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# Society of Fire Protection Engineers

**New Jersey Chapter**

# FUSIBLE LINK

**FEBRUARY 2005**

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# Message from Chapter President...

Well, we are halfway through our Chapter year and we still have so much to do. Our technical programs have been outstanding with more to come this spring. Look at the program schedule and come out and enjoy the presentations, the conversations with your peers in your chosen profession and of course, a great Hanover Manor meal. We are a very diverse group and all benefit from our individual insights and expertise.

As a reminder, we have not heard from a few folks concerning membership renewal. Please take the time and renew your membership this month. We need to update our records and keep your membership active. Please do it today.

Our February program will review the state of the property insurance market. Property insurance touches us all in some way or another and an update will benefit our understanding of this area of fire protection engineering. The speakers are some of the heavy weights in this industry. Don't miss it. See you there.

Rich Reitberger
Chapter President

# NJ SFPE Membership Meeting Minutes January 3, 2005

The meeting was called to order at 6:00 by our President Rich Reitberger. A salute to the flag was followed by all attendees introducing themselves as is our custom.

The December minutes were dispensed with as they are published in the ***Fusible Link*** and Secretary Ed Armm read the minutes he took at the coalition meeting to stop Senate Bill S-1667 which is now S-2176. The bill was moved from its original committee and its number was changed because of opposition. The bill is now in a committee chaired by its sponsor. Motions were made, seconded and both the secretary's minutes and treasurer's report were accepted. The meeting minutes as written in the ***Fusible Link*** and December treasurer's report as read.

Rich talked about a letter that the board would write against this S-2176. It will be sent to all members for their personal signature and faxing to their local legislators. Rich showed the membership a Seasons' Greetings card to the chapter from National and finally informed the membership that our June meeting conflicted with NFPA. After a discussion and agreement it was decided that the June meeting will be moved forward one week to June 13th.

Tom Kuhta asked all present to take part in the NY Metro SFPE "Engineering Career Day" program at John Jay College on February 11. Tom once again reminded us that we were all welcome to what is always an excellent program, the joint meeting of the NY Metro SFPE and the Fire Safety Directors of New York Association. This program is held at the NYC Fire Museum which is an experience in itself.

John Cholin spoke about the SFPE Spring Professional Development Week being held March 14–18. John reminded those interested in sitting for the PE Exam that the registration date was in April and our chapter's training program will begin in May with sufficient applicants. Please don't forget to both register for the exam and the training program if you're interested.

Paul McGrath of City Fire spoke about a seminar being offered at no cost to AHJ's and our members. The seminar will be held January 7 at Seton Hall in South Orange, NJ. It will focus on the test, inspection and maintenance of fire alarm systems based on NFPA 72, 1999 Edition. It is being presented by Ed Armm, SET for the AFAA.

Rich stressed the PE exam registration deadline. He informed the membership that he would no longer be involved in the annual Golf Outing and asked for a volunteer to take his place on the committee.

Our presentation this evening was by John Cholin, PE FSFPE with support from Ed Armm, SET. The title of the presentation was "Design of Occupant Notification in Fire Alarm Systems" which John took from his well received SFPE three-day seminar.

John began with Audible Notification and a definition of dBA as well as why the A weighted scale, being closest to the frequency of human hearing, is used. John explained the difference between Private Mode Notification and Public Mode Notification with detailed information concerning the requirements each type of Notification presents the designer.

John introduced the majority of us present to Narrow-Band Signaling, some of the latest technology in notification accepted by the National Fire Alarm Code©. He explained that it is most useful in areas with high ambient sound levels. These areas would normally call for very high dBA ratings for Audible Notification Appliances and/or Visual Notification Appliances. John showed us that with a

calculation method obtained from ISO 7731 - ***Danger Signals for Workplaces – Auditory Danger Signals***. The designer can use a narrow band signal of the proper frequency at a lower dBA level than would normally be required and being narrow band the sound will not be masked by ambient noise. John demonstrated the methodology in testing ambient noise frequencies and sound pressure levels and how to fit the narrow-band signal. John stressed the need for follow-up testing to verify that new equipment or changes within the protected space would not mandate a new different narrow-band frequency be required for code compliant notification.

John reviewed code requirements for the placement of appliances as well as "rules of thumb" for sound pressure levels decreasing with distance and increasing with power. We were provided with charts for the computation of sound pressure changes with two sounders, various distances and obstacles in the path of the sound waves. John reminded us of what audio engineers have practiced and proven for decades, that intelligibility is higher with more appliances taped at lower wattages. Sound attenuation of walls, partitions and ambient conditions can be overcome with the methods John provided us with. Much of which is from the SFPE Handbook©.

We were provided with an excellent explanation of intelligibility and how it is achieved and measured using a Fourier Series to describe the audible signal. Using mathematics one must restate the function in a Fourier Transform Domain, however a computation routine called the Fast Fourier Transform (FFT) can be introduced into the Mic of a Voice Evacuation System and analyzed. The two scalars can then be compared by a computer.

After John's explanation Ed Armm demonstrated equipment used to measure speech intelligibility. Ed used the Speech Transmission Index-Common Intelligibility Scale (STICIS) Analyzer and Talkbox. Testing is performed by placing the Mic of the Voice Evacuation System in a cradle provided for it in the Talkbox. A CD plays the STI-PA Test Tone through a quality speaker into the Mic. The STI-CIS Analyzer is used to test the resulting sounds. The Analyzer should be at the height of normal ear level, typically 5.5 feet, first sound pressure level is tested (remember this should be 15 dBA over ambient) and once a sufficient sound pressure level is attained the CIS button is pressed and a resulting = 0.70 indicates acceptable intelligibility. Originally the equipment was only available through Simplex/ Grinnell but now you can get the equipment directly from its manufacturer Gold Line who can be reached at http://www.gold-line.com/dspsti.htm.
John next covered Visible Notification beginning with basic requirements for the light and its intensity. John followed with placement requirements both prescriptive and performance based.

The prescriptive section of John's presentation was from the 2002 edition of the National Fire Alarm Code© both from chapter 7 and Appendix A and from UL 1971. John took some of the mystery out of how the prescriptive requirements were created. As far as placement we were provided with some good tips that will hopefully save those of us that design systems some appliances and further allow for lower power requirements and smaller power supplies.

John discussed the inverse square law and its importance in the design of performance based notification he also provided us with an equation to compensate for viewing appliances when the point of interest is not on the optical axis of the appliance. John spent a little time discussing large spaces and finally the ADA before completing his presentation.

After a short Q & A session the meeting was adjourned at 8:45.

# The Case for Performance Metrics for Fire Protection Devices Part III

*The following technical article was written by John M. Cholin, P.E., M.E.E., F.S.F.P.E., J.M.Cholin Consultants, Inc.*
*101 Roosevelt Dr., Oakland, NJ 07436*
*This is the third of several installments.*

A similar set of circumstances exists for spark/ember detectors, used to monitor the interior of pneumatic conveyance ducts that transport combustible particulate solids (dusts) in industrial process facilities. The sensitivity of listed spark/ember detectors is measured and published by the NRTL providing the listing. Usually, sensitivity is measured in watts, milliwatts or microwatts.

The performance criteria for the spark/ember detection system are derived from the minimum ignition energy data that is obtained through laboratory testing of the combustible involved, in accordance with ASTM E-1226. This testing provides a minimum ignition energy, measured in joules, and is intended to establish a numerical parameter characteristic for the dust that can be compared to other dusts to develop a qualitative assessment of the hazard. Minimum ignition energy cannot be used directly as a performance criterion; it must be converted to a power per unit volume or power density criterion for ignition. Then the ignition power density can then be compared to the power of a spark to determine if a spark of given power is capable of igniting the dust/air mixture.

The radiant emission from a spark, integrated over all wavelengths from a non-ideal, Plankian radiator can be obtained by using a form of the Steffan-Boltzman relation:

$P = A T4$

where

P = Radiant Power (W)
= emissivity of the material
A = Area of the radiator (m2)
= Steffan-Boltzmann constant, 5.67E-8 W/m2K4
T = Temperature, K

This relation is used to compute the radiant power emitted by the spark. Once the power of the spark is known it is then modeled as a point-source radiator for performance prediction computations. The same relation that was used for flame detectors is used for spark/ember detectors but the numerical value for the atmospheric extinction factor is now determined by the concentration of non-burning dust in the air instead of absorptive gases. This value is generally orders of magnitude larger when dealing with spark/ember detectors as opposed to flame detectors.

Thus, performance-based design can be executed when the design relies upon the use of radiant energy sensing detectors. These detectors have performance metrics that make it possible to demonstrate the performance or capability of the design through engineering analysis and calculation. The tradition of having performance metrics for radiant energy sensing fire detectors has been responsible for improving the performance capabilities of these detectors over the years. It also allows the fire protection engineer to select the most appropriate product for a given application. The design professional has the information to make a prudent selection, weighing sensitivity versus cost versus stability and a host of other features to arrive at the best choice for the application under consideration. This has led to valid designs that achieve the performance objectives of the stakeholders.

**Heat Detection**

One would think that a technology that has as long a history as heat detection would have well-established performance prediction methods and tools solidly in place. Unfortunately, this is not the case.

The thermodynamics that describes the flow of heat into a heat sink such as a heat detector has been known since the last quarter of the 19th century. Beyler solved the differential calculus represented by these relations to model the flow of heat into a heat detector. For a ceiling-mounted heat detector as shown in Figure 3, the operation of a heat detector can be predicted when one knows:

-Detector set-point temperature
-Rate at which heat can enter detector
-Ceiling jet temperature
-Ceiling jet velocity

The derivation of the basic physics has been presented numerous times in the fire protection literature. The rate of heat uptake by a heat detector in a ceiling jet flow can be described with the relation:

$$dT_d/dt = (T_g - T_d) / \tau$$

where

$\tau = mc/HcA$ (in seconds)

(Continued on page 5)

(Continued from page 4)

Using this relationship and their research into the response of heat detectors, Heskestad and Delachatsios developed a computational method for predicting the response of sprinkler heads in fires. This computational method required that the detector response time constant, $\tau$ , be measured for the sprinkler head or detector in question. Once the time constant, $\tau$ , had been measured it was multiplied by the square root of the simulated ceiling jet velocity used in the test apparatus for determining $\tau$ to obtain a response time index (RTI) for the given detector or sprinkler head. The computational method for predicting sprinkler or detector response uses RTI, not $\tau$ as an input parameter, making the results reliant upon the precision of the numerical value of RTI.

Unfortunately, the nationally recognized testing laboratories were not routinely quantifying $\tau$ for listed heat detectors. Consequently, there was a need for a means to determine a value of $\tau$ if the Heskestad and Delachatsios computational method was to be used for predicting the response of a heat detector. To address this need an empirically derived table was developed by Heskestad and included in Appendix B to permit the user to estimate $\tau$ on the basis of the listed spacing and response temperature of the heat detector.

The use of a "presumed" RTI derived from Table B-3.2.5.1 introduces an error of unknown magnitude because the reference velocity for computing RTI is 1.5 m./sec (5.0 ft./sec.), a reference velocity that is generally greater than that normally anticipated at the detector for fires of the type an magnitude for which heat detection is normally used. Consequently, the usefulness of the computational method is limited by this inherent error of unknown magnitude.

In order to address this problem a public proposal to require the inclusion of the response parameter for heat detectors was made for the 1999 edition of the National Fire Alarm Code. In the 1999 revision cycle the Technical committee added the language: "Heat sensing fire detectors shall be marked with their operating temperature and thermal response coefficient…" (emphasis added) with an effective date of July 1, 2002 for TRC. The term "thermal response coefficient" was chosen to differentiate it from RTI as it was suspected that a different test method and reference velocity would be necessary to quantify the thermal response time of a heat detector.

Unfortunately, after 3 years of disagreement between the manufacturers and one nationally recognized testing laboratory regarding the means by which the research would be funded, no progress had been made and this requirement in the National Fire Alarm Code is being deleted. While the requirement to mark the detector with the value of the TRC has been, as of this writing, removed from the 2002 edition of the National Fire Alarm Code the need to have a credible measure of heat detector response time remains.

Consequently, the engineering community does not yet have the performance metric it needs to properly and accurately model performance of a heat detection system. Despite the simplicity of the detectors and the clarity of the physics the necessary metric for credible design remains unavailable. Instead the designer is forced to use a table of correlations that is imprecise, at best.

**Smoke Detection**

As bad as the situation is with heat detectors the situation with smoke detectors is orders of magnitude worse. With smoke detection the system designer has no performance metrics that she/he can credibly use to predict the performance of the system to actual fires. The term "early warning" is used but has no real meaning. "Early" in terms of what? Does early warning mean that the detection system will detect a fire before some other modality does or does it mean that it will detect the fire sufficiently early to initiate a specific response and hence achieve a specific fire protection objective? Or does it relate to the time of day?

Currently, the designer has only one performance-measuring test upon which to base her/his design. This is the response of the smoke detectors to the full-scale room fire tests as described in ANSI/UL 268, Standard for Safety: Smoke Detectors for Fire Protective Signaling Systems. The details of the tests are quite specific, as they would be expected to be, but essentially include three fire tests and a smoldering test. The fire tests include a paper fire during which the smoke obscuration at the ceiling detector under test attains a level of 27 to 37 %/ft. The second test is a wood crib fire during which the smoke obscuration at the ceiling detector under test attains a level of 17 %/ft. at ceiling. The third fire test is one fueled with a mixture of toluene and heptane that produces a smoke obscuration of 13 %/ft. at the ceiling mounted detector. The successful completion of the full-scale room fire tests is achieved if the detectors under test produce an alarm signal before the completion of the fire test. Most fire protection professionals know that current state of the art smoke detectors are far more sensitive than these smoke obscuration levels imply. We do NOT know how MUCH more sensitive they are. Unfortunately, these are the only values the designer has to work with.

*To be continued in the March edition of the Fusible Link*

## Senior Risk Manager Position
## Stryker Corporation

***Full details of this position were contained in the November Fusible Link edition***

### EXPECTED RISK MANAGER DUTIES AND RESPONSIBILITIES

- Business Continuity Planning
- Assist Stryker plants as they develop their BCPs based on template provided
- Assist in the development of intranet website to allow each plant's BCP Project Team to post and share BCP content as developed
- Highly Protected Risk (HPR) Status Responses to FM Global (FMG) inspection reports
- Participate in joint discussions with FMG Engineering and Stryker plants concerning "disputed" FMG recommendations

**Captive Insurance Company**

- Help research possible additional uses for captive (e.g., benefits, D&O, front for insurers subject to FET)
- Liability Claims Handling
- Help research and respond to insurers' batch claim information requests
- Increased Insurance Renewal Demands
- Help address insurers' significantly increased renewal information requirements, including preparing for underwriting meetings
- Help analyze coverage proposals and options Contract Review - assist as necessary

**Relocation**

Relocation services are completely available

**Please Contact: Richard Meyers, CEO and Client Executive to Stryker Corp.**
**rmeyers@rmainc.com or 973 765-9000 x101**

**CORRECTION TO THE PREVIOUS JANUARY EDITION**

In the last publication on page 3 under the Meeting Minutes, in the third paragraph from the end should have read ***"minutes into the test the ceiling began to melt and fall which may have impeded the sprinklers from operating or if already fused most likely would have obstructed the water flow from reaching the seat of the fire..."***

# Meeting Dates/Program 2004-2005

**(Programs Subject to Change)**
**Watch web page concerning cancellation In case of possible inclement weather conditions**

| | |
|---|---|
| Feb. 7 | "Risk Management - The State of the Property Insurance Market Place" - Panel of Speakers - Bob Baker, FM Global, Mike Newman, Johnson & Johnson, Brad Hart of Willis |
| March 7 | "Mitigating Earthquake Damage - Reinforcing Techniques |
| April 4 | "Fire Trailer & Dynamics" - NFSA Fire Burn Trailer & Fire Burn Dynamics |
| May 2 | "Chubb Lab" - Visit and Demonstration of Chubb's Fire Protection Systems Lab in Warren, NJ. |
| June 13 | **NOTE: DATE HAS BEEN CHANGED** - "Annual Meeting - Election of Officers Topic: Loss Lessons by John Cholin of JM Cholin Associates. |
| June 27 | Joint NY/NJ Chapter Joint Scholarship Golf Outing at West Point |

**POSITIONS TAKEN BY SPEAKERS ARE NOT NECESSARILY THE POSITION OF THE NJ S.F.P.E.**

All meetings are held at the Hanover Manor, Eagle Rock Road, Hanover, NJ (approximately 1½ miles west of Eisenhower Parkway). Get Acquainted Hour 5:00-6:00 p.m. Adjournment is usually before 8:30 p.m. The Executive Committee meets at 4:00 p.m.

Editors Note--If you would like to advertise your company and help offset the cost of this publication, as well as having your business card in front of over 150 Fire Protection Professionals please call John Cholin at (201) 337-8621 for further information. The cost is $100 for fiscal year.

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# MEETING NOTICE

**Date:** February 7, 2005

**Place:** Hanover Manor
16 Eagle Rock Avenue
East Hanover, NJ

**Price:** In Advance - $22 At door - $25

**Dinner:** 5:00-6:00 (Cash bar for mixed drinks)
Dinner at 6 PM

**Speaker(s):** Panel of Speakers - Bob Baker, FM Global, Mike Newman, Johnson & Johnson, Brad Hart of Willis

**Topic:** "Risk Management - The State of the Property Insurance Market Place"

**Please note for this meeting:**
All officers, directors and committee chairman are requested to attend a meeting at 4:00 p.m. at the Hanover Manor.

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PLEASE COMPLETE AND RETURN WITH YOUR CHECK PAYABLE TO "SFPE NJ CHAPTER" TO:

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Parsippany, NJ 07054-1196
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COMPANY: _____ TELEPHONE: _____

ALL RESERVATIONS SHOULD BE RECEIVED BY FRIDAY, JANUARY 28, 2005. TELEPHONE RESERVATIONS OR CANCELLATIONS SHOULD BE RECEIVED BY NOON OF THE MEETING DAY.

Fusible Link Editors NJSFPE
C/O Rich Reitberger
Affiliated FM Ins. Co.
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Parsippany, NJ 07054

# 2004-2005 Chapter Committees

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**NY Chapter Liaison**
Rich Reitberger (Pat Egan back-up liaison)

**PE Examination**
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Joe Janiga
Mike Newman
Chuck Gandy

**Joint Seminar/Chapter Seminar**
Richard Reitberger, Chairman
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**Legislative**
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**P.E. Test Questions**
Chuck Gandy, Chairman