3.1.1 Category A Containers . . . . . 4-24
    - 4.3.1.2 Category B Containers . . . . . 4-25
  - 4.3.2 Unpackaged Equipment Shock Criteria . . . . . 4-25
- 4.4 Earthquake, Office Vibration, and Transportation Vibration . . . . . 4-25
  - 4.4.1 Earthquake Environment and Criteria . . . . . 4-26
    - 4.4.1.1 Earthquake Environment . . . . . 4-26
    - 4.4.1.2 Physical Performance Criteria . . . . . 4-29
    - 4.4.1.3 Functional Performance . . . . . 4-29
  - 4.4.2 Framework and Anchor Criteria . . . . . 4-30
  - 4.4.3 Wall-Mounted Equipment Framework and Anchor Criteria . . . . . 4-31
  - 4.4.4 Office Vibration Environment and Criteria . . . . . 4-32
    - 4.4.4.1 Office Vibration Environment . . . . . 4-32
    - 4.4.4.2 Physical Performance Criteria . . . . . 4-32
    - 4.4.4.3 Functional Performance Criteria . . . . . 4-32
  - 4.4.5 Transportation Vibration Criteria . . . . . 4-32
    - 4.4.5.1 Transportation Environment . . . . . 4-32
- 4.5 Airborne Contaminants . . . . . 4-33
  - 4.5.1 Environmentally Controlled Space and Sealed Network Cabinets . . . . . 4-34
    - 4.5.1.1 Ventilated Outside Plant (OSP) Equipment . . . . . 4-34
- 4.6 Acoustic Noise . . . . . 4-34
- 4.7 Illumination Criteria for Network Equipment . . . . . 4-36
  - 4.7.1 Surface Reflectance and Color . . . . . 4-36
  - 4.7.2 Glare . . . . . 4-36

**5 Network Equipment – Environmental Test Methods**

- 5.1 Temperature, Humidity, and Altitude Test Methods . . . . . 5-1
  - 5.1.1 Transportation and Storage Test Methods . . . . . 5-4
    - 5.1.1.1 Low-Temperature Exposure and Thermal Shock . . . . . 5-5
    - 5.1.1.2 High Relative-Humidity Exposure . . . . . 5-7
    - 5.1.1.3 High-Temperature Exposure and Thermal Shock . . . . . 5-9
  - 5.1.2 Operating Temperature and Relative Humidity . . . . . 5-10

5.1.3	Operating Altitude . . . . .	5-13
5.1.4	Temperature Margin Determination . . . . .	5-15
5.1.5	Operation With Fan Failure . . . . .	5-16
5.1.6	Rate of Heat Dissipation Calculation Procedure . . . . .	5-16
5.1.7	Surface Temperature Test Procedures . . . . .	5-20
5.1.7.1	Infrared Measurement Equipment . . . . .	5-20
5.1.7.2	Contact Measurement Equipment . . . . .	5-20
5.1.7.3	Equipment Evaluation Procedures . . . . .	5-20
5.2	Fire Test Methods . . . . .	5-21
5.2.1	Sample Configuration . . . . .	5-21
5.2.2	Testing Clarification – Circuit Board Removal . . . . .	5-21
5.2.2.1	Adjacent Printed Wiring Boards (PWBs) in Close Proximity . . . . .	5-21
5.2.2.1.1	Case 1 – No Mezzanine Cards . . . . .	5-22
5.2.2.1.2	Case 2 – Mezzanine Card . . . . .	5-23
5.2.2.1.3	Case 3 – Larger or Multiple Mezzanine Cards . . . . .	5-24
5.2.2.2	Adjacent Printed Wiring Boards (PWBs) Not in Close Proximity . . . . .	5-25
5.2.3	ATIS-0600319.2014 Test Deviation – Fan-Powering Options . . . . .	5-25
5.2.4	Needle Flame Test . . . . .	5-26
5.2.4.1	Application to Individual Components . . . . .	5-26
5.2.4.2	In-Situ Application to Individual Components . . . . .	5-26
5.2.5	Guidelines for Re-Testing to Address Product Changes . . . . .	5-27
5.2.6	Test Reporting – Additions . . . . .	5-28
5.3	Handling Test Methods . . . . .	5-29
5.3.1	Handling Drop Tests – Packaged Equipment . . . . .	5-30
5.3.1.1	Category A Container – Test Procedure . . . . .	5-30
5.3.1.2	Category B Container – Test Procedure . . . . .	5-33
5.3.2	Unpackaged Equipment Drop Tests . . . . .	5-35
5.3.3	Test Procedure – Equipment and Field Replaceable Units (FRUs) Weighing Less than 25 kg (55.1 lb) . . . . .	5-35
5.3.4	Test Procedure – Equipment and Field Replaceable Units (FRUs) Weighing 25 kg (55.1 lb) or More . . . . .	5-37
5.4	Earthquake, Office Vibration, and Transportation Vibration Test Methods . . . . .	5-39
5.4.1	Earthquake Test Methods . . . . .	5-39
5.4.1.1	Test Plan . . . . .	5-42
5.4.1.2	Laboratory Equipment . . . . .	5-42
5.4.1.3	Test Configuration . . . . .	5-44
5.4.1.4	Static Test Procedure . . . . .	5-46
5.4.1.5	Waveform Test Procedure . . . . .	5-47
5.4.1.6	Test Report . . . . .	5-48
5.4.2	Office Vibration Test Procedure . . . . .	5-48
5.4.2.1	Test Procedure – All Frame-Mounted or Wall-Mounted Equipment . . . . .	5-48
5.4.3	Transportation Vibration – Packaged Equipment . . . . .	5-49
5.5	Airborne Contaminants Test Methods . . . . .	5-51
5.5.1	Scope . . . . .	5-51
5.5.2	Gaseous Contaminants Test Method . . . . .	5-51
5.5.2.1	Two Cleaning Procedures for Copper Coupons . . . . .	5-55
5.5.2.2	Test Procedure . . . . .	5-58
5.5.2.3	Measuring Parameters . . . . .	5-58
5.5.2.4	Safety Procedures for Testing Gaseous Contaminants . . . . .	5-59

5.5.2.5 Performance Criteria . . . . .	5-59
5.5.2.6 Test Report . . . . .	5-60
5.5.3 Hygroscopic Dust Test Method . . . . .	5-63
5.5.3.1 Sample Selection . . . . .	5-63
5.5.3.2 Sample Handling . . . . .	5-63
5.5.3.3 Test Sequence . . . . .	5-64
5.5.3.4 Performance Criteria . . . . .	5-65
5.5.3.5 Test Report . . . . .	5-66
5.6 Acoustical Measurement Methodology . . . . .	5-66
5.6.1 Procedure for Nominal, 27°C Operating Conditions: Test Room at 27°C . . . . .	5-67
5.6.2 Procedure for Nominal, 27°C Operating Conditions: Test Room at Other Than 27°C . . . . .	5-67
5.6.3 Procedure for Nominal, 23°C Operating Conditions . . . . .	5-67
5.6.4 Procedure for High-Temperature Operating Conditions . . . . .	5-67
5.7 Illumination Test Methods for Network Equipment . . . . .	5-67
5.7.1 Equipment Assembly – Readability, Glare, and Reflectance Tests . . . . .	5-68
5.7.1.1 Test Procedure – Equipment Assembly Readability and Glare . . . . .	5-68
5.7.1.2 Test Procedure – Equipment Surface Reflectance . . . . .	5-69

## Appendix A: References

A.1 Telcordia Documents . . . . .	A-1
A.2 Other Referenced Documents or Material . . . . .	A-2
A.3 To Obtain Additional Reference Material . . . . .	A-5
A.4 Family of Requirements (FR) and Family of Documents (FD) Sets . . . . .	A-5
A.5 Reference Notes . . . . .	A-6
A.5.1 Contact Customer Service . . . . .	A-6
A.5.2 Order Documents Online from our Information Store . . . . .	A-6
A.5.3 Websites for Generic Requirements Information . . . . .	A-7
A.5.4 Licensing Agreements for Telcordia Documents . . . . .	A-7

## Appendix B: Acronyms

### Requirement-Object Index (ROI)

## List of Figures

Figure 2-1	Typical 6-Lineup Floor Plan for Nominal 300-mm (12-in) Deep Frames . . . . .	2-3
Figure 2-2	Typical 4-Lineup Floor Plan for Nominal 460-mm (18-in) Deep Frames . . . . .	2-4
Figure 2-3	Typical Equipment Frame Area (Vertical Section) . . . . .	2-5
Figure 2-4	Typical Equipment Area Using Frames 1829 mm (6 ft) High, 762 mm (30 in) Wide, and 610 mm (24 in) Deep . . . . .	2-6
Figure 2-5	Typical Profile of a Network Distributing Frame . . . . .	2-8
Figure 2-6	Typical Profile of Centralized DC Power Plant Equipment . . . . .	2-9
Figure 2-7	Typical Cable Pathways for 305-mm (12-in) Deep Frame Areas (Conventional Cooling System – Air Diffusers) . . . . .	2-12
Figure 2-8	Typical Cable Pathways for a Distributing Frame Area . . . . .	2-14
Figure 2-9	Console Illumination, Readability, and Glare . . . . .	2-26
Figure 2-10	Lighting System Test 2 – Equipment Distribution Frame Areas . . . . .	2-28
Figure 2-11	Lighting System Test 2 – Power and Cable Entrance Areas . . . . .	2-29
Figure 3-1	Equipment Frame – Overall Dimensions . . . . .	3-2
Figure 3-2	Framework Base (Typical) — Floor Anchoring Hole Pattern . . . . .	3-4
Figure 3-3	Typical Adapter Plate, Spacer, and Hole Locations in the Top of the Framework . . . . .	3-8
Figure 3-4	Example of Closed and Open Slots for Mounting Hardware . . . . .	3-12
Figure 4-1	Equipment-Aisle Air Temperature and Humidity Limits . . . . .	4-5
Figure 4-2	Profile View of Equipment Airflow Schemes Conforming to this Section . . . . .	4-13
Figure 4-3	Earthquake Zone Map . . . . .	4-28
Figure 4-4	Transportation Vibration Environment . . . . .	4-33
Figure 5-1	Low-Temperature Exposure and Thermal Shock . . . . .	5-6
Figure 5-2	High-Relative-Humidity Exposure . . . . .	5-8
Figure 5-3	High-Temperature Exposure and Thermal Shock . . . . .	5-9
Figure 5-4	Temperature and Humidity Sensor Locations for Frame-Level Test . . . . .	5-12
Figure 5-5	Card Removed and Burner Inserted in Plane of PWB . . . . .	5-22
Figure 5-6	Parent PWB Removed and Burner Inserted – Mezzanine Card Left in Place . . . . .	5-23
Figure 5-7	Mezzanine Card Removed and Burner Inserted . . . . .	5-24
Figure 5-8	Drop Surfaces for Category A Container . . . . .	5-31
Figure 5-9	Test Set-Up for Category A Container . . . . .	5-32
Figure 5-10	Drop Surface for Category B Container . . . . .	5-33
Figure 5-11	Category B Container – Equipment Handling Drops . . . . .	5-34
Figure 5-12	Unpackaged Drop Test for Equipment or FRUs < 25 kg (55.1 lb) . . . . .	5-36
Figure 5-13	Unpackaged Equipment and FRU ≥ 25 kg (55.1 lb) Drop Surfaces . . . . .	5-38
Figure 5-14	Earthquake Synthesized Waveform – VERTEQII - Zone 4 . . . . .	5-40
Figure 5-15	Required Response Spectra . . . . .	5-41
Figure 5-16	Office Vibration Test Severity . . . . .	5-49
Figure 5-17	Transportation Vibration Test Severity . . . . .	5-50
Figure 5-18	Sample Test Report (Sheet 1 of 2) . . . . .	5-61

Figure 5-19	Schematic Diagram of Test Chamber . . . . .	5-62
Figure 5-20	Sample Phase 3 Temperature and Humidity Profile . . . . .	5-65
Figure 5-21	Equipment Assembly Readability and Glare . . . . .	5-70
Figure 5-22	Equipment Assembly Surface Reflectance . . . . .	5-71

## List of Tables

Table 1	Participants in the Development of GR-63-CORE, Issue 5 . . . . .	Preface–xiv
Table 2-1	Vertical Space . . . . .	2–5
Table 2-2	Summary of Equipment Space and Load Allocations . . . . .	2–16
Table 2-3	Outdoor Contaminant Levels . . . . .	2–19
Table 2-4	Indoor Contaminant Levels . . . . .	2–20
Table 2-5	Minimum Maintained Illumination Level . . . . .	2–23
Table 4-1	Low-Temperature Exposure and Thermal Shock . . . . .	4–2
Table 4-2	High Relative-Humidity Exposure . . . . .	4–3
Table 4-3	High-Temperature Exposure and Thermal Shock . . . . .	4–3
Table 4-4	Equipment-Aisle <sup>1</sup> Air Temperature and Humidity Limits . . . . .	4–4
Table 4-5	Equipment Area Rate of Heat-Dissipation Objective . . . . .	4–10
Table 4-6	Temperature Limits of Touchable Surfaces . . . . .	4–12
Table 4-7	Correlation of Earthquake Risks . . . . .	4–27
Table 4-8	Acoustical Noise Emission Limits . . . . .	4–35
Table 5-1	Variable Test Temperatures for Frame-Level Products . . . . .	5–2
Table 5-2	Variable Test Temperatures for Shelf-Level Products . . . . .	5–2
Table 5-3	Equipment Rate of Heat-Dissipation Calculation . . . . .	5–17
Table 5-4	Unit Calculation Examples . . . . .	5–18
Table 5-5	Additional Calculations . . . . .	5–19
Table 5-6	ANSI/UL 1694 and IEC 60695-11-5 Application Criteria for the Needle Flame Test . . . . .	5–26
Table 5-7	Category A Container Packaged Equipment Shock Criteria . . . . .	5–31
Table 5-8	Unpackaged Free-Fall Shock Criteria for Equipment and FRUs < 25 kg (55.1 lb) . . . . .	5–36
Table 5-9	Unpackaged Equipment and FRU ≥ 25 kg (55.1 lb) Shock Criteria . . . . .	5–37
Table 5-10	RSA Frequencies . . . . .	5–43
Table 5-11	Configuration Guidelines for Shelf-Level Testing . . . . .	5–45
Table 5-12	Office Vibration Test Severity . . . . .	5–49
Table 5-13	Transportation Vibration Test Severity . . . . .	5–50
Table 5-14	Typical Coupon Weight Gains During MFG Exposures . . . . .	5–57
Table 5-15	Target Air Composition and Duration of MFG Testing for Equipment Designated for Indoor or Outdoor Use . . . . .	5–58