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Standards for Protection of Telecommunications Links

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Introduction

Public and Government attention has been focused not only on better methods of understanding stresses on public telecommunications networks, but also on protecting against these stresses. The development of new standards provides one method of understanding the issues of telecommunications stress. Likewise, these standards provide guidelines and data for building specifications to protect public telecommunications networks from stress threats.

National Security and Emergency Preparedness and T1 Standards Development

In accordance with Office of Management and Budget Circular A-119, the National Communications System (NCS) participates with industry representatives in developing commercial telecommunication standards.[1] NCS participation centers on standards

development organizations (SDO) and standards with the potential to fulfill national security and emergency preparedness (NS/EP) requirements of Presidential Executive Order 12472.[2] One such organization, the American National Standards Institute (ANSI) Accredited Telecommunications Committee T1, enables the NCS to better address NS/EP interests during the actual development of new commercial standards.[3]

In the early 1990s, the NCS recognized the NS/EP potential of T1 standards development in the technical focus area of protection. Consequently, the NCS Division of Technology and Standards initiated development, in T1 Technical Subcommittee (TSC) T1E1 (Interfaces, Power, and Protection), of a baseline standard to better address protection of telecommunications links, including the typical link depicted in Figure 1. T1E1's charter calls for addressing two types of telecommunications protection: electrical and physical. Electrical protection includes grounding systems, electrostatic discharge susceptibility, and electromagnetic interference. Physical protection includes temperature, humidity, fire resistance, earthquake resistance, and contamination prevention.

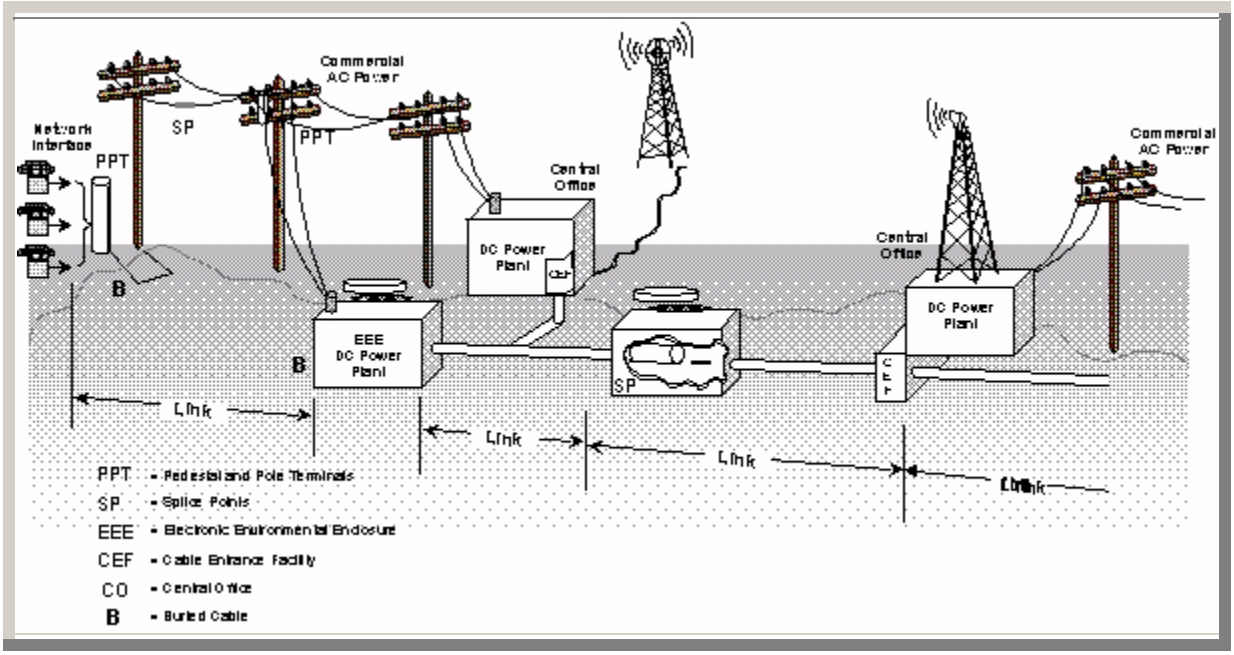

Figure 1. Typical Telecommunications Link

The Process for Development of Protection Standards

In 1992, as a result of NCS Division of Technology and Standards efforts, Telecommunications Committee T1 approved a standards project to address telecommunications protection.[4] This project provided guidelines for TSC T1E1 and the NCS to begin development of a baseline standard to address protection of telecommunications links from stress. Principal guidelines included purpose, application, scope, work products, milestones, resources, and justification of need. The guidelines also described the terms "baseline" and "above-baseline." Baseline establishes foundation level protection for stress under typical environmental conditions. Above-baseline

establishes levels of protection for stress that is over and above that covered by the baseline standard. Service requesters must negotiate above-baseline protection according to individual stress situations.

In 1995, ANSI approved an NCS baseline protection standard, which T1E1 participants developed in accordance with Telecommunications Committee T1 procedures.[5,6] These procedures stemmed directly from the Bylaws of Committee T1 and procedures set forth by ANSI. Robert's Rules of Order, also played a role when parliamentary authority issues emerge during Committee T1's standards development process.[7] To approve an American National Standard, ANSI verifies that the standards developer has allowed due process and consensus to occur during development of the standard. Due process makes the standards development open to all members of the standards development group. Actions requiring comment must be distributed to all group members, who must have the opportunity to comment and provide input during development. All views and objections must be considered and the standards developer must make efforts to resolve any objections that may occur. Significantly, from a Government perspective, all of these standards development measures comply with OMB Circular A-119. Development of an ANSI accredited baseline standard for NCS NS/EP involved following T1 procedures, using Robert's Rules, applying the methodology of due process and consensus, and complying with OMB Circular A-119.

Following ANSI approval of this baseline standard for protection of telecommunications links, the NCS initiated development of a second protection standard in subcommittee T1E1 during 1997, using the baseline standard as a reference source. After extensive open discussion, debate, and review by the power, electrical, and physical protection working groups of T1E1, an above-baseline standard for telecommunications links protection was successfully developed in 1998. The new standard, "Description of Above-Baseline Physical Threats to Telecommunications Links," addresses eight physical and two electrical threats to telecommunications links.[8] In contrast to the baseline standard used as a reference, the threats outlined in the above-baseline standard occur only occasionally. Telecommunications service providers do not ordinarily protect telecommunications links from above-baseline threats. Therefore, the application and methodology addressed in the above-baseline standard must be negotiated according to specific requirements of a service requester (whether Government or industry). Table 1 lists the above-baseline threats and threat sources.

Threat	Source of Threat
Vibration	Train and vehicular traffic, rotation machinery, construction activities, seismic forces
Liquid penetration in cables	Water, other liquids
Radiation	Nuclear, narrowband electric fields, broadband fields
Temperature	Fire, natural and man-made, high ambient temperatures in confined spaces
Exposure to fire	Forest fires, fuel spills, vehicular crashes, gas adjacent

	buildings
Wind and ice	Hurricanes, tornadoes, simultaneous exposure to heavy ice buildup and high wind
Construction	Vehicles, nearby blasts, human errors, digging activities
Corrosion	Chemical environments, seacost environments, heavy truck and automobile traffic
Lightening and exposure to AC power	Lightening strokes, power faults
Loss of telecommunications power	Commercial power outage beyond 3 hours

Table 1. Above-Baseline Threats to Telecommunications Links with Examples of Threat Sources

The above-baseline standard provides telecommunications planners with a guideline to be used when developing specifications for measures to mitigate threats in telecommunications links. Application of the above-baseline standard will provide more robust protection for telecommunications links during natural disasters and some man-made disasters. Finally, both the above-baseline and baseline standards provide a common understanding of threats that can place stress on telecommunications links. Consequently, both standards give Government and industry telecommunications planners significant reference tools for -

- developing protection specifications
- developing future additional protection standards
- incorporating accredited baseline and above-baseline standards protection criteria into telecommunication Requests for Proposals (RFP).

Examples of Applications for Above-Baseline Protection

Application of the above baseline standard to specific telecommunications links depends on the service requester's needs on a case-by-case basis. The standard will likely be applied to specific telecommunications links when a service requester (whether Government or industry) requires special protection to maintain vital communications links during a disaster. For example, occasionally fires pose threats to telecommunications cables and cable entrance facilities. These fires may stem from man-made or natural sources and disrupt vital telecommunications links for essential institutions such as banks or hospitals. Fire sources may include forest fires, flammable liquid fires from fuel spills resulting from vehicular crashes, gas fires from pipeline breaks, or adjacent building fires. Because the above-baseline standard addresses exposure to fire and high temperatures from these potential sources, it serves as an excellent starting point for a service requester to negotiate feasible above-baseline fire protection for vital telecommunications links.

Protection from natural events, such as earthquakes, represents another application of above-baseline standard protection. Service requesters requiring above-baseline protection for vital communications links in buildings of various earthquake zones may receive protection (if negotiated) from a service provider based on the geographic zones of figure 2 and the inserted data. Additional detailed information may be obtained from the "Characterization of Above-Baseline Physical Threats to Telecommunications Links," National Communications System Technical Bulletin, 97-3.[9]

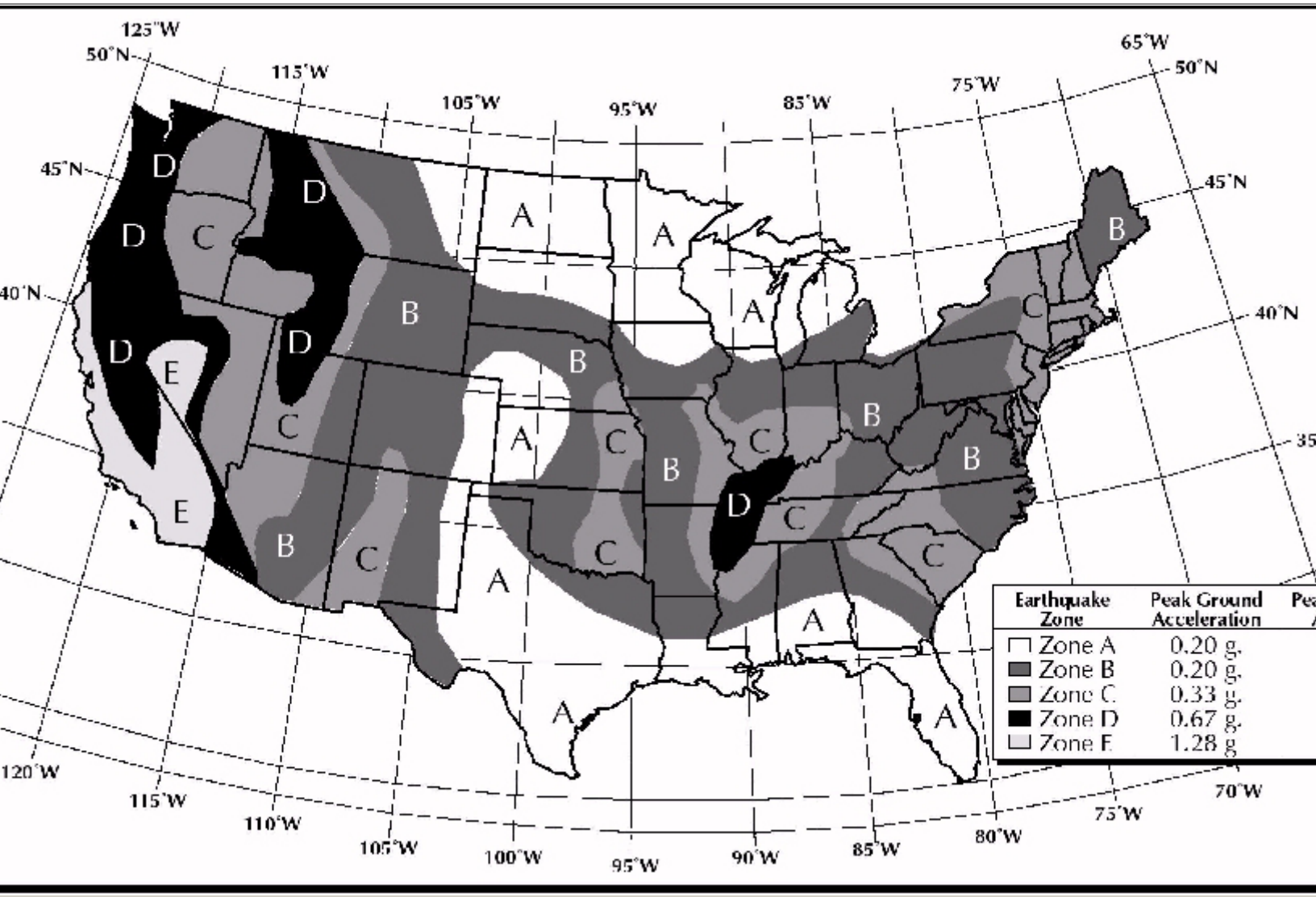

Figure 2. Earthquake Zones (Above-Baseline Threat)

Summary

This Technical Note has highlighted the successful development of two telecommunication standards to better fulfill NS/EP requirements in the technical area of protection. The significance of Committee T1's ANSI accredited standards development

process and the relevance of OMB Circular A-119 have been discussed. In addition, the utility of the two protection standards for the benefit of Government and industry telecommunications planners has been described. Finally, two application examples of above-baseline telecommunications link protection have been provided.

References

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