The Role of NEBS Requirements in the Telecom Marketplace

While product safety and reliability is a core principle of virtually every manufacturer designing equipment for the telecom industry, the Telcordia requirements that serve to ensure the integrity of such devices and systems is not commonly understood by manufacturers around the globe. As an increasing amount of equipment used in telecommunications networks are being produced in different parts of the world, recognizing and adhering to these standards and requirements is essential to competing in this ever-expanding market.

Among these requirements is the NEBS Family of Requirements, which stands for Network Equipment Building System. Unlike more traditional product safety standards, compliance to the NEBS family of standards ensures the personal safety of the equipment operator and service technician, the protection of the facilities housing the equipment, all while ensuring the integrity of the overall telecommunications network. This family of requirements is what members of the Telecommunication Carrier Group (TCG) such as Verizon, AT&T, Qwest, and smaller local service providers use to evaluate telecommunications equipment to ensure network integrity and protect against hazards associated with the location of equipment.

It is this all-encompassing focus on safety, reliability, and performance of network equipment and its impact on the environment of telecom facilities that distinguishes NEBS requirements from other telecommunications standards. NEBS requirements are designed to:

- Protect personnel
- Streamline equipment design and installation
- Prevent service outages and interference in the network caused by incompatible equipment
- Reduce the risks of fire to network facilities
- Guard against the potential negative impacts on equipment from extreme temperatures, vibration, and airborne contamination
- Support equipment compatibility with the network’s electrical environment.

Like other industry requirements, meeting NEBS requirements can positively impact a manufacturer’s bottom line. NEBS requirements consist of three levels of compliance—each ensuring a different stage of network protection. Understanding in advance the required level of compliance for a particular product can help a manufacturer minimize its product development, installation, and maintenance costs. The higher level of NEBS compliance, of course, is its endorsement of product reliability and performance. More and more telecommunications equipment manufacturers around the world are requiring their component suppliers to show compliance with NEBS and have begun including this stipulation in request for proposals (RFPs) and supplier contracts. In fact, these requirements are beginning to be applied not only to wire line installations but to wireless applications as well.

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Understanding levels of compliance

As most TCG members require demonstration of NEBS compliance prior to the purchase and/or deployment on their telecommunication network infrastructure, equipment manufacturers document compliance to NEBS requirements by having testing performed by an ISO 17025 approved third party test laboratory. In certain circumstances, NEBS related testing can be performed in-house—assuming the internal laboratory is properly accredited (ISO 17025). However, some TCG members require all testing to be performed by an accredited independent test lab (ITL).

NEBS requirements apply to telecommunications equipment installed in a Central Office (CO) environment, certain Outside Plant applications (OSP), and Customer Premises Equipment (CPE). There are generally two standards that apply to most equipment designated for use in a CO: GR-1089-CORE (Issue 4), which covers electromagnetic compatibility and electrical safety; and GR-63-CORE (Issue 3), which covers physical requirements. GR-1089-CORE and GR-63-CORE together are commonly referred to as the “NEBS Criteria.” It’s important to understand that individual TCGs may have additional requirements beyond those found in GR-1089-CORE and GR-63-CORE. Helping to speed and simplify the compliance process without jeopardizing network reliability in the deployment of new equipment, NEBS requirements are divided into three levels of compliance.

- **Level 1** is the minimum acceptable level of NEBS environmental compatibility needed to preclude hazards and degradation of the network facility and hazards to personnel. Level 1 comprises only safety and risk criteria. Conformance to Level 1 does not assure equipment operability or service continuity. Level 1 is typically used by the TCGs for early deployment into their CO and/or interoperability lab, and to allow collocaters to install equipment in a central office. A collocater is a company that rents space in a central office and provides some type of telephone service (such as Internet and long distance).

- **Level 2** is the minimum level of NEBS environmental compatibility needed to provide some limited assurance of equipment operability within the network facility environment. This assurance of operability is limited to the controlled or normal environments as defined by the criteria. Rarely a focus of customers, Level 2 includes all requirements of Level 1 and adds some level of operability reliability.

- **Level 3** is the minimum level of NEBS environmental compatibility needed to provide maximum assurance of equipment operability within the network facility environment. The Level 3 criteria provide the highest assurance of product operability. Level 3 criteria are suited for equipment applications that demand minimal service interruptions over the equipment’s life. Most TCGs require NEBS Level 3 prior to acceptance/installation on the network as they require this level of compliance for equipment operation in the central office, but not collocated equipment.

While SR-3580 is the Telcordia standard which dictates the tests required by the three levels, most equipment manufacturers submit their equipment to be evaluated to NEBS Level 3. Even in pursuing the highest assurance of product operability that Level 3 provides, manufacturers should know where their product is going to be deployed on the network—in a CO operated by telecom carriers, an outside plant environment, or a customer premises environment. The setting of product deployment determines the tests that need to be performed to meet NEBS requirements. For example, specific environmental testing, in accordance with GR-63-CORE, simulates exposure to extreme environments that include high/low temperatures, high humidity, shock and exposure, fire ignition and flame spread, seismic conditions and airborne contaminates. By understanding the testing process, and the additional tests that may be required by specific carriers, manufacturers are better able to work most effectively and efficiently with third-party testing laboratories.

**Recognizing the impact of industry trends**

As a fully accredited, ISO 17025 independent test lab, UL is uniquely qualified to assist in determining the application and installation environment, the appropriate level of compliance and, thus, the required test plan for a given product. In fact, representatives of UL serve on committees that help develop and revise industry standards. Through the strength of its relationships with various TCGs, UL is also expertly aware of the unique carrier requirements that complement the fundamental NEBS requirements in order to demonstrate overall compliance. This knowledge and experience is vital in working with manufacturers in new and growing markets such as Asia intent on adapting to these traditionally North American requirements.

For example, in India the telecommunications and network infrastructure is in its infancy. Fueled in part by a local increase in demand for both broadband and wireless subscriber services as well as the globalization of telecommunications research and manufacturing, this country is fast becoming an attractive destination for global research and development (R&D) investments. Its growing and highly
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The educated population seems to be encouraging a government that supports a robust R&D infrastructure with a regulated patent process similar to many western countries.

This increasing worldwide investment in telecom infrastructure coincides with the industry’s ongoing conversion from copper to more efficient and cost-effective fiber-based systems. Carriers such as AT&T and Verizon have made a great investment in fiber and the equipment needed to deliver it. The growing need for products able to convert from fiber to copper, and vice versa, opens up new opportunities for equipment manufacturers focused on developing products compatible with the North American market and beyond. The promise of those opportunities hinges on a number of factors, chief among them, manufacturers’ ability to comply with all appropriate NEBS requirements.

### Exploring qualified NEBS testing laboratories

Choosing the right NEBS service provider to work with involves considering a host of issues, from laboratory capabilities and accreditations to staff expertise. Equipment manufacturers might also examine whether the provider is able to outline start dates and availability for project planning well before testing actually begins.

In assessing provider capabilities, manufacturers should be aware that product size and weight limitations might preclude some labs from completing certain test profiles. In terms of certification, NEBS test facilities should be ISO 17025 certified and qualified under any carrier specific lab accreditation programs, such as the Verizon ITL program. Manufacturers should inquire about the training and expertise of testing staff. Lab staff and engineers should be actively engaged in industry technical committees, regularly attend industry symposiums, and be current with any applicable professional certifications.

It’s important to note that a comprehensive, full service laboratory will support NEBS testing with the following test facilities:

- Full EMC test facility capable of conducting both immunity and emissions testing
- Environmental chambers to conduct temperature and altitude testing
- Vibration and seismic test facilities
- Full scale fire facility
- Facilities to support acoustic power measurements
- Various test facilities to support lightning surge and power fault simulations, DC power measurements
- Conditioning chambers to support mixed, flow and gas testing and test apparatus to support hygroscopic dust exposure.

These labs should document and deliver a test report that outlines an overall test strategy and contains individual test methods and results. The report includes separate fire/seismic DVD’s and VHS tapes, which is an RBOC requirement. Both CD and hard copy of test reports are provided as part of the service provider’s base service.

### Seeking out full service advantages

A full service laboratory should also be able to support the testing process of the Verizon ITL program for manufacturers that seek compliance with Verizon’s carrier specific requirements. Initiated to help expedite product-to-market cycles for Verizon’s telecommunications equipment vendors and create more economical compliance testing processes, the program actually incorporates three different programs. These include:

1. **ITL NEBS-TCP,** or “Testing Certification Program,” which is limited to third-party independent test labs; ITL NEBS-TCWP
2. **“Testing Certification Witness Program,”** which requires 100% witness testing by third-party ITL laboratory personnel and allows select ITL labs to witness or conduct NEBS testing at vendors’ or other laboratory facilities that are capable of conducting NEBS testing
3. **ITL FOC Program,** or “Fiber Optic Component” program, which allows select labs to witness or conduct NEBS testing at vendors’ or other laboratory facilities that are capable of conducting Fiber Optic Component testing and also requires 100% witness testing by third-party ITL laboratory personnel.

The scope of accreditation under the Verizon ITL Program includes standards GR-1089-CORE, GR-63-CORE, and GR-487-CORE. As one of only a few Verizon approved ITLs, UL participates in all three programs. For example, in its partnership with Verizon’s ITL TCWP program, UL performs an initial assessment of the manufacturers’ test facility, including a review of all laboratory documents and processes. It provides a written audit report with all findings and assists in developing the necessary corrective actions to ensure compliance with ISO 17025. UL also provides the manufacturer with technical support during the actual Verizon audit and follows up with an annual audit of the manufacturer’s test facility to ensure continued compliance with ISO 17025 and Verizon specific
requirements. Currently, there are no Asia-based manufacturer labs involved with this program and, including UL, there are only three ITLs authorized by Verizon to participate in the ITL TCWP.

A pioneer in NEBS testing since 1992, UL operates three full service EMC facilities located throughout North America. Each has a variety of NEBS capabilities and is staffed with highly trained, experienced, and NARTE certified engineers. They have in-depth knowledge of Telcordia and industry specifications and standards and extensive telecommunications product knowledge. With a reputation for developing customized test plans and delivering highly repeatable and accurate results using state-of-the-art test equipment and measurement techniques, UL has developed and implemented a program that allows telecom manufacturers to perform on-site NEBS related testing under witness of a UL test engineer.

No matter the current or future setting of laboratory testing, telecom equipment manufacturers should ensure that their equipment undergoes proper NEBS and customer specific required testing. Viewing this commitment as an important part of product investment, manufacturers should seek out an ITL with the technological tools and expertise to carry out the testing process—including test methods that address any modifications to requirements.

In understanding and achieving NEBS compliance, they gain standing as a manufacturer whose equipment enhances rather than jeopardizes network integrity and protects the safety of the personnel who operate it. The return on this product investment not only includes reduced design and related costs over the long-term, but the advantage of being positioned to make great strides in an evolving worldwide marketplace that presents exciting, new opportunities each and every day.

About the author:
Matt Marotto is currently North American EMC/NEBS Sales Manager for Underwriters Laboratories. In 2008, Marotto served as Global NEBS Program Development Engineer and was responsible for developing and implementing UL’s NEBS Fastrack Program, which enables international Telecom manufacturers to perform NEBS and telecom related testing in their own laboratories under the witness of UL staff. Prior to that, Marotto was Operations Manager for UL’s NEBS testing laboratories in Research Triangle Park, North Carolina. Matt completed his bachelor’s degree in electrical engineering from the University of Alabama and is a NARTE Certified Product Safety Engineer.