FIRE PROTECTION Engineering

10 YEARS 1998 2008

History of Fire Protection Engineering

Impact of Fires on the Built Environment Over the Past 10 Years

Ten Years – Changes in the Profession

SFPE THE OFFICIAL MAGAZINE OF THE SOCIETY OF FIRE PROTECTION ENGINEERS

1ne breathtaking tower in Dubai.

It's your career – set the bar high in the sky.

When you join the global leader in fire protection and security consulting, you'll open the door to the most exciting and awe-inspiring projects around the world. Like **Downtown Burj Dubai**, Emaar Properties' spectacular urban development anchored by the world's tallest building. RJA is providing this world-class project with an integrated package of solutions involving fire protection engineering; emergency response planning; security, safety and mass notification consulting; and life safety construction management.

No matter whether you're a recent engineering graduate or a seasoned consultant in our profession, you'll have the unique opportunity to show your "A" game while you challenge yourself on a daily basis. You will be one of the best.

Go to **rjainc.com/careers.php** or call **Jenny Gratson** at **+1 312.879.7220** to put your career on the technical fast track.

Jon Evenson
RJA/Dubai

Become 1 of us™

RJA®
INTERNATIONAL
ROLF JENSEN & ASSOCIATES, INC.
FIRE PROTECTION CONSULTANTS

CONTENTS

FIRE PROTECTION Engineering

12 COVER STORY

Ten Years – Changes in the Profession

Features

FALL 2008

Departments

FIRE PROTECTION Engineering

Online versions of all articles can be accessed at **www.FPEmag.com**.

SFPE

Invitation to Submit Articles:
For information on article submission to *Fire Protection Engineering*, go to *www.FPEmag.com/articlesubmit.asp*.

Subscription and address change correspondence should be sent to *Fire Protection Engineering*, Penton Media, Inc., 9800 Metcalf Ave., Overland Park, KS 66212 USA. Phone: 913.967.1623. Fax: 913.514.6623. e-mail: tyler.motsinger@penton.com

Copyright© 2008, Society of Fire Protection Engineers. All rights reserved.

From the TECHNICAL DIRECTOR

Performance-Based Design

A Review of the Past, Observations of the Present and Predictions about the Future

Although performance-based design has received increasing attention over the last decade or so, performance-based fire protection has been evolving for the last century. While the rate of change is increasing, performance-based design is in no way new.

Early (pre-1900s) fire protection requirements were generally prescriptive, with such requirements including the permissible materials from which building exteriors could be constructed or the minimum acceptable spacing between buildings. However, most modern building and fire code requirements have some element of performance associated with them.

Performance-based approaches for designing building fire protection can be traced to the early 1970s, when the "Goal-Oriented Approach to Building Fire Safety" was developed by the U.S. General Services Administration.[1]

In 1985, the first performance code was published – the performance-based British Regulations. New Zealand published a performance-based building code in 1992, and Australia followed suit in 1995.

Since then, many other countries have developed performance-based building codes. However, in all cases, performance-based codes are provided as an option to the designer; prescriptive or "deemed to satisfy" provisions are also available.

Performance-based codes only represent the formalization of performance-based design. Performance-based design has long been practiced through the use of "equivalency" or "alternate methods and materials" clauses found in most, if not all, prescriptive codes and standards. These clauses permit the use of alternate methods of compliance.

Current State of Practice

Anecdotal evidence suggests that performance-based design is being used on five percent to 10 percent of building design projects. Where performance-based design is used, it is only used on portions of the design – meaning that the bulk of the building is designed in accordance with prescriptive rules.

Most performance-based codes share a common approach – qualitative description of acceptable performance and the hazards against which designs should provide protection. Terms like "sufficient" and "reasonable" are used to define acceptable performance. Similarly, design hazards are either not defined or are defined qualitatively. Therefore, the level of safety that is provided can vary depending upon how these qualitative terms are interpreted by the designers and code enforcers.

While the publication of performance-based codes and design methods has harmonized the practice of performance-based design, the levels of safety provided by performance-based designs are not uniform. Fire safety engineering has not reached the state of modern structural engineering, where building loads, properties of structural materials and design methods are clearly defined.

Modern performance-based fire safety design is also hampered by the fact that fire is extremely complex, and not all fire phenomena, system effectiveness and human response factors are understood to the point that definitive predictions are possible.

The Future

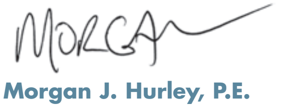
During the short term, the future of performance-based design will not be much different than it is today. Performance-based design will be used on a minority of projects, and when it is used, it will not be for the entire design. For some types of buildings (e.g., one- and two-story residences), prescriptive designs will continue to be the norm for the foreseeable future.

Also during the short term, performance-based design will evolve at an incremental rate. One of the next major changes will be the publication of quantitative performance criteria and descriptions of design hazards in New Zealand. Other countries will likely follow New Zealand's lead and develop similar quantitative criteria.

Another area that is evolving is the performance-based design of structural fire resistance. At least in tall buildings, the century-old method of designing structures based on standard fire resistance ratings will slowly yield to a method where the expected fire boundary conditions are predicted, the thermal response of the structure is calculated and the structural response is determined. Standards are presently under development that will govern this process, and designs of this type are presently being conducted on a limited number of buildings.

In the much longer term, fire science will be better understood, models will improve and performance-based design will be more widely accepted. Someday, all high-end buildings will be designed according to a performance basis. However, this change will take at least a generation.

SFPE has been a leader in the evolution of performance-based design with the publication of the *SFPE Handbook of Fire Protection Engineering*, engineering guides and, soon, engineering standards. SFPE will continue to lead the advancement of the profession into the future. Ultimately, the advancement of performance-based fire safety will be of great benefit to the fire protection engineering profession and to public safety.



Morgan J. Hurley, P.E.
Technical Director
Society of Fire Protection Engineers

Reference:

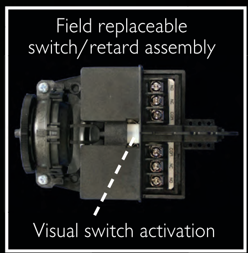
1 Custer, R., and Meacham, B., *Introduction to Performance-Based Fire Safety*, National Fire Protection Association, Quincy, MA, 1997.

There are several reasons why Potter is the best in the industry.

This is one.

This is just one device, but it's the lifeblood of your sprinkler system - the new VSR flowswitch. Replacing the old model VSR-F, the new VSR is the only device with a non-corrosive saddle bushing and NEC 760.136 compliant separate high/low wiring chambers. The VSR is also built with a field replaceable switch/retard assembly and visual switch activation.

This is just one reason Potter is the best.
See the rest at www.pottersignal.com



POTTER®
The Symbol of Protection

866-572-3005 www.pottersignal.com

Dear Editor,

I wanted to respond to a letter from Mr. Michael Chow, P.E., in the Summer 2008 issue. Mr. Chow made some accurate points about the P.E. exam, and his concerns about what the exam covers are concerns that I share. Since I have been involved in the FPE P.E. exam development for the last few years, I have some insights I want to share.

First, all of the NCEES exams have evolved over the last decade to make them objectively graded. This meant doing away with the long answer/essay format that some of us remember, and in the process, the problems on the exam have become less complex. That doesn't mean the new tests are bad but that the licensing boards need to be thoughtful about how they use them.

In the United States, P.E. licenses are granted on the basis of education, examination and experience. Educational credentials demonstrate the candidate has "knowledge." The examination demonstrates that the candidate has "skill" to apply the knowledge. But experience demonstrates "judgment," or the ability to make wise engineering decisions that go beyond textbook knowledge.

There are two messages I believe need to be conveyed.

In the United States, P.E. licenses are granted on the basis of education, examination and experience. Educational credentials demonstrate the candidate has "knowledge."

First, I point out to the licensing boards that since the examinations are moving away from testing "judgment," they need to place greater emphasis on work experience in their licensing decisions and not rely on the exam to be a gatekeeper. Second, I point out to the practicing licensed engineers that when a candidate asks you for a P.E. reference for his application, you need to take that responsibility seriously. Only you can assess whether this person has good enough judgment to be entrusted with the health, safety and welfare of the public. Don't give a borderline candidate a reference and then count on the P.E. exam to trip them up if he isn't qualified.

Roger B. Tate, P.E.
Verité Forensic Engineering LLC
Member SFPE Engineering Licensing Committee

Fire Protection Engineering welcomes letters to the editor. Please send correspondence to: *engineering@sfpe.org* or by mail to *Fire Protection Engineering*, 7315 Wisconsin Ave., #620E, Bethesda, MD 20814.

Meet the New Problem Solver

The first fire detector in the industry accurate enough to KNOW when a fire is a fire.

The implementation of emergency response procedures or evacuations at medical facilities can carry tremendous costs in terms of life safety and lost revenues.

The Advanced Multi-Criteria Fire Detector uses sophisticated technology to adjust to changing environmental conditions and respond accordingly. This latest innovation from System Sensor combines FOUR detection methods to monitor the FOUR major products of combustion and respond with exceptional accuracy.

The Advanced Multi-Criteria Fire Detector incorporates:

1. a traditional photoelectric chamber to monitor smoke particles;
2. a thermistor to measure both fixed (135°F) temperatures and rate-of-rise;
3. a carbon monoxide (CO) sensor recognizes the by-products of a smoldering fire that result from incomplete combustion. CO production during a fire can vary from miniscule amounts (alcohol) to significant amounts (smoldering cotton); and
4. an infrared (IR) sensor watches ambient light levels and flame signatures to provide coverage across 360 degrees, giving our detector the unique capability to look into the space, expanding its detection beyond the physical boundaries of the detector itself.

How it works
If one of the sensors detects a fire condition, the on-board intelligence verifies the condition with another sensor before going into alarm. As site conditions change, an internal algorithm compensates by changing sensor thresholds, sensor combinations, and sampling rates to ensure immediate response to fires and maximum immunity to nuisance alarms.

Here are just a few examples where the nuisance alarm discrimination and accuracy provided by the Advanced Multi-Criteria Fire Detector are warranted:

- Medical facilities
- Research and development organizations
- Data processing centers
- Financial institutions
- High capacity entertainment venues
- Performance theatres
- Complex manufacturing operations
- Specific areas prone to nuisance alarms

The System Sensor Advanced Multi-Criteria Fire Detector senses fires in ALL environments and provides the best immunity to nuisance alarm threats. It's accurate. It's precise. It's ideal when it is imperative to KNOW when a fire is a fire.

To learn more and receive a specification packet, visit **www.SystemSensor.com/multi** or call 800/736-7672.

SYSTEM SENSOR®
advanced ideas. advanced solutions.℠

800/736-7672
www.systemsensor.com/multi

Dear Editor,

I was struck by two articles: (1) Paul Fitzgerald on "The Case for Increased Scientific Fire Research," and (2) Beth Tubbs on the SFPE future priorities.

Paul rightly calls for a higher level of ability in understanding underlying scientific principles needed to address performance codes for fire safety. Beth Tubbs lays out the SFPE key needs – a design scenario standard, model validation and performance criteria including tenability. The approach she lists that SFPE is using to address these issues is based on old technology and knowledge. This course does not provide hope for the future.

The FPE hopes have been made viable by the research in the U.S. of the1970s, when research for science was abundant. That U.S. research effort has now atrophied but, as indicated by Paul, has diffused around the world. We in the U.S. are in dire need of a shot in the arm. The SFPE needs to set as its No. 1 priority a strong national and political advocacy for U.S. fire research. The cost of fire in the U.S. is nearly one percent of its GDP, and the research expenditure is not even one percent of that. There are many needs that I think should be part of the SFPE agenda:

1. A tenfold increase in the FPE graduates per year in the U.S. This is needed to fill the job demand and to ensure a core intellectual leadership.
2. National centers for research and education. It is clear that education is needed in many geographical areas of the U.S., and the center for national research has not kept up with the needs.
3. A renewed enlistment of academia and key laboratories to conduct research. The legacy of the 1970s research effort in fire was based on such a foundation. That foundation ensures consensus and integrity. It was responsible for the *SFPE Handbook of Fire Protection Engineering*.
4. A linkage between the science and engineering practice is needed to the fire service. Only when the fire service becomes an ally of the FPE practice and the enforcement of sound regulations will we have a strong community for growth with respect to new knowledge and needed technologies.

It is a feeble effort to think SFPE has a priority to validate DETACT and ASET when one should already know their strengths and limitations. Yet Beth's article ends with the point that "a variety of models such as FDS and complex egress models exist, but their application is limited to those designs that tend to be performanced-based." How about SFPE urging the validation of these models as they are being used around the world as a *de facto* design standard now? Let's get some peer review here.

I think SFPE needs to rethink its agenda and then seek help by visiting D.C. from their office in Bethesda.

James G. Quintiere
University of Maryland

We know you like change.

You crave variety, to really put your abilities to the test. At Schirmer Engineering, every day brings something new. You'll work with multiple clients in a wide variety of fields, each with a unique problem. Your smarts and dedication will be what finds the perfect approach.

Schirmer Engineering invites you to open yourself up to a new range of possibilities. Are you ready for the challenge? To learn why we are the employer of choice, visit **http://choosetobechallenged.schirmereng.com** or call us at **1.888.SCHIRMER**.

FIRE PROTECTION
CODE CONSULTING
RISK CONTROL
SECURITY CONSULTING

EOE/M/F/D/V

Choose **to be Challenged**

SCHIRMER ENGINEERING

By Jim Quiter, P.E., FSFPE

Ten years ago, I was pleased and proud to write, as SFPE President, the Viewpoint column in the first issue of *Fire Protection Engineering* magazine. At the time, as with most new ventures at SFPE, we knew we were taking a risk. We also knew that our members wanted and needed an application-oriented magazine. We wondered, however, if we could consistently fill it with meaningful material. I think it is safe to say that, under the technical leadership of Morgan Hurley, the magazine has flourished and the fire protection community would be poorer without it.

So what have we seen change in our profession during the 10 years of the magazine? At first, one might think very little is different, but as I thought about life as a fire protection engineer, and as I canvassed others within Arup who have been around through those 10 years, I came to the realization that almost everything we do is different. Since I only get one page to discuss the changes, just look at the following teaser points and imagine the world without them:

- Virtually all business correspondence is by e-mail with the expectation of immediate response. Ten years ago, much was by fax, 20 years ago by express mail, and 30 years ago, it took a week to turn around a document.
- We now run computer models on our desktop that were difficult to run on a mainframe. The zone models so commonly used 10 years ago have given way to CFD models today, with run times in the order of minutes or hours as opposed to days and weeks. Now we need to make sure we evaluate and understand the results, rather than letting our computers do the "thinking."
- We have realistic and credible means of modeling people movement. Models that were developed for fire protection are being used for transport planning and vice versa. The current models have people (agents) who think and react, not just traipse along on a predetermined route. This, of course, leads to validation issues.
- SFPE has evolved into a driving force in the industry. Besides technical journals, the society now publishes technical guides, computer model evaluations and is involved in the codes and standards process.
- We are living in a 3-D world. Our designs and our interaction with the rest of our profession are done on models that could not have been imagined 10 years ago. In some cases, that has led to buildings that could not have been built (the Beijing Water Cube being an example).
- We have developed into a global design community. U.S. based codes are being used in much of the world (neither the *International Building Code*® nor NFPA 5000® existed 10 years ago), and codes from other nations are also in use globally. Many international architects and developers are working in all parts of the globe, and the fire engineer is following suit.
- Partially driven by globalization, the concepts of performance-based design and risk have become much more accepted. The laws of science do not change across the globe, even if the laws of codes do change. Therefore, returning to first principles allows the engineer to practice good fire protection first and deal with code application second. With these first principles, the risk associated must also be considered because the "code crutch" has disappeared. Perhaps China has made the greatest step forward with many major performance-based projects.
- The entire field of fire protection engineering has grown in its influence. Ten years ago, fire consultants on a design team were treated as technical advisors to solve code issues. Today, fire protection consultants are major players in the chain of decision-making, often working with fellow fire protection engineers who are a part of the approving authority, and often having owners as clients who also employ fire protection engineers.
- In the last few years, the concept of fire and structures has developed greatly, particularly for steel structures. Instead of passive fire protection being prescriptively applied over the whole steel frame, significant areas of unprotected steel are becoming commonplace where these methods are applied. This helps us to evaluate robustness, to reduce materials where appropriate or to use those materials in a way to make a better structure.

So what has changed since the first *Fire Protection Engineering* magazine was published 10 years ago? Virtually everything we do! I look forward to an equally exciting next 10 years.

Jim Quiter, P.E., FSFPE, is with Arup.

EMCOR IS HERE

Day two of yet another conference is about to begin. And EMCOR is here.

Hilton Hotels Corporation selected EMCOR to provide fire-protection services for its new 30-story, one-million-square-foot hotel at the San Diego convention center. EMCOR is installing fire-alarm, smoke-control, and CCTV video surveillance and security systems for the hotel, as well as other mechanical and electrical systems such as voice/data, TV, audio-visual, and digital HVAC controls. Our integrated fire-protection and security systems keep you safe and secure, while others—which keep your room warm, the water soft, and the lights dim—let you relax in comfort and peace. Even if that salesman (you know the one) won't.

Wherever and whatever your facility, EMCOR is here.

Business Continuity Solutions | Life Safety Solutions | Green Solutions | Facilities Diagnostic Solutions | Knowledge & Response Solutions | Mobile Service Solutions

Contact us here: 866.890.7794 emcor_info@emcor.net emcorgroup.com

EMCOR®
Build. Power. Service. Protect.

UL Warns of Counterfeit Automatic Fire Sprinklers

Underwriters Laboratories (UL) is notifying consumers, distributors and property owners of automatic fire sprinklers that bear a counterfeit UL Mark for the United States and Canada. Although marked with the word "Globe," these sprinklers are not manufactured by Globe Fire Sprinkler Corp. and have not been evaluated for safety by UL. This information supersedes a public notice released by UL on July 14, 2006.

Names of Products:
GL 5651 Pendent-type fire sprinklers
GL 5661 Upright-type fire sprinklers
GL 5626 Horizontal sidewall fire sprinklers
GL 5681 Concealed-type fire sprinklers
Units: Unknown quantity
Date of Manufacture: January of 2004 to present
Manufacturer: Unknown
Identification: The word "Globe" appears on the product. Sprinklers with the counterfeit UL Mark are manufactured with a slot-head screw and Job F5 or Job FR glass bulb. Non-counterfeit UL-Listed sprinklers manufactured by Globe Fire Sprinkler Corp. contain a hex-head screw and a Job G5 or F3 glass bulb.

Other identifiable markings are found on the counterfeit sprinklers' deflectors on several models.

For a list of model names, along with photographs, go to *www.ul.com/newsroom/newsrel/nr061808.html.*

Three Organizations Develop Position Statement Regarding Roles of FPEs and Technicians

Because of industry-wide concerns over the inconsistencies in state and local engineering regulations regarding the qualifications for those who design fire protection systems, the Society of Fire Protection Engineers (SFPE) has joined the National Society of Professional Engineers (NSPE) and the National Institute for Certification in Engineering Technologies (NICET) to develop a unified position statement entitled *The Engineer and the Technician – Designing Fire Protection Systems.*

The purpose of the position statement is to describe reasonable and prudent roles and responsibilities of licensed professional engineers and certified engineering technicians when designing fire protection systems.

"The position statement stresses the point that both engineers and technicians play an essential role in the process as long as both practice within their areas of competence," says Chris Jelenewicz, SFPE engineering program manager. "Moreover, it establishes basic rules for the relationships between design, code compliance and construction entities. As a result, the general public, firefighters, property and the environment will be better protected from fire."

A copy of the position statement can be found at *www.sfpe.org.*

CORPORATE 100 SFPE

The SFPE Corporate 100 Program was founded in 1976 to strengthen the relationship between industry and the fire protection engineering community. Membership in the program recognizes those who support the objectives of SFPE and have a genuine concern for the safety of life and property from fire.

BENEFACTORS
Ansul, Inc.
Arup Fire
FM Global Corporation
Koffel Associates, Inc.
Risk, Reliability and Safety Engineering
Rolf Jensen & Associates, Inc.
Schirmer Engineering Corporation
Siemens Building Technologies, Inc.
SimplexGrinnell
Tyco Fire and Building Products, Inc.
Underwriters Laboratories, Inc.

PATRONS
Code Consultants, Inc.
Draka Cableteq USA, Inc.
GE, Security (EST, Edwards)
Gentex Corporation
JBA Consulting Engineers
National Fire Protection Association
The Protection Engineering Group
The Reliable Automatic Sprinkler Company
S.S. Dannaway & Associates Inc.
System Sensor
TVA Fire and Lifesafety, Inc.

MEMBERS
Air Products and Controls
Altronix, Inc.
Arora Engineers, Inc.
Automatic Fire Alarm Association
Baker Engineering and Risk Consultants, Inc.
Blazemaster Fire Protection, LLC
Brooks Equipment Co., Inc.
COOPER Wheelock
Cybor Fire Protection Company
en-Gauge Technologies
Fire-Stop Systems
Gagnon Engineering
GE Global Asset Protection Services
Grainger Consulting, Inc.
Harrington Group, Inc.
HSB Professional Loss Control
International Fire Safety Consulting
KCI Protection Technologies
Liberty Mutual Property
Locke Carey
Marriott Systems
Marsh Risk Consulting
National Fire Sprinkler Association
John W. Nolan, Emeritus
Phoenix Fire Systems
The Protectowire Co., Inc.
Randal Brown & Associates, Ltd.
Reliable Fire Equipment Company
Samsung Fire & Marine Insurance Co., Ltd.
The University of Maryland Online Master's Degree Program
Williams Fire & Hazard Control, Inc.

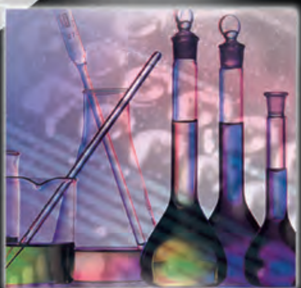
SMALL BUSINESS MEMBERS
Allan A. Kozich & Associates
Beall & Associates, Inc.
Bourgeois & Associates, Inc.
The Code Consortium, Inc.
Davidson & Associates
Demers Associates, Inc.
Engineered Fire Systems
FireLink, LLC
FlexHead Industries
Futrell Fire Consult and Design, Inc.
J.M. Cholin and Associates
Jaeger & Associates, LLC
LeGrand Engineering, Inc.
Lozano & Asociados
Martech Services
Poole Fire Prtection, Inc.
Risk Logic, Inc.
Risk Technologies, LLC
SafePlace Corporation
Saudi Establishment for Safety Equipment
Scandaliato Design Group, Inc.
Slicer & Associates, LLC
WPI – Distance Learning Program


TECHNICAL SUPPORT


FM-200®
3M™ NOVEC™ 1230


CO_2 HIGH & LOW PRESSURE


WATER MIST


ARGONITE

© 2008

Worldwide Protection for People, Property and the Environment.

Chemetron Integrated Fire Suppression Systems

Across borders and across industries, Chemetron is the single source solution.

Chemetron combines fire suppression systems and technical expertise, which afford the extra measure of safety and reliability for any facility – anywhere.

Contact us today to learn more about Chemetron system solutions!

Our products meet or exceed NFPA and Selected Global Standards, as well as being UL Listed and FM Approved.

Your Single Source Solution

CHEMETRON

A UTC Fire & Security Company

For further information, please contact us:
4801 Southwick Drive, 3rd Floor
Matteson, IL 60443 USA
Phone: +1 708.748.1503 Fax: +1 708.748.2847
Website: www.chemetron.com
E-mail: info@chemetron.com

FM-200 is a Registered Trademark
of E.I. du Pont de Nemours and Company.
3M and Novec are trademarks of 3M Company.

No. 1
TEN YEARS –
CHANGES IN
THE PROFESSION

To celebrate the 10th anniversary of *Fire Protection Engineering* magazine, this special issue reviews changes that have occurred in the practice of fire protection engineering over the past decade. Three authors discuss changes in three areas of the profession: structural fire resistance, smoke control systems and human behavior in fire.

WHAT'S NEW IN PASSIVE FIRE PROTECTION

By Richard Davis, P.E., FSFPE

Passive fire protection includes fire and smoke barriers and walls; fire doors; fire windows; fire-rated floor-ceiling or roof-ceiling assemblies; fire-resistive coverings for structural members; and firestop products for penetrations through, and joints within, fire-resistive walls and floors.

In the past decade or so, much attention has been paid to passive fire protection. During that time, some new products have become available, and some old-but-sound guidance has been reaffirmed. This article briefly describes some of the new developments. (Links to the Web sites of specific manufacturers are provided as examples; there are other Web sites with similar products and information, but this short article cannot list them all.)

THINK GREEN

These days, everyone seems to be talking about "green buildings" and designing to meet the standards of the Leadership in Energy and Environmental Design (LEED®) program (*see www.usgbc.org*). This has even trickled down to sprayed fire-resistive materials (SFRMs) and fire-resistive boards. Some of the most common spray-applied coatings are cementitious or mineral fiber-based. These formulations usually include filler materials, as well. The use of recycled materials is encouraged, and some of these coatings and boards now contain between 10 percent and 45 percent recycled material. Whatever the materials are that are used, they should be tested and listed for use in a firestop assembly listed by a nationally recognized testing laboratory. For more information on the subject and a list of some of these products, refer to *www.isolatek.com/leeds.asp.*

FIRESTOPPING

Homemade sealing remedies, such as joint compound or spray foam in a can, do not improve the fire resistance at an opening. When used with a listed assembly, these remedies can compromise the penetration seals. Furthermore, using listed products without following listing criteria results in an indeterminate fire resistance rating.

While it has been more than 30 years since the Brown's Ferry fire,[1] a great effort has recently been made to improve the performance and installation of firestop systems and their components in fire-rated walls and floors. Recent developments include the 2001 creation of a new FM Approvals Standard (Class Number 4991[2]) for approving firestop contractors and the publication of the Firestop Contractors International Association (FCIA) *Manual of Practice*.[3] The FCIA's manual describes the appropriate training and education of its workforce, and can be used to assess the ability of a Designated Responsible Individual (DRI) to interpret and understand relevant information and oversee the work of others. In 2006, UL® developed their Qualified Firestop Contractor Program.[4] A wide variety of firestop products can now be found in both the *Approval Guide*[5] and UL's fire-resistance product directory.[6] For more information, visit *www.fcia.org*.

> One major change in the last ten or so years is the size of the fire load found in some areas of high-rise buildings that will challenge passive fire protection.

NIST REPORT ON THE COLLAPSE OF THE WORLD TRADE CENTER TOWERS

The NIST report[7] on the collapse of the World Trade Center (WTC) towers went into great detail and included several recommendations for the enhanced fire resistance of structures (Recommendations 4 through 7) and new methods for the fire-resistive design of structures (Recommendations 8 through 11). Recommendation 4, in part, proposed the increase of fire resistance ratings for very tall buildings (more than 20 stories). Over the last decade, some progress has been made in this area, as the minimum required fire resistance ratings of columns, bearing walls, beams, girders, trusses and arches supporting more than one floor have effectively been increased from two to three hours in the *International Building Code®* (IBC)[8] and NFPA 5000®[9] for buildings over 180 ft (55 m) and 420 ft (128 m) in height, respectively.

Recommendation 4 also advised studying the impact of spaces containing "unusually large fuel concentrations. "One major change in the last ten or so years is the size of the fire load found in some areas of high-rise buildings that will challenge passive fire protection. Supplies of diesel fuel are no longer limited to 660 gal (2.5 m^3), enough to power emergency lights, etc. Now, thousands of gallons of diesel fuel can be found in tank storage vaults, enough to provide full backup power for normal business operations.[10] Often, this fuel is pumped to generator rooms on upper floors. Oversized pipes (pipe headers) are located in emergency generator rooms and can contain much more fuel than is normally allowed in day tanks. Furthermore, the fire rating provided for the structural framing often is based on the standard time temperature (STT) curve[11] rather than the much more stringent hydrocarbon fire exposure.[12] Based on comparative heat fluxes, and depending on

the actual required rating, this could considerably reduce the fire resistance provided—in other words, an assembly tested for three hours per the standard curve may only resist about two hours in a hydrocarbon fire exposure test.

NIST Recommendation 5 was to improve fire resistance testing and extrapolation of results, including the relationship between actual beam length and the limited length that fits in the test furnace. Such furnaces are currently limited to 17 ft (5.2 m) in length. As described in one of the supplemental NIST reports,[13] limited fire resistance tests comparing the performance of 17 ft (5.2 m) trusses and 35 ft (11 m) trusses implied that, all else being equal, the performance of the longer truss was considerably less. While testing the full length of fire-rated horizontal structural members may not be practical, and tests done by NIST were too limited to draw any definite conclusions, the development of a correlation that allows the determination of increased coating thickness for increased length in relation to the tested sample may be needed. No further research is planned at this time.

Another recommendation in the NIST report called for increased durability and impact resistance of fire-resistive materials. In most cases, as the density of a material increases, its impact resistance does as well. Some of the most common SFRMs have a low density of only 15 pcf (240 kg/m³). While normal-weight concrete and light-weight structural concrete (145 pcf [2300 kg/m³] and 120 pcf [1900 kg/m³], respectively) are at the high end of the scale, they still can be used for this purpose. There are some newer, denser versions of old familiar products that offer increased impact resistance. For an example of a cementitious product available in medium, high and ultra-high densities, see *www.na.graceconstruction.com/prodline.cfm?did=3.*

GLASS FIRE SUBDIVISIONS

One concern with fire-rated windows has always been that, while they remain in place and block the passage of flames and hot gases, they are not required to limit heat transmission to the unexposed surface. Concerns about using glass in firewalls, fire barrier walls or fire partitions include limiting heat exposure to those using the immediate area as a means of egress and locating combustible material near this unexposed surface, which may be auto-ignited. For such situations, there is insulating fire-rated glass, which has gained popularity in the past decade. These assemblies are multilaminates, offer resistance to radiative as well as conductive heat, and limit the temperature rise on the unexposed side. These products are tested as firewalls[11] rather than fire windows.[14] For more information, see *www.fireglass.com/glass/pyrostop.*

Richard Davis, P.E., FSFPE, is with FM Global.

References:

1 Pryor, A. J., *The Brown's Ferry Nuclear Plant Fires.* TR 77-2. Society of Fire Protection Engineers, 1977.

2 *Approval Standard for Approval of Firestop Contractors.* Class Number 4991. FM Approvals, Norwood, MA, 2001.

3 *Manual of Practice*, Firestop Contractors International Association (FCIA), Hillside, IL, 2005.

4 *Qualified Firestop Contractor Program Requirements.* 70-FS-S0025. Underwriters' Laboratories, Northbrook, IL, 2006.

5 *Approval Guide.* Building Materials Section. FM Approvals, Norwood, MA, current edition.

6 UL Product Directory, Fire Resistance, 2A and 2B with Hourly Ratings for Joint Systems, Through-Penetration Firestop Systems and Electrical Circuit Protective Systems and Duct Assemblies. Underwriters Laboratories, Northbrook, IL, latest edition.

7 *Final Report of the National Construction Safety Team on the Collapses of the World Trade Center Towers.* NIST NCSTAR 1. National Institute of Standards and Technology, 2005.

8 *International Building Code®*, International Code Council (ICC), Country Club Hills, IL, 2006.

9 NFPA 5000®. *Building Construction and Safety Code.* National Fire Protection Association (NFPA), Quincy, MA, 2006.

10 "World Trade Center Building Performance Study: Data Collection, Preliminary Observations and Recommendations," Federal Emergency Management Assocaition, FEMA 403, May, 2002.

11 NFPA 251, *Standard Methods of Tests of Fire Resistance of Building Construction and Materials*, National Fire Protection Association (NFPA), Quincy, MA, 2006.

12 ASTM E 1529, *Standard Test Methods for Determining Effects of Large Hydrocarbon Pool Fires on Structural Members and Assemblies.* ASTM International, West Conshohocken, PA, 2006.

13 *Structural Fire Response and Probable Collapse Sequence of the World Trade Center Towers.* NCSTAR 1-6. National Institute of Standards and Technology (NIST), 2005.

14 NFPA 257, *Standard on Fire Test for Window and Glass Block Assemblies.* National Fire Protection Association (NFPA), Quincy, MA, 2007.

SPECIALTY DETECTION

Linear Heat

Linear Cold

SAFE FIRE DETECTION, INC.

Linear H_2O

Air Sampling

Portable Fire

One Company,
Five Innovative Products

Visit us at our website, safefiredetection.com
or in October at the 2008 SFPE Expo in Charlotte NC

SAFE Fire Detection, Inc. • 5915 Stockbridge Dr. • Monroe, NC 28110 • Tel.: 704-821-7920

Clarke driveshafts now UL-Listed

Strong. Tested. Proven. Clarke driveshafts for diesel fire pump engines should be first on your list. Why? Because flexible driveshafts deliver maximum performance. They're stronger and more reliable.

And now they're certified for fire pump service and available for shipment.

When safety is critical, trust the tougher, stronger more reliable choice.Certified driveshafts from Clarke.

When credibility counts... Clarke delivers.

Call 800-513-9591 to order.

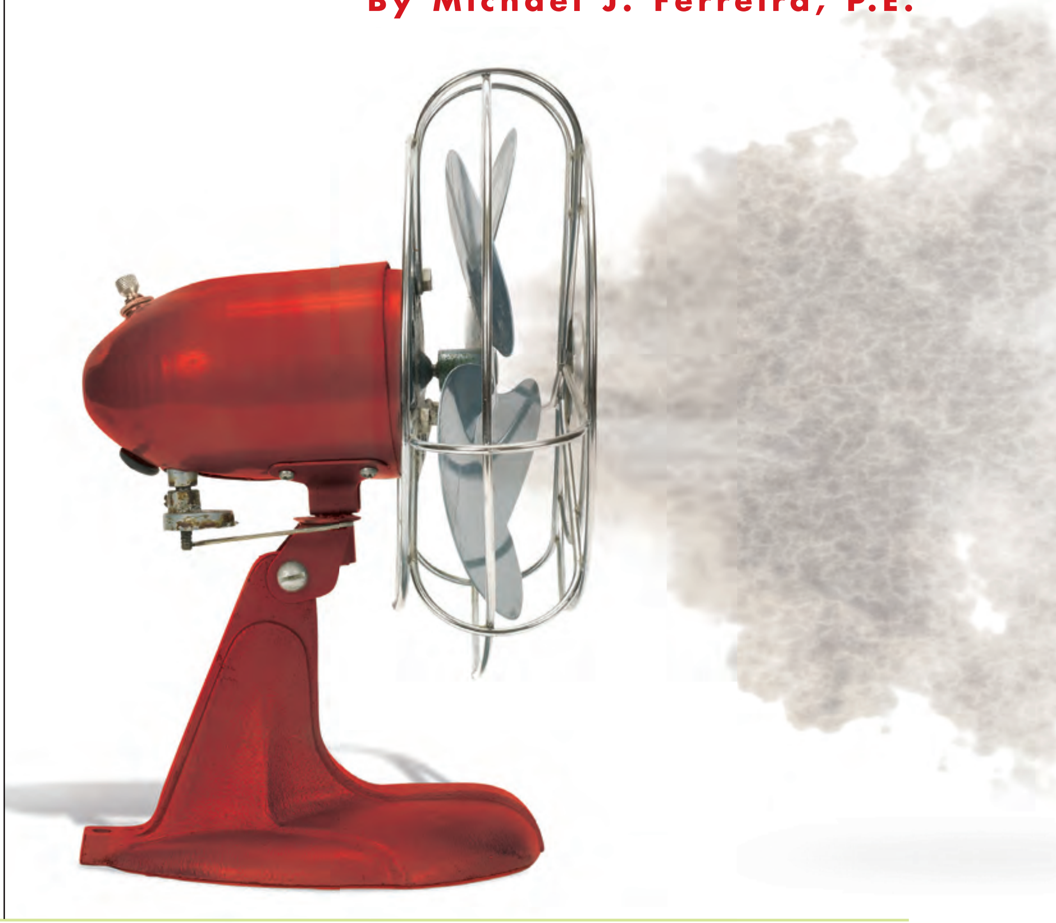
CLARKE™
Fire Protection Products, Inc.

800-513-9591 513-771-2200
www.clarkefire.com

No. 2
TEN YEARS – CHANGES IN THE PROFESSION

DEVELOPMENT IN THE DESIGN OF SMOKE CONTROL SYSTEMS

By Michael J. Ferreira, P.E.



The past decade has seen dramatic changes in the way smoke control systems are designed and evaluated. As recently as 1991, building codes such as the *Uniform Building Code®* (UBC),[1] one of the predecessors to the *International Building Code®* (IBC),[2] contained only basic requirements for the design of smoke control systems.

For both zoned smoke control systems required in places such as high-rise buildings and large volume exhaust systems required for atrium spaces, the 1991 UBC generally required the provision of six air changes per hour from the zone of fire origin, where active (mechanical) smoke control measures were stipulated.

The 6-air-change requirement had no basis in fire dynamics or smoke management performance, and the effectiveness of this approach for protecting building occupants varied widely depending on the geometry of the space being protected. Using the 6-air-change requirement, mechanical engineers rarely sought the expertise of fire protection engineers with regard to the design of smoke control systems due to the straightforward nature of the calculations involved.

In the early 1990s, design documents came out that dramatically increased the technical rigor applied to the design of smoke control systems. Algebraic equations were introduced to calculate pressure differentials required to contain smoke in a zoned system and to quantify the amount of smoke produced for fires in large spaces. NFPA 92A[3] was first issued as a design guide in 1988 and covered the design of pressurization smoke control systems. NFPA 92B[4] was first issued also as a design guide in 1991 and covered the design of exhaust-type systems predicated on maintaining a smoke layer interface at a specified height in a large-volume space.

The 1994 edition of the UBC was the first building code to mandate calculation methods consistent with the NFPA guides for the purpose of the design of smoke control systems. Due to the increased complexity and expertise associated with smoke control system designs, from this point forward fire protection engineers often became involved in projects requiring smoke control systems.

The seminal ASHRAE text *Design of Smoke Management Systems*[5] was authored by Dr. John Klote and Dr. Jim Milke, and was published in 1992. The ASHRAE text went even further than the NFPA design guides in exploring issues such as elevator smoke control, smoke tenability (temperature,

The prevalence of atrium smoke control systems based on the use of FDS simulations to substantiate the design has seen a widespread increase over the past three to five years.

toxicity, visibility) and the use of computer models for the evaluation of smoke control systems. The book pulled together in one place the existing technical knowledge with regard to smoke movement and control in buildings, and became a design text widely used by fire protection engineers.

The mid- to late-1990s saw an increase in the use of computer models for designing smoke control systems. Zone models such as ASET[6] and CFAST[7] were used to calculate smoke filling and smoke exhaust requirements for atrium spaces, but conservative assumptions often had to be used to approximate complex geometries.

The building airflow model CONTAM[8] became widely used to calculate pressurization smoke control systems, as it became recognized that complex systems incorporating multiple elements such as stair pressurization systems and corridor/floor pressurization were also affected by wind and stack effects impacting tall buildings.

The development of the computational fluid dynamics model Fire Dynamics Simulator (FDS)[9] in the early part of this decade presented a powerful tool for use in designing atrium smoke control systems, and allowed for quantification of smoke conditions throughout an atrium space, even for the most complex atrium geometries. With the recognition in the 2005 revision to NFPA 92B[10] of smoke control systems designed to maintain minimum smoke tenability levels, rather than a prescribed smoke layer interface height, the use of FDS to analyze these types of systems became not only desirable, but in many cases necessary. The prevalence of atrium smoke control systems based on the use of FDS simulations to substantiate the design has seen a widespread increase over the past three to five years.

A BAD DAY AT THE OFFICE IS WAKING UP TO FIND THAT YOU HAVE NO OFFICE.

Is your company prepared with leading-edge fire detection and alarm technology? If you work with SimplexGrinnell it is. We're leaders in life-safety systems: integrating fire alarm, sprinkler and suppression with security and emergency communications. We have more than one million customers across North America. Our service commitment is second to none. Wake up to what a life-safety provider can do for you. Choose SimplexGrinnell. And be safe.

SimplexGrinnell
BE SAFE.

A Tyco International Company

800-746-7539
www.simplexgrinnell.com

© 2008 SimplexGrinnell LP.
All rights reserved. SimplexGrinnell and
Be Safe are trademarks of Tyco International
Services AG or its affiliates or subsidiaries.

In 2008, the number of zoned smoke control systems required in the U.S. is declining, as the most recent editions of the IBC[2] removed the requirement for zoned smoke control beyond providing stair pressurization in high-rise buildings. High-rise smoke control systems remain required only by local amendments to the code in states such as California and Florida, and local jurisdictions such as Las Vegas. In contrast, the number of atrium smoke control systems being specified is on the rise, as architects continue to push the bounds of building design by incorporating these unique spaces.

Increased use of FDS as a design tool, along with advances to the model interface making it easier for practicing engineers to use, make it incumbent on fire protection engineers to understand the limitations of the model and to appreciate the impact that design choices such as design fire, fuel properties (e.g., soot yield), visibility parameters and critical tenability limits have on the design. When designing systems predicated on the exposure of building occupants to smoke, it is important that the designer incorporate sufficient conservatism to adequately protect building occupants. The task of better defining minimum tenability requirements for use in designing smoke control systems represents probably the foremost challenge faced by fire protection engineers who design these systems as the profession moves forward into the next decade.

Michael J. Ferreira, P.E., is with Hughes Associates.

References:

1 *Uniform Building Code®*, International Conference of Building Officials, Whittier, CA, 1991.

2 *International Building Code®*, International Code Council, Washington, DC, 2006.

3 NFPA 92A, *Recommended Practice for Smoke Control Systems*, National Fire Protection Association, Quincy, MA, 1988.

4 NFPA 92B, *Guide for Smoke Management Systems in Malls, Atria, and Large Areas*, National Fire Protection Association, Quincy, MA, 1991.

5 Klote, J., and Milke, J., Design of Smoke Management Systems, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Atlanta, 1992.

6 Walton, D., "ASET-B: A Room Fire Program for Personal Computers," NBSIR 85-3144-1, National Bureau of Standards, Gaithersburg, MD, 1985.

7 Peacock, R., et al, "CFAST: The Consolidated Model of Fire Growth and Smoke Transport," NIST TN 1299, National Institute of Standards and Technology, Gaithersburg, MD, 1993.

8 Walton, G., and Emmerich, S., "CONTAM93: A Multizone Airflow and Contaminant Dispersal Model With a Graphic User Interface," National Institute of Standards and Technology, Gaithersburg, MD, 1994.

9 McGrattan, K., and Forney, G., "Fire Dynamics Simulator: User's Manual," NISTIR 6469, National Institute of Standards and Technology, Gaithersburg, MD, 2000.

10 NFPA 92B, *Standard for Smoke Management Systems in Malls, Atria, and Large Areas*, National Fire Protection Association, Quincy, MA, 2005.

VICTAULIC • FIRE PROTECTION SYSTEMS

The First CMSA Sprinkler for 40 ft Ceilings to Exceed the Design Flexibility of ESFR

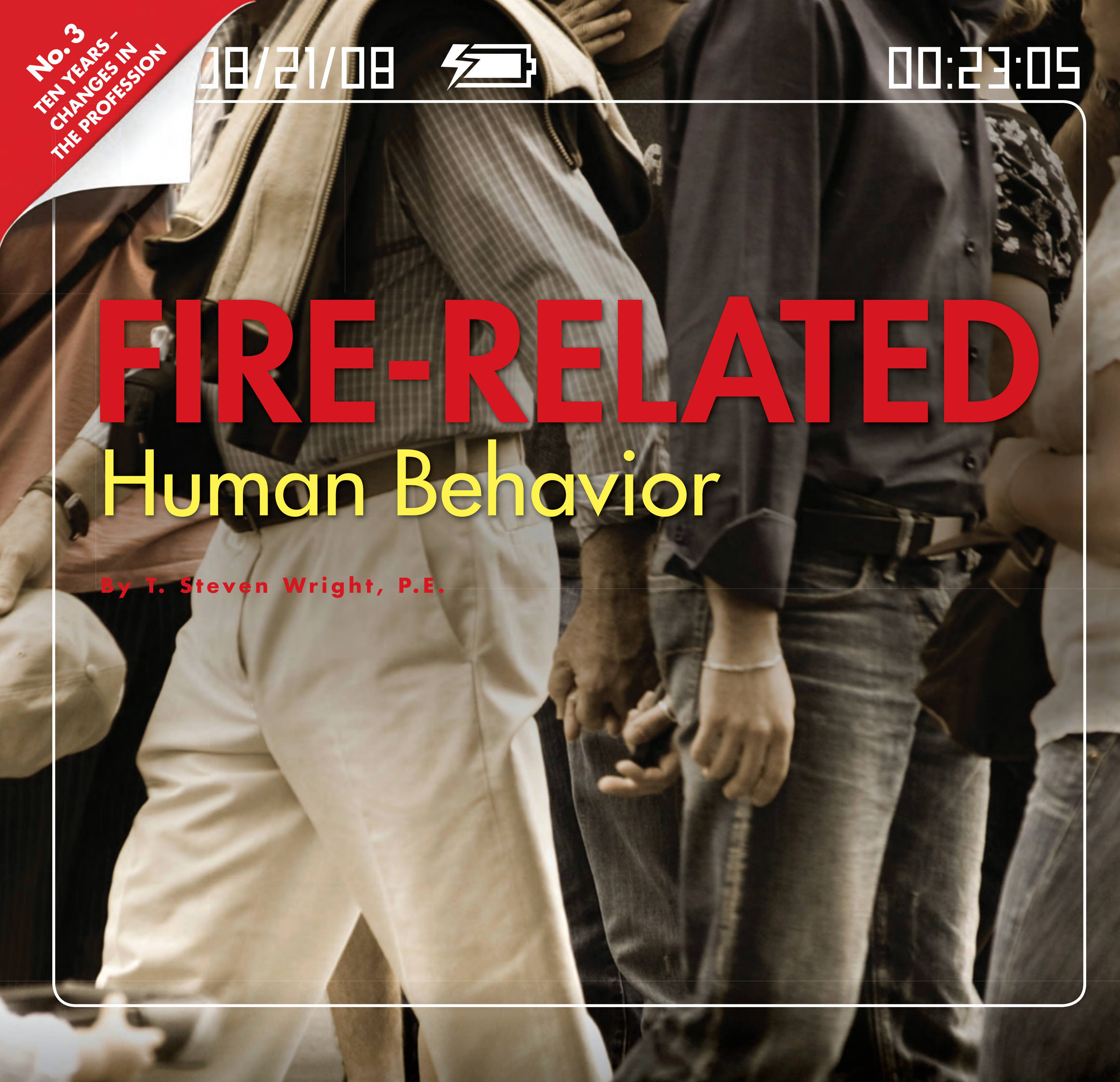
- As much as 70% lower end-head pressure
- Approved up to 40 ft ceilings and storage of cartoned, unexpanded, group A commodities
- As much as 20% savings on materials and labor
- Reduce pipe size requirements for mains and branches by as much as 25%
- Less water demand can eliminate or reduce pump size
- 12 head calculations for ease of design

www.victaulic.com
1.800.PICK-VIC

FM APPROVED

Victaulic®
Piping. Systems. Solutions.

No. 3 TEN YEARS – CHANGES IN THE PROFESSION



FIRE-RELATED Human Behavior

By T. Steven Wright, P.E.

From the vantage point of this practicing fire protection engineer, the most significant change in the last 10 years with regard to fire-related human behavior has been the considerable increase in the awareness and education of fire professionals on the topic. This is likely due to its applicability and necessity to the performance-based design and analysis process. Additionally, several significant fire events have contributed to this educational wave via video footage, as well as the extensive research and plethora of published reports pertaining to these incidents by research professionals.

The first edition of the *SFPE Engineering Guide to Performance-Based Fire Protection Analysis and Design of Buildings*[1] directly integrated human behavioral factors into the building design process. However, the guide provided only a general description of occupant characteristics that must be considered when characterizing design fire scenarios. Additional and necessary guidance at that time was provided in the *SFPE Handbook of Fire Protection Engineering.*[2, 3, 4]

A few years later, the *SFPE Engineering Guide to Human Behavior in Fire*[5] was published and became

Gamewell-FCI On Guard At Fort Knox

Today, time and money have both become rare commodities. Which is why the U.S. Army Armor Center in Fort Knox, Kentucky chose Gamewell-FCI's E3 Series® Expandable Emergency Evacuation System as their network fire alarm and mass notification solution.

Easily installed on just two wires or fiber optic cable and extremely cost-effective, engineers who demand reliability and survivability continually turn to the feature-rich E3 Series® for their fire alarm and emergency evacuation needs.

Visit www.gamewell-fci.com for a wealth of information to help protect your own commercial assets, and a chance to win a 2008 American Eagle ¼-oz. uncirculated, gold coin from the U.S. Mint.

Gamewell FCI FIRE CONTROL INSTRUMENTS

by Honeywell

Gamewell-FCI • 12 Clintonville Road, Northford, CT 06472 • 203-484-7161 • www.gamewell-fci.com

Start Time				End Time
Fire/Cue Initiation or Development	Cue Validation Process		and	Continuing Process
	Receiving Cues	Recognizing Cues	Interpreting Cues	Receiving, Recongizing, Interpreting (RRI)
		Decision-Making Period		
		Premovement Decisions		Transmovement Decisions
				Movement/Refuge Time

Figure 1. Timeline of the Evacuation Process

a vital source for guidance on occupant characteristics, human response to cues, decision-making and movement for direct implementation into the performance-based process. The intent of the guide was to bring together qualitative and quantitative information to facilitate prediction of occupant reaction and egress during fires in buildings for use in the performance-based design process. The "Timeline of the Evacuation Process" (Figure 1) contained in the document serves as a visual representation of the needed information necessary to work through the ASET (available safe egress time) vs. RSET (required safe egress time) estimations required for evaluation of fire scenarios during the building design process.

The most significant educational tool has been the raw video from The Station Nightclub fire in West Warwick, RI, in 2003, which was viewed by fire protection professionals and the public around the world. This video shows, in real-time, the perspective of an occupant who escaped the tragic fire. Revealed in the video are indications of fire cues, verbal and physical indications of reactions to cues by the videographer and others in close proximity, as well as a view of the actual egress.

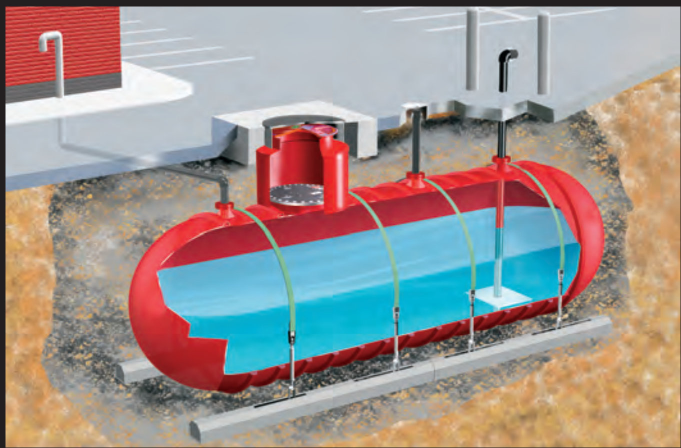
This "nodal" view from beginning to end is likely the first such real-time video that the fire protection community has ever seen. The events of September 11, 2001,

Fire-Protection Water Storage Tanks

Fiberglass underground tanks, now listed in NFPA 22, are ideally suited for storage of standby water as part of your fire protection system. More than 150,000 Xerxes' tanks are safely storing petroleum products at thousands of locations across the country. Consider the many features that make them a popular choice for water storage applications as well.

Features:

- 600- to 68,000-gallon sizes
- Rustproof, long-lasting fiberglass
- Watertight
- NFPA 22 listed design
- Testable for watertightness
- Lightweight, easy to install
- H-20 load rated
- Wide range of accessories
- NSF-listed for dual use in potable-water applications



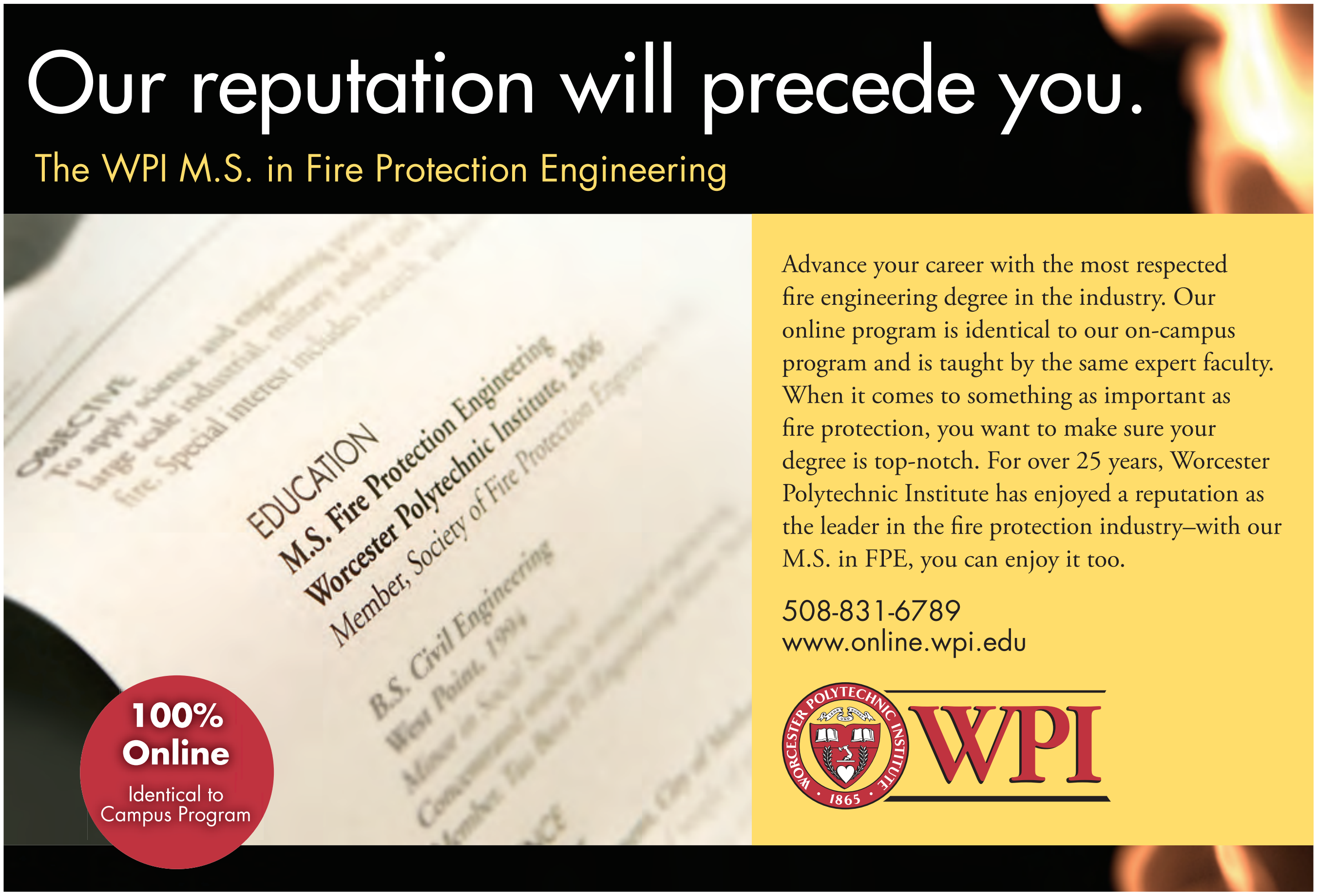
www.xerxescorp.com • (952) 887-1890 phone • (952) 887-1882 fax

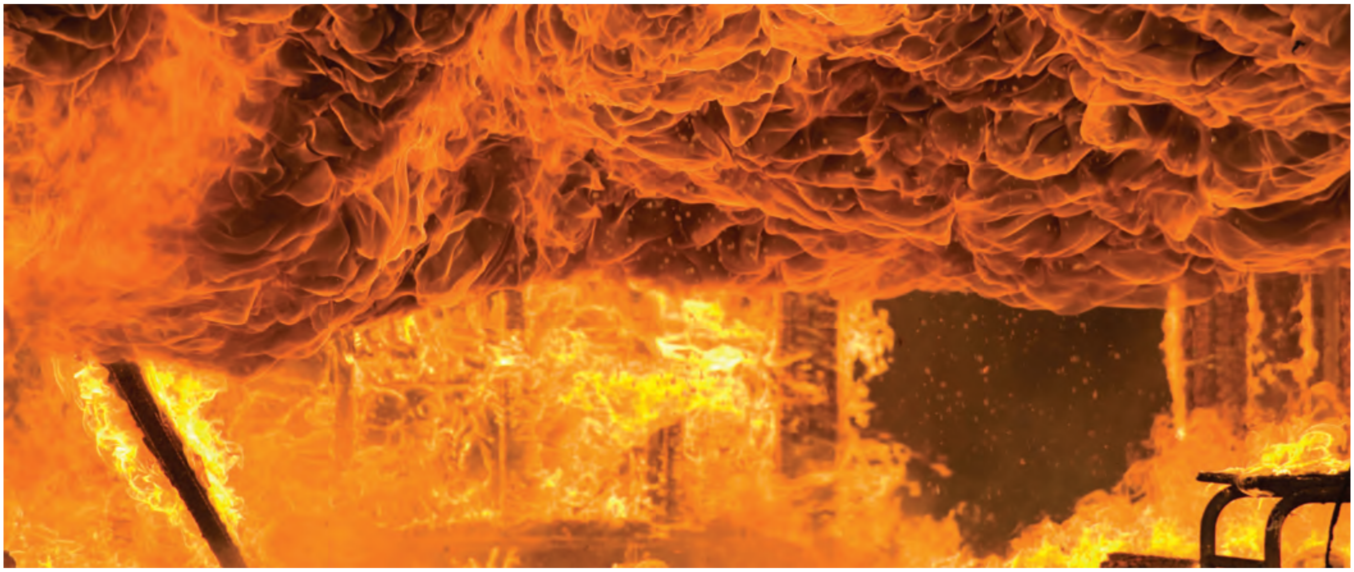
XERXES® CORPORATION

(and most significantly the post-fire analysis by human behavioral researchers) provided equally valuable information regarding high-rise evacuation, cue interpretation and the decision-making process. Though not a fire incident, the E2 nightclub incident in 2003 in Chicago was also a significant event in this regard since it was accompanied by video and press coverage.

Two complete issues of *Fire Protection Engineering* magazine (Fall 2002 and Fall 2005) were devoted to fire-related human behavior. Article topics ranged from an historical review to the use of elevators for emergency egress to human behavior simulation tools. The mere existence of these issues indicates the importance of the topic.

SFPE offers two educational seminars on the topic of fire-related human behavior, one targeting the





engineering community and the other targeting the fire service. In the United States, the University of Maryland at College Park and Worcester Polytechnic Institute both offer graduate-level courses addressing the topic of fire-related human behavior. Most recently, these courses were taught by well-known researchers in the field.

While an odd source, the popular Web site *YouTube.com* offers fire professionals and the international public an opportunity to view fire-related human behavior. Further, the site tracks the number of downloads, which indicates that large numbers of people have already viewed these videos. For example, several videos (found by performing a simple search for "fire alarm") show how people react to fire alarms in differing situations.

The awareness and education of fire professionals in fire-related human behavior will continue to expand and improve with the continued efforts of researchers, educational professionals, SFPE and many others. This effort will also prove beneficial to the fire service and the public.

T. Steven Wright, P.E., is with Fisher Engineering, Inc.

References:

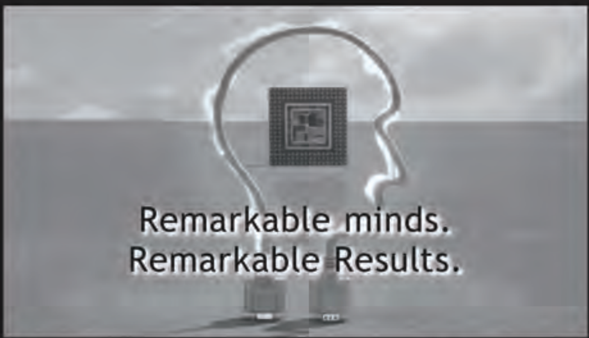
1 *SFPE Engineering Guide to Performance-Based Fire Protection Analysis and Design of Buildings*, National Fire Protection Assoication, Quincy, MA, 2000.

2 Bryan, J., "Behavioral Response to Fire and Smoke," *SFPE Handbook of Fire Protection Engineering*, National Fire Protection Association, Quincy, MA, 2002.

3 Proulx, G., "Movement of People: The Evacuation Timing," *SFPE Handbook of Fire Protection Engineering*, National Fire Protection Association, Quincy, MA, 2002.

4 Nelson, H., and Mowrer, F., "Emergency Movement," *SFPE Handbook of Fire Protection Engineering*, National Fire Protection Association, Quincy, MA, 2002.

5 *SFPE Engineering Guide to Human Behavior in Fire*, Society of Fire Protection Engineers, Bethesda, MD, 2003.



Los Alamos National Laboratory—a premier national security research institution, delivering scientific and engineering solutions for the nation's most crucial and complex problems—has the following opportunity available:

Fire Protection Engineer

Working in a dynamic, fast-paced environment, you will join our team of fire protection professionals who provide routine oversight to programmatic activities and facilities in support of LANL's Fire Protection Program. Your role will be to plan, coordinate and manage one or more elements of the program. You may be expected to serve as an active participant in laboratory facility operations, including new construction and modifications, programmatic activities, loss prevention, and support to laboratory utilities and infrastructure.

Requires a BS degree and relevant professional experience. This position requires a Q access authorization. Applicants must have the ability to obtain a Q clearance, which usually requires U.S. citizenship. This is a full-time, limited term position involving a 2-year commitment.

To apply for this position, visit www.lanl.gov/jobs and apply to job #215285.

Put your brain to good use.

Operated by Los Alamos National Security, LLC for theU.S. Department of Energy's NNSA. AA/EEO

Los Alamos NATIONAL LABORATORY
www.lanl.gov/jobs


tyco
Thermal Controls
HAVE IT ALL
2-Hour Fire-Rated Cables
Full Range of Cables for the Most Demanding Fire-Rated Applications
Highest Performance
Technical Support
Ease of Installation
Low Cost
Field Support
Raychem
Pyrotenax
Pyrotenax MI Power
Raychem MC Power
Raychem RHW Power
Pyrotenax MI Fire Alarm
Raychem CI Fire Alarm
Raychem Ground Wire
For more information, please call (800) 545-6258, or visit
www.tycothermal.com/fpe
Tyco, Raychem and Pyrotenax are trademarks of Tyco Thermal Controls LLC or its affiliates.
© 2007 Tyco Thermal Controls LLC Printed in USA H57965 1/07

HISTORY OF
FIRE PRO ENGINEE

EARLY HISTORY[1,2]

SFPE defines "fire protection engineering" as the application of science and engineering principles to protect people and their environment from destructive fire. The earliest examples of fire protection engineering can be found in the various regulations that were established as a result of catastrophic historic conflagrations.

After Rome burned in 64 AD, Emperor Nero had regulations drawn up after the fire requiring fireproof materials be used for external walls in rebuilding the city. This was perhaps the first recorded example of using the science and engineering of the day in the practice of fire protection engineering.

After the collapse of the Roman Empire and the onset of the Dark Ages, it wasn't until the 17th century, during the Renaissance, that a technical approach to fire protection again emerged. After the Great London Fire of 1666, which destroyed over 80 percent of the city, London adopted its first building regulations requiring stone and brick houses with fire-resisting party wall separations. The London

TECTION RING

By Arthur E. Cote, P.E., FSFPE

fire also spurred interest in the development of fire-suppression equipment in the form of hand-pumper fire apparatus. The design of this equipment is another example of early fire protection engineering.

Throughout the Industrial Revolution in Great Britain in the 18th century and in the United States in the early 19th century, conflagrations continued but began to decline as combustible construction was replaced by masonry, concrete and steel; public fire departments were formed; public water supplies with underground water mains and fire hydrants were installed; and fire apparatus improved. During this same period, the focus of fire protection engineering shifted from addressing multiple building conflagrations to dealing with specific buildings and their contents. New industrial processes and material storage practices resulted in greater fire risks, and a number of spectacular building fires occurred during this period as engineering solutions were being developed to address the new fire hazards.

During the middle of the 19th century, a number of severe fires occurred in textile and paper mills in New England. Caused by lint and paper debris, these fires spread so rapidly that they could not be controlled by traditional manual firefighting. The fire protection engineering solution was to install a system of manually operated perforated pipes at the ceiling, thereby creating one of the first fixed fire-suppression systems. The desire to make such a water extinguishing system automatic ultimately led to the development of one of the most important innovations in fire protection engineering – the automatic sprinkler. The first patent for an automatic sprinkler was awarded to Henry S. Parmelee in 1874. Frederick Grinnell further refined the sprinkler design in the early 1880s.

During the 19th century, many of the advancements in fire protection engineering were brought about by the influence of the insurance industry and the desire to minimize property insurance losses.

THE FOUNDING ORGANIZATIONS[3]

A handful of organizations were formed by the insurance industry in the U.S. that were responsible for establishing the concept of fire protection engineering, putting it into practice and facilitating its growth and recognition as a profession. These were Factory Mutual in 1835, National Board of Fire Underwriters in 1866, Factory Insurance Association in 1890, Underwriters Laboratories in 1893 and the National Fire Protection Association in 1896. These were the founding organizations of fire protection engineering. They were founded in large measure to reduce the loss of life and property from destructive fire. In doing so, they applied the principles of science and engineering, and launched fire protection engineering.

Factory Mutual (FM)

Zachariah Allen, a prominent mill owner in Rhode Island in 1835, combined the concepts of mutual insurance and property protection to form Manufacturers Mutual Fire Insurance Company. This insurance company was based on the concept of insuring only factories that were good risks and that would ultimately pay less for insurance because there would likely be fewer and smaller losses.

A world of support. A lifetime of protection.

No building is more important than your building. That's why when it comes to planning for fire detection and life safety, building owners, architects and engineers turn to NOTIFIER®. Global reach and local expertise, combined with our advanced technology and comprehensive line of products, have made us the choice for buildings large and small all around the world. As industry leaders, NOTIFIER and its network of engineered systems distributors deliver unparalleled service while continuing to innovate for the future. That means the NOTIFIER system you specify today will still be protecting you when other systems have become history.

NOTIFIER. Leaders in Life. Safety. Technology.

NOTIFIER®
by Honeywell

NOTIFIER • 12 Clintonville Road, Northford, CT 06472 • 800-289-3473 • www.notifier.com

By utilizing proper fire prevention methods and regular fire inspections, the concept proved to be successful and the Factory Mutual (FM) system was born. In 1878, MIT engineer C.J.H. Woodbury was hired as an inspector for Boston Manufacturers Mutual, one of the FM insurance companies. This use of a graduate engineer as a fire inspector makes Woodbury one of the first (if not THE first) true fire protection engineers. The second MIT engineer to join Factory Mutual was John R. Freeman in 1886. He gathered around him a corps of engineers and began for the first time to put fire protection and prevention on a truly scientific basis.

A small laboratory was established to test fire protection equipment. This laboratory was the humble beginning of Factory Mutual's research efforts to support fire protection engineering.

With the development of the automatic sprinkler, Factory Mutual encouraged the installation of this new fire protection tool, and by 1901, most FM properties were protected by automatic sprinklers.

FM grew in influence and size to become one of the major insurers of highly protected risks (HPRs) worldwide, continuing the concept of using fire protection engineering to achieve property loss prevention. FM also continued to expand its research activities to meet the needs of fire protection engineering, including continued expansion of its large-scale fire testing capability.

Factory Insurance Association (FIA)

In1890, 11 stock insurance companies banded together to form the Factory Insurance Association (FIA) for the purpose of writing insurance on sprinklered risks in competition with Factory Mutual. FIA had the same basic premise as FM: Industrial properties could be profitably insured if losses are kept to a minimum by utilizing good fire protection practices, that is, good construction, full automatic sprinkler protection and frequent inspections by qualified individuals. FIA became a major insurer of HPR facilities.

In 1975, FIA merged with the Oil Insurance Association and became Industrial Risk Insurers (IRI), and continued to expand its loss prevention services as a major HPR insurer. Throughout its growth and expansion, loss prevention through engineering inspection remained the cornerstone of IRI. In 1998, IRI

was purchased by GE and became GE Global Asset Protection Services (GAPS). In 2006, GAPS was acquired by Swiss Re, and in 2007, Swiss Re was purchased by XL Insurance based in London.

National Board of Fire Underwriters (NBFU)

A conflagration in Portland, ME, in 1866 prompted the establishment of the National Board of Fire Underwriters (NBFU). Initially formed to control fire insurance rates, NBFU, in response to a series of conflagrations in the U.S. from 1871 to 1889, became one of the major fire prevention organizations in the country. It was ultimately responsible for the development of the first model building code in the U.S., the National Building Code®, in 1905 and the first National Electrical Code in 1897.

In response to the Baltimore, MD, conflagration in 1904, NBFU created a municipal inspection system utilizing engineers to assess the ability of major cities and towns in the U.S. to prevent multiblock conflagrations. This evolved by 1916 into a system for grading cities and towns with reference to their fire defenses – the National Board Grading Schedule. The National Board survey engineers were also some of the early fire protection engineers.

From 1900 until 1965, the National Board of Fire Underwriters (NBFU) printed and distributed free of charge the standards developed by the National Fire Protection Association (NFPA). In 1965, NBFU became the American Insurance Association (later the American Insurance Services Group), ultimately phasing out its technical activities and its contributions to fire protection engineering.

Underwriters Laboratories (UL)

Insurance companies' concerns about the fire risk of the electrical wiring of 100,000 Edison incandescent light bulbs at the Palace of Electricity at the World's Columbian Exposition (World's Fair) of 1893 in Chicago resulted in the hiring of a young electrical engineer from Boston, William Henry Merrill, to ensure that the exhibition was safe. The success of this venture led Merrill, with the financial support of NBFU, to set up a laboratory to test the safety of electrical products which became Underwriters Laboratories. In 1901, the NBFU agreed to sponsor UL's work beyond electrical, and by 1903, UL had begun fire performance testing of wired glass windows and tin-clad fire doors.

Throughout the remainder of the 20th century, UL grew to become a major independent, not-for-profit testing organization in North America and a leader in advancing the science of fire protection engineering.

National Fire Protection Association (NFPA)

In 1896, in response to concerns about the reliability of automatic sprinkler systems due to a lack of standardization, a group of insurance company representatives formed the National Fire Protection Association (NFPA) to provide the science and improve the methods of fire protection and

to circulate information on this subject. NFPA organized technical committees of experts to establish consensus on the design of fire protection systems and fire protection safeguards for various hazardous occupancies.

Throughout the 20th century, many of the advances in fire protection were brought about as a reaction to disastrous fires, and NFPA and its technical committees were instrumental in shaping the foundation of fire protection engineering. The rationale for fire protection engineering solutions was published in the *NFPA Fire Protection Handbook*.

Much of the knowledge base for fire protection engineering came from loss experience, the development of property loss prevention innovations and fire research conducted by these founding organizations.

TRAINING AND EDUCATION[4]

FM and FIA were the first insurance organizations to utilize engineers as inspectors of highly protected risks (HPRs). The need for loss-control engineers forced both FM and FIA to create training programs in which graduate engineers could be educated as fire protection engineers. Many practicing FPEs got their fire protection engineering education and experience through these training programs.

A formal degree program in fire protection engineering was first established in 1903, when several prominent fire insurance executives and UL founder William Merrill joined forces to propose the establishment of the first FPE program in the U.S. at Armour Institute of Technology in Chicago, IL. In 1940, Armour became the Illinois Institute of Technology (IIT).

The IIT program was discontinued in 1985, but during its 82-year history, it produced over 1,000 FPE graduates. In 1956, the fire protection engineering program at the University of Maryland was established under the direction of Dr. John L. Bryan, and in 1979, the first master of science program in fire protection engineering was begun at Worcester Polytechnic Institute under the direction of David A. Lucht.

Over the years, a number of FPE degree programs have been established around the world, including programs in Canada, New Zealand, Sweden, Australia, Scotland, Hong Kong and Northern Ireland. Today, however, there are still fewer than a dozen FPE degree programs worldwide.

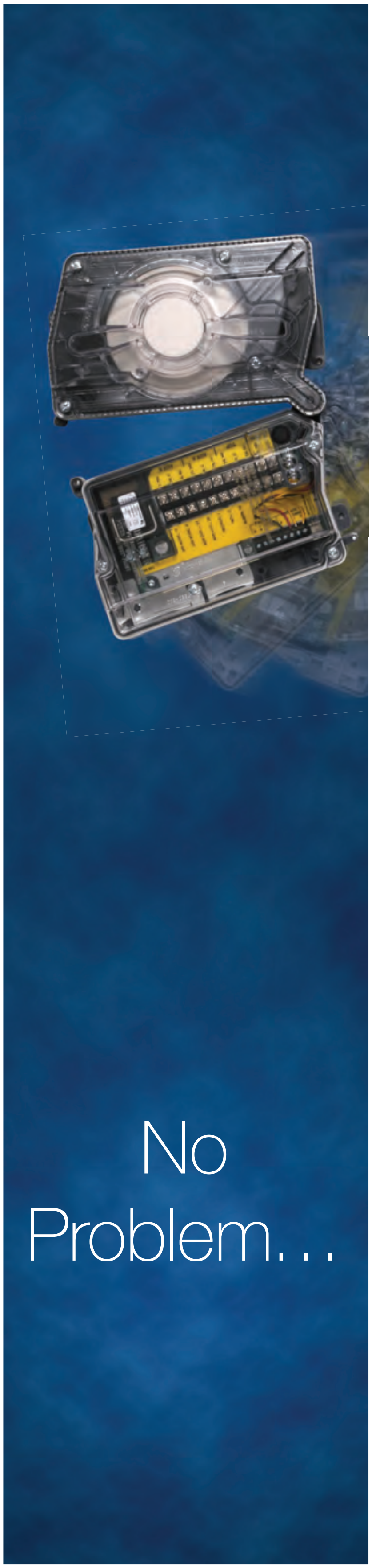
FIRST HALF OF THE 20TH CENTURY

During the first half of the 20th century, building and fire codes and standards became the primary means of applying fire protection engineering for life safety and property protection. Lessons learned from catastrophic fires were applied to revise codes and standards, and improve fire regulations.

During this period, the body of knowledge to support fire protection engineering continued to grow. Much of this knowledge was influenced by and borrowed from other professions, including civil and mechanical engineering, architecture, psychology, and electrical and electronic engineering. Knowledge specific to fire protection engineering also began to emerge. It is impossible to cover all of the advancements, but some of the key ones are detailed below.

The rapid development of tall iron- and steel-framed buildings coupled with the performance of some buildings during the Baltimore conflagration of 1904 led to a desire to quantify fire resistance. The initial effort in the U.S. was led by Ira Woolson of the Civil Engineering Dept. of Columbia University. He set forth for the first time the technical basis for predicting fire behavior in buildings, the time-temperature curve. Standardized fire test methods for building elements were subsequently developed and became ASTM and NFPA standards. Similar efforts with similar results were undertaken in Europe.[5]

In 1914, the U.S. Congress authorized funds for the National Bureau of Standards (NBS) to study fire resistance. Led by Simon Ingberg, significant advances were made in understanding



> At the onset of the 21st century, computational methods for determining a quantitative evaluation of fire protection continue to improve.

the performance of building systems and elements when exposed to high-temperature fires. Fire resistance moved from detailed specification to a component-performance approach tied to the occupancy classification, and heights and area limitations established by building codes.[5]

The Iroquois Theater fire of 1903, which killed 602 people and was the deadliest fire in U.S. history until the World Trade Center terrorist attack, brought attention to the ignition and flame spread of curtains, drapery and scenery. A series of pass/fail tests were initially developed, and in 1922, Albert Steiner of UL developed a test method whereby the fire hazards of materials could be measured and classified with reference to the rate of spread of fire, the amount of fuel contributed to the fire and the production of smoke. The Steiner Tunnel Test ultimately became both an ASTM and NFPA standard.[6]

The first efforts to study human decisions and the movement of people in a building as a result of fire came about primarily due to disastrous major loss-of-life fires, including the Iroquois Theater fire, the Triangle Shirtwaist fire of 1911 that killed 145 and the Coconut Grove fire of 1942 that killed 492. To prevent the recurrence of such tragedies, codes and standards were developed to address the number, location and availability of exits and their design, construction and interior finish materials. The NFPA Safety to Life Committee was formed in 1913, and NFPA's Building Exits Code (later named the *Life Safety Code*®) was one of the first codes to address these issues in 1927.[7]

SECOND HALF OF THE 20TH CENTURY

During the latter half of the 20th century, fire protection engineering as a unique engineering profession emerged. This emergence was primarily due to the development of a body of knowledge specific to fire protection engineering that occurred after 1950. The formation of a professional society, the beginnings of independent fire protection engineering consulting and the development of engineering guidelines for fire protection reinforced the profession.

Much of the body of knowledge supporting fire protection engineering was developed as a result of full-scale fire testing conducted to determine the appropriate fire protection needed to protect new industrial hazards and warehouse storage techniques. Some of the most important were tests on insulated metal deck roofs, palletized and other high-piled storage, heat and smoke vents, transformer protection, high-expansion foam, library book stacks, roll paper storage, rubber tire storage, high-rack storage and aerosol storage.

As a result of this testing, new sprinklers were developed with a wide variety of orifice sizes, thermal elements, special distribution patterns and operating pressure criteria. With the aid of the computer to analyze complex looped and gridded systems, hydraulic design of sprinkler systems virtually replaced pipe schedule systems. During this period, a number of new fixed fire protection systems were developed for use by fire protection engineers. These include halogenated fire extinguishing agents (halons) and later clean-agent halon alternatives, hi-ex foam and water mist. Smoke control systems were developed, and smoke detectors replaced heat detectors as the primary fire alarm system initiating device.

Although a professional society for fire protection engineers was originally proposed by NFPA Technical Secretary Robert Moulton in 1924, it wasn't until 1950 that the Society of Fire Protection Engineers (SFPE) was formed as a section of NFPA. SFPE's first chapter, the Chicago Chapter, was formed in 1953. In 1971, SFPE separated from NFPA and became an autonomous technical-professional society.[8]

KD & ASSOCIATES

Search Consultants for the Fire Protection Industry

KD and Associates, Inc. is a recruiting firm that specializes in the field of fire protection. We have a constant need to identify and build relationships with relevant talent so we can deliver on our client mandates.

If you are a Fire Protection Engineer interested in hearing about exciting opportunities, please give us a call for a confidential discussion. We are dedicated to helping you find that "perfect opportunity".

Testimonial from a recently placed candidate: *"I would (and have) recommend KD & Associates to my friends and colleagues in the FPE field. They listened well to what I was looking for in a career and were able to find a great company whose needs matched my own. Their personal attention and kindness made the process of job searching virtually effortless for me".*

We have a new look! Please check our website at www.kdandassociates.com

Contact Kathy Summer
704-892-3247
kathy@kdandassociates.com

Member

SFPE NFPA®

On Jan. 27, 1967, a fire in the Apollo 1 command module claimed the lives of three NASA astronauts during a routine launch pad test. This fire, which received worldwide attention, showed the lack of knowledge of NASA engineers of the hazards posed by the oxygen-rich environment of the module and pointed to the need for fire protection engineering expertise on the space project. As a result of this fire, fire protection engineers were hired as part of the NASA team.

Less than two weeks earlier, on Jan. 16, 1967, a fire at the McCormick Place exhibition hall in Chicago, IL, resulted in a multimillion-dollar loss during the National Housewares Manufacturers' Association show. The building, which was the largest exhibition hall in the U.S. at the time and was thought to be "fireproof," had been built in 1960 under a Chicago building code that allowed it to be not sprinklered on the basis of "limited combustibles" and the belief that the roof's structure was sufficiently high to be out of danger from collapse due to fire.

The unprotected steel truss roof 37 feet (11 meters) above the floor collapsed in less than 30 minutes. The blue ribbon panel appointed by Chicago Mayor Richard J. Daly to investigate the fire was chaired by then-IIT professor and head of the Fire Protection Engineering Department Rolf Jensen. Under the panel's direction, UL conducted a series of full-scale tests on simulated exhibit booths which showed the need for automatic sprinkler protection and established the fire-suppression criteria for exhibition halls throughout the world. These tests reinforced the need for full-scale fire research test data for fire protection engineering solutions. Two years later, Jensen formed his fire protection engineering consulting firm, Rolf Jensen and Associates (RJA).[9]

In February 1971, a fire occurred above the 30th floor of the office building at One New York Plaza in New York City. The difficulty encountered by the fire department in combating this fire highlighted growing concerns within the fire protection engineering community for fire safety in modern high-rise office buildings.

As a result of this fire, the General Services Administration (GSA) convened an international conference to develop solutions to the fire problem in high-rise buildings. Harold "Bud" Nelson, then with GSA, was the conference organizer and coordinator. The conference, known as the Airlie House Conference, concluded that fire protection for high-rise buildings was not keeping pace with high-rise building design.

In addition to establishing the basic fire protection engineering design parameters for high-rise buildings, including the need for automatic sprinklers, the conference determined that there was a need for a total systems concepts approach for high-rise fire safety.[10]

Under Nelson's direction, GSA implemented many of the conference recommendations into the final design of the 32-story Seattle Federal Building, which became a model for high-rise fire protection design around the world. The Sears Tower in Chicago (at that time, the world's tallest building) was under construction, and Chet Schirmer, president of Schirmer Engineering, utilized the systems concept in developing its total fire protection and life safety design, which included full automatic sprinkler protection. The GSA design approach led to the formal development and use of event logic trees for risk assessment and formation of the NFPA committee on Systems Concepts for Fire Protection that developed the NFPA *Fire Safety Concepts Tree*.[10]

In the late 1970s, the state of California established an examination for a P.E. registration in fire protection engineering (FPE). In 1981, as a result of the efforts of SFPE, the National Council of Examiners for Engineering and Surveying (NCEES) made the FPE exam available on a national basis. Today, 46 states in the U.S. license FPEs.

The application of fire dynamics – the study of how materials ignite and burn, how heat is transferred in fires,


This One Will!

Introducing
Innovair flex™
by System Sensor

The only duct smoke detector that adjusts to fit *any application!*

- Overcome Mounting Constraints
- Reduce Installation Time
- Simplify Test and Maintenance
- ***Available Now!***

Find out more.
Visit systemsensor.com/flex.

SYSTEM SENSOR®
advanced ideas. advanced solutions.™
800/736-7672
www.systemsensor.com

how smoke moves in buildings and how fire grows from ignition to full-room involvement – emerged as the foundation for fire protection engineering solutions. The publishing in 1985 of *Introduction to Fire Dynamics* by Dougal Drysdale[11] as a textbook for FPEs helped to further define the profession.

The publication of the *SFPE Handbook of Fire Protection Engineering*[12] in 1988 was a major step toward broad distribution of the body of knowledge on fire protection engineering calculation methods.

In 2000, SFPE published the *SFPE Engineering Guide to Performance-Based Fire Protection*,[13] which defined the overall process of performance-based fire protection engineering design.

ENTERING THE 21ST CENTURY

At the onset of the 21st century, computational methods for determining a quantitative evaluation of fire protection continue to improve. These include fire severity and fire resistance to determine structural fire protection requirements; fire properties of materials such as rates of heat release, fire spread, smoke developed and smoke movement; and egress flow, and sprinkler and detector response. These methods, coupled with the computational power of today's computers, have in turn resulted in the development of more user-friendly fire models for use by the fire protection engineer.

As the knowledge base expands and the models improve, there continues to be greater worldwide acceptance of the performance-based design approach to fire protection engineering. The review of fire scenarios and design fires have now become major elements of fire protection engineering design.

Performance-based design is currently used primarily for unique structures that cannot be adequately protected utilizing the existing prescriptive building and fire codes, or to determine engineering alternatives to prescriptive code requirements. More universal use and acceptance of performance-based design will come about as consensus is established on the performance objectives required for particular occupancies and hazards, as well as the design fires and scenarios that must be considered by the fire protection engineer.

Arthur Cote, P.E., FSFPE, is with Prometheus Fire LLC.

[Author's note: The primary source of information for this article is Richardson, K. (Ed.) *History of Fire Protection Engineering*, National Fire Protection Association, Quincy, MA, 2003.]

References:

1 Richardson, K., "Historical Evolution of Fire Protection Engineering," *History of Fire Protection Engineering*, National Fire Protection Association, Quincy, MA, 2003.

2 Fitzgerald, P., Mawhinney, J., and Slye, O., "Water-Based Fire Suppression," *History of Fire Protection Engineering*, National Fire Protection Association, Quincy, MA, 2003.

3 Cote, A., "Founding Organizations," *History of Fire Protection Engineering*, National Fire Protection Association, Quincy, MA, 2003.

4 Milke, J., and Kuligowski, E., "Fire Protection Engineering Education Programs," *History of Fire Protection Engineering*, National Fire Protection Association, Quincy, MA, 2003.

5 Nelson, H., "Fire Severity and Fire Resistance," *History of Fire Protection Engineering*, National Fire Protection Association, Quincy, MA, 2003.

6 Nelson, H., and Slye, O., "Fire Properties of Materials," *History of Fire Protection Engineering*, National Fire Protection Association, Quincy, MA, 2003.

7 Nelson, H., "Human Behavior Factors," *History of Fire Protection Engineering*, National Fire Protection Association, Quincy, MA, 2003.

8 Lund, D., "Fire Protection Engineering Professional Societies," *History of Fire Protection Engineering*, National Fire Protection Association, Quincy, MA, 2003.

9 Maybee, W., "Events That Have Shaped the Profession," *History of Fire Protection Engineering*, National Fire Protection Association, Quincy, MA, 2003.

10 Hall, J., and Nelson, H., "Risk Assessment," *History of Fire Protection Engineering*, National Fire Protection Association, Quincy, MA, 2003.

11 Drysdale, D., *An Introduction to Fire Dynamics*, John Wiley & Sons, Cichester, UK: 1985.

12 Dinenno, P., (editor), *SFPE Handbook of Fire Protection Engineering*, National Fire Protection Association, Quincy, MA, 1988.

13 *Engineering Guide to Performance-Based Fire Protection Analysis and Design of Buildings*, National Fire Protection Association, Quincy, MA, 2000.

GE
Security

Works well with others

EST FireWorks™ offers centralized monitoring by integrating fire systems from different manufacturers.

With FireWorks, you now have a single point of monitoring that consolidates events from both GE and non-GE panels. Plus, with Web connectivity features, you can log onto a workstation from a remote location and monitor in real time—without the need to refresh.

For more information call 1-877-GES-MKTG or visit **gesecurity.com/est_fireworks**.

GE-Security, making the world safer.

imagination at work

IMPACT of FIRES On the Built Environment Over the Past 10 Years

By Michael A. Crowley, P.E., FSFPE

During the last 10 years, the reduction in annual home fire deaths has slowed, and the impact of uncontrolled fire on the built environment has focused attention on solutions to the fire challenge. A select group of fires affected the built environment by shaping code writing and code enforcement. Fires in assembly spaces, high-rise office buildings, nursing homes and atrium buildings impacted the fire services, authorities having jurisdiction, code-writing organizations and the general public.

The United States fire loss records[1] indicate a decrease in the total number of fires from 3.2 million to approximately 1.6 million fires per year between 1977 and 2006. Civilian fire deaths in homes in the United

Let Harrington Signal Get Your Business On the Right Track With the New FireSpy® Tracker 2000

The T2000 Control Panel is designed for your small to medium business. The T2000 comes with 2 addressable loops that will support up to 252 devices per panel.

- 3 remote annunciators per panel
- Normal walk and silent walk tests
- Expandable to 60 conventional zones
- Alarm verification
- Detectors provide drift compensation
- Holiday schedule settings up to 20 different days per year
- Universal dialer with contact or Sia format (optional)
- Day/night sensitivity

Auto programming by the keyboard or a PC makes this panel simple to install, operate and configure.

Contact us at 800-577-5758 or visit our website harringtonfire.com
2519 Fourth Avenue ▪ P.O. Box 590 ▪ Moline, IL 612625

States have also decreased substantially over the same 30-year period.

In 2006, 80 percent of the 2,580 civilian fire deaths occurred in a residential setting. The home fire death rate has fluctuated over the past 17 years, ranging between 2,580 and 3,720 deaths per year. The total number of structure fires was nearly equal between 1997 and 2006.

The question is, Why has the reduction in the number of structure fires and civilian deaths slowed in the past 10 years? Major fires have influenced the built environment in both new and existing construction. Although these fires did not uncover new fire challenges, they have focused attention on solutions to the fire challenge. Can these solutions greatly reduce the loss of life or number of fires?

Several fires have had particularly significant impact on building and fire codes.

Recommendations from the National Institute of Standards and Technology (NIST) in the World Trade Center Report[7] stressed the importance of adequate fireproofing, structural integrity in high-rise buildings and enhancements of existing methods of fire-resistive design in high-rises.

STATION NIGHTCLUB

In February 2003, a fire at the Station Nightclub became the fourth-deadliest nightclub fire in U.S. history. The fire killed 100 people and injured more than 200 people.[2]

The fire started with the use of indoor pyrotechnics and quickly spread to soundproofing foam used as an interior finish. This nightclub facility was not provided with automatic sprinkler protection. Egress for the large occupant load from the facility was constrained due the limited access to the exits. The egress actions of the crowd were recorded on tape and gave a clear depiction of the horrific events within the facility.

As a result of this fire, modifications were made to NFPA 101®.[3] Existing nightclubs with greater than 100 persons occupant load and all new nightclubs were required to be protected with automatic sprinklers throughout. These retroactive sprinkler requirements for existing assembly occupancies have been adopted by some local jurisdictions. The *International Building Code*® (IBC)[4] was similarly revised to require automatic sprinkler protection for A-2 assembly occupancies (restaurants and nightclubs with more than 100 occupants).

Additional recommendations on indoor pyrotechnics and interior finish, proposed by National Institute of Standards and Technology (NIST),[5] have not been adopted. NIST recommended the prohibition of non-fire-retarded flexible polyurethane foam and other materials that ignite easily and propagate flames as rapidly as non-fire-retarded flexible polyurethane foam. NIST also recommended limits on indoor special pyrotechnics effects.

WINDSOR TOWER

In the winter of 2005, the 32-story office building located in downtown Madrid, under renovation at the time, caught fire on the 22nd floor.[6] This building had a concrete core and a steel exterior frame.

Due to the inability of the fire department to access the fire, it burned out of control for hours, causing

OKLAHOMA STATE UNIVERSITY

TENURE TRACK ASSISTANT OR ASSOCIATE PROFESSOR

Applications are invited for a nine-month Tenure Track faculty position (open rank) in Fire Protection and Safety Engineering Technology at Oklahoma State University (OSU), Stillwater Campus.

Primary responsibilities include teaching, recruiting, advising students, and conducting outreach activities. The successful candidate must be able to teach in two or more of the following areas: Fire Safety Engineering, Fire Protection Hydraulics, Fire Dynamics, Smoke Management, and Fire Suppression and Detection Systems. Minimum qualifications include a master's degree in engineering, engineering technology, or a related discipline and three years of professional experience. An earned doctorate and teaching experience are desirable. Applications must include a letter of application with a statement of teaching philosophy, curriculum vita, and the names, addresses and phone numbers of three references.

Send applications to Dr. Michael Larrañaga, Head, School of Fire Protection and Safety, Oklahoma State University, 499 Cordell South, Stillwater, OK 74078. The preferred hire date is August 15, 2009. For full consideration, apply by November 30, 2008. OSU is an Affirmative Action/Equal Opportunity/E-Verify Employer committed to diversity.

the structural frame on the exterior to fail. Due to the extensive damage and the possibility of the upper floor collapse, the entire 32-story building was demolished after the fire.

This fire did not have any direct documented impact on Spanish or European Union codes and standards; however, it occurred during the debate as to the major cause of the collapse of World Trade Center Towers 1 and 2.

The Madrid fire emphasized the importance of passive fire-resistive protection of structural steel in buildings that depend upon internal firefighting responses. Recommendations from the National Institute of Standards and Technology (NIST) in The World Trade Center Report[7] stressed the importance of adequate fireproofing, structural integrity in high-rise buildings and enhancements of existing methods of fire-resistive design in high-rises. Recommendations were adopted in the 2007 IBC Supplement[8] and will be incorporated into the 2009 edition of the IBC, which will require higher adhesive forces for fireproofing of buildings taller than 130 meters (420 feet).

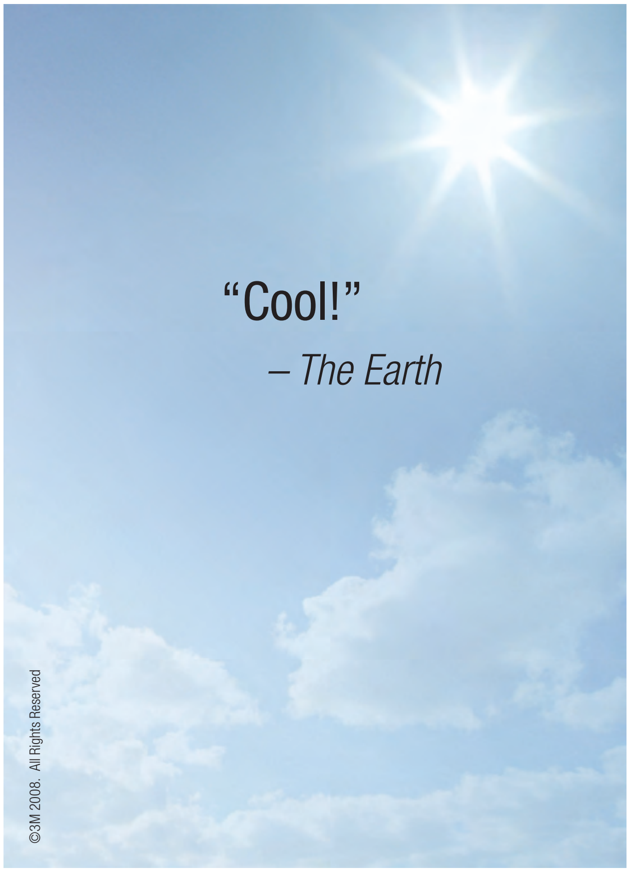
NURSING HOMES

In 2003, there were two major nursing home fires that occurred in the U.S. The first, on February 26, 2003, in Hartford, CT, caused the deaths of 16 residents, all within the vicinity of the room where the fire broke out. Later in the year, on September 25, 2003, in Nashville, TN, there was a fire in a multistory nursing home that caused 15 deaths, 10 on the fire floor and five on floors located above the fire floor.

Both of these facilities had recent fire safety inspections, and in both cases, there was a timely response of the fire department. Both of these facilities were not sprinklered.

Due to the large loss of life in both fires, the Government Accountability Office (GAO) conducted a survey of nursing home fire safety.[9] The findings indicated there were a number of fire safety deficiencies that were missed or not cited in previous surveys. It also noted that the presence of automatic sprinklers would have greatly changed the outcome of these two fires.

The nursing home industry and the International Fire



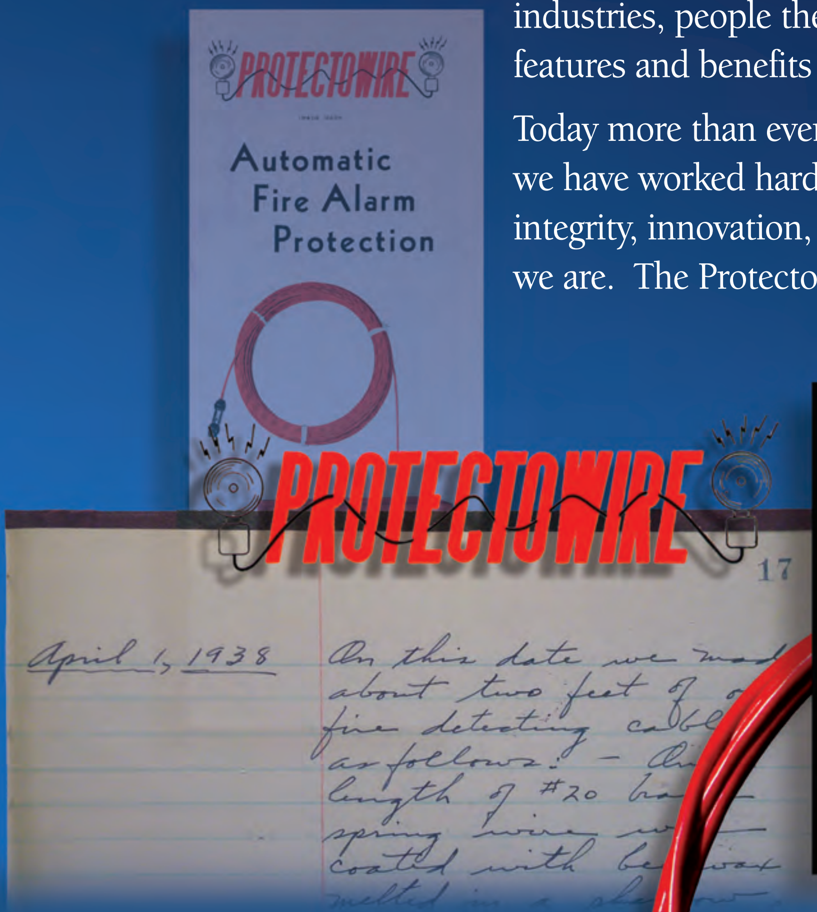
A Tradition of Leadership in Linear Heat Detection

In today's highly competitive world, it's nice to know there is a company that believes success is measured by providing quality products and the highest level of customer service, with the integrity to stand behind their products. We call it Leadership.

Founded 70 years ago, Protectowire was the first company in the industry to develop, patent, and market continuous line heat detection systems. Today, The Protectowire Company continues to offer an ever-growing global network of distributors, superior products, service, and a reputation for excellence.

With proven experience and thousands of critical installations in a wide range of industries, people the world over continue to rely on the unique features and benefits provided by Protectowire FireSystems.

Today more than ever, Leadership must be earned. For 70 years we have worked hard everyday to realize that goal. Quality, integrity, innovation, and customer satisfaction . . . that's who we are. The Protectowire Company.



Protectowire, the ***first*** name in linear heat detection.

The Protectowire Company, Inc.
40 Grissom Road, Plymouth, MA 02360-7205 U.S.A.
781-826-3878; Website: www.protectowire.com
An ISO 9001 Registered Company

PROTECTOWIRE® FireSystems

Marshal's Association proposed changes to the NFPA 101 to require automatic sprinkler protection throughout all existing nursing homes. These changes became part of the 2006 edition of the *Life Safety Code*®.[3] The requirement is retroactive, requiring all non-sprinklered, code-compliant facilities to provide automatic sprinkler protection.

CHICAGO, ILLINOIS

On October 17, 2003, a fire happened at approximately 5:00 p.m. on a Friday afternoon at 69 West Washington, a 37-story high-rise building located in downtown Chicago, owned by Cook County.[10] In this fire, the locked stairway doors were a major contributor to the loss of life.

The fire occurred on the 12th floor. In the confusion of the emergency, clear direction to the building tenants was not provided. The Chicago Fire Department staged in a stair tower to attack the fire on the 12th floor. As a result of their fire attack, the stairwell became filled with smoke.

The stair doors were locked to prevent re-entry from the stair side. People entering the stair could not escape the stair once the doors had closed. The six deaths in this fire were located within the stair enclosure.

There were many issues cited for the loss of life. The *International Building Code* and NFPA 101 have addressed the locking of stairways doors for more than 15 years. Corrections and modifications to the *Chicago*

RFP System
for
Residential Fire Protection
NFPA 13D Applications

- Stainless Steel, TEFC Pump
- All Non-Ferrous Components
- NEMA Rated Electrical Control Box
- Narrow Water Tank Assembly
- Inlet, Outlet & Test Connections
- Custom Configurations Available

Fast & Cost Effective Installation

GENERAL
AIR PRODUCTS

Call 1-800-345-8207

to request a brochure or visit our web site now to download your copy

www.GENERALAIRPRODUCTS.com

Building Code were adopted, addressing the stair locking arrangements. Recommendations for firefighter response in high-rise facilities were also presented.

There was an ordinance presented to the Chicago City Council for the retroactive sprinklering of all high-rise buildings, with an alternative to retrofitting sprinklers in residential and landmark structures included in the ordinance. The alternative was based on an engineered approach which assigns numeric values to the various systems within the building, much like NFPA 101A, the *Guide on Alternative Approaches to Life Safety*.[11]

This ordinance to retroactively require sprinklers in high-rise buildings was slowly working its way through the Chicago City Council process, when on December 13, 2004, there was a fire on the upper floors of the LaSalle Bank Building in downtown Chicago.

While this fire did not cause any loss of life, it did focus the attention of the City of Chicago on the hazards of existing high-rise commercial buildings relative to fire.[12] On December 15, 2004, the City of Chicago Council voted to enact an ordinance to require sprinkler protection for high-rise commercial buildings constructed before 1975. These buildings would be required to be sprinklered in stages, with the entire building protected by sprinklers by 2017. The ordinance also affects high-rise residential and landmark buildings throughout the Chicago area.

HOUSTON, TEXAS

Retroactive automatic sprinkler requirements in nursing homes and high-rises have been adopted by nationally recognized codes and have also been incorporated into the local requirements. The City of Houston has adopted a retroactive high-rise sprinkler ordinance very similar to the Chicago ordinance.

The driving force for this retroactive requirement was a local fire in a high-rise that caused the death of an occupant and a firefighter. In addition, the City of Houston has also adopted a retroactive sprinkler ordinance for mid-rise buildings up to six stories in height with atria. During the course of code development in the City of Houston, there was a point in time (before 1980) when low- to mid-rise atrium buildings did not require automatic sprinkler protection. The major impetus for the retroactive ordinance was the death of three people in a nonsprinklered six-story atrium-type building.[13] The ordinance allows for an engineered solution.

The above-listed fires and losses were not the only incidents affecting the current codes. As a result of the NIST World Trade Center investigation and recommendation reports, NFPA 101[3] requires wider stairs serving high-rise buildings or buildings with more than 2,000 people using the exiting system. This change reflects comments gathered during the preparation of the World Trade Center report identifying a need for two-directional flow for responders in the up direction and occupants exiting in the down direction.

The critics agree. 3M™ Novec™ 1230 Fire Protection Fluid doesn't just put out fires. With the new 3M™ Blue Sky℠ Warranty, it also puts your mind at ease: If Novec 1230 fluid is banned from or restricted in use as a fire protection agent due to ozone depletion potential or global warming potential, 3M will refund the purchase price of the fluid. That's a promise and performance you can take to the bank.

Novec 1230 fluid is a next-generation halon replacement, designed to balance concerns for human safety, performance and the environment. Unlike first-generation HFC's, Novec 1230 fluid has:

- Zero ozone depletion potential
- Global warming potential of one
- Five-day atmospheric lifetime
- High margin of human safety

The 3M™ Blue Sky℠ Warranty for Novec 1230 fluid: If 3M™ Novec™ 1230 Fire Protection Fluid is banned from or restricted in use as a fire protection agent due to ODP or GWP, 3M will refund the purchase price of the Novec 1230 fluid. Warranty good for 20 years. Must register your system with 3M within 30 days of system commission and every five years.
For complete terms and conditions or to register your system for the Blue Sky Warranty, log onto www.3M.com/novec1230fluid.

Created For Life. 3M.com/novec1230fluid

3M

©3M 2008. All Rights Reserved

The ICC's Task Force for Terrorism-Resistant Buildings was successful in passing a code change requiring a third stair in super-tall high-rises, i.e., those taller than 130 meters (420 feet). The cited reason for the third stair is to permit firefighters to use a stair without impacting egress. Attempts to overturn this code were unsuccessful; therefore, this requirement for a third stair will be part of the 2009 IBC.

The ICC's Task Force for Terrorism-Resistant Buildings was successful in passing a code change requiring a third stair in super-tall high-rises, i.e., those taller than 130 meters (420 feet). The cited reason for the third stair is to permit firefighters to use a stair without impacting egress.

These fires focused the public's perception of fire and its effects on these types of occupancies. Coupled with this focus was a presentation of acceptable solutions. These solutions were proposed while the public memory of the fire-related life losses was still keen and painful.

Because of this public focus, there was action in the development of code and ordinance changes to address the fire safety issues. It appears that local ordinances are much more responsive to a specific fire in their jurisdiction. The model codes in the United States have responded to these issues more slowly. There are still reservations in many areas of the country to require retroactive sprinkler systems to address some of the unique fire challenges in special occupancies such as assembly spaces, nursinghomes and high-rise buildings. The information regarding retroactive automatic sprinkler protection is readily available, the debate is usually lively, and the results will depend upon the public's perception of the hazard.

Michael A. Crowley, P.E., FSFPE, is with Rolf Jensen & Associates.

Retrofit with SEVO 1230

Clean Agent Fire Suppression Systems

Designed with 3M Novec™ 1230 Fire Protection Fluid

FM APPROVED

Retrofit with SEVO 1230 Systems:

- Utilize existing piping
- 1 to 1 cylinder/nozzle replacement

- **Existing Halon 1301 Systems**
- **Existing HFCs Systems**
  & High Global Warming Materials

No other halongenated alternative can match:

- Zero Ozone Depletion
- Atmospheric Lifetime of 5 days
- Global Warming Potential 1
- Life Safety Margin 67-150%
- 20 year environmental warranty

www.sevosystems.com
info@sevosystems.com
Phone: 913.677.1112

SEVO SYSTEMS
The Safe Environmental Choice

14824 W. 107th Street
Lenexa, KS
USA, 66215

References:

1 Karter, M., "NFPA Reports U.S. Fire Loss for 2006," *NFPA Journal,* September/October 2007.

2 Reese, S., "If Only Becomes Never Again," *NFPA Journal,* January/February 2004.

3 NFPA 101®, *Life Safety Code®*, National Fire Protection Association, Quincy, MA, 2006.

4 *International Building Code®*, International Code Council, Washington, DC, 2004.

5 Grosshandler, W.L., Bryner, N., and Madrzykowski, D., *Report of the Technical Investigation of the Station Nightclub Fire*, NIST NCSTAR 2, National Institute of Standards and Technology, Gaithersburg, MD, June 2005.

6 Henckle, H., "High-Rise Office Building in Downtown Madrid, Spain Engulfed by Flames, Top Floors Collapse" *http://cms.firehouse.com/web/online/News/High-Rise-Office-Building-in-Downtown-Madrid--Spain-Engulfed-by-Flames--Top-Floors-Collapse/46$39297.*

7 "Federal Building and Fire Safety Investigation of the World Trade Center Disaster: Final Report of the National Construction Safety Team on the Collapses of the World Trade Center Towers," NIST NCSTAR 1, National Institute of Standards and Technology, Gaithersburg, MD 2005.

8 *2007 Supplement to the International Codes*, International Code Council, Washington, DC, 2007.

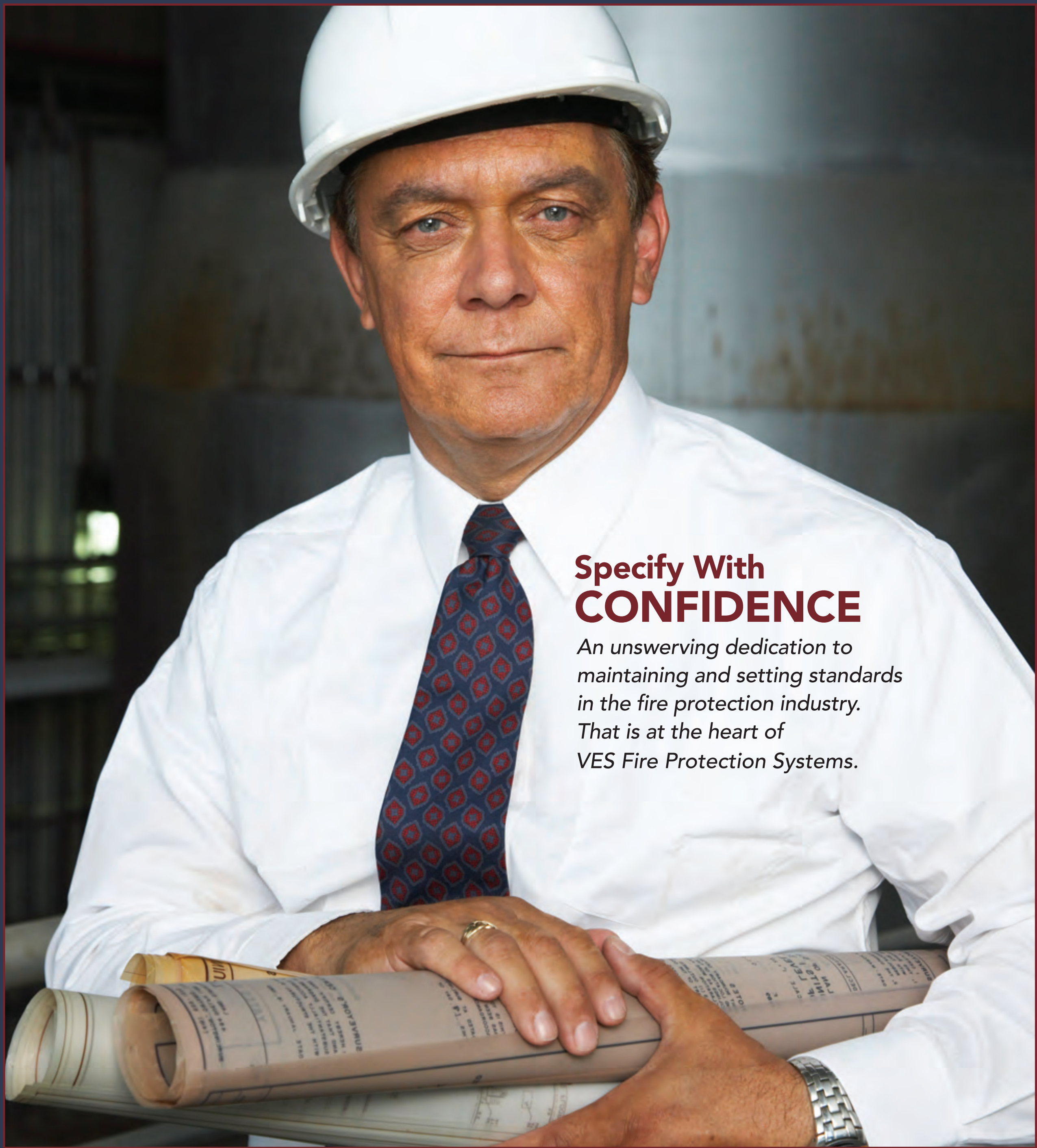
9 *Nursing Home Fire Safety Recent Fires Highlight Weaknesses in Federal Standards and Oversight*, Government Accountability Office, Washington, DC, 2004.

10 Report of the Cook County Commission Investigating the 69 West Washington Building Fire of October 17, 2003, Cook County Board, Cook County, IL, 2004.

11 NFPA 101A, *Guide on Alternative Approaches to Life Safety*, National Fire Protection Association, Quincy, MA, 2007.

12 Fleming, R., "High-Rise Sprinkler Retrofit," *NFPA Journal*, March/April 2005.

13 Stiles, M., and Lezon, D., "Fears Raised Years Before Blaze," *Houston Chronicle,* April 1, 2007.



The engineered eLAN FIRE ALARM SYSTEM from VES provides comprehensive protection, real-time system information via the Internet to property owners, and a user-friendly design that architects and engineers have embraced.

Specify with confidence, specify with VES.

Lunch On Us!
If you're a specifier, we'll pick up the tab for lunch! Call 800.270.3066 now to arrange your own lunch & learn, or visit our website, www.ves-network.com for more information.

VES FIRE PROTECTION SYSTEMS

800.270.3066 • www.ves-network.com

Retirement

Is There Life After Fire Engineering?

By Peter Johnson, FSFPE

Many in the fire protection community were born after the Second World War and are now in their 50s and 60s. Some are contemplating retirement. These "Baby Boomers" have lived through periods of prosperity and economic growth. But many are now entering a post-work environment that poses significant challenges, from the recent sub-prime mortgage crisis, to rising oil prices, climate change and perhaps political changes.

However, retirement does not have to mean a life devoid of interest and excitement. Far from it! With a little planning and a willingness to explore all options, the transition to the next phase of life can bring new challenges and opportunities.

For someone preparing to make the move to full retirement or simply scaling back to part-time work, there are several factors to consider, including:


THERE IS MORE THAN ONE WAY TO SUPPRESS A FIRE.
THE EXPERTS AT FIKE SELECT ONLY THE BEST.
ECARO-25®
Exceptional, cost-effective clean agent fire protection. Dupont™ FE-25™
PROINERT®
Unique inert gas valve yields significant system and installation savings.
DuPont™ FM-200®
Waterless clean agent fire suppression solutions for the modern workspace — only from DuPont.
Fike doesn't just offer protection. We develop technologically advanced fire suppression systems that protect your bottom line, as well as your facility and assets. ECARO-25, PROINERT, DuPont™ FM-200® are USGBC LEED® recognized.
At Fike, we're known for:
• Innovative, reliable products
• Fast, responsive service
Visit Fike at ASPE, Booth #1167
FIKE HAS THE MOST COST-EFFECTIVE, INNOVATIVE FIRE SUPPRESSION SOLUTIONS AVAILABLE.
Fike®
WWW.FIKE.COM
1-866-758-6004

- There is a worldwide skills shortage, especially in engineering, project management, skilled trades and related professions. There is also a shortage of senior leaders and managers. Many firms are encouraging employees to stay on and retire later, and in some countries, governments are making it more difficult to retire early.
- Financial or family obligations may require some people to continue earning, including supporting children and grandchildren.
- Advice from aging specialists suggests that the 60s are an important time. It is a period when people have the energy and mobility to travel and engage in more energetic pursuits (e.g., golf, tennis) that may become challenging later on. The message seems to be, "If you can, don't leave it too late to retire!"

Smart companies and governments recognize these trends and influences, as well as the need to manage the expectations of younger Gen-X and Gen-Y staff, to maximize corporate performance.

So what are the options to consider when approaching retirement?

SCALING BACK – SEMI-RETIREMENT

With many enlightened companies, it is possible or even encouraged to work out a transition to retirement through part-time employment. This may involve fewer hours, fewer days or a tailored flexible arrangement.

This benefits the employer because it retains the wisdom and knowledge of a highly experienced individual to work with clients, review key projects, mentor younger staff or take specialist roles removed from line management. It also allows individuals to get involved in leisure pursuits and other activities they see as priorities for retirement. These could be travel, golf, gardening, painting lessons, home maintenance, minding grandchildren or many other business, family or community activities.

BUSINESS HANDOVER

Individuals who own and manage companies, either alone or in partnership, can find it difficult to extricate themselves from the business and still get the financial rewards for their business endeavors. A succession and exit plan is required, as it is for senior leaders and managers in large companies.

This type of transition requires long-term planning and appropriate professional advice.

It is often possible to ease out of a business arrangement slowly, provided the other parties are willing and can see the value brought to the business in a reduced role.

In the fire protection area, the importance of the work to the community means that fire safety professionals will usually want to see the business handed over to others with an equal passion for saving lives and property.

FINANCIAL ADVICE

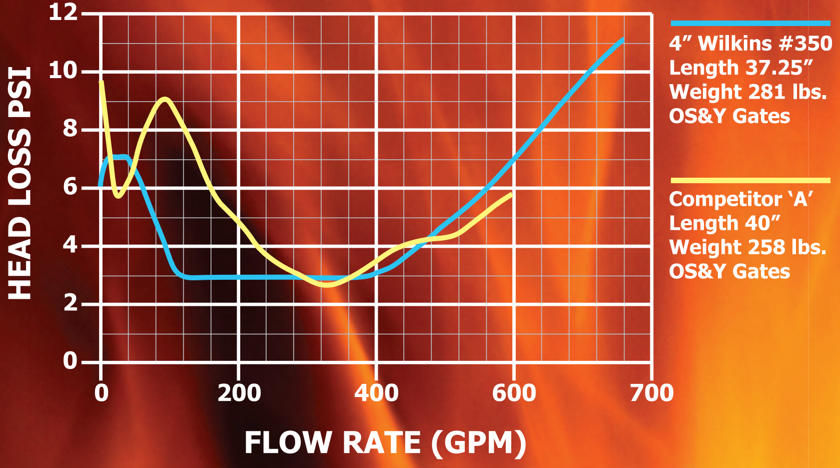
One of the most important aspects of planning for retirement is to have sufficient financial capacity to support oneself and one's family. This can be a complex area and varies tremendously from person to person and from country to country. For those who have worked in a number of different countries throughout an international career, it can be even more complex.

A number of companies and governments have generous pension schemes and social support programs, with tax incentives to encourage saving for retirement. Other countries and firms have less generous arrangements, and financial preparation for retirement can be more problematic.

Healthcare coverage is also an important consideration, given the

The Best Curves In The Fire Protection Business!

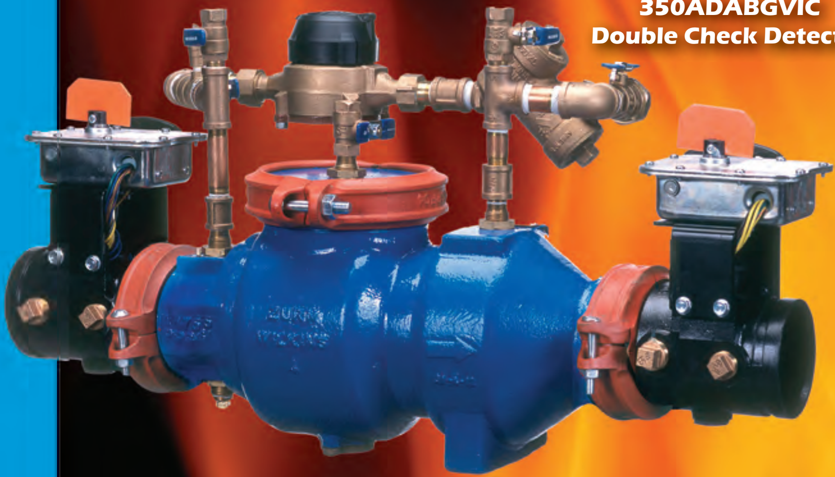
4” Wilkins #350 (USC) vs.
Competitor ‘A’



450 DA
Double Check Detector

375AOSY
Reduced Pressure
Principle Assembly

350ADABGVIC
Double Check Detector



350 ADABGVIC
Double Check Detector

475V
Reduced Pressure
Principle Assembly

Sometimes Less is More!
Especially when it comes to head loss. When pressure loss is important, ask for original approval agency documentation. This ensures accurate performance information as flow increases from no-flow to fire-flow.
Wilkins publishes detailed, accurate FCCCHR@USC letterhead curves!
If you are not buying Wilkins, ask your source for their USC curves, and *Compare!*

Customer Service Representatives available Monday through Friday
5:30 am to 5:00 pm PST • Call: 877-222-5356 or 805-226-6297
info@zurnwilkins.com or visit us online at www.zurn.com

WILKINS
a ZURN company

likelihood of the need for more medical services in later life.

The best advice here is to seek independent advice from professional, reputable financial planners and legal practitioners. It may be too late if one waits until the day they retire to seek advice! Too often, people rely on friends or colleagues, or on financial practitioners with vested and undisclosed interests, only to find that their retirement savings have been lost through incompetence or unscrupulous dealings.

In fire protection, the cheapest design solutions can have great risks and unfortunate consequences. So it is with finance and investments, where seemingly attractive investments can have very high risks, particularly during tough economic periods. The best approach is to read the small print and seek sound professional advice. And if an investment looks too good to be true, then it probably is!

VOLUNTEERISM

It is a sad fact that as working hours increase, people have less time and energy for volunteering. As a result, many professional associations, charities and community organizations, such as volunteer fire departments, are struggling to serve the communities as effectively as they did in the past.

For many people, retirement or semi-retirement offers the opportunity for further study and learning.

This represents a real opportunity for people in the fire protection profession who have a strong commitment to helping their communities. Opportunities include:

- Volunteering for a local fire department, even if not in an operational role. This could involve fundraising, training or education.
- Getting involved in the local SFPE Chapter through committee membership or other organizational positions.
- Participating in a wide range of charities and philanthropic organizations that provide support for individuals and community groups, particularly those that provide for the less fortunate.
- Re-establishing links with school or college alumni societies to help with academic or research programs, and encouraging and mentoring students with potential to enter the fire protection profession.

FURTHER STUDY

For many people, retirement or semi-retirement offers the opportunity for further study and learning. This may be academic or nonacademic. Some people use this period to take academic classes in new fields, often through distance learning.

Others see opportunities to learn new languages or to gain skills in arts and crafts, gardening, sports, music and other areas through local colleges or community groups.

FAMILY TIME

Retirement often means more time for family and friends. This is especially true for people who have spent much of their professional life on the road. Time spent with family can be a great opportunity to pass on learning to the next generation, be it with your grandchildren or children at the local school or community group. This is a great chance to educate young family members and others about fire safety and what a great career fire protection offers.

Peter Johnson, FSFPE, is with Arup Fire.

ATTENTION

FM APPROVED

all 35′ & 30′ High Buildings
The Best Sprinkler to Install

THE N252 EC

Extended Coverage with No In-Rack Sprinklers
Huge Savings on Materials & Labor

Covering Solid-Pile, Palletized and Single, Double, Multiple Row Racks for Class I-IV and Cartoned Unexpanded and Cartoned Expanded Plastics

Building Height: 30′ Storage Height: 25′ Coverage: up to 196 sq ft (14′x 14′)

K-14.0 ESFR	K-16.8 ESFR	K-25.2 ESFR	K-16.8 CMDA	Ultra K-17	N252 EC
100 sq. ft.	100 sq. ft.	100 sq. ft.	100 sq. ft.	100 sq. ft.	**196 sq. ft.**
50 psi	35 psi	15 psi-UL 20 psi-FM	22.7 psi (.80)	22 psi	**30 psi**
12 sprs	12 sprs	12 sprs	2000 sq. ft.	15 sprs (1500 sq. ft)	**7 sprs** (min. of 1200 sq. ft.)
1200+ gpm	1200+ gpm	1200+ gpm-UL 1352+ gpm-FM	1600+ gpm	1200+ gpm	Sys. demand **966+ gpm**
250 gpm HS	250 gpm HS	250 gpm HS	500 gpm HS	500 gpm HS	**250 gpm HS**

Building Height: 35′ Storage Height: 30′ Coverage: up to 144 sq ft (12′x 12′)

K-14.0 ESFR	K-16.8 ESFR	K-25.2 ESFR	N252 EC
100 sq. ft.	100 sq. ft.	100 sq. ft.	**144 sq. ft.**
75 psi	52 psi	20 psi-UL 30 psi-FM	**40 psi**
12 sprs	12 sprs	12 sprs	**9 sprs** (min. of 1200 sq. ft.)
1455+ gpm	1452+ gpm	1352+ gpm-UL 1656+ gpm-FM	Sys. demand **1435+ gpm**
250 gpm HS	250 gpm HS	250 gpm HS	**250 gpm HS**

- Wet Pipe or Pre-action Systems (when they meet the equivalency of a wet system).
- Approved for Non-combustible Obstructed Construction.
- Refer to Reliable Bulletins 008 & 908 for more information.
- Refer to FM Global's Data Sheets 2-8N, 2-2 & 8-9 for installation and design of CMSA and extended coverage sprinklers.

PATENT PENDING

9/08 P/N 9999970372

Reliable®
TECHNOLOGY • QUALITY • SERVICE

1.800.431.1588
www.reliablesprinkler.com
The Reliable Automatic Sprinkler Co., Inc.
Manufacturer & Distributor of Fire Protection Equipment

Survivable Design and Installation of Signaling Systems for Disaster Management: Part 2

The first article in this series introduced the concepts of circuit and system survivability as currently required by NFPA 72®, *National Fire Alarm Code®*. This second and final installment details and compares specific code-mandated circuit and equipment survivability requirements, and looks beyond prescriptive requirements using the concept of mission survivability.

The 2007 edition of NFPA 72[1] only addresses survivability with respect to fire as a hazard and only for systems used for partial evacuation or relocation. Other hazards such as bombs, radiation, chemical exposure and severe weather are not addressed. Security issues such as cable access and secure radio communications are not addressed. Also, any system that is intended to be used for some amount of time during a disaster or emergency may need to be designed for survivability, not only those used for partial evacuation or relocation.

Where the code requires a circuit to be survivable (see Part 1), the following menu is listed under 6.9.10.4.2 and 6.9.10.4.3. NFPA 72 permits any of the following options:[1]

1. A 2-hour fire-rated circuit integrity (CI) cable;
2. A 2-hour fire-rated cable system (electrical circuit protective system);
3. A 2-hour fire-rated enclosure;
4. Performance-based alternatives approved by the authority having jurisdiction; and
5. Buildings fully protected by an automatic sprinkler system installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*, and with the interconnecting wiring or cables used for the operation of notification appliances installed in metal raceways and in accordance with Article 760 of NFPA 70®, *National Electric Code*®.

Options 3, 4 and 5 are self-explanatory. Circuit integrity cable (CI, option 1) is a cable that has been tested for both fire exposure and hose stream (fog nozzle) impact following the fire exposure. An electrical circuit protective system (option 2) is a complete system consisting of either cable or fire-resistive cable combined with a protective system such as a fire-rated wrap.[2] Although CI cable might seem to be a simpler solution compared to an electrical circuit protective system, both have many details that make their manufacture, design and installation far more complex than regular wiring methods.

For example, CI cable works, in part, when the insulation heated by the fire ceramifies, changing from a flexible material to a hard, nonconductive ceramic material. Obviously, if the insulation is cut during installation, a point of failure has been created. Therefore, CI cable cannot be spliced in an area where the code requires 2-hour rated performance. CI cable must be installed in a continuous, unspliced length through the fire zone. Also, CI cable cannot be installed in conduit unless it is specifically listed to be installed in conduit – and not all CI cable has that listing.

In addition to special fire-rated wraps used to create a 2-hour fire-rated cable system (electrical circuit protective system), another *system* is called CIC – Circuit Integrity Conduit. This system consists of a fire-rated cable that must be installed in conduit and has been tested as an assembly to achieve the required 2-hour (or other time period) rating. CIC cable should not be confused with CI cable that may also be listed to be installed in conduit.

In addition to having to select one of the protection/survivability options, designers and installers must still choose the proper type of cable when using one of the cable options (1 or 2). For example, power-limited circuits (defined by NEC Article 760)[3] can include a type FPL cable while non-power-limited circuits would require a type NFPL cable. Also, if the cable were being installed vertically from one fire area to another fire area, the cable would need a riser rating – FPLR or NFPLR. If the cable were being installed in another space for environmental air (as defined in the NEC3), the cable would need a plenum rating – FPLP or NFPLP. Interestingly, if the circuit were non-power-limited (as many voice circuits would be), plenum-rated cable (NPLP) cannot be installed in ducts and plenums as defined in the NEC. However, a power-limited circuit, such as most signaling line circuits (SLC) or initiating device circuit (IDC), could be installed in certain ducts and plenums using FPLP cable.

> NFPA 72 has some minimum provisions for survivability, and a future edition may have more; a proper survivable design and installation requires careful planning and may require features beyond the minimum code requirements.

For example, if a power-limited SLC is used to communicate between the main fire or emergency control unit and a remote set of amplifiers that provide voice notification appliance circuits (NAC) for the upper floors of a high-rise building, the circuits would require one of the five survivability options listed in 6.9.10.4.2 for protection of the circuit. If option 1 was selected, the cable from the panel to the remote amplifiers would have to be a CI-FPLR-type cable. The cable would not be permitted to be installed in conduit unless it was also listed for conduit installation. If the cable were not listed for installation in conduit, it would still need some form of mechanical protection when within seven feet (two meters) of the floor on each level between the control unit and the remote amplifiers. Alternately, a CIC-FPLR system could be used (option 2). As the riser circuit passes through the floors from one fire area to the next, the penetrations must be properly sealed.

Option 5 permits the use of non-CI-type cables or wire installed in metal raceway when the building is fully sprinklered in accordance with NFPA 13. Designers should seriously evaluate this option with respect the system performance goals and expected hazards. For example, certain spaces above suspended ceilings or in wall cavities would not require sprinklers. Installing circuits in these spaces may create the risk of a failure mode that would impact the system's mission.

Presently, each option listed in Sections 6.9.10.4.2 and 6.9.10.4.3 of the 2007 edition is treated as an acceptable alternative. However, the technical committee is considering creating a hierarchical list of survivability options. (See the sidebar on page 58.) The options would permit designers and other codes or parts of NFPA 72 itself to specify different levels of survivability for different hazards, conditions, occupancies or use groups.

Part 1 of this series also noted that the equipment must be listed to have certain survivable performance features when one its circuits is attacked by fire. There are other requirements in the code that also impact system survivability. For example, Section 4.4.5 requires smoke detection at the control unit unless the space is continuously occupied or unless the environment is not suitable for smoke detectors. This is to provide an indication that the control unit may be under attack by fire. Knowing that the control is being attacked could be important, but does not necessarily contribute to the survivability of the system for the particular mission.[4] Designers must consider possible common-mode failures, such as the failure of a control unit, and decide if additional protection of some sort should be provided to reduce the risk or if redundant controls should be considered to eliminate the common-mode failure. Section 4.4.5 permits the elimination of the smoke detection in fully sprinklered buildings. Designers should consider whether a control unit might be disabled before sprinkler operation or even by the operation of a sprinkler before the system's mission is completed.

So far, this article has focused on fire as the hazard. When designing emergency communication systems for use during disasters or emergencies other than fires, the progression and impact of those hazards must be considered. For some systems, physical and electronic security are important to ensure that unauthorized persons cannot disable the system or use it as part of their attack plan. On a military base, a wide area communication system might have to remain operational even after part of it has been destroyed by a bombing. The system might have to isolate, heal or protect itself for any combination of electrical shorts, opens, grounds and even for power crossovers. A system might require multiple, secure control locations so that it remains usable even when one control location has been commandeered or if it has been attacked or rendered unusable by a chemical or radiation release.

While the current edition of NFPA 72 has some minimum provisions for survivability and a future edition may have more, a proper survivable design and installation requires careful planning and may require features beyond the minimum code requirements. Engineers should analyze and document their designs with a thorough Threat Analysis and with detailed Failure Modes and Effects Analyses (FMEA) and Fault Trees analyses.

References:

1 NFPA 72®, *National Fire Alarm Code*®, 2007 edition, National Fire Protection Association, Quincy, MA 2007.

2 *Electrical Circuit Protective Systems (FHIT) New Guide Information*, Underwriters Laboratories, Inc., May 14, 2004.

3 NFPA 70®, *National Electrical Code*®, National Fire Protection Association, Quincy, MA 2007.

4 "Mission Effectiveness," *Fire Protection Engineering*, Summer, 2002.

5 *Report on Proposals*, NFPA 72®, *National Fire Alarm Code*®, 2010 edition, National Fire Protection Association, Quincy, MA 2007.

Possible Survivability Options Proposed for the 2010 Edition of NFPA 72®[5]

Pathway Survivability Level 0. In Pathway Survivability Level 0, pathways shall comply with the requirements of NFPA 70® Articles 760, 770 or 800.

Pathway Survivability Level 1. In Pathway Survivability Level 1, pathways in buildings shall be fully protected by an automatic sprinkler system in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*, and with the interconnecting wiring or cables installed in metal raceways.

Pathway Survivability Level 2. Pathway Survivability Level 2 shall consist of the following:

1. 2-hour fire-rated circuit integrity (CI) cable;
2. 2-hour fire-rated cable system [electrical circuit protective system(s)];
3. 2-hour fire-rated enclosure or protected area; and
4. 2-hour performance alternatives approved by the authority having jurisdiction.

Pathway Survivability Level 3. Pathway Survivability Level 3 shall consist of one of the following:

1. Pathways in buildings fully protected an automatic sprinkler system in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*, and 2-hour fire-rated circuit integrity (CI) cable;
2. Pathways in buildings fully protected an automatic sprinkler system in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*, and 2-hour fire-rated cable system [electrical circuit protective system(s)];
3. Pathways in buildings fully protected an automatic sprinkler system in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*, and 2-hour fire-rated enclosure or protected area; and
4. Pathways in buildings fully protected an automatic sprinkler system in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*, and 2-hour performance alternatives approved by the authority having jurisdiction.


FIRE SUPPRESSION THAT WILL MAKE OTHER SUSTAINABLE BUILDINGS GREEN ... WITH ENVY.
ANSUL® INERGEN® CLEAN-AGENT FIRE SUPPRESSION. SAFE FOR PEOPLE, PROPERTY AND OUR PLANET.
If you're an architect, engineer or builder dedicated to sustainable design, INERGEN Clean Agent from ANSUL is the fire protection for you. An inert gas mixture, INERGEN puts out fires by lowering the amount of oxygen to levels below that needed for combustion yet remains safe for humans. And because it is inert, made entirely of natural argon, nitrogen and CO_2, INERGEN does its job without harming the environment. ZERO ozone depletion, ZERO global warning potential and ZERO atmospheric lifetime. For those who see green, INERGEN systems are the answer in fire protection.
We're so confident of its performance, we've given INERGEN our Evergreen Discharge Warranty as well as our Environmental Warranty. Ask for details.
www.ansulinfo.com/fpe8
ANSUL
Innovative Fire Solutions
tyco

UPCOMING EVENTS

November 2–3, 2008
2008 International Symposium on Elevator Evacuation During High-Rise Fires
Shanghai, China
Info: www.isee-sh.org

November 10-11, 2008
Hazards of Combustion Products: Toxicity, Opacity, Corrosivity and Heat Release
London, England
Info: www.intercomm.dial.pipex.com/html/events/tox08z.htm

March 18-19, 2009
Fire Safety International Conference
Melbourne, Australia
Info: www.sfs.au.com/

July 13-15, 2009
4th International Symposium – Fire Safety – Putting People First
Cambridge, England
Info: www.intercomm.dial.pipex.com/html/events/hb09a.htm

BRAINTEASER > Problem/Solution

Problem

Create fire-related anagrams for "FIRE PROTECTION," and send them to *engineering@sfpe.org*. We will publish each anagram submitted in the next issue, and acknowledge each person who is the first to submit a unique anagram.

Thanks to Jane Lataille for submitting this issue's brainteaser.

Solution to Last Issue's Brainteaser

Bob has two resistors, but their resistances are not marked on them. When they are placed in series, the resistance is 143 kΩ. When they are aligned in a parallel circuit, the resistance is 30 kΩ. What is the resistance of the two resistors?

When two resistors are placed in a series circuit, the resistance of the circuit is the sum of the resistances. Therefore:

$$R_1 + R_2 = 143k\Omega$$

The total resistance of a circuit of resistors in parallel is found by adding up the reciprocals of the resistance values, and then taking the reciprocal of the total:

$$\frac{1}{\frac{1}{R_1} + \frac{1}{R_2}} = 30k\Omega$$

Rearranging the first equation and substituting into the second yields

$$\frac{1}{143k\Omega - R_2} + \frac{1}{R_2} = \frac{1}{30k\Omega}$$

This can be rewritten as

$$R_2^2 - 143k\Omega R_2 + 143k\Omega \times 30k\Omega = 0$$

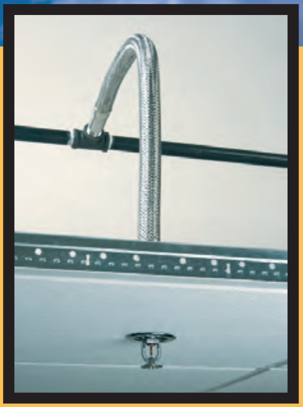
Solving provides the resistances of the two resistors – 100 kΩ and 43kΩ.

FlexHead Industries is committed to the environment and green building principles

FlexHead Industries demonstrates its commitment to sustainability by supporting LEED (Leadership in Energy and Environmental Design) principles and USGBC (U.S. Green Building Council) objectives.

Millions of gallons of water are drained from sprinkler piping every year. FlexHead products can help minimize hydrostatic testing during initial installation and eliminate the need to drain sprinkler piping during tenant fitups and/or sprinkler head relocations.

It's just one more way FlexHead helps reduce operating costs as it increases the value and sustainability of your property.



FlexHead sprinkler connections are not only environmentally friendly, but they also facilitate fast-track construction, perfect aesthetic uniformity, simplified project management and cost effective code compliance.

Flexhead sprinkler connections have been seismically qualified for use and meet all of the International Building Code (IBC) requirements without the need for an oversized ring, sleeve or adapter through the ceiling tile.

FLEXHEAD® INDUSTRIES

The best idea in sprinkler systems since water

56 Lowland Street
Holliston, MA 01746
toll-free 800-829-6975
(508) 893-9596
fax (508) 893-6020
info@flexhead.com
www.flexhead.com

FGG BM CZ SYSTEM COMPATIBLE · FM APPROVED · c UL us LISTED · LPCB · U.S. GREEN BUILDING COUNCIL MEMBER

U.S. and international patents pending: #6,123,154, #6,119,784, #6,752,218, #7,032,680, #6,488,097.

FGG/BM®, FlowGuard Gold®, BlazeMaster®, and Corzan® are registered trademarks of Noveon IP Holdings Corp.
USGBC® and LEED® are registered trademarks of the U.S. Green Building Council.

SFPE CORPORATE 100 PROGRAM

The SFPE Corporate 100 Program was founded in 1976 to provide a vehicle for business organizations to support the mission of SFPE. That early mission has evolved today to "advancing the science and practice of fire protection engineering internationally."

With the financial support of the SFPE Corporate 100 Program and the dedication of both volunteers and staff, SFPE has made great strides in defining and improving the practice of fire protection engineering. SFPE has:

- Established and continues to maintain the state licensing examination for fire protection engineers;
- Issued three editions of the *Handbook of Fire Protection Engineering*;
- Developed *Fire Protection Engineering* magazine, *SFPE Journal*, the SFPE Engineering Guide series; and
- Provided a comprehensive continuing education program for members and allied professionals.

The current members of the SFPE Corporate 100 Program are diverse in their enterprise but share the common vision of the importance of fire protection engineering to the health, safety and common well-being of society. Membership is not restricted or exclusive but is open to all organizations who wish to support the goals of SFPE. Members include engineering consulting firms, equipment manufacturers, industry associations, insurance companies and other organizations valuing the accomplishments of SFPE.

The Benefits

Recognition

- Through prominent placement on the SFPE Web site with mutual Web linkage.
- Through new member announcements in SFPE's newsletter and in releases sent to the SFPE press.
- In every issue of SFPE's widely read magazine – *Fire Protection Engineering*.
- At the Annual SFPE Awards and Honors Banquet, at the annual SFPE chapter breakfast and SFPE exhibit booth displays at major industry shows.
- Through use of the SFPE Corporate 100 Member logo.
- Through the public receipt of an SFPE Corporate 100 plaque demonstrating support to the fire protection profession.

Information and Referrals

- Free library copies of SFPE publications.
- Annual access to the SFPE chapter Presidents' contact information.
- Listing on the referral and recruitment portions of the SFPE Web site.
- Referrals from phone inquiries to SFPE.

Leadership

- Through periodic leadership summits on issues of concern to the industry.

Please add my organization to the SFPE Corporate 100 Program Membership.

❑ Benefactor $5,000 ❑ Patron $2,500 ❑ Member $1,500 ❑ Small Business Member* $750

*Limited to firms with fewer than 10 full-time employees.

❑ Check enclosed ❑ Bill me ❑ Credit Card – Call 301-718-2910, ext. 101

Name: ______________________________ Title: ____________

Organization: ______________________________

Street: ____________________ City: ______________ State/Province: _____

Zip/Postal Code: ________ Country: ________ Phone: ______________ Fax: ____________

e-Mail: ____________________

They share my passion for perfection.

Design is about choices. But when it comes to fire protection systems, I don't cut corners and I don't make compromises. That's why I choose Viking. Precision engineered, dependable and durable, I trust Viking to protect my buildings and my reputation. With the most advanced testing facilities of any sprinkler manufacturer, Viking products are engineered to the industry's highest standards. That's another reason they earn the right to be installed in my buildings. Best of all, Viking gives me flexibility. Whether it's sprinklers that are nearly invisible when I need an aesthetic solution, or products that make the most of a limited water supply, Viking makes it all possible. After all, that's not just a sprinkler system over my head, it's my reputation.

800-968-9501 • 269-945-9501 • www.vikinggroupinc.com

design

Trusted above all.™

VIKING®

CASE STUDY

GAMEWELL-FCI

Oklahoma Blood Institute Banks On Gamewell-FCI

Gamewell-FCI
12 Clintonville Rd.
Northford, CT 06472-1653
203.484.7161
www.gamewell-fci.com

As the United State's tenth largest non-profit regional blood center, the Oklahoma Blood Institute's (OBI) operations are comprised of 15 campus-style locations of laboratories, donor centers and a main headquarters, spread throughout Oklahoma.

"It's not a campus in the true sense. There are a number of different locations and each could be considered a campus unto itself," said Rodney Stamps, CEO of STAMPSCO, a local distributor of Gamewell-FCI fire alarm products.

The OBI facilities required an innovative fire alarm solution with remote monitoring and easy expansion capabilities. "We wanted a system that satisfied our needs for voice evacuation and mass notification. Ease of use was another requirement and we wanted all locations to be networked," says Jerry Martinez, Safety Officer for OBI.

Taking into account OBI's future growth and technology needs, STAMPSCO went with Gamewell-FCI's E3 Series® line of emergency evacuation products. Its distributed communication control with Style 7 wiring, makes the E3 Series a more "survivable system".

The system's broadband technology also has the bandwidth to enable split-second performance with no delays while delivering clear, intelligible communications.

Only two-pair of copper wires or fiber-optic cables are required for networking of a complete E3 Series system of panels and nodes. This exclusive feature reduced costs and minimized the impact of wiring on OBI's retrofit areas.

For remote monitoring, a FocalPoint® graphic workstation, manufactured by Gamewell-FCI, was installed. Configured with site-specific graphics, this desktop PC provides information on the whole fire alarm network. Its intuitive interface allows users to easily monitor remote site activity and a history log of events, plus link to multimedia files (text, audio, video, and bitmaps).

Future plans call for a "FocalPoint Mobile" wireless tablet PC that works in tandem with FocalPoint desktop stations. FocalPoint Mobile allows facility managers, security personnel and emergency responders to quickly evaluate emergency incidents while on the go.

"With the success of the installations, we feel confident that we're providing OBI with the highest level of quality and protection available," said Stamps.

GRICE ENGINEERING

Grice Engineering, Inc. Provides Custom Engineered Solutions at Chicago O'Hare International Airport

The Soffi-Steel® System,
division of Grice Engineering, Inc.
121 E. Burbank Ave.
Janesville, WI 53546
800.800.3213
www.soffisteel.com

The elaborate reconstruction and infrastructure improvements at Chicago O'Hare International Airport have been a multistage process. Upon considering the life and fire safety needs existing in Terminal 2, several unique challenges quickly became apparent.

Original design of the fire sprinkler system retrofit entailed a complicated gridlock of piping and strategically placed sprinkler heads. While this plan was well thought out, designers soon agreed that a more simplistic sprinkler system layout would be equally adequate.

Great Lakes Plumbing & Heating Co. of Chicago, IL, was selected to provide installation of the wet system, Schedule 40 sprinkler pipe. They quickly realized that proper activation and aesthetic appeal could create future issues. A dually effective solution soon materialized.

The staff of Great Lakes Plumbing & Heating Co. had previously dealt with similar concerns and achieved successful project completion with the **Soffi-Steel® System** offered by Grice Engineering, Inc.

When Jack Grice, P.E., President of Grice Engineering, Inc., first spoke with Brian Conway of Great Lakes Heating & Plumbing Co., innovation and flexibility took precedence. Several more conversations and job site visits ensued prior to configuring a uniquely customized Soffi-Steel® System.

The Soffi-Steel® System provided was tailored to adapt to the heat collection needs as posed by the sprinkler system layout. The modifications made to the Soffi-Steel® System insured the sprinkler systems would be properly triggered in the instance a fire occurred.

The flexibility and adaptability of the Soffi-Steel® System supplied an uncomplicated installation and exceeded the expectations of the Airline Parties Construction Representative working with Carl Barone, Project Manager for Great Lakes. According to Barone, "Our clients have been impressed; and it's (the Soffi-Steel® System) been simple to install."

Although the reconfigurations to Terminal 2 have been challenging, Grice Engineering, Inc. supplied a 'first-class' solution that contributed to the fire and life safety measures O'Hare International Airport affords to the millions of passengers traveling yearly.

SIMPLEXGRINNELL

SimplexGrinnell Introduces New Technologies to Streamline the Fire Alarm System Commissioning Process

SimplexGrinnell is taking a step forward in fire alarm system commissioning with the introduction of two new products – a diagnostic instrument that can provide early identification of potential problems and a software advancement to make required system inspection simpler and more accurate.

"Based on voice-of-the-customer feedback from contractors, engineers, building owners, local fire officials and technicians, SimplexGrinnell is offering the life-safety industry important new tools and technologies that can simplify the commissioning of fire alarm systems and support the timely issuance of occupancy permits," says Dave Baer, vice president of Marketing.

Simplex® TrueSTART™ Analysis and Testing Instrument

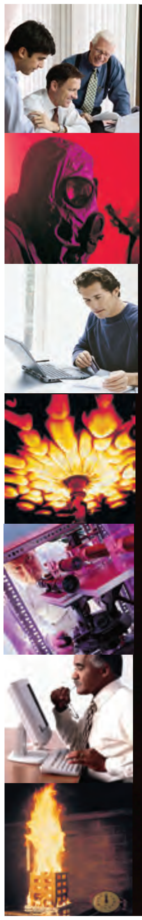
The new Simplex TrueSTART (System Technical Analysis and Readiness Testing) instrument is a portable, hand-held diagnostic tool that can simplify and expedite the commissioning process for Simplex fire alarm systems. The TrueSTART instrument enables contractors or technicians to quickly verify that wiring and peripheral devices are installed correctly and operating properly – even before the system wiring is connected to the fire alarm control panel. Battery-operated and simple to use, the TrueSTART instrument uses advanced software technology to scan hundreds of addressable fire alarm system devices and pinpoint potential problems, such as ground faults, shorted wiring, or incorrect or duplicate addressing.

Simplex® 4100U Fire Alarm System Inspection and Testing Software

With an important software enhancement to its flagship Simplex 4100U fire alarm system, SimplexGrinnell offers a new way to streamline the inspection and testing process – and help ensure that the report is complete and accurate. The new technology enables a Simplex 4100U system programmer to create a downloadable report that mirrors the Inspection and Testing Form prescribed in *NFPA 72®*. What's more, the report is prepopulated with a listing of all system devices – and their specific address and building location.

For more information, visit *www.simplexgrinnell.com* or call 800.746.7539 in the U.S. or 800.565.5400 in Canada.

SimplexGrinnell LP
50 Technology Dr.
Westminster, MA 01441-0001
800.746.7539
www.simplexgrinnell.com



BURN TO LEARN

Fire Protection Engineering at Maryland

- only ABET accredited program in the nation
- subject areas (*analytical structural fire protection, fire assessment methods fire dynamics, fire modeling, fire risk analysis, fire suppression, forensic fire analysis, performance based design, smoke detection and management, toxicity evaluation and analysis*)
- world-class faculty are foremost experts in fire protection engineering

Online Graduate Program Highlights

- completely web-based
- no thesis/research requirement
- 10 courses to complete a Master's degree
- 4 courses for a highly focused Graduate Certificate
- individual graduate courses are available
- GRE not required for admission
- faculty available via e-mail, chat sessions, teleconferences
- online library and full technical support available to all students

Apply by November 3 for classes starting December 1...

www.oaee.umd.edu/fire_careers

UNIVERSITY OF MARYLAND
A. JAMES CLARK
SCHOOL OF ENGINEERING

1

New Residential Sprinklers

Globe Fire Sprinkler Corp. announces its new Model GL5610, 155°F., 5.6 "K" factor residential sprinkler in both pendent and 1/2-in. adjustable recessed-pendent style. When used in NFPA 13 systems, the GL5610 can obtain a 0.1 design density at low pressures. It is UL- and CUL-Listed for room sizes ranging from 12 x 12-ft. to 18 x 18-ft. Available in factory bronze, chrome, white or black polyester, and other finishes.

www.globesprinkler.com
—Globe Fire Sprinkler Corp.

2

Silicone Sealant Joins System Compatible Program

The Lubrizol Corporation announces that Pensil® 300 Silicone Sealant from Specified Technologies, Inc. (STI) is chemically compatible with FlowGuard Gold®, BlazeMaster® and Corzan® CPVC piping systems and has been added to FGG/BM/CZ™ System Compatible Program. Pensil 300 (*www.stifirestop.com*) is approved for use in many through-penetration firestop systems involving a variety of different penetrating items, including CPVC piping. The sealant is available in 10.3-ounce tubes, 20-ounce sausages and five-gallon pails.

www.systemcompatible.com
—The Lubrizol Corporation

3

Plug-In Transformer Protection

The new HPTCOVER protective enclosure for AC plug-in transformers helps security installers avoid accidental system shut-downs. It mounts over any duplex wall receptacle and can be screwed shut to ensure the transformer remains securely affixed to the outlet. Designed with easy installation in mind, the HPTCOVER features three half-inch conduit knockouts in the bottom and back, which allow the low-voltage wire to exit easily to the alarm panel.

www.honeywellpower.com
—Honeywell Power Products

4

Vault Sound Alarm System

Potter announces the new UL-Listed VSA-2 Series Vault Sound Alarm System, used for detecting noise within reverberant and nonreverberant vaults. The more-compact and easier-to-install VSA-2 Series is a direct replacement to the older Potter model VSA. It has an on-board accumulator, a sensitivity pot, the ability to balance the system with the push of a button and other installer-friendly features. The VSA-2 Series is a 12VDC device that can be powered by the alarm panel.

www.pottersignal.com
—Potter Electric Signal Company

When Failure is Not an Option...
DEPEND ON LIFELINE® TO PROTECT CRITICAL CIRCUITS
Support emergency evacuation and crisis control with qualified fire rated critical circuit cables. Lifeline cables will protect power, communications and notification circuits against attack by fire or physical damage providing real time system operation during evacuation and crisis resolution.
Lifeline products are manufactured with ceramification technology to produce two hour fire rated cables qualified to the most demanding standards. This results in the best and most economical method of protecting critical circuits against attack by fire and physical damage. Lifeline is your solution for high risk locations (for example dormitories, high rises, health care facilities, places of assembly and underground transits), and for your essential building functions when **Failure is Not an Option**.
For more details and an informative fact sheet, plus video of the UL burn test, visit
www.drakausa.com/lifeline
or call your Lifeline Representative
800-333-4248 ext 2600
• Code Compliant
• RoHS Compliant
• UL/CSA/ULC Approved
lifeline Cables
Draka
Draka Cableteq USA • 800.333.4248 ext. 2600 • www.drakausa.com/lifeline

Sales Offices

HEADQUARTERS
Fire Protection Engineering
1300 East 9th Street
Cleveland, OH 44114-1503
216.696.7000, ext. 9566
fax 216.696.9441

NORTHEAST
Chris Cheney *District Manager*
110 Frost Avenue
Red Bank, NJ 07701
732.741.0012
fax 732.741.0024
christopher.cheney@penton.com

NORTH CENTRAL/SOUTHEAST
Joe Dahlheimer *District Manager*
745 Damon Drive
Medina, OH 44256
216.696.7000, ext. 9279
fax 216.696.3432
joe.dahlheimer@penton.com

CENTRAL/WEST
Alan Ring *District Manager*
16815 Von Karman Avenue, Suite 150
Irvine, CA 92606
949.838.2187
fax 913.514.7245
alan.ring@penton.com

FIRE PROTECTION Engineering

Index of Advertisers

CORPORATE 100 SFPE

Corporate 100 members in red

FIRE PROTECTION Engineering

Fire Protection Engineering (ISSN 1524-900X) is published quarterly by the Society of Fire Protection Engineers (SFPE). The mission of *Fire Protection Engineering* is to advance the practice of fire protection engineering and to raise its visibility by providing information to fire protection engineers and allied professionals. The opinions and positions stated are the authors' and do not necessarily reflect those of SFPE.

Editorial Advisory Board

Carl F. Baldassarra, P.E.,
Schirmer Engineering Corporation

Don Bathurst, P.E.

Bob Boyer,
Edwards Systems Technology

Thomas C. Brown, P.E.,
Rolf Jensen & Associates

Russell P. Fleming, P.E.,
National Fire Sprinkler Association

Morgan J. Hurley, P.E.,
Society of Fire Protection Engineers

William E. Koffel, P.E.,
Koffel Associates

Jane I. Lataille, P.E.,
Los Alamos National Laboratory

Margaret Law, M.B.E.,
Arup Fire

Edward Prendergast, P.E.,
Chicago Fire Dept. (Ret.)

Warren G. Stocker, Jr.,
Safeway, Inc.

Beth Tubbs, P.E.,
International Code Council

Personnel

Executive Director, SFPE
David Evans, P.E.

Technical Editor, SFPE
Morgan J. Hurley, P.E.

Account Manager
Christy Barksdale, Penton Custom Media

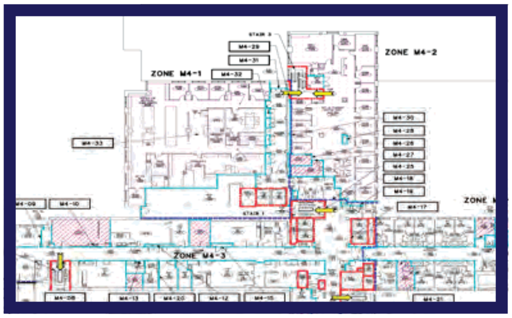
Art Director
Greg Kiskadden, Penton Custom Media

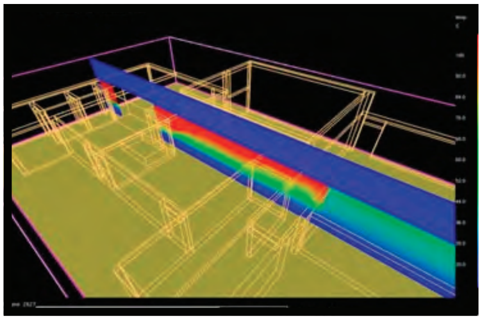
Production Manager
Shaun Kelly, Penton Custom Media

SFPE

Penton Custom Media
Branded Content. Turnkey Solutions.

KOFFEL ASSOCIATES, INC.





FIRE PROTECTION ENGINEERS

CODE CONSULTANTS

KOFFEL ASSOCIATES, INC.

Maryland Office:
6522 Meadowridge Rd,
Suite 101
Elkridge, MD 21075
Phone: 410-750-2246
Fax: 410-750-2588
Email: info@koffel.com

WWW.KOFFEL.COM

Connecticut Office:
81 Pennsylvania Ave
Niantic, CT 06357
Phone: 860-739-1886
Fax: 860-691-1123
Email: jlathrop@koffel.com

CORPORATE 100 SFPE

koffel associates, inc.

FIRE PROTECTION ENGINEERS CONSULTANTS

GET RID OF THEM WITH A QUELL™ DESIGNED FIRE SPRINKLER SYSTEM!

No Antifreeze!

Quell designed fire sprinkler systems use ceiling-only coverage to "surround and drown" fires when they happen. Here are some of the reasons you should look into Quell:

- In-rack sprinklers are easily damaged. **Avoid costly cleanup, repair and down-time** with ceiling-only coverage.
- In-racks limit your storage flexibility. You can increase your storage array designs and quickly rework your floor plan to meet your storage needs and **increase your profit**.
- In-racks are more labor-intensive and costly to install than ceiling-only protection. If you're looking into a new system, **save labor and materials costs** by protecting yourself from overhead!

Designed for cold storage and unheated warehouses, the Quell fire sprinkler system is the latest evolution in fire protection. These systems provide for the protection of high-piled storage including single, double and multiple-row rack storage as well as palletized and solid-piled storage.

- Class I, II & III commodities can be protected up to 40 feet high storage / 48 feet building height
- Group A commodities can be protected up to 30 feet storage and 35 feet building height

Components manufactured by Tyco are backed by the industry's best 10-year limited warranty. Call 1-800-381-9312 to speak with one of our cold storage specialists or visit www.tyco-fire.com today.

tyco 10 YEAR LIMITED WARRANTY

IARW® International Association of Refrigerated Warehouses

Quell™ FIRE SPRINKLER SYSTEMS

© 2008 Tyco Fire & Building Products. 451 N. Cannon Avenue, Lansdale, PA 19446