N E W S
L E T T E R

"Tek" Newsletter

Vol. 2 No. 19
October 1, 1997

Static Electricity

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The ability or propensity of carpet to generate static charge has been a problem that dates back to the use of oriental rugs. Even today static electricity remains a major concern that ranges from commercial environments with sensitive electronic equipment, general office areas with a network of personal computers, to the average residential end-use. Further advancements in heating and insulation have added to this problem by providing warmer and dryer indoor climates that are ideal for static generation.

The amount of static electricity generated by a material is based on the Triboelectric Scale and is expressed in kilovolts (KV). One kilovolt is the equivalent of 1,000 volts. It is generally accepted that the level of human sensitivity to static electricity is 3,500 volts, or 3.5 KV. Fortunately, shocks generated by carpet from higher KV's are generally only a nuisance, and are not damaging to individuals.

One important factor that will determine static generation is room temperature and ambient relative humidity. Studies show that static electricity is generally not discernable until relative humidity drops below 40%. Years ago, static electricity was controlled in this manner by placing pans of water on top of stoves and radiators. Today we use humidifiers for this same purpose, (although condensation on windows can occur in the cooler months). An alternate method for static control is the use of topically applied antistatic sprays. It must be emphasized however, these treatments are incapable of providing permanent static protection and some can accelerate soiling.

Other factors that will influence static generation in carpet is body weight, walking habits, type of shoe sole worn, and type of pad used.

The two major carpet fibers used in carpet today are nylon and polypropylene (olefin). Without a static treatment nylon can generate up to 6 KV or more when new. Although polypropylene is known for its natural low initial KV rating, with use static electricity can increase to as much as 7 KV. In many cases, initial KV ratings of untreated carpets can be effected by factors which may eventually lend them unsuitable for sensitive environments.

The most applicable test for static electricity in carpet is the AATCC 134 Electrostatic Propensity of Carpets test method. Using this test, carpets are tested for static generation by step and scuff action using various shoe sole materials at ambient conditions of 70 degrees fahrenheit and 20% relative humidity. Ratings are then recorded and averaged. According to this test, carpets that do not yield voltages in excess of 3 KV for commercial environments, and 5 KV for residential end-use, yield acceptable static performance.

In todays computer intensive workplace we interface with a variety of computing devices. The computer entry system, or keyboard, operates on electronic impulses of different frequencies (usually less than 5 volts) in order to command the computer to perform a specific task. The problem with static electricity is that when a static discharge is introduced into a computer the electronic surge created is not identified as being unintentional. The computer tries to obey the discharge, which it interprets to be a command, resulting in damage to the software (e.g.; memory or data loss, distortion of visual display). Fortunately, todays personal computers are very well insulated to protect components from damage due to static discharge.

In most cases, computer manufacturers that require a static propensity will not accept a static level greater than 1.5 to 2 KV. The addition and permanency of built in static inhibitors such as static dissipative filaments and conductive primary and secondary backings are often required in carpet to protect sensitive computer components and meet this criteria. Typically, these carpets will generate 1500 to 3500 volts (1.5 to 3.5 KV), depending on construction and static component materials.

Although a carpet's static generation properties are important, an additional interest to computer environments when specifying a flooring system is a carpet's surface resistivity to an applied charge (from built up electricity in a person from an external source) and volume resistivity (the ability of the carpet to conduct the charge to the ground). Good surface resistivity numbers depend on the construction of the carpet and what components are built in to provide a

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Mark Johnston--Tech Manager

"permanent fix". In some cases a carpet can provide good surface resistivity numbers but not good volume resistivity numbers. Both surface resistivity and volume resistivity are imperative when resistivity is a concern. The NFPA-99 Surface and Volume Resistivity test method (a.k.a. IBM Burroughs test method) addresses these issues. Test measurements are stated in megohms. Since many computer and technical requirements vary, the maximum and minimum resistivity criteria generally depends on the specifier.

Care must be emphasized when specifying a carpet for sensitive computer areas. Following known specifications and guidelines can ease the burden of the parties involved. In offices and other facilities where personal computers, work processors, etc...are used it is not uncommon to find that no specific carpet recommendations exist. In this case carpets with low static generation characteristics are generally sufficient.