FIRE PROTECTION
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How Property Insurance Companies Prepare for Major Losses

Mass Notification Systems: Design Challenges for the FPE

Planning for Disasters

SFPE Technical Priorities for the Future

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From the TECHNICAL DIRECTOR

Fire Protection Engineering in Japan

Japan is joining many countries in requiring engineers to be authorized by the government in order to design buildings. Beginning in November 2008, architects, structural engineers, mechanical engineers and electrical engineers are required to be authorized by the Japanese government in order to design buildings that exceed defined heights and areas. To become authorized, the design professional is required to have a minimum of five years' experience after graduation and pass an examination.

The requirement for government approval of building designers was instituted in the wake of a scandal that involved substandard earthquake-resistant designs of building structures. A Japanese architect was found to have designed dozens of buildings to withstand earthquakes with a magnitude that was lower than required by Japanese regulations.[1] The architect also falsified data relating to the earthquake resistance of his designs to make it appear that they were sufficient.[2]

The architect claimed that he prepared the inadequate designs in response to pressure from his client, a construction company. In the end, the occupants of the substandard buildings were forced to vacate their properties over safety concerns.

In response to this scandal, the Japanese government instituted the requirement for approval of certain design professionals. However, fire protection engineering is not among the professions for which practitioners must be authorized.

The Japanese chapter of SFPE is working to have fire protection engineers qualified in Japan. Indeed, the Japanese chapter was established in 2002 with this objective in mind. Ultimately, the Japanese government will have to take action to institute a credentialing program for fire protection engineers (akin to licensing professional engineers in the United States). The members of the Japanese chapter felt that the Japanese engineers would have a better chance of success if they organized under the banner of an association such as SFPE.

The chapter plans to use the media to spread messages about the importance of fire protection engineering and the importance of having competent practitioners. This strategy is very similar SFPE's current public awareness efforts. The ultimate goal of the Japanese chapter's media campaign is to encourage the Japanese government to begin credentialing fire protection engineers.

The challenges that face fire protection engineers in Japan are not unlike those that face or have faced fire protection engineers in other countries. For example, licensure as a fire protection engineer was not available on a national basis in the United States until 1981, even though the profession had been established many decades earlier.

As a fundamental matter, it is important to have all engineers who design aspects of buildings that could affect public health, safety and welfare to do so in a competent and ethical manner. Adoption of a formal approval program of fire protection engineers by the Japanese government will ensure that the engineers who work on building design projects provide the safety expected by the public.

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

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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.

Dear Editor,

I would like to thank you for publishing Chris Jelenewicz's article "After 100 Years of Engineering Licensure, What's Next?" The article addresses many of the topics that are on the minds of P.E.s. I would have liked to read the author's view of the industry exemption for engineers. This exemption allows non-P.E.s to produce engineering drawings, specifications, etc., for industry. For example, it does not make sense to allow non-P.E.s to design vehicles while the road the vehicle is driven must be designed by a P.E.

ABET is helping engineering colleges teach relevant, real-world material. But the skills needed to protect the health, safety and welfare of the public are to be learned through experience.

I took and passed the electrical P.E. exam in 2000. Unfortunately, the P.E. exams I have taken did not test practice-related applications. The exam covered many different categories of electrical engineering with only a couple of questions in each category. The problems on the P.E. exam were questions relating to material I studied as an undergraduate. Very few questions related to real-world applications. This helps explain why first-time examinees with less than four years of experience in Nevada have higher pass rates than first-time examinees with four or more years of experience.

In my opinion, the P.E. exam did not adequately test the engineering skills needed to protect the health, safety and welfare of the public. It appears the NCEES is trying to make the electrical P.E. exam more specific and less broad. This is a step in the right direction. The electrical P.E. exam has changed format and is now all multiple choice. The electrical exam now has a common breadth exam and the examinee now chooses one depth exam (of three offered).

The fire protection exam is not broken into two separate exams. Should examinees be required to have four years of experience before taking the P.E. exam? Yes, but the P.E. exam should contain real-world-related problems that test the skills necessary to protect the health, safety and welfare of the public. The exam should offer the different depths for each field of engineering because disciplines such as electrical engineering are too diverse to be covered with one or even three depth exams.

I do not feel examinees without experience are qualified to take the P.E. exam. ABET is helping engineering colleges teach relevant, real-world material. But the skills needed to protect the health, safety and welfare of the public are to be learned through experience.

Thanks again for a great article. And thanks for having such a wonderful magazine. I love the style, layout and even the quality of the paper it is printed on.

Best regards,
Michael Chow, P.E.
Metro CD Engineering, LLC


5:30am
San Diego, CA Room 523
Please Do Not Disturb.

By Paul M. Fitzgerald, P.E.

The tragedy of September 11, 2001, raised the awareness of the entire engineering community of both the strengths and weaknesses of current fire protection engineering codes, standards and design practices. A healthy debate has been ongoing in the building code communities for the past several years over the "appropriate" level of safety that should be incorporated in both new and existing buildings to assure realistic occupant and first responder safety. This debate, like many other post-disaster code and standards debates, is as much concerned with cost-effectiveness as with the appropriateness and reliability of the technical solutions being proposed to address new performance requirements. Like those previous debates, this current debate is likely to continue for some time into the future – and for the same reasons: the incomplete scientific data and models needed to codify final engineering and code decisions.

Regrettably, many of today's fire protection engineering practices originated because of some prior disastrous fire or explosion. Catastrophic fires, from as the Triangle Shirtwaist fire in the early twentieth century to a fire in a "non-combustible" steel-frame automobile parts assembly building and the numerous post-World War II warehouse disasters, always triggered empirical testing into causal factors and the best way to prevent future similar fires. This research, while valuable for developing immediate answers to understanding what happened and how to minimize the chances of a similar occurrence, was often too specific to the occurrence to address other, slightly different situations. Exploration of fundamental human factor and/or technical matters that involved basic or fundamental research was often put on the shelf, and empirical solutions, rather than scientifically based solutions, dominated fire protection engineering practice for most of the twentieth century.

History shows that a major underlying contributor to most fire disasters is the continuous change in the environments in which people live and work. Construction technologies and building usage and occupancy are always on the move. In buildings designed to prior code requirements, the fire protection, which was designed for specific uses, becomes inappropriate or inadequate for a new use. Societal acceptance of an undefined, but seemingly acceptable, level of safety becomes a design goal. When a major fire occurs, the results are a "surprise" to everyone. In many cases, history repeats itself and new, empirical solutions are developed to address a single, particular situation.

In today's world, rapid change is inevitable. As a result, surprise disasters are inevitable, and therefore, some level of empirical testing and research to resolve the immediate issues from major fire incidents will probably always have a place in the fire protection world. That said, total reliance on empirical solutions is usually expensive, limited to a particular application and, least beneficial of all, unlikely to be applicable to future changes. Today, design approaches based on scientific and fundamental research aimed at providing a better understanding of potential catastrophic fire exposures should be more cost-effective and provide longer-lasting, adequate levels of safety.

The development of performance-based codes and standards is raising the engineering practice bar to a higher level than previously required. Performance-based codes and standards also require better understanding of underlying scientific principles, and the continuing development of supporting data and verified models has to accompany this sea change in engineering practice. While the need for this higher level of scientific understanding of physical and human factor phenomena is obvious, progress in developing such data and tools has been slow. To continue to move ahead apace with demands of engineering practice, the limited financial and scientific resources currently available must be expanded.

There are reasons to be somewhat optimistic about the future of scientific research. In the last three decades of the last century, new scientific tools and testing protocols have been used in direct support of engineering practice. There is growing, worldwide interest in scientific fire research, partially offsetting the loss of the previous generation of trailblazing scientists in North America and the United Kingdom. Finally, with an ever-increasing rapid rate of change, businesses have recognized that a significant fire or other disaster could result in loss of market share or a slowdown in their basic technologies.

Many of the world's most successful businesses support fundamental research in the specific technologies used in developing their products and services. As such, businesses are aware of the importance of fundamental research in developing new, practical technologies. The fire protection world must also increase the awareness of the importance of fundamental research in preventing future disasters and developing new and/or improved products designed to mitigate incipient problems driven by technology change. It is up to us the professional engineers in the realm of fire protection, to take the lead in raising this awareness and the financial support needed to make new, innovative programs successful.

Paul Fitzgerald is formerly with Factory Mutual Research (now FM Global).

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Releases of New Topical Fire Reports

The Department of Homeland Security's United States Fire Administration (USFA) recently released several special reports as part of its Topical Fire Report series.

Three of the reports, ***Fire Risk in 2004, Fire Risk to Children in 2004*** and ***Fire Risk to Older Adults in 2004***, examine the risk of death or injury from fire by various demographic, geographic and socio-economic characteristics. The reports explore factors that influence risk and are based on 2004 data from the National Fire Incident Reporting System (NFIRS), the National Center for Health Statistics (NCHS) and the U.S. Census Bureau. These reports are an update of the previous fire risk reports issued in December 2004.

"Because of limited cognitive and physical abilities, very young children and older adults face a greater risk of dying in a fire," says United States Fire Administrator Greg Cade. "The U.S. Fire Administration has developed fire safety campaigns targeted at high-risk groups. These campaigns provide awareness to parents and caregivers, and aid in reducing the risk of fire death and injury."

Another report, ***Civilian Fire Injuries in Residential Buildings in 2005***, examines the causes and characteristics of civilian fire injuries occurring in residential buildings. Nearly three-quarters of all civilian fire injuries occur in the home. In 2005, there were an estimated 13,375 civilian fire injuries resulting from an estimated 376,500 residential building fires. Thirty-nine percent of residential building fire injuries occurred while victims were trying to control the fire. An additional 23 percent of civilians were injured when trying to escape; another 11 percent happened while victims were sleeping.

For more information, download the reports at *www.usfa.dhs.gov/statistics/reports/index.shtm.*

Theme Announced for Fire Protection Week 2008

Since 1922, the National Fire Protection Association (NFPA) has sponsored a fire prevention campaign each October to raise the public's awareness about the importance of fire safety. The theme for 2008 will be "It's Fire Prevention Week – Prevent Home Fires!"

In the United States, eight out of 10 people killed in a fire die in one that has occurred in a home. The two leading causes of home fires are cooking and heating equipment. Fires that involve smoking materials and heating equipment are the leading cause of home fire deaths. During the week of October 5–11 and throughout the month, the public is urged to take steps to protect themselves and their homes by learning about how to prevent home fires and taking action.

NFPA's newly launched 2008 Fire Prevention Week Web site (see below) offers safety tips, statistical information and many other resources. Materials can be used by anyone interested in learning about how to prevent home fires or looking for resources to help teach others.

For more information, go to *www.firepreventionweek.org.*

How Property INSURANCE Companies Prepare for Major Losses

By John Frank, P.E.

Property insurance companies are exposed to major losses in the form of fire, business interruption, boiler machinery breakdown, natural catastrophe and terrorist attacks. Major fire loses are now exceeding the billon-dollar mark and natural catastrophe losses can be in the billions of dollars. It is obvious that insurance companies need to prepare themselves to deal with these losses.

Such preparation takes the form of engineering measures and underwriting measures. The fire protection engineering community should understand the underwriting measures because the insurance underwriting community is an important stakeholder in a fire protection design. The new SFPE online course, *Introduction to Fire Risk Analysis,* does an excellent job in describing the insurance company as a stakeholder.

Common underwriting measures include:

- Deductibles
- Limits
  - Loss estimate line guides
  - Individual risk total insured value (For the purposes of this paper, a risk is a facility such as a factory, hospital or chemical plant.)
  - Policy
- Reinsurance
  - Treaty
  - Facultative
- Structured programs
  - Layered
  - Proportional share
  - Combinations thereof

Each of these programs is discussed below.

DEDUCTIBLES

Like a homeowner's policy, commercial and industrial facilities will have a deductible. These deductibles serve several functions, such as the avoidance of "trading dollars" on nuisance fires or mechanical breakdowns, encouraging loss-prevention measures, risk-sharing with the insured and premium savings for the insured.

When a business says that they are self-insured, they usually mean that they have a large self-insured retention. From a loss prevention engineering perspective, a self-insured retention is essentially a very large deductible. If a loss exceeds the self-insured retention, there is usually some type of insurance in place to avoid catastrophic losses to the business.

The level of deductible is dictated by many factors, not the least of which is how large of a loss the insured can sustain before there is an adverse effect on the operating results or, worse yet, to their stock value. If the insured has excellent loss prevention and control programs, they may be able to save money by accepting a higher deductible, relying on their loss prevention and control programs to minimize the losses that they must fund themselves. Conversely, a customer with a high frequency of minor fires or high normal loss expectancies (NLEs) may need to accept a higher deductible to be attractive to the underwriting community. With respect to fire, the definition of a normal loss expectancy is a loss from a common ignition scenario where the elements of the fire protection system function as intended.

LIMITS

Loss estimate line guides tell the underwriter the maximum estimated loss they can accept for a given risk. This is usually based on the inherent features of the occupancy, construction factors and the quality of the occupancy from a fire protection standpoint. Other factors, such as susceptibility to mechanical breakdown, are also considered, but these are not discussed further in this article. Given an occupancy with low inherent susceptibility to fire and excellent fire protection, an underwriter can accept a higher loss estimate.

For example, a $1 billion hospital has a probability that it could suffer a $100 million fire loss, and a $1 billion oil refinery also presents the probability that it could sustain a $100 million fire loss. While both occupancies could experience a loss of the same magnitude, the probability that it will occur in the refinery is much higher than in the hospital. As a result, the underwriter will risk more money on the less "risky" occupancy – the hospital.

Individual risk total insured value limit is another line guide item that reflects the maximum total insured value (TIV) that an underwriter can insure for a given risk under a given set of circumstances. The total insured value is not just the value of the property itself, but also the revenue lost to business interruption that results from the loss of the property. For example, a facility with limited fire protection may be eligible for $100 million in coverage, but the same facility with complete and adequate fire protection may be eligible for $500 million in coverage. More-hazardous individual risks may have a lower limit than less-hazardous risks.

Policy limits are an upper cap on how much an insurance company will pay regardless of how large the loss is. This is a primary tool used by underwriters to control the ultimate amount of money they may be required to pay in any given event to prevent losses that the insurance company is not willing or able to pay.

REINSURANCE

In simplest terms, reinsurance is insurance on insurance. Reinsurers' customers are direct insurance companies. The term "direct" means insurance companies that provide insurance to a business. Reinsurers also have this type of protection available to them through retrocessions (a reinsurer who assumes reinsurance from another reinsurer). Two main types of property reinsurance are described below.

Treaty reinsurance. Treaty reinsurance tends to be purchased across an insurance company's entire portfolio. A primary insurer and a reinsurer agree that if a certain type of loss occurs, such as if a fire loss exceeds $10 million, the reinsurer will provide the agreed-upon coverage, thus limiting the primary underwriter to paying no more than $10 million. Primary insurers cannot rely on treaties to compensate for poor underwriting decision-making. If the treaty is not profitable to the reinsurers, over the long term they may refuse to continue the treaty, make the primary insurer retain a larger portion of the loss or make the treaty prohibitively expensive.

The level of deductible is dictated by many factors, not the least of which is how large of a loss the insured can sustain before there is an adverse effect on the operating results or, worse yet, to their stock value.

Facultative reinsurance. As opposed to the very broad concept of treaty reinsurance, facultative reinsurance tends to be very specific. The reinsurance may apply only to a certain account or, even more specifically, to an individual location or an individual coverage.

For example, an insurance company has a total insured value (TIV) limit of $200 million for a properly protected facility and $100 million for an inadequately protected facility. The facility is valued at $150 million and is written by the underwriter as a properly protected facility. The commodity in the warehouse is changed from a class II commodity to a class IV commodity, perhaps by introducing reinforced plastic pallets, and the sprinklers are no longer adequate. This means that the underwriter is $50 million over line. The underwriter buys facultative reinsurance to cover the $50 million.

Facultative reinsurance can also be used if the value of a facility is higher than the TIV limit, even if that facility is properly protected. For example, the same insurance company wishes to insure a properly protected facility that has a TIV of $250 million. Because the TIV limit is $200 million, the underwriter needs to purchase $50 million of facultative reinsurance to be able to inure the facility.

STRUCTURED PROGRAMS

Layered insurance programs. Insurance capacity is the amount of coverage that an insurance company is allowed to provide based on their filing with an insurance regulatory body. If, for a variety of reasons, a single insurance company cannot provide enough capacity to insure a risk, a layered insurance program may be put together. Each layer represents a specific amount of coverage. For example, a primary layer may pay the first $10 million once the loss exceeds the deductible. Then, if the loss exceeds $10 million, an excess layer will pay up to another threshold, say $100 million. If the loss exceeds $100 million, a high excess layer would pay up to another threshold, say $500 million. Beyond that, the insured would self-retain the rest of the loss over $500 million. See Figure 1.

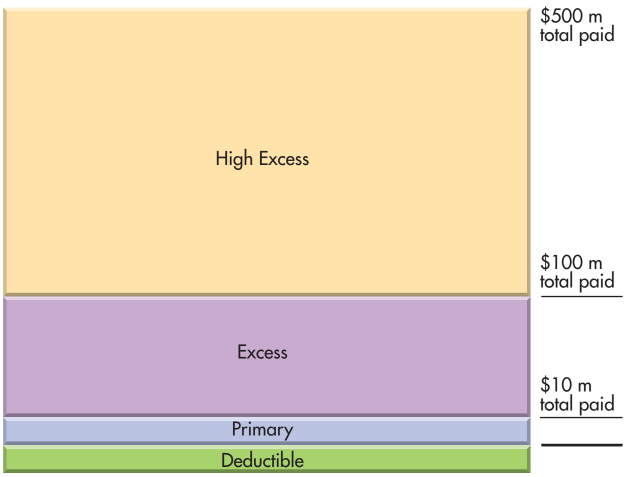

Figure 1. Structured Program – Layered

Proportional share insurance programs. Like layered programs, proportional share programs are used when a single insurance company cannot provide enough capacity. In this case, a number of insurance companies take a pro rata (or proportional share) share of the loss. A simple example is where four insurance companies each take 25% of a loss. (The four companies share the premium and the losses according to their proportional share of the program. As an example, if four companies shared equally in a $100 million insurance program, they would each receive 25% of the premium and pay 25% of every dollar of loss that might take place.) If there is a loss of $100 million, each insurance company would pay $25 million. The shares do not have to be equal. In the previous case of four insurance companies, the prorata shares could be 5%, 15%, 30% and 50%. See Figure 2.

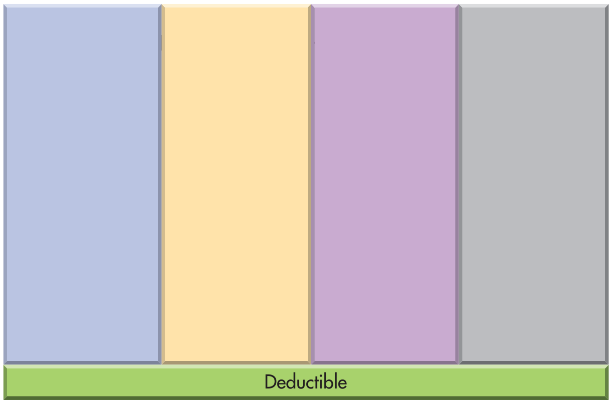

Figure 2. Structured Program – Proportional Share

Combining deductibles, layered programs and proportional share programs. Very large companies often use a combination of a high deductible, self-insured retentions, and combinations of proportional share and layered programs. See Figure 3.

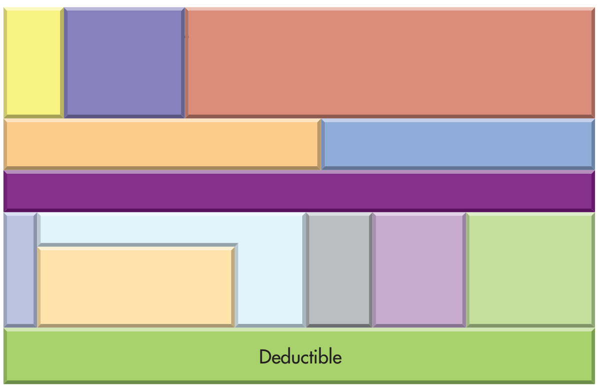

Figure 3. Structured Program – Combination

If none of the above tools are deemed adequate, a peril can be excluded altogether.

Insurance company loss prevention engineers are involved with multiple perils. The peril of natural catastrophe is often the primary underwriting screening criteria in today's marketplace. The quality of the account from a fire

protection standpoint may be secondary to the quality of the account from a natural catastrophe standpoint. Nevertheless, the quality of a facility from a fire protection standpoint is still important in the insurance marketplace, and it is in this area that the fire protection engineer can have a tremendous impact.

The term "highly protected risk" means different things to different insurance companies, but in general means that a risk meets all of the characteristics deemed necessary to protect a facility. This often includes protection that exceeds the requirements of building and fire codes and standards. Redundant protection is frequently expected. A management commitment to loss prevention is the primary requirement to qualify as a highly protected risk.

The term "highly protected risk" (HPR) has not been used in this article. Instead, the term "adequately protected" is used. Each insurance company determines what is adequate to them.

The underwriting measures described above are used to help an insurance company meet its obligations to their insureds while still ensuring that they can remain financially stable. These measures are used to prepare for all types of losses. For the remainder of this article, the focus will be on the peril of fire.

THE ROLE OF THE FIRE PROTECTION ENGINEER

With an understanding of the needs of the underwriting stakeholder, the fire protection engineer can develop designs that will meet the needs of the building owner and their insurers.

Property loss prevention engineers and property underwriters had collectively developed performance-based protection strategies to meet the needs of insurance companies long before the term "performance-based design" became popular. This connection of performance-based design to insurance loss prevention engineering was discussed by Lataille[1] when she wrote in *The Sentinel* that, "Since our founding in 1890, we have been analyzing what is needed to protect large industrial and commercial properties."

The historical insurance company approach may not have had the technical sophistication that is used in performance- based design today, but the examples below show that it was and still is a form of performance-based fire protection design, even if not recognized as such by its practitioners.

Custer and Meacham[2] have defined a seven-step performance-based process as shown in Figure 4 on page 14. Other processes have been described such as in the *SFPE Engineering Guide to Performance-Based Fire Protection*,[3] the *Life Safety Code® Handbook*[4] or in the *National Fire Alarm Code®*.[5] The intent of this article is not to detail the performance-based design process, but instead to demonstrate its link to the insurance company stakeholder.

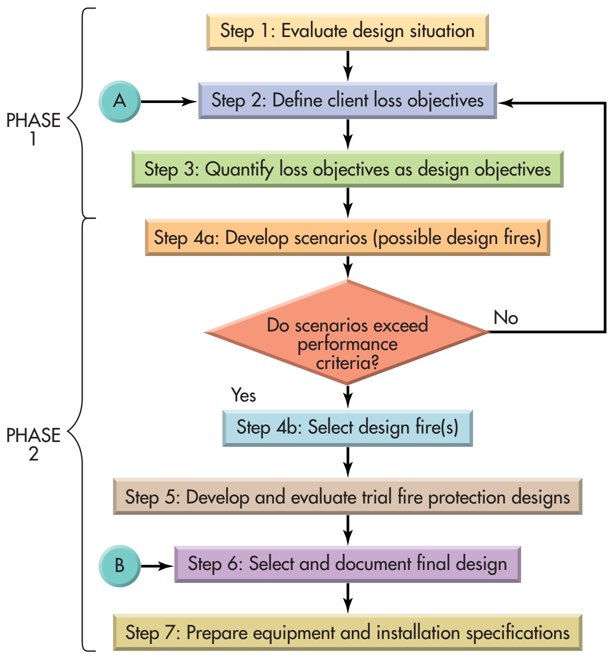

Figure 4. Overview of the Performance-Based Design Process

Step 1, the design situation with respect to the insurance company, has been discussed above. Of course, the needs of many other stakeholders and parameters must be addressed as well.

Insurance company objectives would be considered step 2 of this process.

For example, an insurance company may have as an objective that the normal loss expectancy should not exceed $250,000.

Implicitly, this means that, given a loss frequency commensurate with the implementation of management loss prevention programs, fire loss is limited to $250,000 at least 96 percent of the time.

An explicit frequency is not given; that is, there is no statement such as "no more than once every five years" or "no more than once per every 500,000 square meters of manufacturing space per year". However, industry and insured loss history is generally known, so there is an implicit understanding of loss frequency.

The 96 percent figure comes from a commonly accepted sprinkler system success rate. Different figures have been published; however, this was the commonly accepted value when this author started in the insurance industry.

Normal loss expectancy assumes normal ignition sources. Although it is expected that the prevention measures expected by the management loss control programs will eliminate many ignition sources, fires will still occur. This is a form of step 4a of the process described by Custer and Meacham.

The $250,000 figure is a representative loss tolerance established by the insurance company.

In many cases, properly designed sprinkler systems will satisfy this objective. Loss experience is usually the guide as to whether or not a properly designed sprinkler system will meet this objective. If the occupancy is particularly smoke-sensitive, has a high business interruption potential or has an extremely high value-per-unit volume, additional protection may be needed. This corresponds to step 5 of the process described by Custer and Meacham.

At this time, specific performance criteria to prevent excessive smoke damage are usually lacking. There is no agreed-upon criterion such as reducing smoke concentration to some specified value. Instead, more qualitative solutions are used such as ignition resistance of wet benches, early smoke detection, faster suppression of smaller fires, smoke control or separation. If these measures are not felt to be adequate, an underwriting solution such a proportional share policy may be used.

If the ignition frequency is too high, measures to reduce the frequency will probably be required.

In countries where sprinkler protection is not common, the lack of sprinklers is compensated for in a variety of ways. A higher normal loss expectancy may be accepted as a fact of doing business where sprinklers are not common, and a higher premium is charged to cover the higher expected loss. Stronger management loss control programs may be required to lessen the frequency of loss. Manual firefighting by occupants or industrial fire brigades may be the norm. Spot hazard protection, such as dry chemical systems, are more common. Greater reliance on passive protection may be used. Structured insurance programs may be used. Insurers will use combinations of these compensatory factors to arrive at a satisfactory outcome.

The above discussion was based on the normal loss expectancy. To address low frequency events where a more challenging scenario than the normal loss expectancy occurs, an additional example objective might be that given

an ignition with a single sprinkler system out of service, a fire loss should not exceed $100 million.

The $100 million figure in this example would be based on a line guide limit of $100 million for a system out of service scenario. Meeting this objective is most commonly achieved by the establishment of fire areas, either with space separation or with firewalls. Insurance companies expect firewalls to prevent the spread of fire without the aid of active fire protection systems such as sprinklers.

The scenario of a single sprinkler system out of service is commonly called a probable maximum loss (PML) scenario. This is similar to the Design Fire Scenario 8 established by Chapter 5 of the *Life Safety Code®*:[6]

1. It is a fire originating in ordinary combustibles in a room or area with each passive or active fire protection system independently rendered ineffective.
2. It addresses concerns regarding the unreliability or unavailability of each fire protection system or fire protection feature, considered individually.
3. It is not required to be applied to fire protection systems for which both the level of reliability and the design performance in the absence of the system are acceptable to the authority having jurisdiction (AHJ).

An even more severe scenario is the maximum foreseeable loss (MFL). In this scenario, all active fire protection is out of service, and there is no effective fire department response. This is essentially a free burn. The loss is stopped only be space separation, lack of continuity of combustibles or MFL (high challenge) walls. Maximum allowable losses are generally higher than PML allowances because an MFL is indeed a rare event.

Some insurance companies do not consider the PML at all, instead underwriting to the MFL only. Others underwrite to the PML only, limiting losses through policy limits.

Step 3 of Custer and Meacham's flowchart, quantifying the loss objective as a design objective, has not yet been discussed. In some cases, historical experience has proven the validity of a particular design that may have evolved through trial and error for a particular hazard. In a sense, the engineering performance criteria are implicitly accounted for even though not explicitly stated. Essentially, a prescriptive solution such as an extra hazard sprinkler density is applied to solve the performance need.

In other cases, specific engineering performance criteria are stipulated such as, "while using ceiling sprinklers only (no in-rack sprinklers):

- The peak ceiling steel temperature should not exceed 50°C;
- The peak air temperature should not exceed 800°C; and
- No more than XX sprinklers open,"

are used in developing sprinkler densities for warehouses. This is accomplished through full-scale fire testing. If a design meets the specified criteria, it can then be used to protect the warehouse.

Another example is designing a ventilation system to keep vapors in an industrial oven below 25 percent of the lower explosive limit.[7]

In still other cases, specific engineering performance criteria are not known and a qualitative approach is used.

Because step 3 is somewhat loosely applied by insurance companies, an argument can be made that insurance company loss prevention engineers are not practicing true performance-based design. The distinction, however, is largely a matter of semantics.

Step 4b of the process, select design fires, also has not been discussed. Custer and Meacham describe the design fire in terms of heat release rate at a given time. Currently, only ignition scenarios (step 4a) are explicitly considered. Heat release rates are implicitly accounted for by occupancy (based on loss experience and engineering judgment) but not in terms of growth to xx Megawatts in xx minutes.

OTHER RELATIONSHIPS OF FIRE PROTECTION ENGINEERING TO MAJOR LOSS INSURANCE PLANNING

The preceding discussion on designing to certain loss limits can impact several aspects of underwriting controls. For example, lower deductibles may be offered if normal loss expectancies are reduced. Or, an insured may choose to have a higher deductible or a large self-insured retention on the basis of being able to control normal losses themselves.

More robust fire protection designs will generally result in higher insurable limits. For example, a properly protected facility with only a single water supply would likely have a lower line guide limit than one with an adequate secondary water supply. If the facility exceeds the line guide limit, the cost of the secondary supply could be paid for with the elimination of the need for facultative reinsurance. This says nothing of the advantages of preventing a catastrophic loss if a fire occurs when the primary water supply is out of service.

Better-protected facilities are more attractive to underwriters. All other things being equal, this leads to more underwriters wishing to pursue the business which leads to better rates. It reduces the need for complex programs like the one shown in Figure 3.

THE ROLE OF THE FIRE PROTECTION ENGINEER IN MEETING NATURAL CATASTROPHE INSURABILITY EXPECTATIONS

Fire protection engineers not working for insurance companies are usually not directly involved in engineering designs to reduce the effects of natural catastrophes. There are, however, some areas where fire protection and natural catastrophe protection designs are related.

One common example is roof construction. In a wind- prone area, the roof may need to withstand relatively high wind uplift pressures. Uplift resistance should not be achieved at the expense of the fire classification of the roof. How can the two be in conflict? If too much adhesive is used on a metal deck roof to hold roofing material in place during high winds, the adhesive may be susceptible to ignition from a fire originating in the facility.

John A. Frank, P.E., is with XL GAPS.

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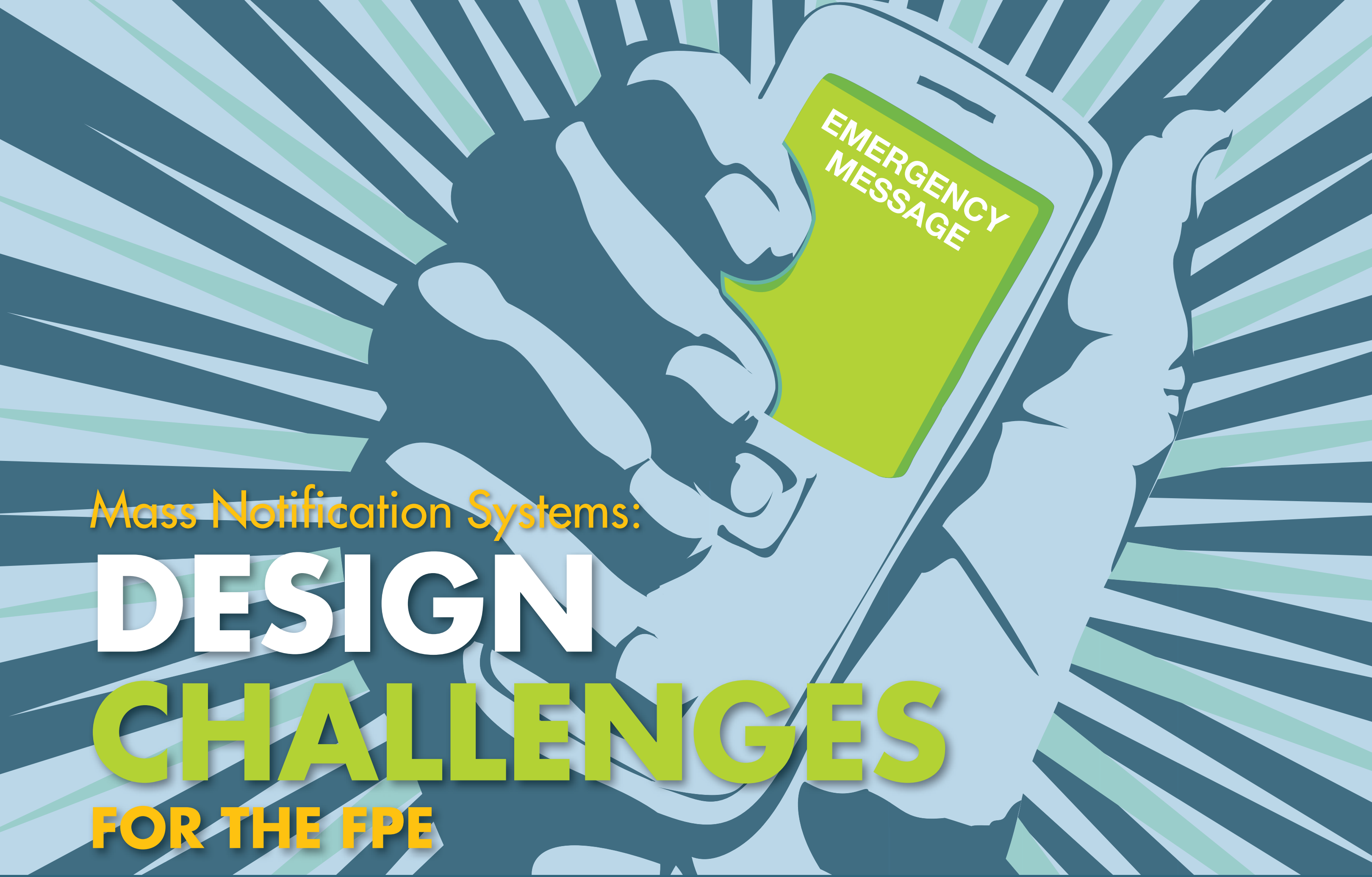

Mass Notification Systems: DESIGN CHALLENGES FOR THE FPE

By Wayne D. Moore, P.E., FSFPE

In the aftermath of September 11, and again in each of the military barracks and embassy bombings, and school, college and mall shooting incidents, it has become clear to both the general public and the engineering community that emergency communications must be provided on a much grander scale.

Emergency communication needs involving large numbers of people have generated the development of mass notification systems (MNS). The military services began investigating this concept soon after the 1996 bombing incident at the Khobar Towers complex in Dhahran, Saudi Arabia.

As a result of the military services work, the Unified Facilities Criteria, UFC 4-021-01 document titled *Design and O&M: Mass Notification Systems*[1] was created in order to provide guidance and requirements for MNS in DoD facilities. In the 2007 edition of the *National Fire Alarm Code*®,[2] the Technical Correlating Committee established Annex E to provide guidance for the interface of MNS with standard fire alarm/voice communication systems. For the first time in the history of the *Code*, the content of the Annex would permit an MNS signal to override a fire alarm signal.

The earliest form of mass notification began with telephone "trees" used by voting groups and parent-teacher groups to "get the word out" to as many people as possible. So an MNS simply provides a system used to notify a great number of people of an emergency event.

As stated in the UFC document, "Mass notification provides real-time information and instructions to people in a building, area, site or installation using intelligible voice communications along with visible signals, text and graphics, and possibly including tactile or other communication methods. The purpose of mass notification is to protect life by indicating the existence of an emergency situation and instructing people of the necessary and appropriate response and action.[1]

An MNS system can take many forms, from campus-wide text messages to student and staff cell phones, to e-mails, to voice broadcasts in open areas or buildings. For example, the Providence, Rhode Island, police can send a text message through the cell system to notify citizens of child abductions.

Typically, the fire protection engineer (FPE) will encounter MNS when designing fire alarm systems. He or she will need to ensure that the system design meets the client's needs from both a performance and economic point of view.

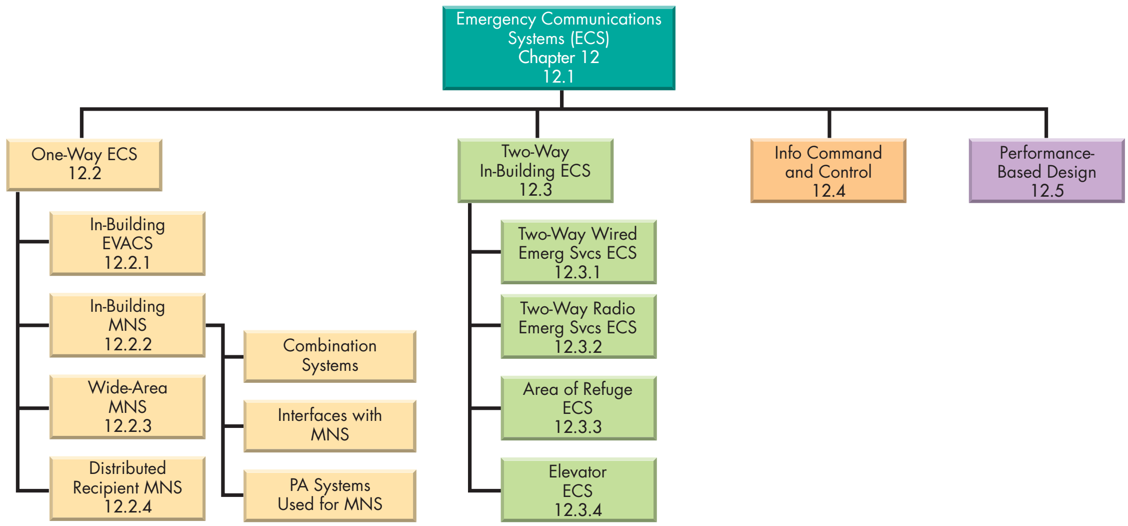

Figure 1. Proposed Emergency Communications Systems Chapter Outline

As noted in the most recent UFC, "Implementation of an effective MNS will require the coordinated efforts of engineering, communications and security personnel. Fire protection engineering personnel are needed for the successful implementation of this UFC because they bring a special expertise in life safety evaluations, building evacuation systems and the design of public notification systems."[1]

When an FPE needs to incorporate MNS with the fire alarm/voice communication system in order to deliver time-sensitive emergency information to a building or entire campus, what type of systems and procedures should a particular design use?

In order for an FPE to provide competent services in the MNS area, he or she will need to gain knowledge in the principles of sound and communications. In addition, the engineer will need to ask a few basic questions to determine exactly what the building owner expects from the MNS. The answers to these questions will help to determine what products will help assure the efficiency and reliability of the MNS.

Often, engineers get caught up in the technology of a system design and forget about the people interface. For instance, some of the questions that an FPE should ask include:

- Who will operate the system?
- Who will have control of the system?
- Who needs to be notified of the emergency?
- What is the flexibility of the system?
- How quickly must the messages be transmitted?
- Will the messages be recorded or live?
- Will visual messaging be required, such as strobes or message boards?
- Will the system be used daily for non-emergency needs or only for emergency information delivery?
- Does the system need to be designed for both current needs and future expansion?
- What levels of reliability and survivability are desired?
- Will there be interfaces required with systems other than the fire alarm/voice communication system, such as security access control?
- Does the system need to be designed so that building occupants or the fire alarm system can provide feedback to those in charge regarding their status?

Obviously, the FPE needs to remember that an MNS must operate reliably and must remain available during catastrophic events, including fire events in a building. If the MNS will consistently operate reliably, the equipment and operating software must consist of very robust components. And its design must anticipate continuous use. In addition to ensuring a reliable interface to the fire alarm/voice communication system, the MNS must remain secure from tampering or destruction by a terrorist.

The question of who will operate the system leads to another question. Should the design include strategically located "panic switches" that can trigger specific announcements in a building, while also notifying those in charge – security personnel, for example – of the emergency.

Those expected to operate or initiate the operation of an MNS must receive training in the purpose, functions, procedures and anticipated actions of the system. These individuals must have a familiarity with the equipment. If these operators must also initiate live voice messages, their training must continue through the reinforcement of regular drills in the proper use of microphones and content of the appropriate messages they must transmit. The training should include typical scenarios expected in the building or environment, such as intruders and terrorist events.

The NFPA 72® Technical Correlating Committee has established a new chapter for all communications systems, including MNS, in the proposed 2010 edition of the

National Fire Alarm Code®. This new Chapter 12 has the title "Emergency Communications Systems." It will provide guidance and requirements for all mass notification and fire alarm/voice communication systems. See Figure 1.

The content of the proposed chapter is available for review on the NFPA Web site (*www.nfpa.org*).

As stated in the "purpose" section of the proposed chapter, "The systems covered under Chapter 12 are for the protection of life by indicating the existence of an emergency situation and communicating information necessary to facilitate an appropriate response and action… An emergency communications system is intended to communicate information about emergencies including but not limited to fire, terrorist activities, other dangerous situations, accidents and natural disasters."[3]

Some of the highlights that will be important to those FPEs who will design mass notification systems include major changes on the use of fire alarm/voice systems for other uses. For example, the technical committee has proposed requirements that permit the use of code-compliant fire alarm/voice systems for routine, frequent use, such as for paging, without requiring the approval of the authority having jurisdiction. The committee has also agreed on requirements that permit mass notifications systems to use the same speakers used as alarm notification appliances on fire alarm/voice communication systems.

The present *Code* recognizes that dedicated fire alarm/voice communications systems need not monitor the integrity of the notification appliance circuits while actively in use for emergency purposes. However, the system must monitor these circuits for integrity while actively in use for nonemergency purposes. Because someone could deliberately tamper with these systems, the system designer should take steps to ensure the system will work when needed. Tampering usually attempts to reduce the output of a sound system that annoys the people it serves for background music or paging.

The FPE needs to consider the potential for tampering with the system in his or her design. Design considerations must include such things as loudspeaker accessibility and system operation. For example, the design can limit access through the use of vandal-resistant listed loudspeakers and placement of those loudspeakers in areas that will prove difficult to access, such as high ceilings (any ceiling higher than a person can reach by standing on a desk or chair). As stated in the proposed new chapter of the *Code*, "Non-emergency operation of the system should always consider that an audio system that annoys an employee potentially reduces employee productivity and can also annoy the public in a commercial environment. Most motivations for tampering can be eliminated through design and appropriate use of the system and employee discipline. Access to amplification equipment and controls should be limited to those authorized to make adjustments to such equipment. It is common practice to install such equipment in a manner that allows adjustment of nonemergency audio signal levels while defaulting to a fixed, preset level of playback when operating in emergency mode. Under extreme circumstances, certain zones of a protected area might require a dedicated emergency voice/alarm communications zone."[3]

The design of mass notification systems must ensure that other systems will not override notification appliances required to provide special fire suppression predischarge notification, including the mass notification system. As permitted in the 2007 edition of the *Code*, the local building mass notification system may have the ability to override the fire alarm system with live voice or manual activation of a high priority message only when the risk analysis criteria required by the *Code* have approved both the override and the particular message.[2]

Understanding sound and communications principles that affect the intelligibility of a voice message provides an issue many FPEs encounter in developing effective fire alarm/voice communications systems. The proposed changes to the 2010 edition of the *Code*[3] require that mass notification systems provide intelligible voice messages in accordance with ISO 7240-19, Fire detection and alarm systems — Part 19: *Design, Installation, Commissioning and Service of Sound Systems for Emergency Purposes*.[4] The *Code*[3] would also require that the system provide an alternative means if adverse conditions render the normal system messages unintelligible.

The alternative means referenced in the proposed *Code*[3] would require analysis by the FPE to ensure both the safety of the occupants and the transmission of some type of intelligible messages to those occupants during any adverse conditions. In all cases, the design must assign local building fire alarm operation the highest priority. This priority must include the fire alarm system's own voice message. No other message may override this fire alarm message except under certain circumstances, such as for emergency mass notification operation.

As one may expect, not all mass notification messages should take priority over the fire alarm messages to relocate or evacuate. The proposed *Code* suggests the development of messages using risk analysis and offers the following voice message priority suggestions:[3]

1. Live voice messages from qualified personnel on-site should be the highest priority. Systems could permit microphone locations that are usable by nonemergency personnel, but those microphones should be disabled during emergency operations.
2. Automatic fire alarm messages/other high priority messages as determined by risk analysis criteria.
3. Message priority for emergency conditions, such as severe weather warnings, gas leaks, chemical spills, and other hazardous conditions should be determined by risk analysis criteria.
4. Nonemergency messages, such as general announcements and time function signaling (work breaks, class change, etc.) should have the lowest priority.

"In multibuilding, campus, area or regional systems, local buildings could be controlled and overridden from a central control station. When the local fire alarm system is not in an alarm condition, the central control station can override without restriction. If a local system is active for any reason, the central control station should only be able to override if authorized personnel can determine the status of the local system. If the local fire alarm system is actively in alarm mode, it can only be overridden by a central control station where the interface meets all requirements of the proposed *Code*."[3] For example, one would not expect a message advising

of an impending weather event to take priority over a fire emergency.

The fire protection engineer will face many design challenges as the need for mass notification systems continues to increase. Many of these challenges will require additional training to understand the use, intelligibility and occupant reaction to sound and communication systems. This training will necessarily rise above and beyond the training presently available in the design of fire alarm/voice communication systems.

The proposed new chapter in the *National Fire Alarm Code*[3] will help in that endeavor. The FPE community should thoroughly review this new chapter during the ROP stage. The comment closing date is August 29, 2008 (5:00 PM). The fire protection engineering community should participate in the review of this proposed new chapter to ensure they understand the communication challenges of the future.

Wayne D. Moore, P.E., FSFPE, is with Hughes Associates, Inc.

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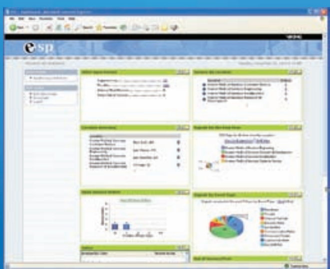

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Planning for Disasters

By Donald L. Schmidt

One can't pick up a newspaper or tune into a television news broadcast without reading or hearing a story about a fire, flood, tornado, act of violence or other "disaster." News stories, photographs and video depict the casualties and show some of the property damage. However, the long-term economic impact of the event is generally not discussed. Businesses that are unprepared to respond to an incident can suffer serious and long-term consequences. Those who are unprepared to deal with the media scrutiny following an incident can suffer additional damage – to their carefully crafted image.

Most businesses know they have to be prepared. They are aware of health and safety regulations that require employers to protect their employees, visitors, contractors and others. Property insurers may conduct surveys and make recommendations for property protection and to reduce the possibility of business interruption. Customers also ask for proof that their suppliers have plans in place. However, many businesses, particularly small- and medium- sized, are uncertain what preparedness entails.

There are many names used to describe plans – "disaster plan," "contingency plan," "emergency action plan" and "disaster recovery plan." These plans are components of what should be an integrated emergency management and busi-


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ness continuity program. A program is needed, not just plans and procedures. The program should be based on national standards – specifically NFPA 1600.[1] NFPA 1600 has been adopted by the U.S. Department of Homeland Security,[2] recommended by the 9-11 Commission,[3] recommended within Title VII of the National Intelligence Reform Act of 2004, and most recently has been referenced within Title IX of the "Implementing Recommendations of the 9/11 Commission Act of 2007."[4] NFPA 1600 is often referred to as the "National Preparedness Standard."

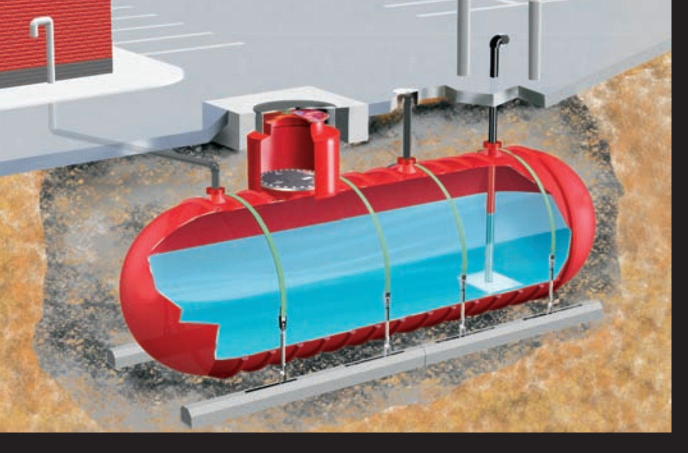
NFPA 1600 is not a "how-to guide" that provides pages of prescriptive requirements. Rather, it defines the essential elements and the relationship of those elements within an emergency management and business continuity program. This article will discuss many of these essential elements.

GETTING STARTED

Development, implementation and maintenance of an effective emergency management and business continuity program begins with management commitment. NFPA 1600, section 4.1, requires the program to include an "executive policy including vision, mission statement, roles and responsibilities, and enabling authority." This includes multiyear funding support, commitment to engage the people and resources within the organization, and direction for the program so it is consistent with the vision of the senior management team. Management should articulate its support by signing an executive policy statement and distribute it throughout the organization.

An advisory committee should be formed to provide guidance and assist with development of the program, as specified in NFPA 1600, section 4.3. The advisory committee should include representatives of all important departments of the organization. Outside agencies including fire, law enforcement, emergency medical services and emergency management agencies should be consulted. A program coordinator should be appointed to lead the advisory committee and program development activities.

Initial efforts should also include an evaluation of any existing program. This program evaluation, specified in NFPA 1600: 4.4.2, should include a review of people organized to respond to emergencies, maintain critical business functions and recovery facilities and operations. The review should also include plans, procedures and an assessment



> Risk assessment is often overlooked when plans and procedures are developed. Conducting a thorough risk assessment is important to identify hazards.

of the availability and capabilities of resources that are needed for preparedness, response, business continuity and recovery. The purpose is to build on the strengths of the existing program and prioritize actions to address identified deficiencies.

Laws and regulations that define what must be done.

Regulations that may apply include OSHA standards, building codes, fire codes, life safety codes, environmental regulations, homeland security regulations and many more. Similarly, best practices should be reviewed, such as NFPA standards and recommended practices, and professional practices for business continuity.

RISK ASSESSMENT

Risk assessment is often overlooked when plans and procedures are developed. Conducting a thorough risk assessment is important to identify hazards and the hazard scenarios that a facility or business organization may face. A risk assessment is also required by NFPA 1600, section 5.3. An understanding of the nature of a hazard, its probability of occurrence and the potential impact of the hazard on people, facilities, systems, equipment, business operations and the environment is needed to determine priorities for prevention, mitigation and plan development. Hazards that are probable, or whose impacts may be significant, should be studied further. Experts should be engaged to conduct a vulnerability analysis to identify weaknesses in infrastructure, buildings, systems and equipment.

One of the goals of the program should be to prevent hazards that can be prevented. Fire prevention, employee safety and health, security and environmental management programs all include aspects of prevention or deterrence (NFPA 1600:5.4). Recognizing that some hazards, in particular natural hazards, cannot be prevented, professionals should be engaged to identify opportunities to mitigate the impacts of these hazards (NFPA 1600:5.5). Land use practices to locate new buildings away from earthquake faults, flood zones and attractive terrorist targets are a few examples. Designing and building to withstand maximum expected wind or seismic forces can help mitigate the impacts of hurricane-force winds and earthquake-induced ground shaking.

Hazards to be considered should include:

- Injury
- Illness
- Food-borne illness (mass)
- Explosion
- Fire
- Bomb explosion
- Rescue from confined space, high angle or entrapment
- Hazardous material spill or release
- Radiological accident
- Hazmat incident off-site
- Nuclear power plant incident
- Natural gas leak
- Flooding
- Dam/Levee failure
- Severe thunderstorm
- Tornado
- Windstorm
- Hurricanes and tropical storms
- Winter storm (snow/ice)
- Tsunami
- Earthquake
- Landslide
- Subsidence/Sinkhole
- Volcano
- Labor strike
- Demonstrations
- Civil disturbance (riot)

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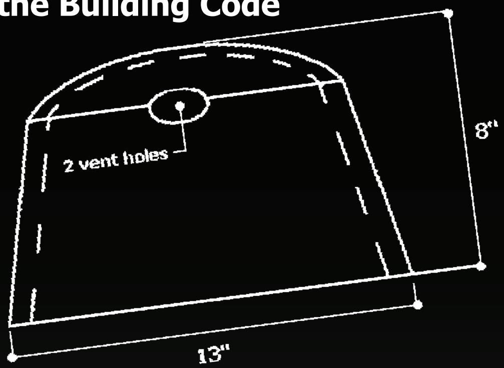

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- Resource management

Resources also include facilities, systems, equipment and materials. Fire detection and suppression systems, the means of egress system, communications and warning systems, and environmental containment systems are a few examples. Competent professionals, including fire protection engineers who can evaluate occupancy hazards and required fire protection, should be engaged. Likewise, other disciplines, including safety, security and environmental professionals, are needed to evaluate other hazards, recommend prevention and mitigation strategies, develop program components and respond when an incident occurs.

NFPA 1600, section 5.6.6, requires compilation of an inventory of resources. Periodically, an evaluation of the availability and capability of personnel, facilities, systems, equipment and supplies needed to support the program should be conducted. Outside agencies and service providers should also be evaluated to determine gaps or shortfalls.

NFPA 1600, section 5.12.1, requires that each "entity shall establish a primary and an alternate emergency operations center (EOC), physical or virtual, capable of managing continuity, response and recovery operations." The backup EOC is required in case the primary EOC is unusable or inaccessible. Many larger corporations have well-appointed EOCs, whereas small businesses can equip a conference room with additional communications capabilities and planning tools. Virtual EOCs that use telephone conferencing and computer networking capabilities now enable collaboration between staff scattered between distant offices.

PLAN DEVELOPMENT

Detailed plans for emergency response, business continuity, crisis communications and recovery should be written to define the organization, roles, responsibilities and hazard- specific actions to take when an incident occurs.

The minimum emergency response plan should include protective actions for life safety, including evacuation, sheltering-in-place and lockdown (NFPA 1600:5.11.3). Evacuation teams should be organized and plans should be developed in compliance with fire prevention and life safety codes, and OSHA regulations for scenarios including fire, bomb threats, hazardous materials spills and other hazards. Shelter-in-place plans should be developed to protect building occupants when there is an exterior airborne hazard, such as a hazardous materials incident or act of terrorism. Lockdown procedures should be established to protect occupants when there is a security threat outside the building or when there is a security threat such as an armed perpetrator within a building.

Information gleaned from the risk assessment and the resource management processes may also identify scenarios that warrant organizing and equipping emergency response teams and development of hazard-specific plans. Organization of a medical response team with personnel certified to administer first aid, perform CPR and utilize automated external defibrillators may be appropriate if public emergency services cannot respond promptly. A medical capability may also be required by OSHA standards if a medical facility is not in near proximity. Additional teams may be warranted for firefighting, rescue or containment of hazardous materials. If so, OSHA regulations and applicable NFPA standards should be consulted to determine minimum requirements and best practices for staffing, plans, training and equipment.

Plans should be developed for hazards with a high frequency of occurrence or whose severity of impact may be significant. This includes natural hazards, such as flooding, earthquake, hurricane, tornado and severe weather. Staff should be organized and procedures should be documented for response to security threats, including bomb threats, suspicious packages, protests, disturbances and acts of violence.

Facilities and business operations are highly dependent upon critical infrastructure, which includes electricity, telecommunications, potable water, natural gas and steam. Loss of utilities may be an inconvenience if short in duration or could develop into an emergency if the duration of the outage is lengthy.

Today, businesses operate in a world of just-in-time manufacturing, computer-controlled processes and a high dependence on telecommunications and data processing functions. The quest for high efficiency and maximum profitability has eliminated duplication and redundancy that provided a measure of resiliency when something went wrong. Business continuity and information technology disaster recovery planning have become essential to maintain critical business functions during interruptions or disruptions.

The challenge in developing business continuity strategies and defining the requirements to implement those strategies is one of cost. To ensure a high level of resiliency and the ability to overcome any outage would require a totally redundant facility that operates in parallel. The cost to run a parallel facility is prohibitive in most cases and can only be justified by firms such as those in the financial services sector processing millions of dollars in transactions every hour.

the financial services sector processing millions of dollars in transactions every hour.

Before business continuity strategies can be developed and the requirements to support them defined, businesses must conduct a business impact analysis (BIA), as specified in NFPA 1600, section 5.3.3. The BIA must identify critical business processes and functions, the maximum time that a process or function can be down before the impact on the organization reaches an unacceptable level, and the resource requirements to restore the critical process or function to a minimum acceptable level.

Completion of the BIA should identify the operational and financial impacts of the interruption or disruption of business functions. Graphing the financial impact over time (e.g., 8 hours, 1 day, 2 days, 3 days, 1 week, 1 month, etc.) makes it easier to understand when the financial impact of an outage become too great for the organization to accept. This point becomes the Recovery Time Objective – the point in time when a process or business function must be restored before the impacts are unacceptable.

Determination of the financial impact for loss of critical functions over time provides justification for prevention and mitigation strategies, and helps determine how much capital should be invested in recovery strategies.

Development of business continuity strategies and

identification of the required facility, systems, equipment, personnel, materials, supplies and other resources needed to implement the strategy should be developed next (NFPA 1600:5.6.3). Strategies could include use of another company-owned facility to manufacture a product or house staff that provides a specific service. Other strategies could include use of vendor or partner resources to produce a product or provide a service. Formal agreements should be formalized for any mutual aid or partnership arrangements (NFPA 1600:5.7).

Information is the life blood of business, and information is stored on electronic media such as tapes, servers, individual computer hard drives and even portable devices. Vital records are also essential to running a business and rebuilding a business that suffers damage. Vital records include legal documents, drawings and specifications for facility production machinery, equipment and processes. Protection of electronic information and vital records should be evaluated during the risk assessment process and protected as much as economically justified. Secure backups of electronic information should be maintained offsite, and the backup schedule must be frequent enough so the amount of data lost between backups is not significant (NFPA 1600:5.6.3(1)). Today, the cost for data mirroring and online data backup has dropped to become affordable for even small businesses.

Recovery plans should also address the human impact of emergencies and disasters. The provision of counselling services available from employee assistance providers or other mental health service providers should be defined in the plan. Protocols and procedures for supporting family members of employees should also be included.

TRAINING, DRILLS AND EXERCISES

Training is essential to ensure that everyone knows about plans and procedures and their role and responsibilities (NFPA 1600:5.13.2). This includes all employees. At the very least, all employees should be aware of basic identify and protect business information including computer networks and electronic media. Everyone should know emergency plans including evacuation, shelter-in-place and lockdown procedures.

Members of emergency response teams, business continuity teams and those who are responsible for communications during an incident must receive a higher level of training. A training curriculum should be established in accordance with NFPA 1600, section 5.13.1, that covers the organization, policies, procedures and all aspects of the program. In addition, members of emergency response and business continuity teams should be trained on the use of the entity's incident management system as specified in NFPA 1600, section 5.13.4. Within the United States, the National Incident Management System/Incident Command System has been codified by Homeland Security Presidential Decision Directive 5[5] as the incident management system to be used within the public sector.

Evacuation, shelter-in-place and lockdown drills should be conducted at least annually, or more frequently if required by regulations. Members of emergency response and business continuity teams should participate in drills to hone individual skills. Drills that involve hands-on operation of occupant warning systems, communications systems, fire protection systems and manual firefighting equipment are recommended and may be required by regulations.

NFPA 1600, section 5.14.1, requires that each "entity shall evaluate program plans, procedures and capabilities through periodic reviews, testing and exercises." Exercises are an excellent means to evaluate the program. They include tabletop exercises that familiarize team members with plans, challenge them to assess hypothetical situations and determine how to protect people, property, operations and the environment. Functional exercises require more planning and require team members to act in their assigned roles and follow prescribed plans to manage a simulated incident. Full-scale exercises are the most extensive and costly type of exercise and involve the physical movement of people and equipment in response to a staged emergency incident.

PROGRAM EVALUATION AND REVISION

Periodic evaluation of the emergency management and business continuity program is required by NFPA 1600, section 4.4. There are numerous triggers that would necessitate a program review. Whenever hazards change or the knowledge of hazards changes, the risk assessment and program elements that depend upon the risk assessment should be updated. Construction or substantial renovation of buildings, changes or additions to major processes or systems, and changes to rosters of emergency response and business continuity teams are all reasons for program evaluation. Post-incident critiques and published lessons learned from major events may also trigger program evaluation.

Whenever deficiencies are identified, deficiencies should be resolved through a corrective action program (NFPA 1600:5.14.4). Program elements should be revised or updated, and action should be taken to ensure capable resources are available when needed. This continuous improvement process is needed to ensure that when the time comes, the emergency management and business continuity program will be able to protect people, property, business operations, the environment and the organization itself.

Donald L. Schmidt is with Preparedness, LLC.

References:

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2 U.S. Department of Homeland Security Science & Technology Standards, *http://www.dhs.gov/xfrstresp/standards/editorial_0420.shtm*

3 *The 9/11 Commission Report*, p. 398, http://govinfo.library.unt.edu/911/report/911Report.pdf

4 *Implementing Recommendations of the 9/11 Commission Act of 2007, p. 106.*

5 Homeland Security Presidential Directive/HSPD-5, "Management of Domestic Incidents," The White House, Washington, DC, 2003.

SFPE Technical Priorities for the Future

By Beth Tubbs, P.E.

INTRODUCTION

SFPE, through the diligence of its members, has produced many guides in the last decade and is currently in the process of developing two structural fire engineering standards. The further development of guides and standards will continue to provide a foundation for fire protection engineers to strengthen their role on the design team and generally increase the recognition of fire protection as an engineering discipline.

BACKGROUND

At the end of 2006, the SFPE board of directors looked for some direction from the technical steering committee in terms of future priorities for technical guide and standards development. It had been about five years since priorities of this type had last been set by SFPE. Many projects have been completed or are currently under development. Table 1 provides a listing of the guides that have been developed to date. Table 2 provides a listing of the guides and standards that are presently under development.

The SFPE board is extremely satisfied with the developments to this point in time and would like to see continued success. The SFPE board looked to the technical steering committee for recommendations. Given this direction, the SFPE technical steering committee formed a task group to form a list of priorities. Many factors were addressed during this process to understand the needs of the future.

Table 1 – Completed Guides

- *SFPE Engineering Guide for Assessing Flame Radiation to External Targets from Pool Fires*
- *SFPE Engineering Guide to Predicting 1st and 2nd Degree Skin Burns*
- *SFPE Engineering Guide to Piloted Ignition of Solid Materials Under Radiant Exposure*
- *SFPE Engineering Guide to the Evaluation of the Computer Model DETACT-QS*
- *SFPE Engineering Guide to Human Behavior in Fire*
- *SFPE Engineering Guide to Fire Exposures to Structural Elements*
- *SFPE Engineering Guide to Fire Risk Assessment*
- *SFPE Engineering Guide to Performance-Based Fire Protection, 2nd Edition*
- *SFPE Code Officials Guide to Performance-Based Review*
- *Engineering Guide on Room of Origin Fire Hazards*

Table 2 – Guides and Standards Under Development

- Evaluation of ASET-B
- Engineering guide on design performance criteria
- Engineering guide on design basis fires
- Engineering guide on fire department operations
- Standard on calculating fire exposures to structures
- Standard on thermal response of structures

PRIORITIZING PROCESS

The task group that was formed within the SFPE technical steering committee followed a comprehensive approach to develop recommendations for the SFPE board. The task group first created a basic framework to help pinpoint gaps and areas that need further development. Two frameworks were formed for this process. One focused upon technical needs and the other on overall process needs. The process framework focused on the overall performance-based building regulatory system. The reason for this focus was that a key aspect of increasing the awareness of fire protection as an engineering discipline is creating a more solid role in the building regulatory process. Although all fire protection engineering is not necessarily linked to regulatory compliance, the concepts learned through this review certainly apply to other aspects of fire protection.

TECHNICAL

The technical needs framework consisted of three subsections with the following areas.

- **Exposing Hazards.** Basic fire and explosion science.
- **Impact of Exposures and Fire Protection Systems.** Elements that fires and explosions impact, including people, structures, building systems, contents and the environment.
- **Fire Protection System Response.** Fire protection systems such as suppression and alarm.

Figures 1a (page 40), 1b (page 42) and 1c (page 44) show these basic frameworks. Note that these frameworks were formed to assist in the brainstorming process and therefore were fairly informal in nature. They are provided simply to give some depth of understanding as to the issues considered.

PROCESS

An important part of the brainstorming process was looking at the role of fire protection engineering from the perspective of the performance building regulatory system. Figure 2 on page 46 shows a general view of the performance system model. This model has been developed through the IRCC[1] and CIB TG37[2] through their study of the needs of a successful performance building regulatory system.

This provides both a U.S. and an international perspective on fire protection engineering needs. It is a fairly generic model and provides the basic components of the system. There are essentially two major parts of the model, which can be described as qualitative and quantitative. The qualitative aspects of this model represent performance codes, such as those developed by ICC, NFPA and a variety of countries, such as Australia, New Zealand, Spain, UK, Japan and Canada. This is where the goals of the regulations are stated in qualitative objective form. The second portion of this model is focused on the quantitative part of the regulatory system. This is the portion of the process where the goals and objectives are turned into designs, plans and then the actual construction of a building. This portion of the model is where the fire protection community must focus in order to strengthen the whole system. It is quite clear from this model that issues such as design fires and performance criteria play a critical role.

BRAINSTORMING AND RANKING

Based upon the frameworks, an extensive list of priorities was formed from contributions of each of the task group members. This list was placed into logical groups to eliminate duplication and was presented to the SFPE technical steering committee.

From this priority list, a survey was created for the SFPE technical steering committee members to provide comments and to rank the priorities on a scale of 0 to 5, with 5 being the most important. There were also comments requested in the survey for the following questions.

1. Is the subject already addressed?
2. If currently addressed, where?

The ranking of priorities was based upon the review of five criteria:

1. Is the topic relevant to SFPE's mission, goals and objectives?
2. Is it a benefit to the SFPE to pursue such a topic?
3. Is the subject currently technically possible to address in practice?
4. Is SFPE the most appropriate group/organization to be working on the specific subject matter?
5. Can the guide/standard be developed within a reasonable time frame?

Finally, once the ranking was complete, the task group members were asked to provide overall comments on the basis for their rankings.

The results of this survey were then compiled and reviewed by the SFPE technical steering committee members. These results included the rankings and also the specific comments requested in the survey.

Once the results of the survey were reviewed, a final ranking of each topic through a simple numerical process (highest to lowest) was undertaken. This resulted in the priorities ultimately presented to the SFPE board.

THE RESULTS

Ultimately, there were 16 topics ranked by the technical steering committee. Therefore, there were a solid number of issues reviewed that played into the prioritization process of the top five priorities that were presented to the SFPE board. This number was based upon the assumption that the time frame was probably about five to six years for development. This number of priorities seemed to be a manageable number for such a time frame.

These priorities were reviewed with an awareness of current activities and currently available guides published by SFPE. In some cases, these elements may overlap with the existing documents or efforts but contain a new level of focus and urgency. Looking at the process and technical frameworks helped to put pieces of the puzzle together and really define the immediate needs. When describing the top five priorities to the board, these areas of overlap were acknowledged.

TOP FIVE PRIORITIES

The following are the top five priorities that resulted from the prioritization process. This list includes the intended goal of the activity, a list of possible current activities to consider and finally some comments that provide more-detailed direction for the possible tasks to accomplish the goal.

1. Design Scenario Standard

Goal. Develop a standard that provides prescribed design fire scenarios to be used in performance-based design for a variety of occupancies and situations.

Current related activities.

- Engineering guide on design basis fires.
- Scenarios in NFPA 101 and NFPA 5000.
- A fire load standard presently being developed by NFPA.
- Standard on calculating fire exposures to structures.

Comments. This standard would need to be in a form that can be referenced by regulatory bodies. It would be more detailed than the scenarios in NFPA 101 and NFPA 5000, and would be more occupancy-specific. Perhaps the document would make use of work currently being undertaken in New Zealand. Also, this standard would address objectives other than life safety. Some concern exists that this will eliminate engineering from performance-based design. Others argue that this is the next step to allow more widespread application of fire engineering and will foster the engineering discipline as a whole.

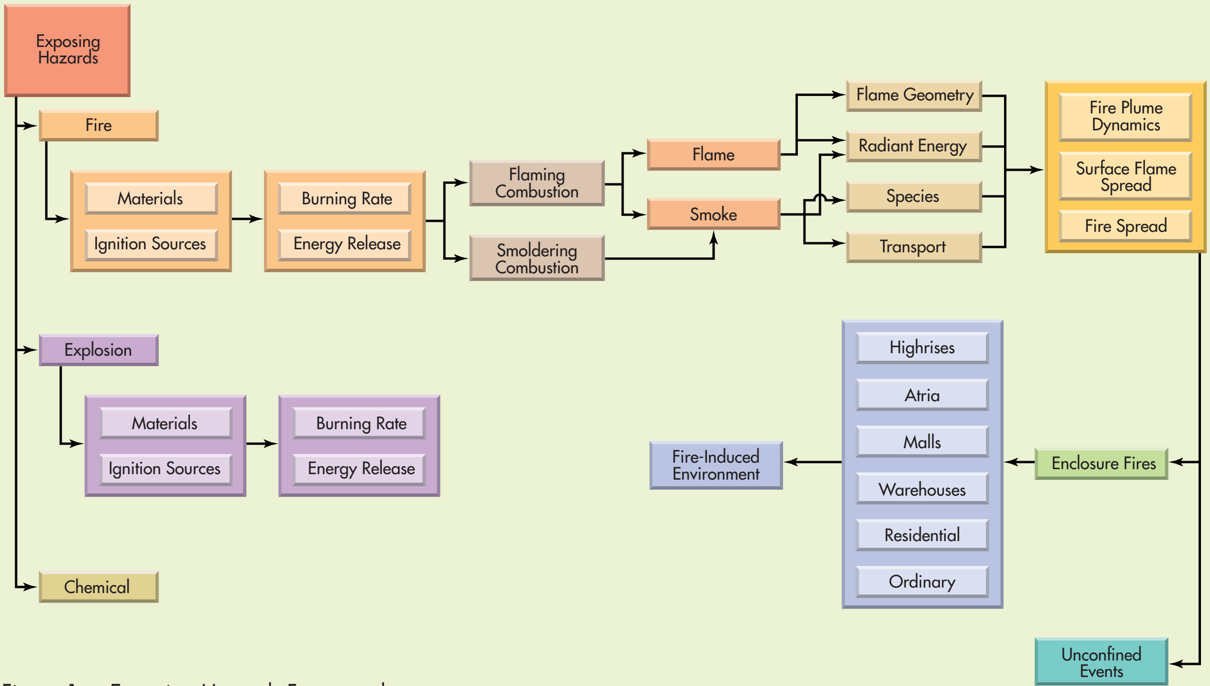

Figure 1a. Exposing Hazards Framework

2. Model Validation/ Applicability Guide

Goal. To produce a guide that assists in the more-appropriate use of computer models for fire protection engineering applications.

Current related activities.

- Computer modeling task group in general.
- *Engineering guide to the evaluation of the computer model DETACT-QS.*
- Evaluation of ASET-B.
- *SFPE Code Officials Guide to Performance-Based Design* review.

Comments. This was seen as critical to elevate the practice of fire protection engineering and promote proper use of computer models in design. There was some level of concern that this cannot be addressed comprehensively.

3. Performance Criteria

Goal. Develop performance criteria for a variety of design goals, whether regulatory or from other stakeholders, that will provide for a more consistent approach for fire protection engineering.

Current related activities.

- *SFPE Engineering Guide for Assessing Flame Radiation to External Targets from Pool Fires*
- *SFPE Engineering Guide to Predicting 1st and 2nd Degree Skin Burns*
- *SFPE Engineering Guide to Piloted Ignition of Solid Materials Under Radiant Exposure*
- *SFPE Engineering Guide to Human Behavior in Fire*
- Engineering guide on design performance criteria

Comment. This could be a standard or a guide, preferably a standard to gain more widespread buy-in from the regulatory community. This is similar to the current development of the Engineering Guide already underway with renewed emphasis on the need for such a document and the need to link to regulatory goals. There is some concern with the level of difficulty related to putting such a document together. See item 4 below.

4. Engineering Guide on Tenability Analysis

Goal. To provide a better understanding of tenability as it relates to fire protection engineering in the form of a guide.

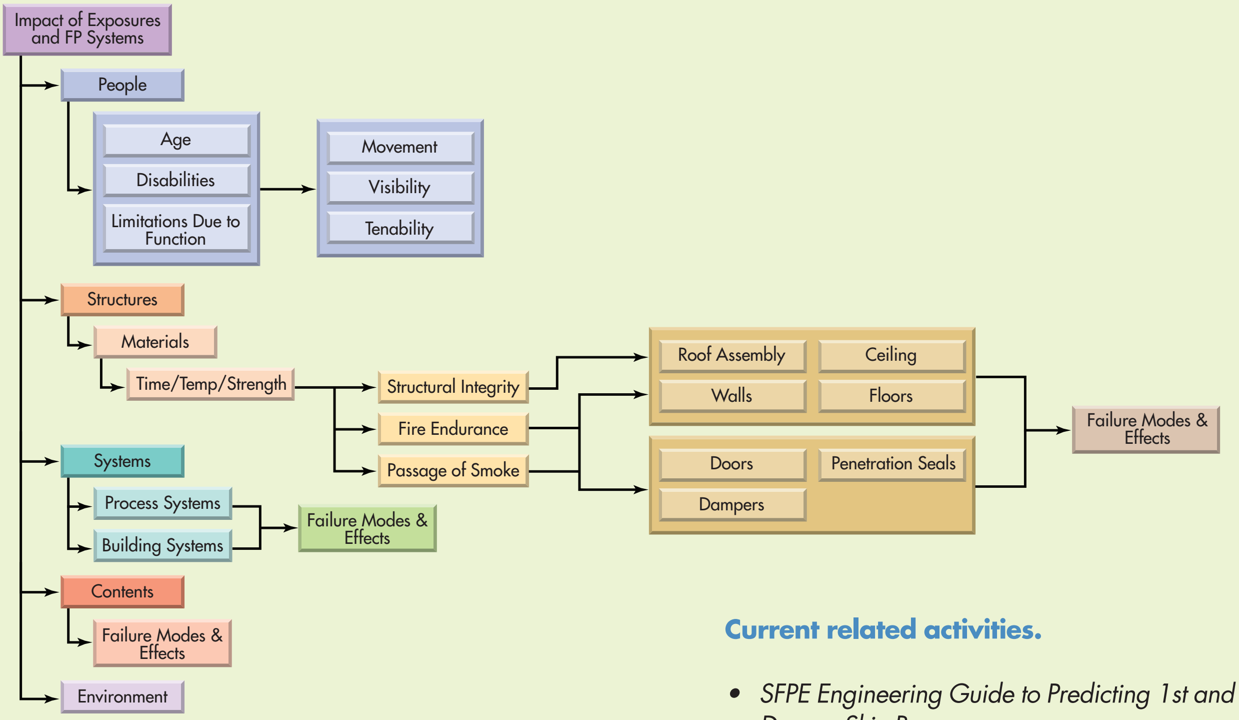

Figure 1b. Impact of Exposures and Fire Protection Systems Framework

Current related activities.

- *SFPE Engineering Guide to Predicting 1st and 2nd Degree Skin Burns*
- *SFPE Engineering Guide to Human Behavior in Fire*
- Engineering guide on design performance criteria

Comment. This priority appears to be possibly a subset of the design performance criteria guide presently under development. Comments in the survey reflected the complexity of the issue and the possible need for consultation with the medical community.

5. Peer Review Quality Document

Goal. Develop a document based upon international quality standards focused upon developing and maintaining a quality peer review process for fire engineering firms. It is intended to be a self-regulating/self-certifying approach.

Current related activities.

- *SFPE's Peer Review Guidelines*
- *SFPE Code Officials Guide to Performance-Based Review*

Comments. There was strong general consensus for the need, but there were some concerns as how the document should be developed and by whom.

The priorities presented to the SFPE board of directors provide a solid direction for the future for SFPE and its members. It is felt that priorities such as developing a standard containing design fires or performance criteria that can be referenced by regulatory documents is critical to taking fire

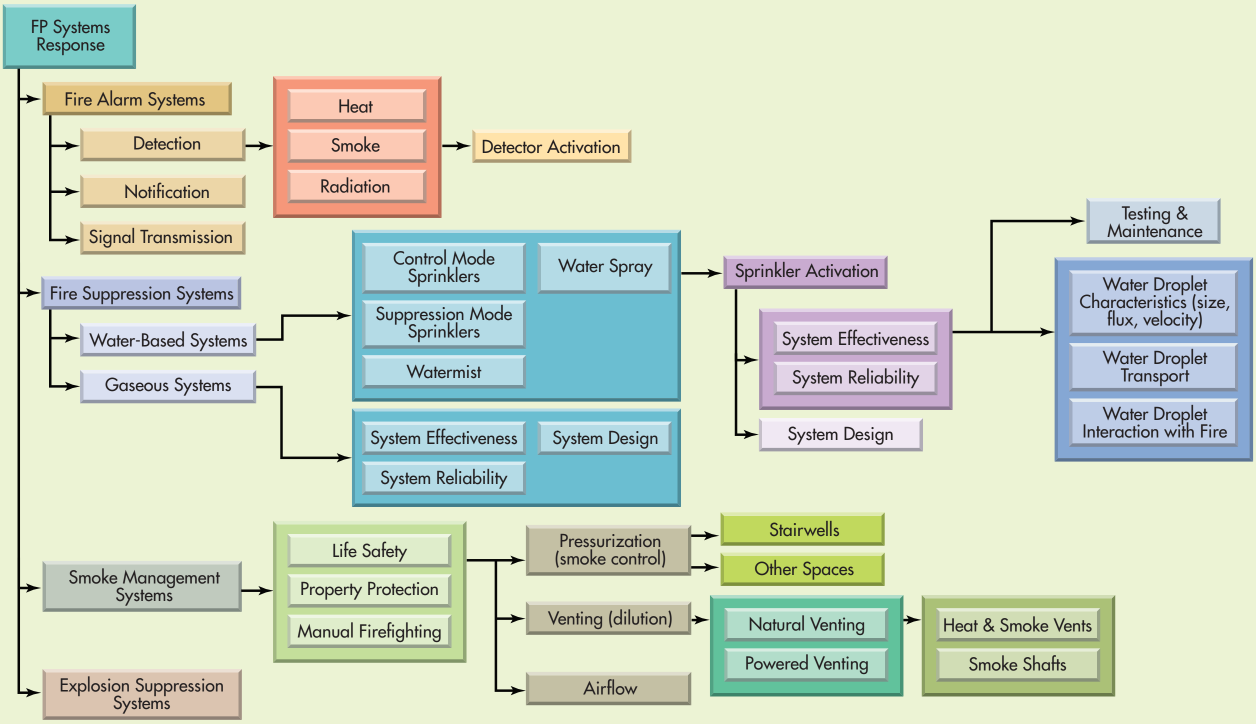

Figure 1c. Fire Protection Systems Framework

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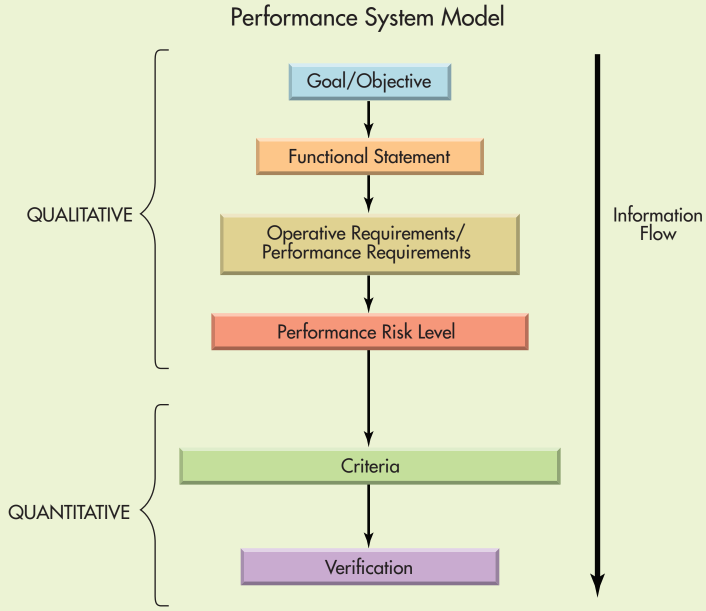


Figure 2. Performance System Model

protection engineering to the next level. Without a more solid basis for design and ultimately acceptance by authorities, the level of performance design will remain somewhat stagnant and buildings will continue, largely, to be designed based upon prescriptive methods. It is recognized that creating such standards is not an easy task and one that must be undertaken such that it is as flexible to unique situations as possible, at the same time creating a baseline for most designs.

A variety of models such as FDS and complex egress models exist, but their application is limited to those designs that tend to be performance-based. A system that encourages their appropriate application will provide additional confidence to the authorities and will also strengthen the role of the fire protection engineer. In addition, the more that models and similar tools are applied, the more they will be refined.

Beth Tubbs is with the International Code Council.

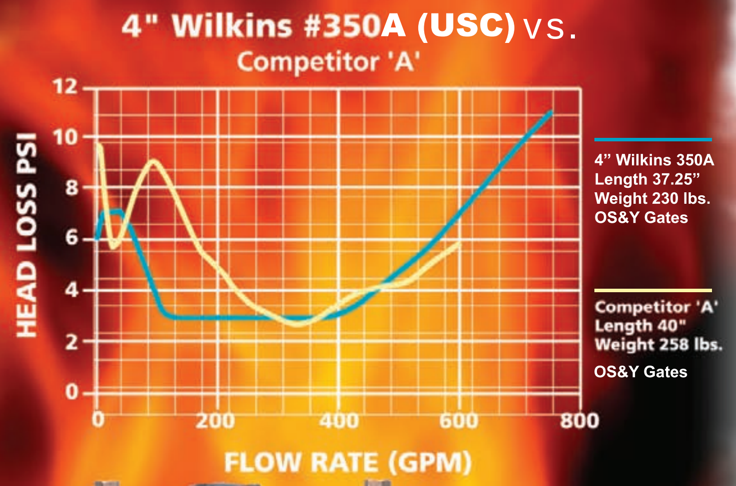
References:

1 "Guidelines for the Introduction of Performance-Based Building Regulations, Discussion Paper," Inter-jurisdictional Regulatory Collaboration Committee, ABCB, Canberra, Australia, April 1998.

2 Tubbs, B., CIB TG37, *Performance-Based Building Regulatory Systems*, Publication 99, CIB, Netherlands, 2004.

The New Grooved Body,
In-line Backflow Preventers from Wilkins.

Here's The Long And Short Of It!



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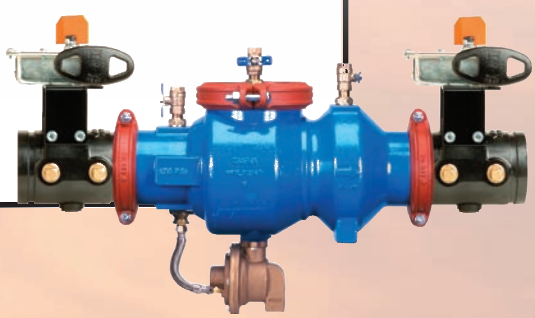

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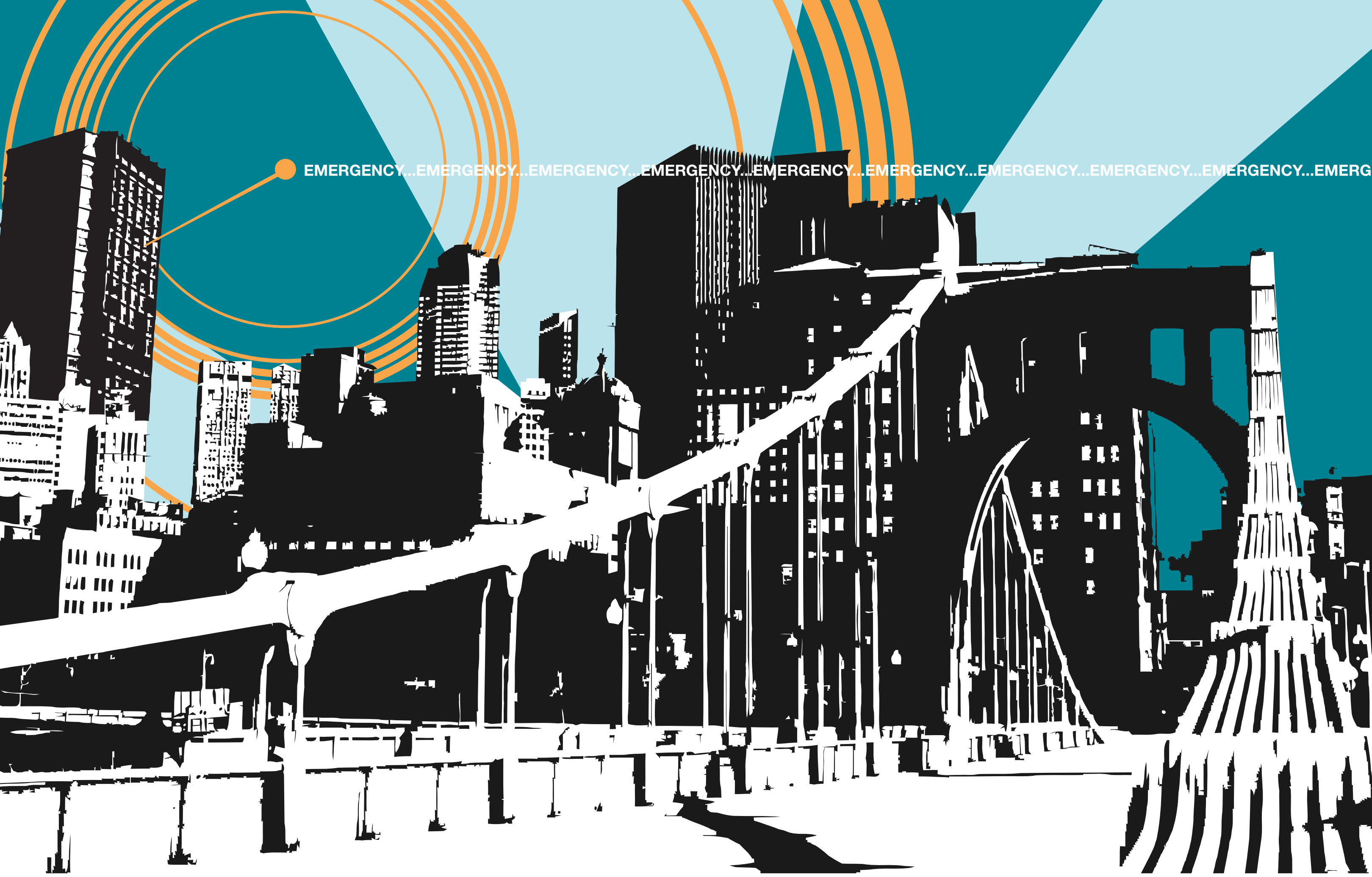


Survivable Design and Installation

of Signaling Systems for Disaster Management

NEMA
Setting Standards for Excellence

As fire detection and alarm systems morph into more complex fire and disaster management tools – Emergency Communication Systems[1,2] (ECS) – their ability to survive a specific threat or for some specified period of exposure can be critical to mission success.

Many designers, installers and authorities are not familiar with the survivability requirements for certain circuits and equipment that are listed in NFPA 72®, *The National Fire Alarm Code*®.[3] This article will outline those requirements. However, NFPA 72 is a set of minimum requirements, and survivability is about a lot more than just circuits and equipment. The second installment of this article will detail and compare specific code-mandated circuit and equipment survivability requirements and look beyond prescriptive requirements using the concept of mission survivability.[4]

Survivability requirements in NFPA 72 are specifically mandated for systems that are used to affect the partial evacuation or relocation of occupants. Typically, partial evacuation or relocation is used in high-rise buildings, hospitals or large industrial buildings where it is not necessary or practical to evacuate the entire building or area. Where a system provides a common evacuation notification to the entire building, survivability is not mandated by the code.

The requirements for survivability are listed mostly in section 6.9, Emergency Voice/Alarm Communication Systems (EVAC). However, paragraph 6.9.10.4 says: "The requirements of 6.9.10.4 shall apply to both audible (tone and voice) and visible notification appliance circuits".[3] The 2007 *National Fire Alarm Code Handbook* commentary points out that although the survivability requirements are in the section on EVAC, prudence suggests that any system used for partial evacuation or relocation of occupants should meet the requirements.[5] For example, some large industrial facilities still use coded tone signals for occupant and staff notification and information transfer. So, while that is not an EVAC system subject to requirements under 6.9 of the code, survivability of the system should be considered if it is used for partial evacuation or relocation of occupants.

The origins of survivability requirements in NFPA 72 go back to the original 1985 edition of NFPA 72F.[6] Although the requirements have changed with almost every new edition, the concept has remained the same: to ensure operability of a system that may be needed at some time during an evolving fire emergency. The principal requirements were based on two desired performance goals: 1) the need to ensure that a circuit that fails because of a direct attack by fire will not affect the ability to provide notification to any other discrete area of the building, and 2) the need for notification appliance circuits that serve a remote area to remain operational for some amount of time even when they pass through a fire area.

Specifically, for the first performance goal, the code says:

"6.9.10.4.1 Fire alarm systems used for partial evacuation and relocation shall be designed and installed such that attack by fire within an evacuation signaling zone shall not impair control and operation of the notification appliances outside the evacuation signaling zone."[3]

Figure 1 shows a section view of a high-rise building. Each floor, stair and elevator bank is a separate evacuation signaling zone.[3] That is, the signaling system has the ability to communicate discretely to each of those areas. An evacuation signaling zone is sometimes also called a paging zone. A single evacuation signaling zone may be served by audible and visible appliances on multiple notification appliance circuits (NAC), provided that the NACs are arranged to operate as a group. The shaded area in Figure 1 shows that when a fire is detected on one floor, the notification zone 3 is composed of the fire floor, floor above and floor below.

The first survivability requirement cited in 6.9.10.4.1 dictates that any notification appliance circuit or circuits (NACs) serving an evacuation signaling zone cannot serve any other evacuation signaling zone. Why? Because if that circuit is attacked and the wires short, break or go to ground, the circuit might fail, and that failure is not permitted to affect any other evacuation signaling zone.

This requirement also dictates that the equipment have certain performance characteristics. When a fault, such as a short circuit, occurs on an NAC, it cannot result in the failure of NACs that serve other evacuation signaling zones. Therefore, any common control, power or amplification equipment must be unaffected by the fault. This requirement also impacts the path, installation and performance of addressable signaling line circuits (SLCs) that may be used to control remote amplifiers and remote extender/booster panels for strobes. Also, there is no "performance" time associated with this requirement. It does not say that the circuit must be able to work for two hours in some standard test. It says that a system attack in an evacuation signaling zone cannot affect the control and operation of the notification appliances in any other evacuation signaling zone.

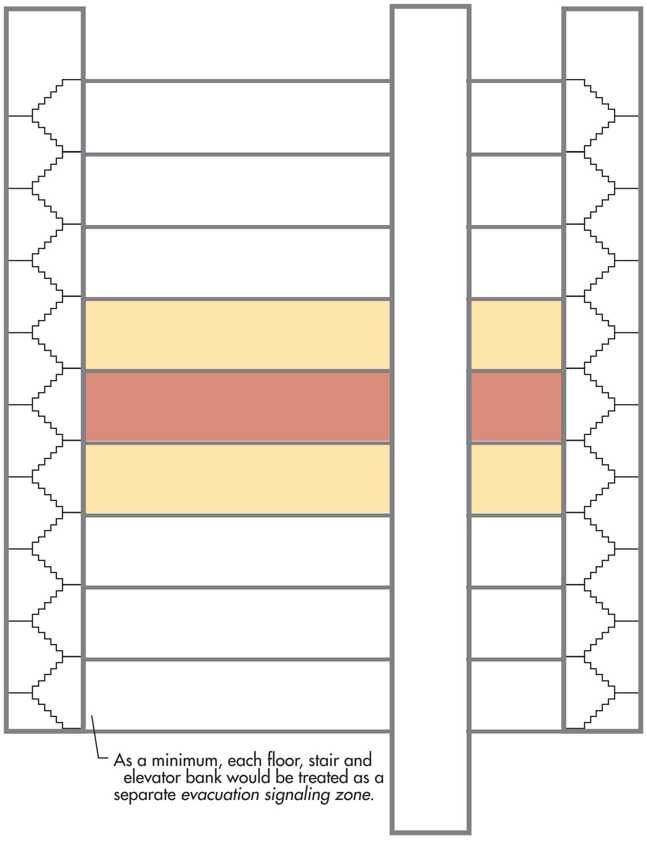


Figure 1. A notification zone may be composed of several discrete evacuation signaling zones. For partial evacuation/relocation, notification zones and dynamic are dynamic and may automatically or manually change during an emergency.

Many designers, installers and authorities are not familiar with the survivability requirements for certain circuits and equipment that are listed in NFPA 72®, The National Fire Alarm Code®.

Therefore, the test is simple: For any circuit, if it is attacked by fire and shorts, opens or goes to ground fault, it cannot affect the ability to provide notification to any other evacuation signaling zones. A key factor is what will the circuit fault do to the control system and its ability to operate other evacuation signaling circuits? The code does not explicitly list shorts, opens and ground faults as the effects to be guarded against. However, most experts interpret the code that way.

The second set of requirements addresses circuits as they pass through a fire zone:

"6.9.10.4.2 All circuits necessary for the operation of the notification appliances shall be protected until they enter the evacuation signaling zone that they serve."[3]

This second performance goal recognizes that circuits that serve evacuation signaling zones that are remote from the fire may have to pass through the fire area. For example, in Figure 1, the circuits serving the floors above the fire might have to pass through the fire area. The evolution of the fire may dictate the need for the evacuation/relocation zone to expand. Also, it would be necessary to provide information, instructions and assurances to occupants in other paging zones that are not being evacuated or relocated.[7] Therefore, the circuits necessary for the operation of other paging zones should survive for some amount of time (performance goal #2).

To achieve the requirement of 6.9.10.4.2, the code[3] lists five protection methods intended to ensure that the circuits necessary for the operation of other paging zones will survive for some amount of time as they are attacked by a fire. This protection requirement only addresses those parts of the circuits leaving the control unit up until they enter the evacuation signaling zone that they serve.

Section 6.9.10.4.3 is similar to 6.9.10.4.2 and lists the same five protection methods as acceptable methods for protecting circuits that interconnect remotely located control equipment.[3] A key difference is that this section addresses dependent equipment in one "location" interconnected to equipment in another "location." The code does not define what is meant by the different "locations." This requirement has origins in the 1985 edition of NFPA 72F[6] and was intended to address situations where a fire command station was remote from the actual control equipment – the fire command station being the actual user interface. Although "remote" was not defined, the old standard did have different requirements for separations up to 100 ft (30 m) and for separations greater than 100 ft (30 m).

The five protection methods listed under 6.9.10.4.2 and 6.9.10.4.3 are:[3]

1. A two-hour fire rated circuit integrity (CI) cable.
2. A two-hour fire rated cable system (electrical circuit protective system).
3. A two-hour fire rated enclosure.
4. Performance alternatives approved by the authority having jurisdiction.
5. Buildings fully protected by an automatic sprinkler system installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*,[8] 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.[9]

In the second part of this article, to be published in the Fall edition, these protection alternatives will be explained and discussed in greater detail. In addition, other key requirements in NFPA 72 that contribute to system survivability and mission effectiveness will be presented. The concepts of survivability for ECS systems that are used for emergencies other than fire will also be discussed, as will design practices and installation considerations that are specifically not in the code.

References:

1 "It's Not Your Father's Fire Alarm Code Anymore," NEMA Supplement in *Fire Protection Engineering*, Fall 2007.

2 "Mass Notification Systems," NEMA Supplement in *Fire Protection Engineering*, Fall 2005.

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

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

5 Richardson, L., and Moore, W. (Eds,) *National Fire Alarm Code Handbook*, National Fire Protection Association, Quincy, MA 2007.

6 NFPA 72F, *Standard for the Installation, Maintenance and Use of Emergency Voice/Alarm Communication Systems*, National Fire Protection Association, Quincy, MA 1985.

7 "Messaging and Communication Strategies for Fire Alarm Systems," NEMA Supplement in *Fire Protection Engineering*, Summer 2003.

8 NFPA 13, *Installation of Sprinkler Systems*, National Fire Protection Association, Quincy, MA 2007.

9 NFPA 70, *National Electrical Code®*, National Fire Protection Association, Quincy, MA 2008.

UPCOMING EVENTS

September 21–26, 2008
9th IAFSS Symposium
Karisruhe, Germany
Info: iafss.org/html/events.htm

October 12–17, 2008
SFPE Progessional Development Conference and Exposition: The Annual Meeting
Charlotte, NC, USA
Info: www.sfpe.org

October 15–17, 2008
International Congress: Smoke Control in Buildings and Tunnels
Santander, Spain
Info: http://grupos.unican.es/gidai

November 2–3, 2008
2007 International Symposium on Elevator Evacuation During High-Rise Fires
Shanghai, China
Info: www.isee-sh.org

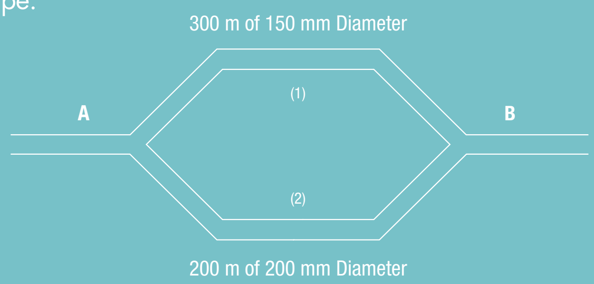
BRAINTEASER > Problem/Solution

Problem

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?

Solution to Last Issue's Brainteaser

In the parallel pipe network A-B shown below, what fraction of the flow would travel through the 200 mm diameter pipe? Neglect pipe fittings such as tees and elbows. The Hazen-Williams "C" factor is the same for all of the pipe.



Since the pipes are parallel, the friction loss must be the same in each leg. This can be written as:

$$h_{l_1} = h_{l_2}$$

Where h_l is the friction loss and the subscripts 1 and 2 represent legs 1 and 2, respectively.

The Hazen-William equation for SI units is

$$h_l = \frac{6.05 Q^{1.85} L}{C^{1.85} D^{4.87}} \times 10^2$$

Where h_l = pressure loss (kPa)
Q = flow rate (l/min)
L = length of pipe (m)
C = Hazen-William "C" factor
D = pipe diameter (mm)

Equating the Hazen-Williams formula for each leg yields:

$$\frac{6.05 Q_1^{1.85} L_1}{C_1^{1.85} D_1^{4.87}} \times 10^2 = \frac{6.05 Q_2^{1.85} L_2}{C_2^{1.85} D_2^{4.87}} \times 10^2$$

Since $C_1 = C_2$, this can be rearranged as:

$$\frac{Q_1}{Q_2} = \sqrt[1.85]{\left(\frac{D_1}{D_2}\right)^{4.87} \frac{L_2}{L_1}}$$

Substituting known terms results in:

$$\frac{Q_1}{Q_2} = \sqrt[1.85]{\left(\frac{150\text{mm}}{200\text{mm}}\right)^{4.87} \frac{200\text{m}}{300\text{m}}} = 0.37$$

or $Q_1 = 0.37 Q_2$

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.

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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.

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The Rhode Island Statehouse, which sits atop a hill in the city of Providence, is constructed with a beautiful white Georgia marble and lit by 109 floodlights with two searchlights at night. Erected between 1895 and 1904, the complex is listed with the National Register of Historic Places, based in Washington, DC.

Not only is the Rhode Island Statehouse the seat of state government, it is also considered an important monument and a significant piece of historical architecture on the Providence cityscape. For these reasons, state officials had to ensure the right life safety system was selected for the job.

The job was bid by electrical contractors (ECs), and they received equipment pricing from many suppliers. In fact, the job was originally put on the street specified as a totally different system," says Steve Cunha, Fire Alarm Division Manager with the Fire Suppression Systems Group LLC (Cintas Fire Protection) of Pawtucket, RI.

"The EC that was awarded the contract went back to state planners and told them that he wanted to use the Gamewell-FCI E3 Series because of its flexibility and the two-wire network configuration." After careful consideration, all parties agreed that the E3 Series system was indeed the right choice.

The Statehouse's new E3 Series system includes analog-addressable smoke and heat detection, intelligent projected beam detectors with remote test/status stations, and addressable manual fire pull stations. Another integral part of this installation is the E3 Series Voice/Alarm Communication (EVAC) system. Offering audible instructions on a zone-by-zone, floor-by-floor basis, the EVAC component enables custom instructions to be announced directly to each floor/zone based on the emergency situation.

For better command and control, a smart touchscreen annunciator is included for enhanced communication with management. The annunciator is an intuitive, easy-to-use touchscreen interface. The attractive, state-of-the-art display is user-friendly and allows full control of the system.

Able to support 25,000 devices and up to 64 nodes, the E3 Series is the first system of its kind to offer complete integration using just two twisted-pair metallic wires (or fiber-optic cable). This savings in material and labor costs proves to be one of the E3 Series' biggest selling points.

The E3 Series system also features ARCnet™, a high-speed data network over which control and sensor data, as well as audio communications, travel. With ARCnet™, each pair of wires is isolated on a node-to-node basis, increasing system survivability during a catastrophic event.

The E3 Series system is the next thing to a one-size-fits-all platform because of its high degree of scalability and component-style architecture.

As Rhode Island's officials have demonstrated, engineers, contractors and the like now have a single system platform that will work in most applications – the Gamewell-FCI E3 Series.

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Gamewell FCI FIRE CONTROL INSTRUMENTS
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1

Concealment Systems

Grice Engineering Inc. recently launched an improved and redesigned Web site for its main product line, the Soffi-Steel® System. The Soffi-Steel® System is a custom-fitted universal metal concealment shield used for the decorative and protective covering of exposed mechanicals. Soffisteel.com has been updated to include detailed product descriptions and uses, a photo gallery, project lists, specifications, CAD drawings, installation data, downloadable brochures and product catalogs, in addition to pricing request forms.

www.soffisteel.com

—Grice Engineering Inc.

2

Viking VFR-400 Releasing Panel

Viking's new VFR-400 panel replaces its current PAR 3 and FireCycle® III releasing panels. This single, field-programmable releasing panel accommodates any Viking deluge and preaction system, including the exclusive FireCycle® III and Surefire® preaction systems. The new VFR-400 also accommodates multiple voltage applications, including 110/220 V and 50/60 Hz, with a single panel offering. In addition to being a releasing panel, the VFR-400 is also suitable as a stand-alone, six-zone fire control panel. It is FM-approved and cULus listed to the new UL 864-9 standard.

www.vikinggroupinc.com

—Viking Group

3

Halon Retrofit Fire Suppression System

SEVO® Systems announces the availability of its "One for One" halon retrofit fire suppression system, utilizing 3M™ Novec™ 1230 fire protection fluid, as a replacement for halon and HFCs in fire suppression systems. Generally, the existing halon 1301 piping network can be utilized, and the existing halon 1301 cylinder will be replaced with a SEVO 1230 cylinder containing Novec 1230 fluid pressurized to 500 psig along with replacement of existing nozzles.

www.sevosystems.com

—SEVO Systems

4

Fire Alarm Control Panel

The FireSpy® Tracker T2000 is a two-loop addressable fire alarm control panel, designed for small- to medium-sized commercial, industrial and institutional applications. The T2000 comes with four NACs (three amps max per NAC, for seven amps total). The Tracker T2000 also features auto learn, drift compensation (through smoke heads) and 126 devices per loop. In addition, the NAC circuits may be used as an auxiliary power supply.

www.harringtonfire.com

—Harrington Signal Inc.

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18 x 18 (5.5x5.5)	17 (64.3)	12.0 (0.83)
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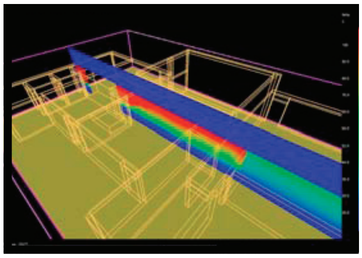

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