

**LIGHTNING DATA CENTER
MINUTES
May 8, 2009
ST. ANTHONY CENTRAL HOSPITAL, DENVER, CO
www.stanthonyldc.org**

Monthly Quote: "The trouble ain't that there is too many fools, but that the lightning ain't distributed right."--Mark Twain

1. Meeting began at 11:45 AM and adjourned at 1:45 PM. Moderated by Greg Stewart.
2. Members present: Wallace, Foley, Burrows, Stewart, Wachtel, Mendez, Nibbe, R. Gift, McDonough, Wells
3. Roundtable discussion. Bob Wallace (St. Anthony Outreach Program), reported that as far as the safety poster study is concerned, "We are making progress toward it's funding. I've identified some initial funding." He went on to say that other [funding] sources that can be identified would be appreciated. Like many others, "...our foundation has taken a hit...". "Programs like this are what we use discretionary funds for, but these funds have been nearly depleted this year." Update as of 6/17/09: Thanks to contributions from St. Anthony Hospital, Ken Langford's Mr. Random Enterprises and Dr. Michael Cherington, we have secured \$2100. toward the \$3000. cost of the initial study. If anyone wishes to contribute toward the safety poster survey study please contact Steve Clark at sclarktoto@eml.cc

An article about the fire at the Putrajaya Hospital (Malaysia, April 11, 2009) ..."raised some concerns about the type of lightning protection systems used to protect public and private buildings." It calls into question the efficacy of Early Streamer Emission (ESE) type systems. Stewart provided article highlights, including that [the ESE systems] do not comply with the [Sirim] lightning protection standard, MS-IEC 62305. The systems were declared a risk to public safety in a warning issued (2005) by the International Conference on Lightning Protection (ICLP). "ESE. lightning rods failed to attract lightning and has led to buildings being struck and damaged", the article reported. A recommendation was issued that E.S.E. rods be replaced with Franklin rods. Full article is available at: www.lightningsafety.com/nlsi_lhm/Recall-Unsafe-Lighting-Rods.pdf. For a University of Florida report on non-conventional lightning rods see: www.lightningsafety.com/nlsi_lhm/Uman_Rakov.pdf Thanks to Rich Kithil of the National Lightning Safety Institute (NLSI) for the above links. Another article on this topic entitled "War of the Lightning Rods" (Abdul M. Mousa, Ph.D., P.Eng., Fellow IEEE) can be found at: www.lightningsafetyalliance.com/documents/lightning_war.pdf.

4. Robert Rapp is introduced, President of the National Lightning Protection Corporation (NLPC). Founded in 1977, the company manufactures and installs lightning protection and grounding systems. Mr. Rapp has been on the National Fire Protection Association (NFPA) technical committee since 1994. Stewart noted that NLPC was chosen to install the Lightning Protection System (LPS) for the [yet-to-be-built] St. Anthony Hospital facility in West Denver.

Mr. Rapp said that NFPA writes standards, but they don't perform inspections. Underwriters Laboratories (UL) writes a standard comparable to NFPA's, but they do have an inspection function. There are changes due on requirements for a Master Label. UL Master Label was explained: A lightning protection system that has been

installed to UL specifications(UL 96A). An inspector comes out and if it passes, the building would get a Master Label. The Lightning Protection Institute (LPI) used to perform inspections, but they no longer do.

One of the differences between NFPA 780 and UL 96A was pointed out: NFPA requires a ground loop on any building over 75 feet tall, UL does not. "That's significant, very significant, as far as I'm concerned," said Rapp.

Rapp continued with a presentation, previously given to the Florida Hospital Association. He showed a photo of lightning striking a "Prevectron," one of his company's Electronically Activated Streamer Emission (EASE) terminals, atop a wind turbine tower in Japan. The Japanese company was having difficulty with lightning striking the turbine blades. "We ran a study on it and there's been no damage to the blades," said Rapp. He went on to say that photographic imaging will help the protection industry advance at a faster pace. Additional information on the EASE study or NLPC products and services can be accessed at www.nlpcorp.com.

According to an NFPA committee source and insurance industry consultant, lightning causes 5 billion dollars in negative economic impact each year in the U.S.. Mr. Rapp reviewed basic meteorological dynamics in the formation of lightning. Also presented were the basic requirements of a protection system: air terminals (or "rods"), interconnecting conductors, down conductors, grounding system, potential equalization and surge protection devices (SPDs).

The general categories for systems were reviewed: Franklin type, ESE. and catenary. Photos and illustrations helped clarify components. A Colorado Springs building using a Franklin system was featured with air terminals placed at 20-foot intervals, terminal-topped equipment, cable connectors, through-roof assembly and down conductors (100-foot intervals). Trip values (trip/fall likelihood from cables) and impalement hazard (from falling on terminal) are other factors to consider. Even with blunt-tip terminals, they can pierce the skin. "It is a big problem," confessed Rapp. "It's a safety problem to be concerned about." There have been documented injuries. The company holds a patent on a preventive fixture called a "flathead," designed to circumvent the problem. It is essentially a Cal-OSHA-approved safety cap for air terminals.

ESE terminals were originally equipped with a radioactive feature, promoted with claims of producing an "enhanced" streamer (attachment point to downward leader). Ornamental design features were claimed to elevate ionization near the air terminal. The advantage, proponents argue, is a single ESE air terminal could replace a conventional, multi-terminal system. Aside from the "conditioned" streamer, bonding and grounding is similar to conventional systems. Catenary systems employ elevated wires, suspended from masts above a protected zone, designed to intercept a downward strike, grounding it safely. This system has been applied to several NASA launch pads. It features large cables strung between three 594-foot-tall steel and fiberglass towers. Information on catenary and other protection systems can be found in Martin Uman's [The Art and Science of Lightning Protection](#) (Cambridge University Press, 2008).

NLPC's Prevectron system has been installed at the IBM Boulder campus, Denver Performing Arts building, Coors Field, Pepsi Center, US West Building and other locations. An EASE system involves an arrangement of passive electronics and electrodes designed to affect the electrical breakdown of spark gaps in a high electric

field of the approaching stepped leader. NFPA 780 by charter does not cover Prectron technology. "Lightning protection is a theory, not a science," said Rapp. "We have nothing we can prove. We can prove that lightning goes down through a conductor to the ground, but we can't prove, for instance, that air terminals spaced at 20-foot [intervals] around the building is exactly what needs to be all the time [to insure] a zone of protection. We can't do it. It's a theory." NLPC has tested the product for about 15 years, but will never, according to Rapp, be able to prove a specified zone of protection. The company provides an "insurance certificate" for \$10 million, thus providing an "insured area". To date, there has not been a claim on this policy. If any installer offers an LPS with a "zone of protection," Rapp recommends regarding it as a false claim. "We can say that the lab test *infers* this, our field test *infers* this...it's as close as we can get." There are currently no U.S. installation standards relating to the Prectron system. There are nearly 10,000 units installed throughout the U.S., with no documented damage to structures.

Potential equalization process was reviewed as well as surge suppression technologies. Stray voltage and induced voltage effects require a series of measures clients need to address. Rapp noted that NFPA committee members have a financial interest at stake. They want to make sure nothing passes that will hurt their interests. Mike Foley pointed out that despite NFPA's goal to represent varied interests in a balanced way, the deck seems stacked in favor of manufacturers. "You always get a swing towards installers...businesses that have an economic interest." A partial roster of current NFPA committee members and affiliations was reviewed.

The US government is interested in having future criteria (2011) include more on explosive applications. Builders installing an LPS look for either a UL Master Label or an NFPA compliance letter. Regarding compliance, neither UL or NFPA offer periodic inspections for recertification, though a UL's Master Label expires 5 years from date of issuance. If certain additions/alterations are made on a roof, like adding an antennae, the certification is voided. Both UL and NFPA have comprehensive disclaimers for any liability in connection with their codes and standards. Neither organization conducts empirical tests for the effectiveness of their recommendations. Some of the key areas in discussion for revision are the following: explosives, grounding, helipad safety, modeling, risk assessment, strike termination and system testing. Howard Wachtel suggested that the helipad hazard problem could be solved with retractable terminals. It is a goal of the NFPA that all changes are arrived at through balanced consensus.

At the time of UL recertification, electrical systems are required to meet all revised criteria (12th edition). Rapp pointed to a problem: as LPS installers are notified about the new demands/criteria, building owners may not know when or if their buildings are falling out of compliance (loss of label). Insurance company/client relations are then likely to be severely strained. Also, label expiration information is not readily available to building owners. Mike Foley commented: "My take on UL...is that it used to be run by engineers, now it's run by attorneys, pure and simple." UL used to be non-profit, now it's for-profit. Rapp said that certain UL surge suppression technologies interfere with signals from incoming lines. While some dedicated systems will be exempt, "...this predicament is going to be very hard to handle," said Rapp. A "Letter of Findings" designation allows installers to exempt surge-suppression systems and even grounding systems. The question arose: if grounding is excluded, how can the standard properly address LPS requirements?

5. The Lightning Data Center does not recommend or endorse any product or service. These minutes do not represent official positions of the LDC or its members.

6. Next meeting: Friday, July 10, 2009 at 11:45 AM in the Main Auditorium, St. Anthony Central Hospital. Subject/Speaker: TBA.

Respectfully Submitted,

Gregory Stewart