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Society of Fire Protection Engineers

New Jersey Chapter

FUSIBLE LINK

JANUARY 2005

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NJ SFPE Membership Meeting Minutes December 6, 2004

The meeting was called to order at 6:10 by our First Vice President Glen Deitz. A salute to the flag was followed by all attendees introducing themselves as is our custom.

The November minutes and December treasurer's report were read, motions were made to accept, seconded and both the secretary's minutes and treasurer's report were accepted.

Paul McGrath President of City Fire spoke about the flyers on each table. They are for a seminar he and City Fire is offering 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.

Tom Kuhta mentioned that the NY SFPE would be holding a seminar at John Jay College in February. Details will be provided to us shortly. Tom also mentioned a program allowing students to speak one-on-one with Professionals on February 11 at John Jay in coordination with Brooklyn Polytechnic. Tom encouraged any of our members that were available to come and take part in this opportunity for Fire Protection Engineering.

Past President Sarge Slicer, presented John Cholin with his SFPE Fellow Pin.

Ed Armm brought up the new Senate Bill No. 1667. Again, the general consensus of the meeting attendees was that this is not a good bill. Ed stressed that each member must write to their state legislatures. We must let them know that this new bill will be a restraint of trade and a handicap to both the engineering industry as well as that of our clients. The URL for the State of NJ web site is http://www.state.nj.us/. To find information about the bill or to locate your area's representative, the web site is http://www.njleg.state.nj.us/. If we do not voice our displeasure with this bill we will have to live with the law.

One request for membership was read by Glenn for Peter Schmidt. Motions were made to accept Peter as a Chapter Supporter which was seconded and approved by all in attendance.

Past President Chuck Gandy informed those P.E.'s in the room that exam question writing will be taking place tomorrow at FM Global.

Our presentation this evening was done in three parts and presented by fellow NJSFPE members Past President Jim Tolos, Past President Mike Newman, Past President Joe Janiga and current First Vice President Glenn Deitz.

First up was Jim Tolos who spoke about a loss involving a halon 1301 cylinder, it's mishandling and the resulting damage to a client's facilities and an employee. An employee with no training for the handling of pressure vessels decided to relocate two 250-pound halon cylinders with 165 pounds of gas in each. Neither cylinder was secured to the wall or had an anti-recoil plug installed.

Using first diagrams and then pictures Jim showed the route or trail of destruction and mayhem a cylinder that fell over took. The cylinder caused damage to the floor, mechanical structure of the first building, hitting an employee in the process and finally traveling over 70 feet to cause damage to a second building.

Lessons learned, one always secure pressure vessels at 2/3 their height from the floor and secondly to always install anti-recoil plugs at the outputs of pressure vessels. By the way, the employee only suffered a compound fracture of his leg.

Our second presentation was by Mike Newman and concerned three issues: first the losses J & J have endured over the past ten years, secondly a laboratory fire and finally a loss due to the explosion of a cylinder of acetylene.

Generally in the past ten years J & J has suffered losses due to 69 incidences of fire, 79 incidences dealing with a HazMat, 46 incidences pertaining to infrastructure, 86 incidences of damage due to nature, 90 incidences due to power related problems and 83 incidences of theft.

The lab fire was quite serious at first causing two sprinklers to fuse and extinguish the flames. However, the majority of damage was due to water as the Fire Department handled the fire as a HazMat issue and would not allow anyone from J & J to enter the building and turn off the sprinkler system once it had done its job. Only one employee was injured, the person that was intimate with the flammable liquid that caused the fire when they broke the bottle.

The cylinder explosion is still under investigation so Mike could not provide us with all of the details, however, he did show us the gravity loss in major structural damage and the loss of one life. It appears a local contract welder was in the process of stealing acetylene. He was transferring the gas from an approved pressure vessel into a cylinder used for CO2 or nitrogen in pubs. The resulting explosion lifted a large part of the building four inches off of its foundation, blew out wall sections, windows and damaged a number of structural load bearing wall and non-structural temporary walls. Gypsum board walls were damaged at a distance from the explosion of up to 300 feet.

The final presentation by Glenn and Joe differed from the first. Rather than suffer a loss, a PVC plastic wall covering material was tested at FM prior to its acceptance as a covering for walls and/or ceilings. The material had been guaranteed by its manufacturer to pass ASTM E-84 which is a Steiner Tunnel flame spread test. Materials must not exceed a prescribed flame spread or smoke propagation level.

When the material was subjected to the ASTM E-84 testing, the result was the first piece of plastic installed on the top testing area of the Steiner Tunnel melted and fell into the test chamber. This prevented the char from reaching an unacceptable level or sufficient smoke to be generated to cause a failure of the test.

FM believes the Steiner Tunnel test to be antiquated and totally unacceptable for plastics which were not invented when the Steiner Tunnel was created to test materials. Joe explained how the Steiner Tunnel gets its reference of 0 from a non-flammable material being placed in the test area followed by red oak which once tested for ten minutes has its char measured for the reference 100. Joe further explained the difference between Thermo Plastics which soften from heat and Thermoset Plastics which

harden the first time heat is applied and stay hardened in that shape thereafter.

Glenn was uncomfortable when a contractor used the plastic material on walls and ceilings at this site. He contacted Joe at FM Global who arranged for testing at the FM Global labs.

When the FM 4880 test was performed using enough heptane to support open combustion for ten minutes, walls and ceilings were covered with this material for a distance of eight feet from the corner of the room where the heptane was located. A fire was ignited in the pan of heptane and the results were filmed. Those attending the meeting were lucky enough to watch a movie of this test. We were both surprised how a material that passes ASTM E-84 performs so poorly with FM - 4880.

Heavy black smoke was soon generated which would impede egress. Flame spread rapidly as well and the ceiling panels soon melted to the point that they would prevent sprinklers from getting the water to the fire. Minutes into the test the ceiling began to melt and fall which would have allowed the sprinklers to operate or if already fused to get the water to the fire, however, by this time the fire had spread, flashover was imminent and proper suppression of containment of such a fire is questionable.

Each of the presentations was followed by a question and answer period. All three presentations were well received and provided us with some lessons, answers and as with any good presentations, some new questions.

The meeting ended at 8:30

The Case for Performance Metrics for Fire Protection Devices Part II

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 second of several installments.

Performance-Based Design Of Fire Detection Systems

Radiant Energy Sensing Fire Detection

The concepts underlying performance-based design were adopted into the NFPA fire alarm standards with the adoption of The Standard on Initiating Devices, NFPA 72E-1990. This document adopted performance-based design as the sole design method permissible when using radiant energy sensing detectors. When this standard was incorporated into the **National Fire Alarm Code** in 1993 the section on radiant energy sensing detectors was adopted without material change. This section has been reaffirmed in the 1996, 1999 and 2002 editions of the **National Fire Alarm Code**. Thus for over 10 years the **National Fire Alarm Code** has included performance-based design as not only a permissible method but the only permissible method when designing systems using either flame or spark/ember detectors.

Paragraph 2-4.2.2.3 of the **National Fire Alarm Code**, NFPA 72-1999, states: "The system design shall specify the size of the flaming fire of given fuel that is to be detected." This requirement is read in light of paragraph 2-4.3.1.1, that states: "Radiant energy sensing fire detectors shall be employed consistent with the listing or approval and the inverse square law, which defines the fire size versus distance curve for the detector." These two paragraphs establish a design environment in which the designer must postulate a fire of given size and fuel and then computationally demonstrate that the detection system, as designed, will detect that fire.

As radical as this approach might seem to some fire alarm system designers, this design method yields system that performs consistent with the design objectives for the hazard area. This design approach is possible because the listing investigation, provided by the nationally recognized testing laboratory (NRTL) providing the listings (in the US it is F. M. Global - Research) for both flame and spark/ember detectors, results in a performance metric.

In the listing investigation for flame detectors the distance at which a detector can detect a given test fire of known size and fuel is used as the metric of that detector's response sensitivity. Radiant energy sensing detector sensitivity to a fire radiator can be described with the relation:

$$S = kP\exp(-\zeta d)/d^2$$

Where S = radiant power (W) reaching detector sufficient to cause alarm
k = detector proportionality constant
P = heat release rate of fire (W)
ζ = extinction coefficient of air at detector operating wavelengths
d = distance between detector and fire

This relation is merely the inverse square law with a factor for atmospheric extinction added to the base relation. A value for the sensitivity of the detector, S, can be computed by solving this relation for the fire used in the listing investigation. Since the radiant power emanating from a fire is proportional to the radiating area and a proportionality constant for that fuel we can write:

$$P = c\,A$$

Where P = Radiated power (W)
c = Proportionality constant for the fuel
A = Radiating area of the flame

Flaming fires are generally best modeled as optically dense radiators. The radiant output of the fire available to a sensor is actually proportional to the frontal aspect of the flame plume rather than the floor surface area of the fire. A flaming surface that is wide relative to its depth will appear larger than one that is deep relative to its width even when they occupy the same area.

The term cA can be substituted into the response relation to yield:

$$S = kcA\exp(-\zeta d)/d^2$$

Where cA = the radiant output of the fire (W)

The nationally recognized testing laboratory (NRTL) providing listing of radiant energy sensing detectors in the U.S. is F. M Global Research Corporation. In the listing process the performance of the detector is determined by measuring the distance at which the detector can detect a 1.0 foot (0.3 m) wide flaming fire, fueled with regular grade, unleaded gasoline. The radiating area of the "test fire" is used to calculate the detector sensitivity, S.

The radiating area of the test fire is calculated by approximating the frontal aspect of the flame plume as an isosceles triangle. The flame height is computed as a function of heat release rate using any of a number of correlations available in the literature. In the National Fire Alarm Code, NFPA 72-1999, flame height is calculated from the correlation:

$$h_f = 0.584(kQ)^{2/5}\ \text{(Btu/sec \& ft.)}$$

$$h_f = 0.182(kQ)^{2/5}\ \text{(kW and m)}$$

The flame front width is derived from the test fire parameters. In the case of the NRTL test we use 1.0 feet (0.30 meter). The radiating area is then computed from the relation:

$$A_x = \tfrac{1}{2}\, h_f w_f$$

where $h_f = 0.584(kQ)^{2/5}$ (Btu/sec & ft.) or
$h_f = 0.182(kQ)^{2/5}$ (kW and m)
w_f = width of test fire.
Q = total heat release rate, k = 1

When the radiating area is calculate from this relation it can be used in equation [3] to provide a numerical measure of the detector sensitivity. Unfortunately, the manufacturers of product do not publish detector sensitivity in this form. They rely on stipulations of distance for fires of given size as the published performance metric. However, since detector sensitivity is essentially constant over the range of ambients for which the detector is listed we can use the concept of identity to obtain a relation that compares the performance in the NRTL sensitivity determination testing to that in the hazard area under design.

$$kcA_t\exp(-\zeta d_t)/d_t^2 = kcA_d\exp(-\zeta d_d)/d_d^2$$

where: "t" subscripts are test parameters,
"d" subscripts are design parameters

Equation [7] can be solved by successive iteration to obtain either the fire size that can be detected at a known distance or the distance at which a given size fire can be detected.

It is important to note that a numerical value for the atmospheric extinction factor, ζ, is necessary to solve this relation to normally expected precision. The atmospheric extinction factor, ζ , is dependant upon the wavelengths used by the flame detector for detection. The extinction is caused by the absorbance of flame emissions by molecular species in the air, different molecular species having unique absorption spectra. The amount of intensity attenuation is determined by to the distance the radiation has traveled and the concentration of the absorbing species in the air. Flame detectors that use multiple wavelengths or regions of the spectrum have values of ζ for each wavelength or region of the spectrum being used. This complicates the computations somewhat. Consequently, the numerical value of the atmospheric extinction factor, ζ , is potentially different for each make and model of flame detector. Unfortunately, neither the manufacturers nor the NRTL providing the listing currently publish this data for the detector.

Nevertheless, the fact that flame detector listings include a performance metric for the listed detector makes it possible to calculate the performance of any proposed design. With a known fire and detector operating parameters, the distance at which a given detector can reliably detect the given fire can be calculated with quite acceptable precision, generally less than 5% and often as close as 2%. This permits the designer to demonstrate *"the performance or capability of a design… through engineering analysis and calculation".*

To be continued in the February 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

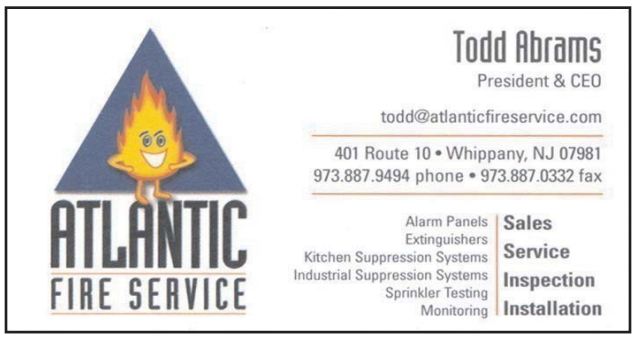
Captive Insurance Company

- 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



Meeting Dates/Program 2004-2005

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

Jan. 3	Note: Change - "Fire Alarm Occupant Notification" Issues and Design of Occupant Directed Alarms - John Cholin of JM Cholin Associates and Ed Armm, Rolf Jensen & Associates
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 6	"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: January 3, 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): John Cholin, JM Cholin Associates

Topic: "Fire Alarm Occupant Notification" Issues and Design of Occupant Directed Alarms"

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.

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

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ALL RESERVATIONS SHOULD BE RECEIVED BY FRIDAY, DECEMBER 31, 2004. TELEPHONE RESERVATIONS OR CANCELLATIONS SHOULD BE RECEIVED BY NOON OF THE MEETING DAY.

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