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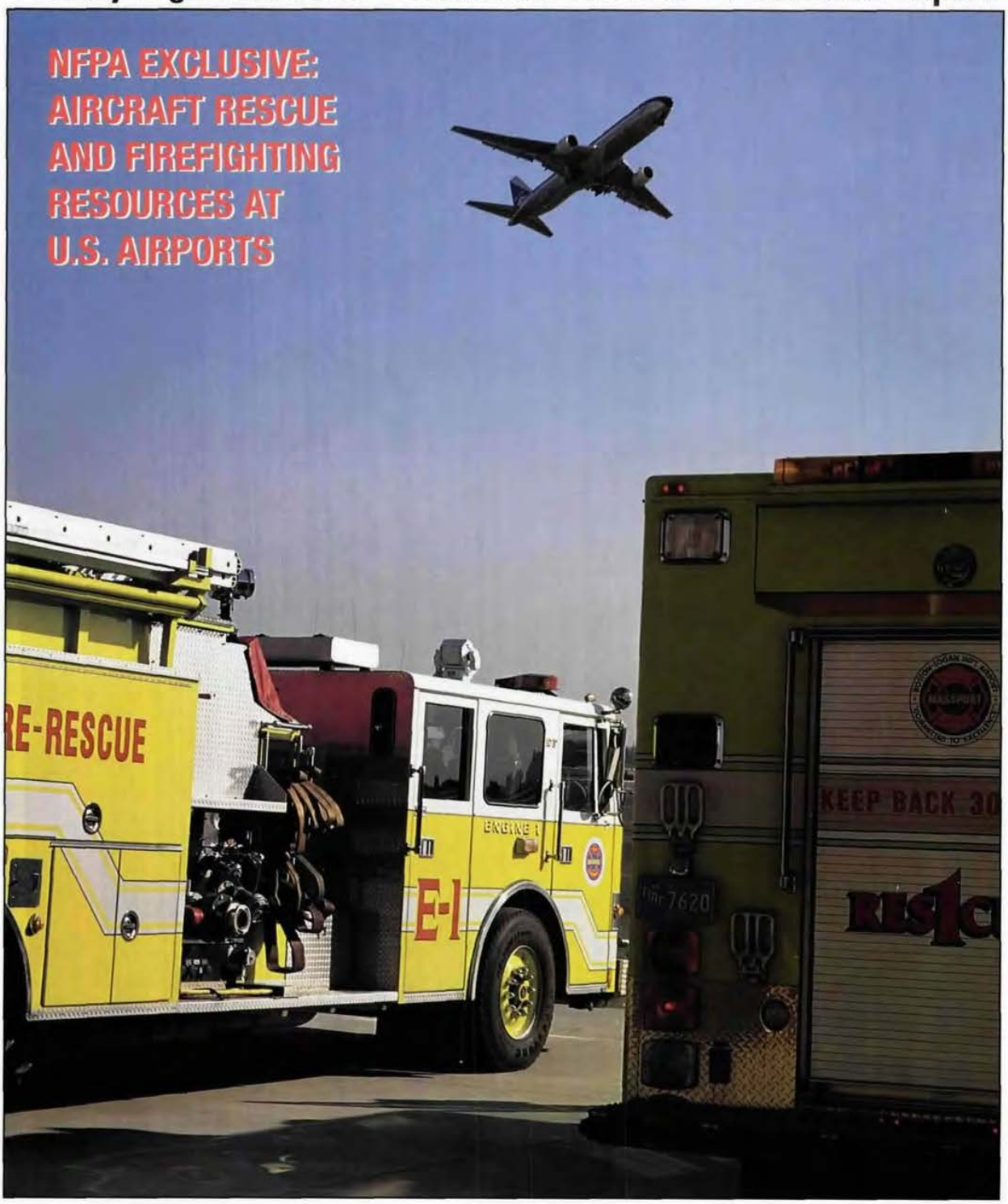
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May/June 1999

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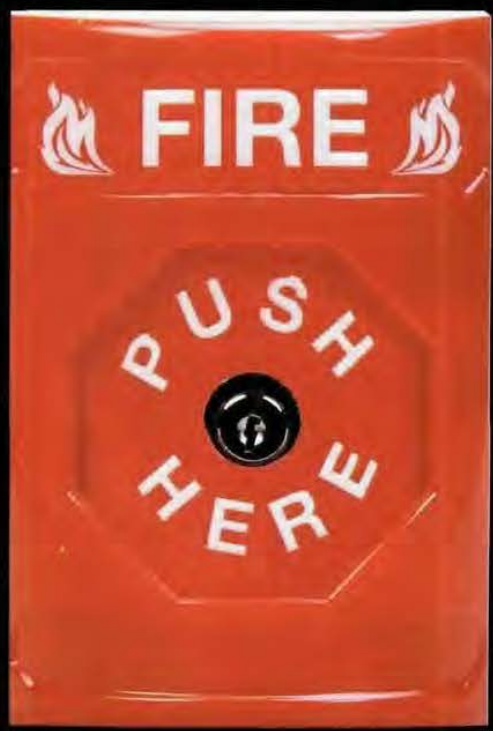
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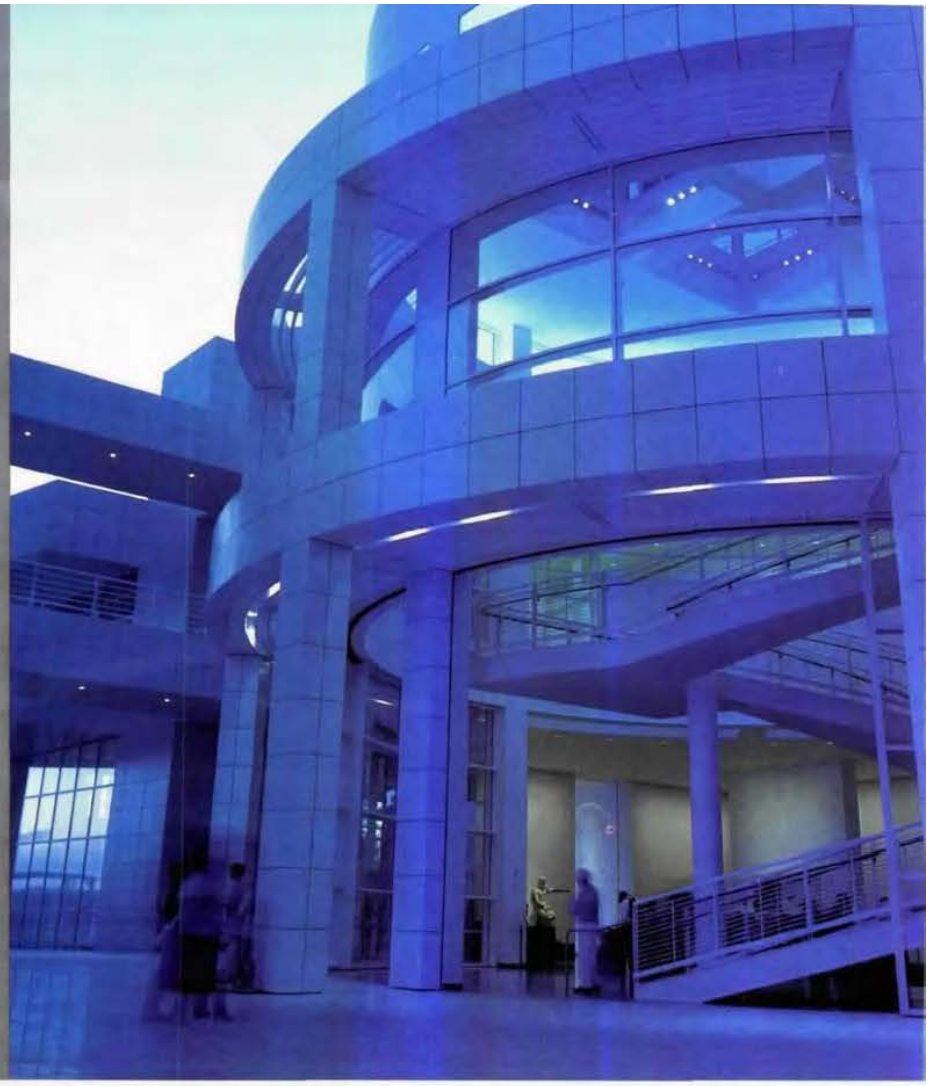
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Photo: Keller and Peet, George Peet

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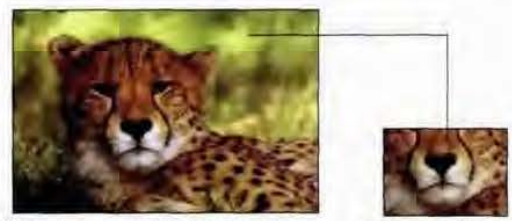


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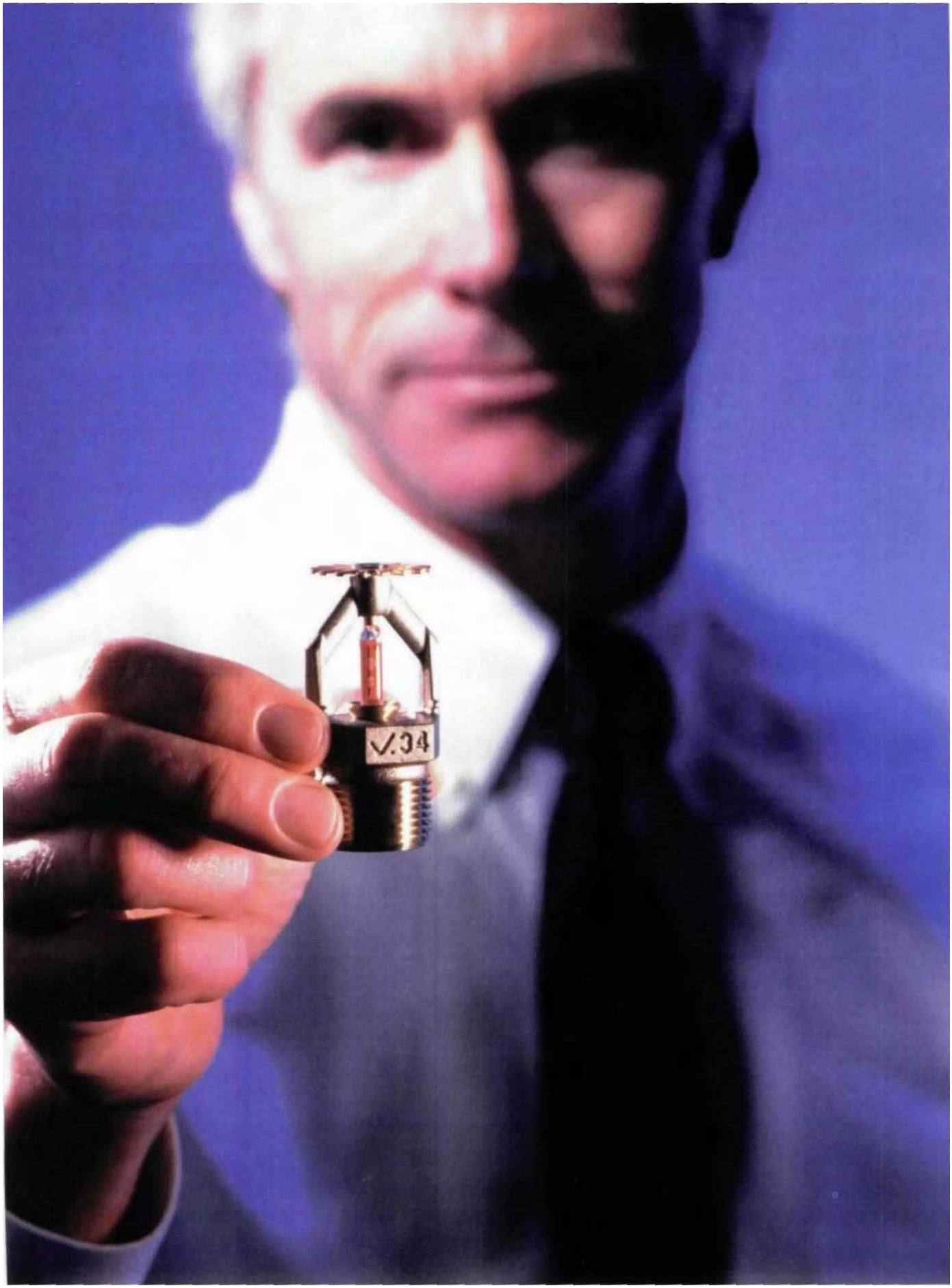
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Opening a Dangerous Door Even Further



Photograph: Cloudnoch

Summer's almost here, and with it, America's Independence Day holiday to commemorate our nation's precious freedoms. At this time of year, NFPA's basic mission to safeguard our society from the pain and suffering caused by fire and fire loss collides with an altogether too common element of Independence Day celebrations: the amateur use of fireworks.

For most of this century, NFPA has steadfastly opposed any use of fireworks by consumers. There are several good reasons for this, but perhaps the most compelling is that these devices are simply too hot, too fast-acting, and too dangerous to be used, transported, or stored by anyone who hasn't had specialized training. The use of fireworks by untrained people is one of the few fire hazards for which education, product standards, and fire protection—even combined—aren't enough to ensure safety.

As July 4th approaches, the public will once again be bombarded with information promoting "fireworks safety"—a dangerous oxymoron. However well-intentioned, campaigns to teach "safe" use of fireworks represent tacit endorsement and encouragement of amateur recreational use of explosive and burning devices. They may unintentionally empower families to experiment with fireworks, undoing the good work NFPA and others have done teaching children about fire safety and undermining the basic fire safety messages central to our work.

If we fail to convince the public that fireworks should be left strictly to trained professionals, I fear we will see a sharp rise in the already unacceptable toll of thousands of people, mostly children, who show up in hospital emergency rooms each year with burns, loss of eyesight, or tissue damage.

NFPA's view is shared by most of the major fire organizations. But others in the broader injury prevention community continue to offer "safety tips" for firing rockets and fountains and handling sparklers and other searing hot fireworks. We must help them understand that their tips *don't* ensure safe use, and, by implying it's okay to play with explosives, these groups open a dangerous door even further.

With the impending millennium celebration, 1999 poses a special threat through the public's potential exposure to consumer fireworks. NFPA's voice on this issue must be clear and unambiguous as we wage an ongoing struggle to preserve the safety of our citizens' lives and property. It's time to acknowledge that recreational use of legalized fireworks isn't about personal choice and that the effects spread far beyond the individual amateur user. "Amateur recreational use of fireworks" is just a fancy term for playing with fire, and we must do everything possible to put a stop to it. If we succeed, the millennium will be safer for everyone.



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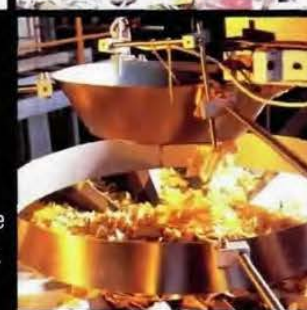






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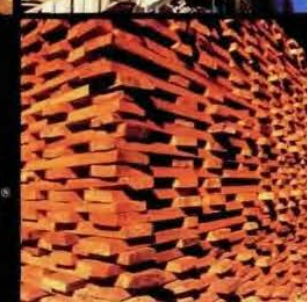
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■ OSHA standards for fire investigators

In "Mail Call" of the January/February 1999 issue, there were comments made relative to a previous issue depicting fire investigators wearing no respiratory protection while using instruments to evaluate conditions in a burned structure. The letter and the *NFPA Journal* response alluded to OSHA standards and their applicability to this situation. There seems to be no question about the need for their wearing of respiratory protection.

If the investigators were working within a state that has chosen to fund and provide its own federally approved, state-operated OSHA enforcement program, however, the OSHA Respiratory Protection rule may not have been legally applicable. The OSHA Act exempts state governments and their subdivisions from its rules. Therefore, if fire service personnel are working for a municipality in a state where OSHA enforcement is federally provided, the standard may not apply to them by law.

To their credit, our commissioners created a risk management policy for county departments in 1987. In that policy, they adopted OSHA standards as organizational guidelines for the job safety and health of our county government employees. Enacting a similar policy may be useful to other municipalities located in states with federally operated OSHA programs. This is especially true if they wish to cite OSHA standards as a rationale for requiring specific work conditions, equipment, and controls.

Ray Bishop
Safety Officer
Gwinnett County, Georgia, Government

■ *Journal* article misdirects from issues

In proposing their position on 10-year battery technology in a recent article in the *NFPA Journal*, NEMA (the National Electrical Manufacturers Association) has attempted to misdirect people from the real issues.

NEMA represents the interests of companies that produce carbon-zinc and alkaline 9-volt batteries. In recent years, the remaining marketplace for these products has dwindled considerably to the point where their major application has been to power residential smoke alarms. In order to bolster sales, the industry began what appeared to be a logical and well-intentioned campaign several years ago that promoted "Change Your Clock—Change Your Smoke Detector Battery." This appeared to be a reasonable approach to remind consumers of the need to have "working" smoke alarms. This really was a solution to a problem that had yet to be defined.

National statistics showed that the number of inoperable smoke alarms found in fatal and serious fires was far too high. After many years of promoting this program, two facts have emerged. The number of fatal and serious fires that occur have not been reduced by this campaign, and the number of 9-volt replacement carbon-zinc and alkaline batteries sold for smoke detectors has reached an all-time high. How is this so?

Surveys tell us that the same 60 percent of consumers change their batteries regularly. Roughly one-third do not, and the remaining 7 percent of residences have no smoke alarms at all. (Interestingly enough, many of the consumers who replace their batteries regularly do so in detectors that have outlived their reliable 10-year life expectancy.)

We can say confidently that 40 percent of all homes are still at serious risk for having inadequate or no warning of fire...the same number that existed before the "Change Clock—Change Battery" campaign began. The single big difference for this campaign has not been the number of lives or properties saved, but the number of batteries sold. At an average of $2.50 per battery twice a year for 10 years, the average consumer pays roughly $60 for each smoke detector in his or her home over a 10-year period. (This includes $10 for the cost of the detector.)

Government statistics show that the vast majority of homes with nonworking smoke alarms—roughly 33 percent of all homes fall in this category—are disabled for power supply reasons. That is, the battery has been removed because of nuisance alarms or the low-battery alert was interpreted as a malfunction or nuisance alarm and the battery was never replaced.

The real issue facing fire professionals is how to reduce the number of fatal and serious fires in the community. If, as has been shown, the majority of fatal and serious fires occur in homes where there are inadequate or no functioning alarms, and most of these have detectors that have been disabled because of nuisance alarms, clearly the single major cure for this issue is to require hush circuits in all ionization smoke alarms. (Ionization alarms represent 95 percent of all battery-operated smoke alarms sold to consumers.) The second major cure to solve this problem is to require 10-year lithium batteries be sold in these alarms. The combination of the two technologies directly resolves the real reason that the majority of

From the managing editor:

Spring is here! Well, technically it is. Living in New England, we can't count out a late-spring snowstorm, and we *can* count on a fair amount of raw, rainy weather. As the saying goes, "April showers bring May flowers."

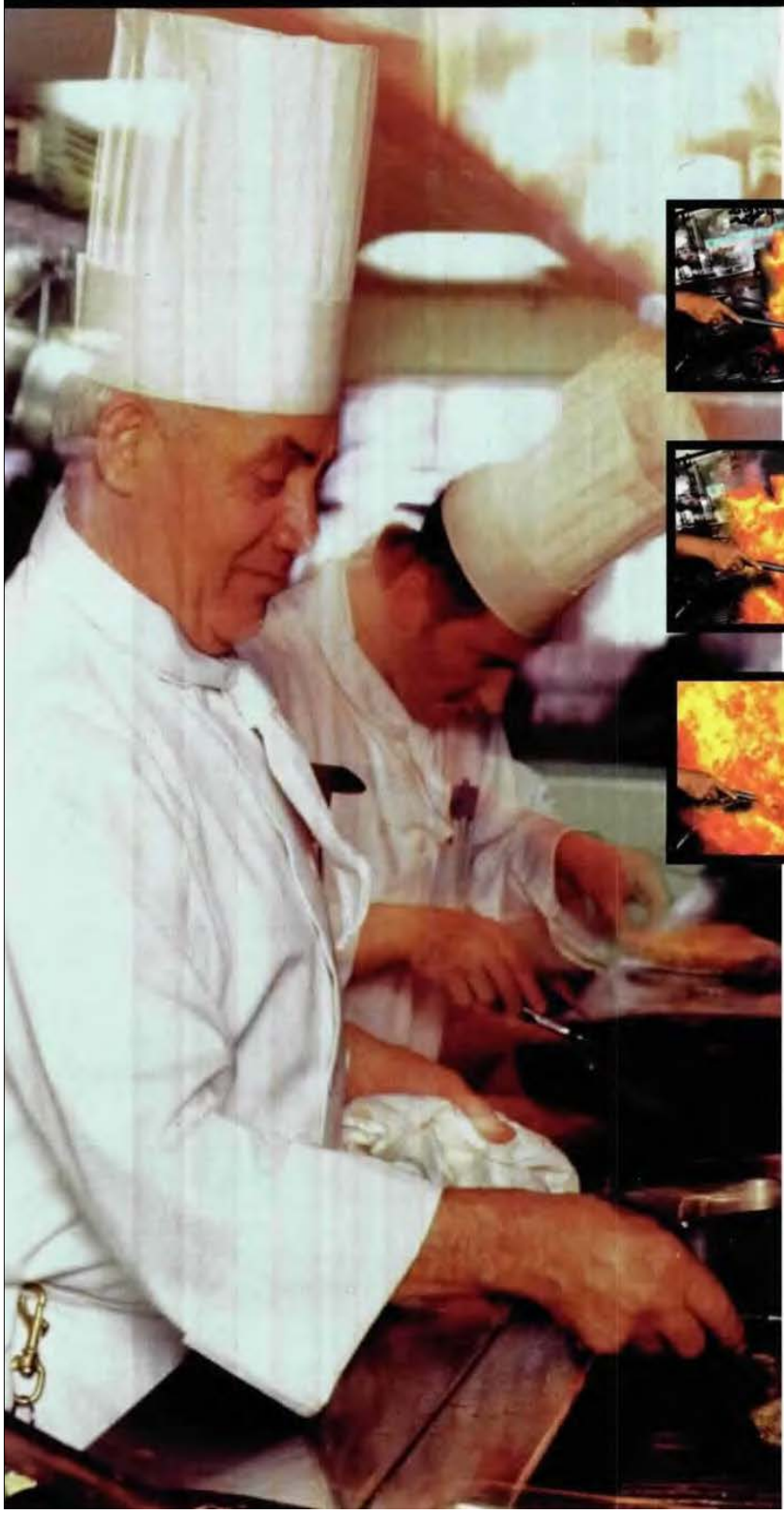
Spring signifies birth and new beginnings. This spring, NFPA has given birth, so to speak, to a new annual meeting with a fresh, innovative agenda. As you must know by now, the first World Fire Safety Congress and Exposition is being held this month in Baltimore, featuring a whole new format that includes educational tracks, the opportunity to earn continuing education units for all educational sessions, and session handouts and other supplementary materials. And this year, we're pleased to have Mike McCurry, former press secretary and assistant to President Clinton, speaking at the Opening General Session.

We hope that you've made plans to join us in Baltimore from May 16 to 20 so that you can experience firsthand the improvements we've made to make this meeting the foremost forum worldwide for education and information in the fire protection industry.

Kriston L. Welch

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smoke alarms are disabled. Models of these detectors are readily available from numerous manufacturers in every state.

NEMA has chosen to provide information that casts doubt on the existence of a reliable 10-year battery and claims that more time is needed to study this product. In fact, the lithium batteries chosen by the major manufacturers of smoke alarms have shown in industry standard tests to last on average 12.3 years, and after more than 6 years in real-time testing, the lithium batteries "keep going and going and going."

The cost to the consumer for a hush-circuited, 10-year smoke alarm runs $10 to $15. This, compared to the $60 for the alternative (which also requires many trips up and down ladders, trips to the store, and [the] environmental implications of battery disposal), makes the true solution—to require the adoption of rules raising the standards for smoke alarms—a "no brainer."

Concerns over cleaning [by] disabled or impaired homeowners...are a "fraction of 1 percent" [of the] issues raised by NEMA on behalf of their client/member battery manufacturers.

From my perspective, the choice for Oregon's legislators is clear: Adopt the minor proposed fixes to the landmark Oregon legislation offered in HB2586 by Representa- tive Randy Leonard and supported by the state fire marshal and many fire professionals. Save [the] lives and money of consumers, municipal fire departments, [and] health-care and property insurance providers and set the new standard for national home fire safety, or protect the transparent protestations of the big battery manufacturers.

Bob Pliskin
Consumer Home Safety Advocate
BobPliskin@aol.com

NFPA responds: Among Mr. Pliskin's several points, we agree that life-time cost is a more appropriate basis than initial cost for comparing the 10-year-battery option to the conventional battery option, that use of a 10-year battery should largely eliminate the dead-battery portion of the nonworking smoke alarm problem, that most of the nonworking smoke alarm problem is now known not to be due to dead batteries but to missing or removed batteries, and that reactions to nuisance alarms are the leading reason for missing or removed batteries. We also agree that a hush circuit is a possible solution to the problem of people disabling smoke alarms because of nuisance alarms, but it's a solution with cost implications and some added risk that fires will be detected later. It's also unknown what fraction of people who now disable their smoke alarms would regard this solution as sufficient and leave them operational.

Some of Mr. Pliskin's statistics are too high, in part because he's mixed statistics on households in general with those on households that have fires. However, this isn't central to his argument, because the problem of nonworking smoke alarms is large enough



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for concern even with better statistics.

We do disagree with Mr. Pliskin on some points. For example, the "Change Your Clock—Change Your Battery" campaign calls for once-yearly, not twice-yearly, battery changes. And while the campaign may not have solved the problem of nonworking smoke alarms, the problem at least stopped growing when the campaign and others like it began, so it appears to have had some positive effect. To the extent that the "Change Your Clock—Change Your Battery" campaign has sold more batteries, it's reduced the number of nonworking smoke alarms, so it's inconsistent to claim the former but deny the latter. Finally, there's no good reason to question NEMA's motives or those of the industry generally.

If Mr. Pliskin were to address these points, he would still have a viable technical counterposition to NEMA's, turning primarily on differing estimates of how well the 10-year battery and hush circuit technology would work and at what cost, and on how well educational campaigns designed to keep smoke alarms operational have worked and can work. These are legitimate subjects for discussion and debate among knowledgeable technical people and those responsible for public safety. We thank Mr. Pliskin for stimulating that discussion.

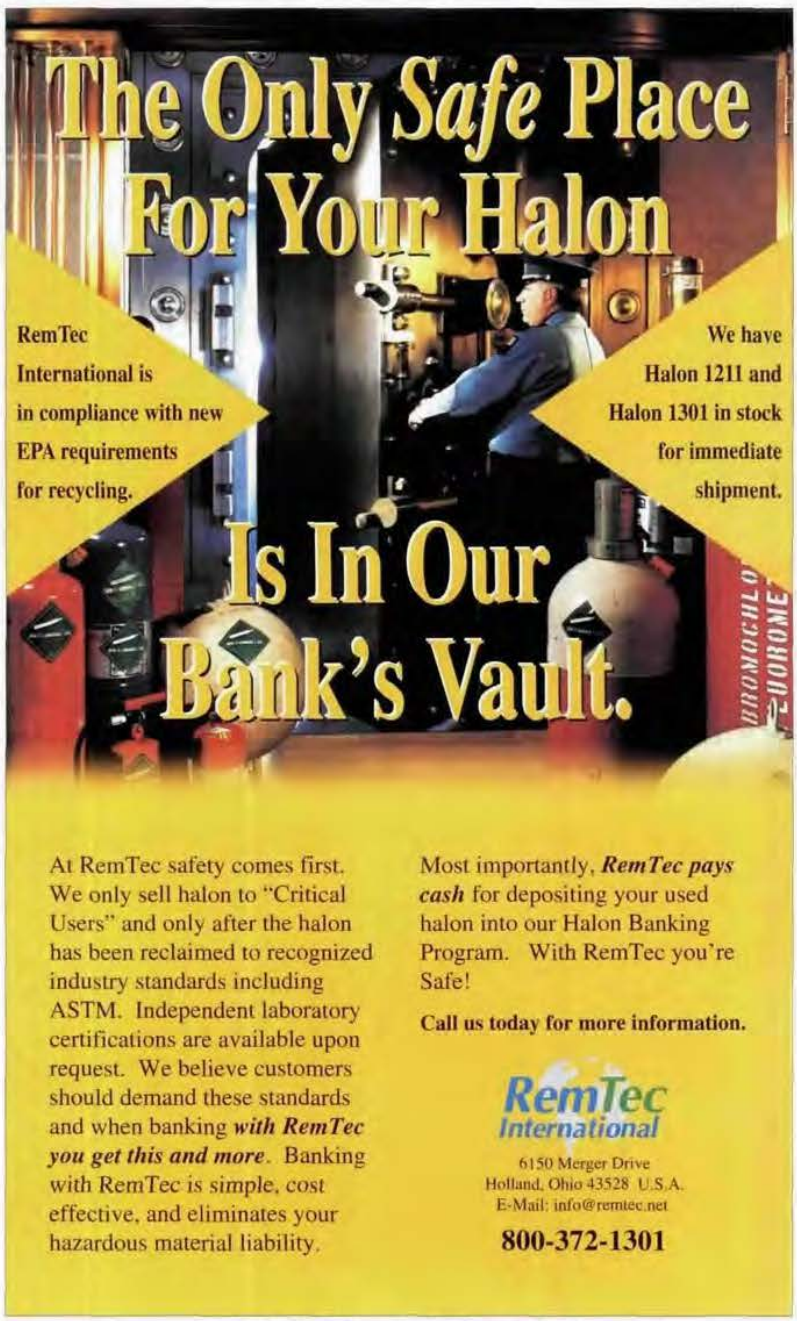
John R. Hall, Jr.
Assistant Vice President
NFPA Research and Analysis

■ Disappointed in 10-year battery article

I am terribly disappointed in the article you recently published entitled "The 10-Year Battery."

Simply put, we know that smoke alarms are disabled because of nuisance alarms, and a "hush" feature provides an alternative to disabling the device. It does not silence the alarm, but temporarily decreases the sensitivity. The alarm will resume activation if the smoke level increases. We believe the chance of someone misusing the hush feature is far less a problem than disabling the smoke alarm. I don't buy for a minute the argument that someone might use this technology to silence the detector in a real fire any more frequently than they would disable the detector. Our experience tells us that someone determined to silence an alarm will find a way to do it. Common sense tells us this hush feature will provide an alternative we can promote.

We also know that 10-year batteries exist in a number of forms and that placing one in the alarm is cheaper over the long haul than replacing batteries annually. It also allows us to promote the idea of changing the smoke alarm every 10 years, as Dick Bukowski of NIST recommends. There is a UL listing for one type, and no doubt others are possible. It seems to me a perfect match that the power source and the alarm itself should be on the same timetable for replacement. More than one manufacturer of 10-year smoke alarms is willing to stand behind its product and warrantee it for that period. However, some



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battery manufacturers did contact us and raised the same fears you've appeared to buy into in your article. But those fears have not materialized. You quoted Chief Deputy Bob Garrison pointing out that those same marketplace problems did not materialize then, and we still haven't seen them. I'm not sure that part of the article got the same readers attention the catch-line did.

In any event, your article also points out that a battery lasting less than 10 years is not a safety problem because the alert for low battery power is still required. What have we got to lose by requiring longer lasting battery sources?

We've changed the language that eliminated photoelectric detectors from being sold in Oregon. That takes care of a major concern of the industry and effectively minimizes their argument about limiting consumer choices while raising the bar on technology for alarms in residential properties.

We believe that our legislation gets at a basic issue that cannot be addressed by the NFPA standard. Specifically, it becomes the law of the land and allows us to determine what is sold for use, not just installed in new construction. It makes the retail outlets a partner in raising the level of technology because of their own liability concerns. And, most important, it allows us to tell people they should be replacing their old detectors with new and better technology. We believe we'll be able to provide more focus on smoke alarms than we've been able to do since the market went flat some years ago.

Finally, our belief is that by improving technology and pushing new style smoke alarms, we can get at the remaining "7 percent of homes without any smoke alarms at all," and the (roughly) one-third of all homes that have smoke alarms that don't work. We don't suppose that we have the perfect answer, but are confident we're moving in the right direction. Frankly, we're not willing to wait for perfection because it hasn't been invented yet.

Neither the consumers nor the retailers have complained about our efforts to improve the technology of smoke alarms. In fact, the Multi-Family Housing Council and the Oregon Apartment Association support our efforts to reduce the number of disabled detectors. There are plenty of alarms available for use at a price people can afford. My suspicion is that some of this concern comes from people with a proprietary interest in old technology who do not wish to see the bar raised for fire and life safety purposes.

And it appears the article bought into their arguments and portrayed it in a biased fashion before fully exploring the progress we've made in our legislative strategy.

Jim Crawford
Fire Marshal
Portland, Oregon

NFPA responds: We appreciate and understand Mr. Crawford's comments concerning the 10-year battery article in the January/February issue of *NFPA Journal.*

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However, we'd like to respond to some of his salient points.

It's true that 10-year battery-powered smoke alarms, which NFPA 72, *National Fire Alarm Code*, has permitted since 1993, can be cheaper in the long run than replacing carbon-based batteries annually. And it's true 10-year battery-powered smoke alarms help reduce failures of the power supply. However, unwanted alarms are responsible for many disconnected power supplies, something that 10-year battery-powered smoke alarms won't necessarily remedy.

We should be also note that the remaining 7 percent of U.S. homes without smoke alarms are frequently occupied by people with very limited economic options, making it unlikely that they'd choose higher-priced units when single-station smoke alarms are available for $5 or $10. It's more important to have a working smoke detector than it is to focus on what type of detector to use. Recent NFPA statistics indicate that simply having a smoke detector cuts your chances of dying in a fire nearly in half.

The use of a smoke alarm with a hush button feature is also permitted, provided the unit is listed for such use.

Hush buttons sometimes temporarily decrease smoke alarm sensitivity for several minutes. Pushing the button will silence the alarm, and as long as the quantity of smoke doesn't increase above this new threshold, the unit will stay silent. However, the use of hush buttons doesn't address the larger issue of improper smoke alarm location. Moving a smoke alarm farther from the source of the offending aerosol usually helps reduce the frequency of unwanted alarms. Photoelectric smoke alarms may also be slightly more resistant to some types of nuisance alarms, and this type of technology shouldn't be eliminated from the marketplace.

Because proper application, installation, and maintenance of equipment are crucial to reducing nuisance alarms, it's imperative that authorities having jurisdiction, installers, and the public understand smoke alarm technology and basic code requirements. NFPA strives to educate the public through campaigns such as *Learn Not to Burn®* and Fire Prevention Week. These educational programs are designed to help the public understand how smoke alarms work and where they should be installed. Education and technology are real solutions to the problem of unwanted alarms and failed power supplies.

The *National Fire Alarm Code* applies to both new and existing construction, and it's enforceable as law where adopted—which makes the need for local legislation of this nature somewhat redundant.

While NFPA applauds the Oregon state fire marshal's efforts to protect his constituents, we support the adoption of nationally recognized codes and standards developed by technical committees made up of technical experts familiar with the subject in a balanced, consensus process

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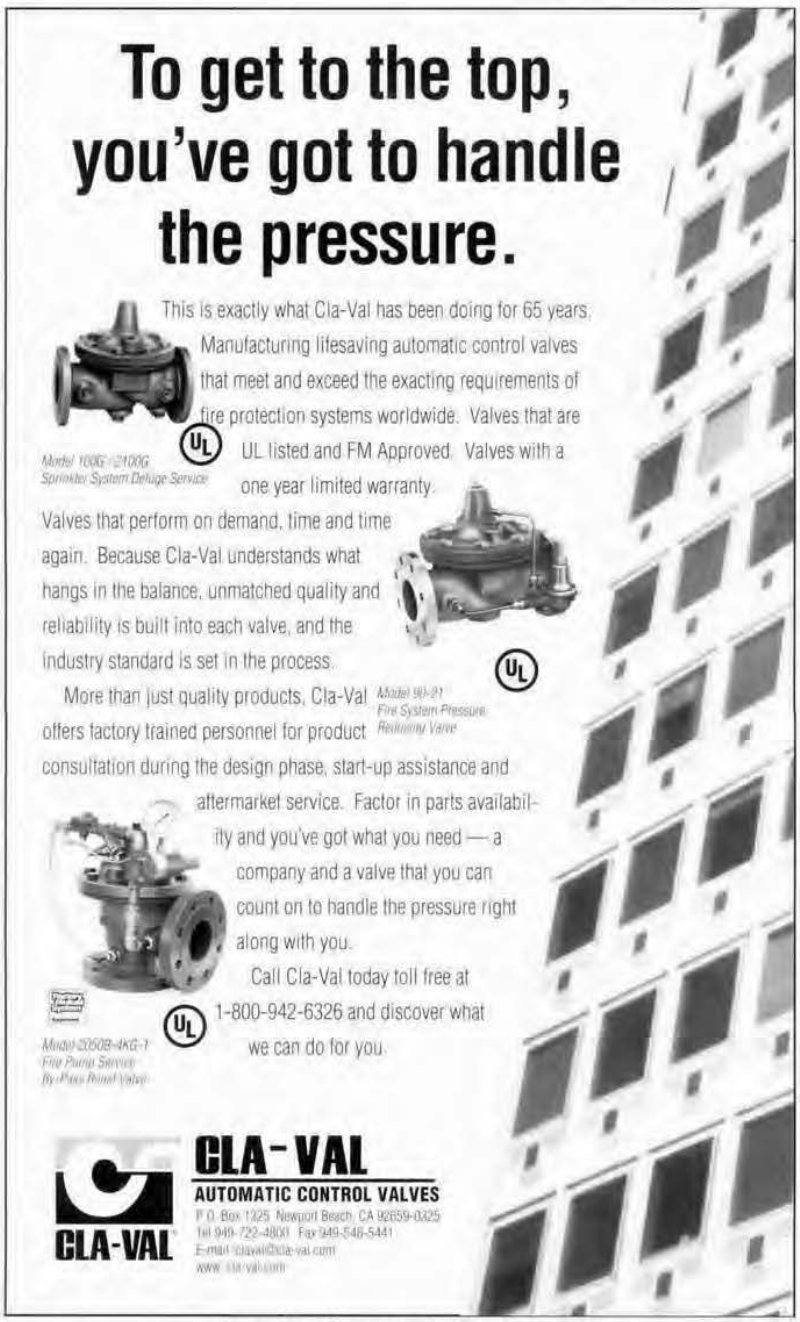
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that allows for a maximum public input. The adoption of local requirements or amendments to NFPA codes and standards undercuts the established consensus process and may create hazardous conditions that weren't considered when local changes were made. An open consensus process on the national level helps ensure that requirements don't create hazardous conditions because there are many sources of review.

NFPA encourages Oregon fire officials to participate in the NFPA process rather than producing local legislation. Proposed changes to NFPA documents receive full public review by participating on a national level.

Merton Bunker, P.E.
NFPA Chief Electrical Engineer



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■ A 10-year battery advocate has his say

The article "The 10-Year Battery" (*NFPA Journal*, January/February 1999), in which I was quoted, contains an astonishing amount of false information. The result—intended or not—is a biased, unfair critique of Oregon's smoke alarm legislation. To provide readers with a balanced view of this issue, I have prepared the following analysis....

The article says, "According to the CPSC, '20 percent of residential smoke alarms don't sound during fires' and 'the power source in 60 percent of such nonworking alarms is disconnected.'"

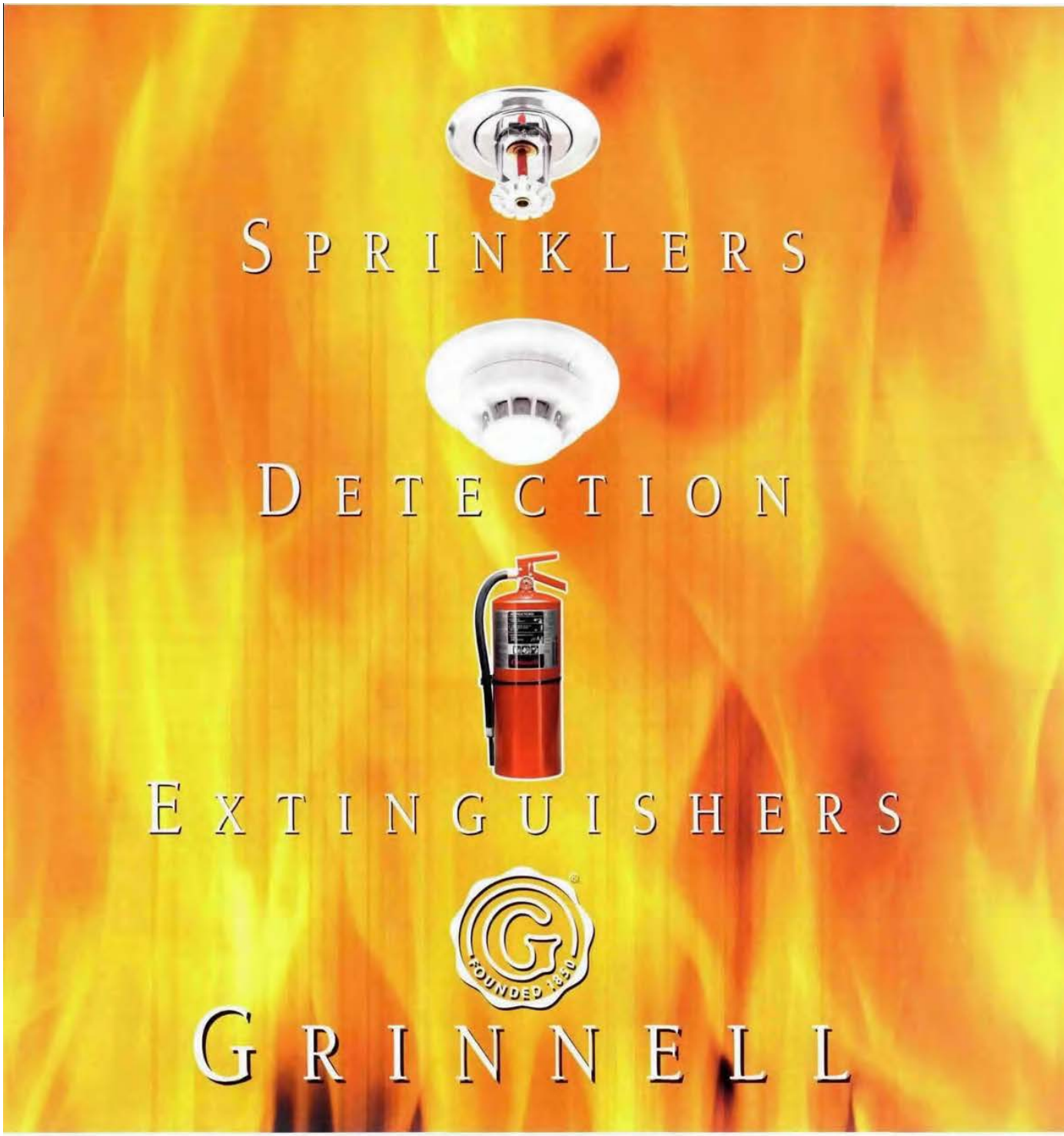
But the fact is this is a significant understatement and/or misrepresentation of the CPSC data. The CPSC study [titled *Smoke Detector Operability Survey Report on Findings* by Charles L. Smith] states that only "73 percent of detectors worked" when first tested, which means 27 percent would not sound during a fire. The 20 percent figure refers specifically to detectors that "did not have functioning power sources." Thus, 75 percent (20/27) of all nonworking alarms had power source problems. Of all alarms with nonworking power sources, 75 percent were actually "disconnected" and 25 percent had "dead batteries." All together, an overwhelming "93 percent of detectors observed to have problems with power sources were powered by batteries only."

The article says, "The Oregon law SB 874 mandates a '9-volt lithium battery' for all battery-powered smoke alarms."

But the fact is...the law prescribes a "10-year battery" only. Many types of lithium batteries could satisfy this requirement. First Alert, for example, uses three 2/3A-size lithium cells in some of their 10-year smoke alarms. Also, the law, as amended, applies only to ionization alarms, not "all battery-powered" alarms.

The article says, "Oregon fire officials' 'main concern' was adequate supply of 10-year alarms."

But the fact is this was a non-issue long before the bill became law. There are more than 25 models of 10-year smoke alarms available, and [as Ms. Wolf noted in her article] Bob Garrison, Oregon deputy chief fire marshal, said, "We had no problem at all keeping competitively priced alarms on the shelf."





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The article says, "Other manufacturers don't seem eager to compete with Ultralife...because the 9-volt battery market itself is limited."

But the fact is...9-volt batteries account for about 15 percent of the $2 billion U.S. alkaline battery market [according to Craig Leavitt in his article "The Battery Game," which appeared in *Discount Merchandiser,* in February 1998, and to Ultralife Batteries, Inc. industry research]. And the big alkaline battery makers can compete with Ultralife on 10-year batteries. Duracell, for example, makes millions of 2/3A lithium batteries—the same type of batteries that First Alert uses in 10-year smoke alarms.

The real issue behind [the] opposition to 10-year smoke alarm legislation is almost certainly profit. Each 10-year smoke alarm sold means up to 20 9-volt alkaline replacement batteries won't get sold. If you "change your clocks/change your batteries"—a slogan created by an alkaline battery maker's PR firm—you'll buy as many as 20 alkaline smoke alarm batteries over 10 years.

The article says, "Ultralife [Batteries, Inc.] could find it difficult to keep up with demand."

But the fact is this red-herring issue is being circulated in Oregon by lobbyists [Russ Spencer and Brian Boe] hired by Duracell and NEMA [respectively]....As noted above, the Ultralife 9-volt lithium battery is not the only 10-year battery available...Ultralife has consistently taken measures to meet demand for its products, and there is every indication the company will continue to do so.

The article says, "Smoke alarms packaged with the 9-volt lithium battery may carry the UL mark, but that doesn't mean UL lists them for 10-year use."

But the fact is...battery life calculations are based on elevated-temperature tests that are accepted and used throughout the battery industry. In fact, Ultralife Batteries, Inc., for one, has real-time tests ongoing that are currently beyond six years. In fact, engineers at First Alert, KIDDE, Maple Chase, and elsewhere have accepted 10-year battery life substantiations.

The article says, "According to a NEMA representative, a smoke alarm's hush feature could be 'deadly' for people with impaired judgment, who might push it in a real fire."

But the fact is this "argument" is simply absurd. First, hush circuits have an automatic override that defeats the manual button when heavy smoke is present. Second, an "impaired" person would benefit from a 10-year smoke alarm because he/she wouldn't have to remember to replace (and then physically replace) the smoke alarm battery once or twice every year!

The article says, "Mandating a 10-year battery and hush feature 'constrains the marketplace to the detriment of the consumer.'"

But the fact is these are technological improvements that will, according to actual firefighters, save lives. And the cost to consumers will be lower....In addition, the mandate applies *only* to single-station ionization smoke alarms. There is no constraint on any other types of detectors.

The article says, "It may be 'wrong' to focus on 'nonworking detectors' since an NFPA study shows 'a majority' of fire deaths occur in homes with no smoke alarms at all."

But the fact is the actual NFPA statistic is "nearly 60 percent" of home fire deaths occur in homes without detectors. That means more than 40 percent of fire deaths occur in homes *with* detectors. The NFPA study [*U.S. Experience with Smoke Detectors and Other Fire Detectors*] also states, "In one-third of the detector-equipped homes that had fires, the detectors didn't work...usually because the batteries are dead, disconnected, or missing."

The article says, "There are a 'relatively small number of cases in which consumers fail to replace dead batteries.'"

But the fact is the CPSC survey shows [that] 5 percent of all alarms had dead batteries inside; 15 percent of all alarms had missing or disconnected power sources (virtually all of which were batteries); of the missing or disconnected batteries, more than 45 percent were due to consumer failure to replace the battery; and an additional 32 percent were removed to stop nuisance alarms.

The article says, Oregon has "abolished sales of single-station photoelectric alarms."

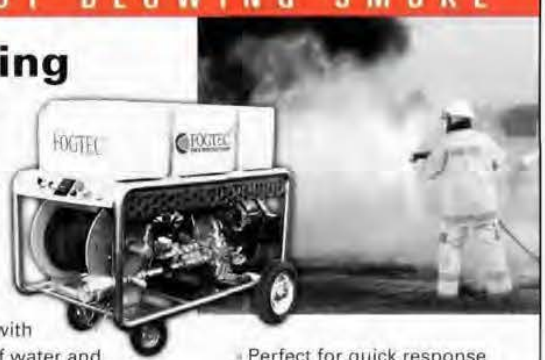
But the fact is the...bill, as amended, clearly applies only to single-station ionization alarms. Retailers can sell, and consumers can buy, any other types of smoke detectors they choose.

The article says, "In Oregon, 'ionization-

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type alarms have been elbowed off the shelf by the new law.'"

But the fact is...as Oregon Deputy Chief Fire Marshal Garrison noted, there are plenty of ionization alarms on retail shelves, and they have state-of-the-art safety features like 10-year lithium batteries and nuisance hush buttons.

The article says, "Other types of residential alarms" (like combination CO detector-smoke alarms) "suffer under the Oregon law."

But the fact is...the bill, as amended, applies to single-station ionization alarms only. Combination alarms, like photoelectric alarms, can be bought and sold in the state as always.

The article says, "According to some safety experts, the mandatory use of 10-year batteries introduces new safety issues."

But the fact is Paul Patty of Underwriters Laboratories, perhaps the preeminent safety experts in the world, stated that it is not "a safety issue." Rather, "it's more of a marketing and warranty issue" [as Ms. Wolf notes in her article]. There are both 9-volt lithium batteries and 2/3A lithium batteries warranteed by their manufacturers to last 10 years in smoke alarms.

The article says, "10-year batteries might encourage" people to hold onto 10-year-old smoke alarms "when they should be replaced."

But the fact is alkaline batteries have to be replaced every six months to a year, so how do you know when the alarm is 10 years old? In contrast, when a 10-year battery dies, you know it's time for a new alarm. Forget about the "change your clock/change your battery" slogan—the far superior safety message is "When the battery dies, get a new smoke alarm!" The 10-year battery is the perfect way to educate consumers on the useful life of ionization smoke alarms.

The article says, "A 10-year battery might give consumers a 'sense of complacency.'"

But...does battery life really impact the way people test and clean their smoke alarms? Those who do clean and test regularly would likely do so no matter what the battery life. And for those who don't clean and test their alarms, battery life is irrelevant. Even if complacency is a concern, it would be simple to place a sticker on the alarm as a reminder that a 10-year alarm must be tested just like any other alarm.

The article says, "Another issue that concerns some experts is cost."

But the fact is...10-year smoke alarms are readily available for $10 to $15, and they last 10 years. Alkaline-powered smoke alarms cost $7 to $10. But when you buy a new alkaline battery once (or twice) a year (at an average of about $2.50 each), the true cost of ownership over 10 years becomes $32 to $57 for that "cheap" one-year alarm. Meanwhile, the cost of the 10-year alarm remains at just $10 to $15.

The article says, "The cost of the 10-year battery may 'hamper efforts' to get smoke alarms into 'low-income homes.'"

But...it is...obvious from the analysis above that the "cost savings" of a "one-year" alarm is only an illusion....One may assume that most poor families rent, not own, their homes. It is therefore not the low-income family that buys the smoke alarm, it is the higher-income landlord. Indeed, "one-year" smoke alarms burden a poor family with having to buy replacement batteries every year. And it seems likely that many poor families would choose not to buy those batteries, leaving their lives at risk with a nonworking alarm.

The article says, "Hard-wired smoke alarms are 'an approach that eliminates the missing battery problem.'"

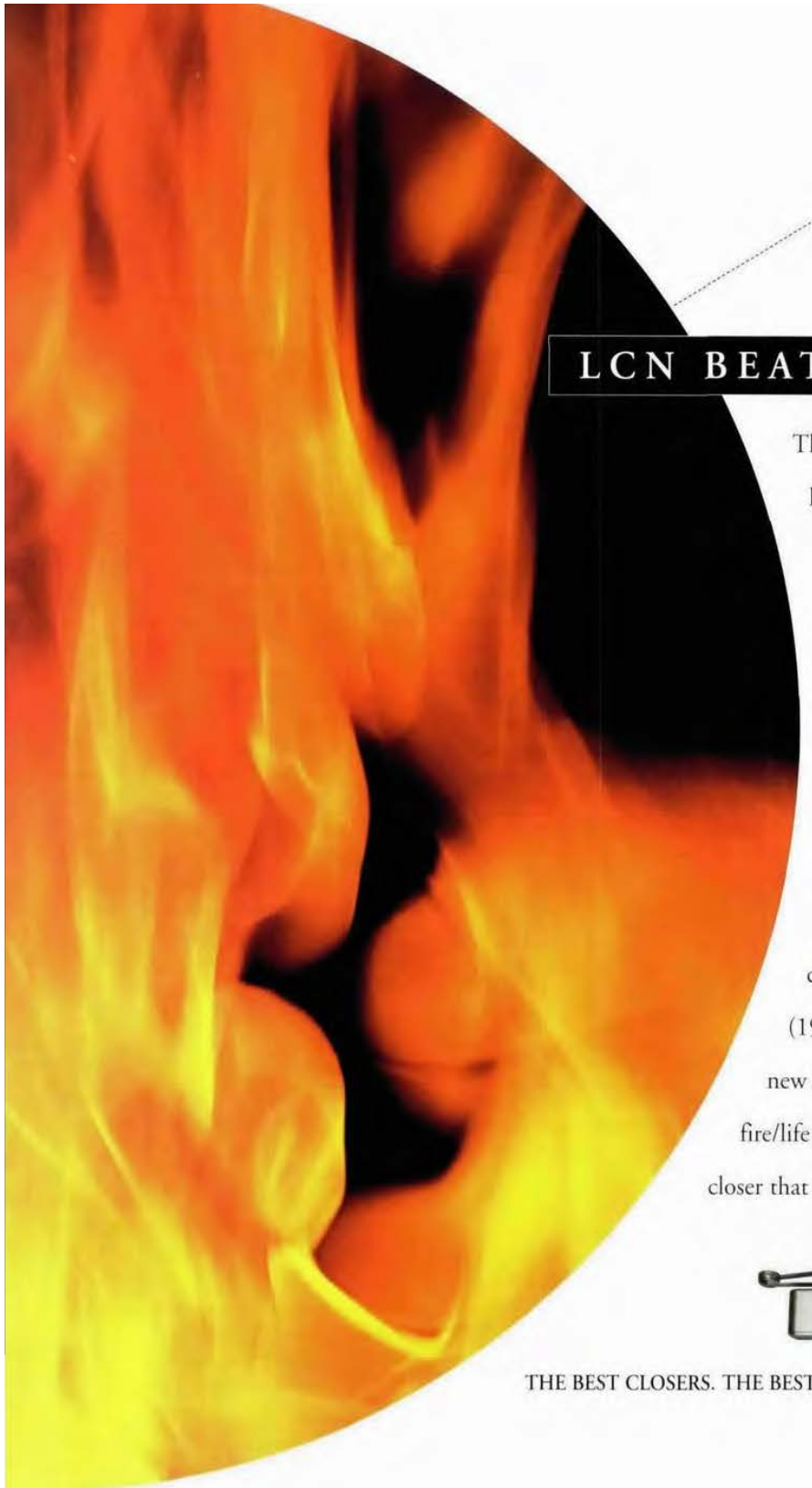
But the fact is...many hard-wired alarms require battery backup power, because in an electrical fire, AC current to the alarm can be cut off. In addition, with hard-wiring, the alarm can be powered far beyond 10 years, far past the recommended useful life of the alarm. So, ironically, maybe it makes more safety sense, and is more cost-effective, to use 10-year battery-powered alarms instead of hard-wired units.

The article says, "The Oregon legislation may keep 'new applications' of smoke alarm technology 'off the shelves.'"

But the fact is 10-year smoke alarms with hush features are like seat belts or grounded electrical outlets. Did seat belt laws prevent airbags from being introduced? Did code on grounded outlets stop the invention of GFI outlets? These analogies are apt. You can safely drive a car without a seatbelt; you can safely plug into ungrounded outlets; and you can safely use a one-year smoke alarm. But



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in each case, you are much safer with the improved technology.

Thank you for the opportunity to counterbalance some of the serious misrepresentations in this article. I urge all interested parties to look at the facts and listen to what fire professionals around the country are saying. The Oregon law is an exemplary initiative. It addresses major shortcomings in the most common type of smoke alarms; it advances safety technology in those alarms cost-effectively; and it makes people safer in their homes.

Gregory B. Smith
Marketing Manager
Ultralife Batteries, Inc.

NFPA responds: It should be noted that this article was prepared before the Oregon law was amended, so Mr. Smith's comments about the changes are duly noted. This situation will sometimes occur due simply to *NFPA Journal's* production lead time requirements.

That said, I'm compelled to note that the point of this article wasn't to downplay the problem of nonworking smoke alarms. In fact, NFPA's been hammering home that very point for years, as its members and regular readers of *NFPA Journal* are aware—and as the fact that the statistic Mr. Smith cites comes from an NFPA study attests. One would be hard-pressed to find a bigger group of advocates of working smoke alarms than the 65,000 members of NFPA.

The CPSC study to which Mr. Smith refers indicates that approximately 20 percent of installed smoke alarms fail because their power supplies fail. Of this 20 percent, approximately 5 percent of power supplies fail because of dead batteries. In the remaining 15 percent of failures, the power sources are either missing or have been disconnected, and the primary reason for disconnecting a power source or removing batteries is nuisance alarms. Approximately one-third of the study's respondents indicated that they'd intentionally disconnected their smoke alarm power supplies because they were tired of nuisance alarms, and nearly 93 percent of detectors that had power supply problems used only batteries, which are easily removed.

Obviously, disconnected power sources and missing batteries present a much larger problem than dead batteries, and the solution to it isn't a 10-year battery. It's proper installation and maintenance in accordance with NFPA 72, *National Fire Alarm Code®*, which will prevent many nuisance alarms.

As to Mr. Smith's assertion that the article says "Smoke alarms packaged with the 9-volt lithium battery may carry the UL mark, but that doesn't mean UL lists them for 10-year use," he is mistaken. The article actually says that "*Other* smoke alarms packaged with the 9-volt lithium battery may carry the UL mark, but that doesn't mean UL lists them for 10-year use." We note, in fact, that BRK's First Alert 10-year smoke alarm is the only one listed by UL for 10-year use. Other smoke alarms may be packaged with the 9-volt 10-year battery, but that doesn't mean that UL lists them for 10-year use with the lithium battery. It simply means that they contain a battery that may last up to 10 years.

Mr. Smith also seems to be mistaken in assuming that the reference to "impaired" individuals in the article refers to those who are physically impaired. A closer reading would reveal that we specifically talked about people suffering from impaired judgment, not those with physical handicaps. In cases such as these, a hush button may not be practical as it might cause impaired individuals to silence the smoke alarm when they should, in fact, evacuate the premises. In any case, the statement was made by a NEMA representative, who is certainly entitled to voice NEMA's position on the subject, just as Mr. Smith is voicing Ultralife's.

Mr. Smith quotes Paul Patty of UL as saying in Ms. Wolf's article that the mandatory use of 10-year batteries introduces not safety issues, but marketing and warranty issues. We agree, as long as the smoke alarm produces a low-battery trouble signal at the end of its life. Unfortunately, this chirp is often thought by the public to be a nuisance alarm—which leads people to disconnect the battery rather than replace it. Since this can happen as easily with a 10-year battery as any other type, it's a problem for all smoke alarms.

NFPA's also concerned that 10-year battery-powered smoke alarms may induce a sense of complacency because most people with conventional carbon or alkaline bat-

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teries perform regular maintenance when they change their detectors' batteries. Concerned about the cost of detectors for low-income families, Mr. Smith points out that "it is...not the low-income family that buys the smoke alarm, it is the higher-income landlord." While it's true that 10-year battery-powered smoke alarms may be cheaper in the long run than other types of alarms, many landlords don't maintain smoke alarms regularly. As a result, savings on maintenance isn't really an issue with this segment of property owners.

NFPA 72 doesn't currently mandate the use of 10-year battery-powered smoke alarms instead of hard-wired units primarily because hard-wired smoke alarms must be interconnected so that if one alarm sounds, every unit connected to it will sound at the same time. This is something no single-station battery-powered smoke alarm can do, and it's of tremendous importance to people sleeping with bedroom doors closed. In addition, the cost of installing a 120-volt-powered smoke alarm at the time of construction is relatively small compared to the cost of retrofitting an existing home.

In summary, many problems associated with failed power supplies are due to improper installation or maintenance practices. Simply following the requirements of NFPA 72, *National Fire Alarm Code*, helps eliminate many nuisance alarms and the subsequent disconnection of power supplies, as do educational efforts, such as Fire Prevention Week programs and the "Change Your Clocks/Change Your Batteries" campaign, which raise the public's awareness of the problem.

NFPA always supports the introduction of technology that promises to improve reliability. However, the Technical Committee on Household Fire Warning Equipment, composed of nationally recognized experts from many different interest groups, didn't reach consensus on the provisions of the Oregon law. Until this committee recognizes the mandatory use of 10-year powered smoke alarms, NFPA will continue to support the requirements of NFPA 72, rather than local legislation.

Merton Bunker, P.E.
NFPA Chief Electrical Engineer

■ Assuming responsibility for protecting LP-Gas facilities

The article [in the January/February 1999 issue of *NFPA Journal*] about the Albert City, Iowa, BLEVE that killed two firefighters emphasized that the burden of the protection for this large LP-Gas installation rested with the fire department. The author should have explained that the facility owner also has an obligation to the safety of emergency responders. The LPG vessel volume was 18,000 gallons (68,136 liters), and a water supply was not available. According to NFPA 58, *Liquefied Petroleum Gas*, Section 3-10.2, this installation required a competent fire safety analysis.

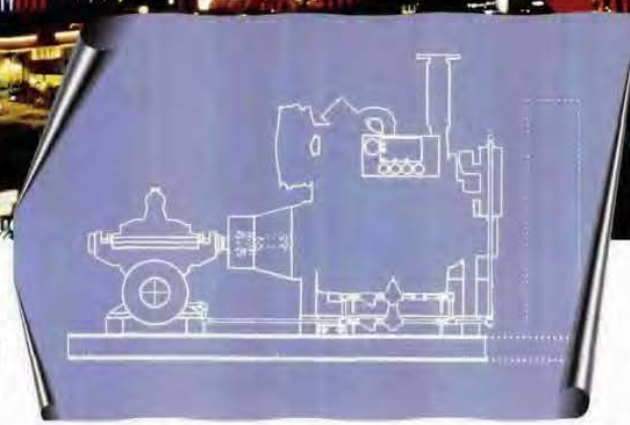
A competent fire safety analysis is required for LPG storage containers with an aggregate water capacity of more than 4,000 gallons (15,141 liters) that can be subject to exposure from a single fire. The analysis evaluates hazards within the container site, exposures, the water supply, the effectiveness of the fire department. The analysis must consider the safety of emergency personnel (NFPA 58, Section 3-10.2.2).

The first consideration of this analysis is the ability of the fire brigade or fire department to apply water for control of leaks or [to] protect...the LPG tank from fire exposure. If the analysis finds that a serious hazard exists, NFPA 58 then requires special protection for the LPG container. This can be in the form of insulation, burial, mounding the pressure vessel with a minimum 1-foot (0.3-meter) layer of sand or earth, or the installation of automatic water spray systems or monitor nozzles.

This particular LPG container was located in an area without a water supply. The *NFPA Alert Bulletin* stated that it took the fire department 11 minutes to respond to the scene and begin operations. Approximately 7 minutes into the operation, the vessel BLEVEd. Given the long response time and the lack of a water supply, this installation presented a serious hazard to firefighters.

The "lessons learned" section of the article emphasized [that] the burden of protecting large LPG containers rests on the firefighters' shoulders. The article should have equally emphasized the facility owner's responsibility under NFPA 59, *Storage and Handling of Liquefied Petroleum Gases*. This

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obligation would have been met if a competent fire safety analysis had been performed and a method of special protection... provided for this LPG container.

Paul Maldonado
Assistant Fire Chief
City of Austin, Texas, Fire Marshal

NFPA responds: You are correct in explaining that the LP-Gas tank installation on the turkey farm in Albert City, Iowa, required a fire-safety analysis. The tank that suffered the BLEVE had a capacity of 18,000 gallons, and Paragraph 3-10.2 of NFPA 58, *Liquefied Petroleum Gas Code*, requires such an analysis of tanks with a capacity of more than 4,000 gallons.

The NFPA fire investigation report and the *Journal* article about the incident addressed fire department safety and strategy and tactics. Our intention was to stress to the fire service that this type of installation exists in every community, and while they look innocent enough, a fire in one can have tragic consequences. Even if the fire department doesn't know for certain whether a fire safety analysis has been conducted on a particular installation, the fact remains that firefighters should be aware of LP-Gas tanks and associated equipment in their jurisdiction and plan accordingly for fires involving them.

NFPA fire safety analyses of such installations differ in each jurisdiction. A small community, such as Albert City, may not have the resources or expertise to conduct a complete engineered analysis of each installation in its response district. In such cases, the analysis usually consists of a planned response, not the installation of protection.

On an encouraging note, Iowa State Fire Marshal Roy Marshall reported that attendance at LP-Gas training classes has increased dramatically in the months since the Albert City incident. Marshall says that his office has presented more than 70 such training sessions to the fire service in the past 12 months. With training, the fire service can avoid tragedies such as the one that occurred in Albert City.

Robert Duval
Fire Investigator
NFPA Fire Investigations Department

■ Cause of ship fire?

I spent several years working in the textile industry and would like to comment on a possible implication for the investigation of the cruise ship fire, based on [the following] excerpt from the text in the article on page 40 [of the January/February 1999 issue of *NFPA Journal*]: "The resulting electrical arc produced sparks, which ignited a small fire under the mangle. The mechanics were trying to extinguish the flames with water when they saw a large fire in the vent opening over the machine."

Assuming that a large portion of the laundry processed on the ship is cotton towels and sheets, I would offer that cotton lint dust, which had accumulated over time and had not been cleaned away, caused the fire

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to spread rapidly from under the mangle to and through the ducts. I have observed fires from accumulated cotton dust burn along overhead pipes, wiring, and conduit like gunpowder...in a textile dye house with very high humidity.

Ray Bishop
Safety Officer
Gwinnet County, Georgia, Government

■ Changes in standard hurts consumers

I'm writing in response to Matt O'Connor's article on CO detectors entitled "Changing for the Better" in the January/February 1999 issue of *NFPA Journal*.

The changes in the new standards may be better for NFPA's standard setters, for fire departments, and for manufacturers, but they are definitely worse for consumers.

While the new detector limits will reliably warn people of levels that are immediately hazardous to life, the old detector limits provided consumers with an inexpensive method of monitoring CO at levels that will damage their health. Workers also have lost the ability to monitor CO workplace levels inexpensively at levels that approach the eight-hour-per-day exposure limits....

Monona Rossol, M.S., M.F.A.
Industrial Hygienist
United Scenic Artists, Local 829 (IBPAT)
New York, New York

NFPA responds: The carbon monoxide (CO) alarms discussed in Mr. O'Connor's article are designed, tested, and listed solely for household use. These alarms are *not* permitted to be used to monitor workplace CO exposure. CO in the workplace must be monitored by a system designed, tested, and listed for the commercial use.

Early threshold values for household CO alarms roughly corresponded to the 5 percent blood carboxyhemoglobin (COHb) curve for healthy adults. However, outside temperature inversions and low ambient CO levels caused a very large number of nuisance alarms in these early detectors, and nuisance alarms of any kind erode public confidence, create a "cry wolf" syndrome, and tie up valuable fire department resources.

In 1996, the U.S. Consumer Product Safety Commission (CPSC) conducted a hearing on this matter. After examining extensive public input, UL set the new household CO alarm threshold values to correspond to the 10 percent COHb level, rather than the 5 percent level. The new alarm threshold setpoints were chosen as optimal values that would help eliminate nuisance alarms, yet protect the user to the maximum extent possible. Of course, manufacturers may design their alarms for lower limits if they wish to.

Very few people will notice any health effect at the 10 percent COHb level. Symptoms of CO poisoning, such as headaches and nausea, start to appear at 15 percent COHb levels and higher, so CO alarms using the 10 percent COHb curve will still alarm early enough to prevent death from, or even most symptoms of, CO poisoning. Even people with risk factors will be able to respond before they feel the effects of CO poisoning. In addition, the current NIOSH



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level of 35 ppm for eight hours roughly corresponds to the 10 percent COHb curve

CO alarms should not be a substitute for safe working practices or preventive maintenance, and fuel burning appliances such as engines and gas grills should never be used indoors. Where it's necessary to use fossil-fuel-burning equipment in commercial settings, adequate precautions, such as good ventilation, must be taken. Appliances such as furnaces and fireplaces should be inspected and maintained by a quailified technician at least once a year.

Merton Bunker, P.E.
NFPA Chief Electrical Engineer

■ Was that a misprint?

I just want to point out what I hope to be a misprint, and not a true statement, in "Building a Fire Safe Dorm," January/February 1999 *NFPA Journal*. The last sentence of the "Sprinkler and smoke evacuation systems" portion of the article [says], "It will also open the supply and exhaust automatic control dampers and start the exhaust and supply fans to maintain a negative pressure in the smoke-proof vestibule on the floor on which the fire has been detected." This appears to be a reference to the exit stair vestibule which, if negatively pressured with respect to the fire floor, will result in smoke and products of combustion being drawn into the stair tower. I respect that the designers probably know what they are doing and this is a simple misprint, but I need to let it be known that it exists, on the off-chance that they are actually doing it that way. By the way, *NFPA Journal* is an excellent publication. Keep up the good work.

Rob Campbell
ESI Engineering Services, Inc.
Walnut Creek, California

NFPA responds: I'm not familiar with the specifics of this particluar building's smoke management system, but the designers may have used a purged vestibule, in which occupants enter an area that's separated from the stairwell and the rest of the floor before entering the stair enclosure. The vestibule is then exhausted or pressurized negatively to draw smoke out of the stairwell. This approach is outside the guidelines offered by NFPA 92A, *Recommended Practice for Smoke-Control Systems*, but it could be a valid approach if part of an engineered system.

Greg Harrington
Fire Protection Engineer

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**Gas Research Institute Report, 1997*

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■ Article update: Esso refinery



In our last issue, we reported on a fire in Australia that shut down an Esso refinery on September 25, 1998. The Australian Associated Press reports that the Longford Royal Commission has heard from an expert from Esso's United States parent company, Exxon, who told management at the refinery that they should have shut down the plant before the explosion, which killed two workers.

The investigator also suggested that a fault in the plant's design may have contributed to the disaster.

The blast and the massive fire that followed killed two, injured eight, and cut the state of Victoria's gas supply for almost two weeks.

The Esso production coordinator in charge of gas production at the time of the disaster said that, in hindsight, he wouldn't have tried to warm a heat exchanger had he known exactly how cold it had become.

The Royal Commission heard that, in the hours before the explosion, high levels of cold condensate lowered the temperature of equipment to dangerous levels.

The production coordinator, a 28-year veteran, said he was unaware of the amount of condensate in the plant's lean oil system on the morning of the blast or of the true temperature of key equipment.

He agreed that a contributing factor to the disaster was that "the right information was not given to the right people."

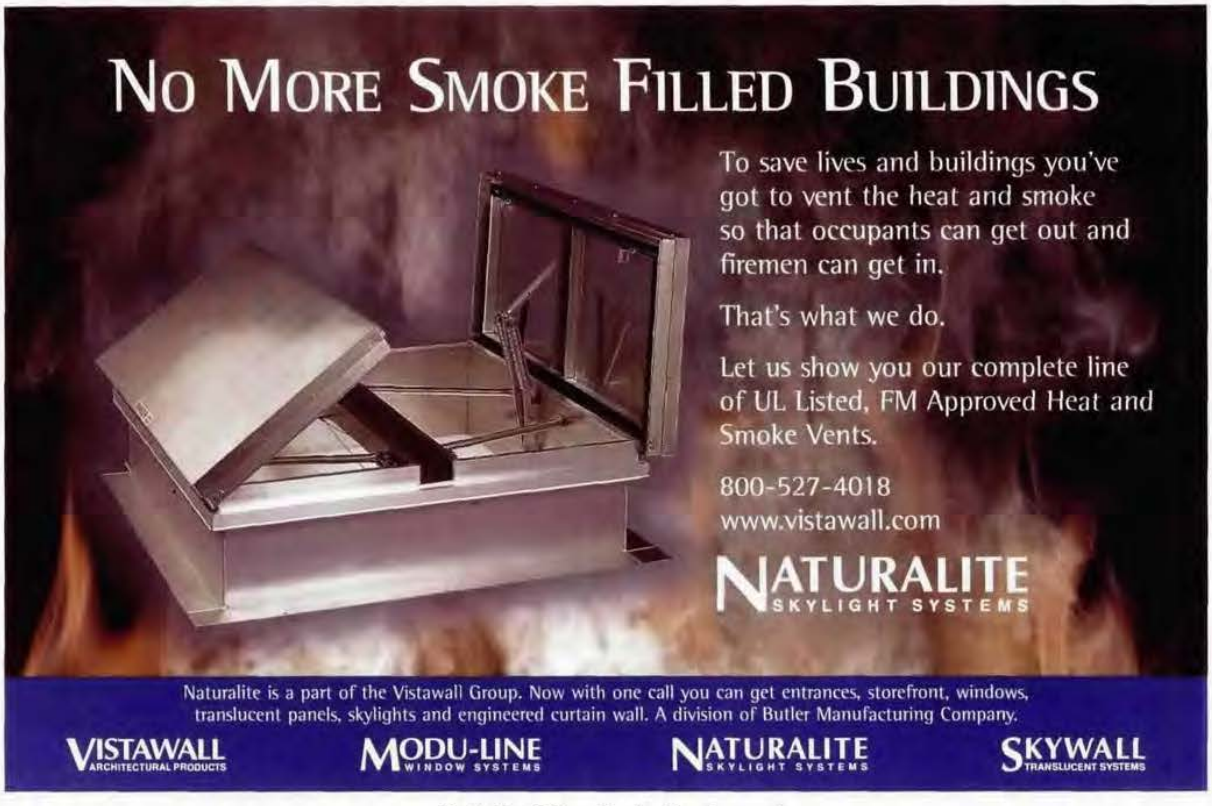
The production coordinator helped restart the lean oil system through the plant to warm cold equipment, despite the risk that warm liquid could rupture equipment that had become brittle with cold.

The Royal Commission heard that the rupture occurred about 15 seconds after "maximum output" of lean oil through a bypass around two exchangers at about 12.25 p.m. The escaping vapor ignited about a minute later.

The Royal Commission was told that work on restarting the lean oil circulation system continued, despite warnings that the 922 exchanger that had been leaking oil should be shut down.

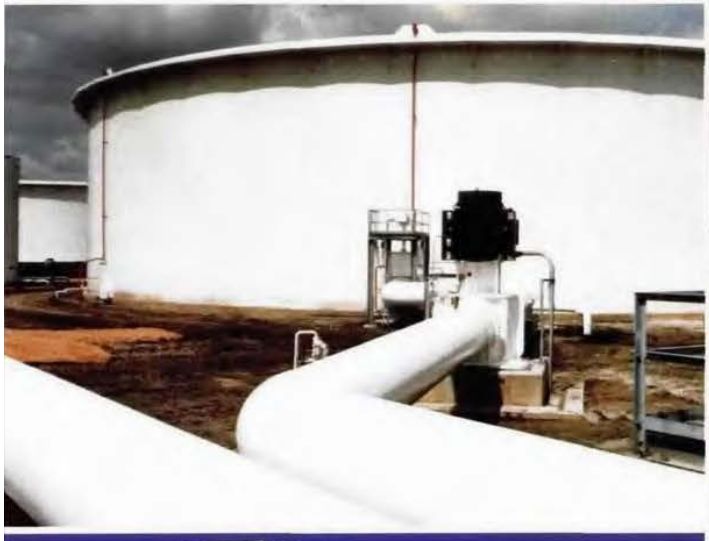
The acting maintenance supervisor and another supervisor, who were killed in the explosion, were trying to repair the exchanger. They had said that the system should be shut down and depressurized so they could replace a gasket on the exchanger.

The Royal Commission is continuing its investigation.



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■ NATO goes NFPA

by Gaetan Perron

At a recent meeting of the North Atlantic Treaty Organization (NATO) at their headquarters in Brussels, senior fire service representatives of the member nations officially recognized NFPA 403, *Airport Rescue and Fire Fighting Services at Airports*, as the standard for aircraft rescue and firefighting at their military installations. They also recognized NFPA 418, *Heliports*, as the standard for heliport protection.

This agreement is one of hundreds that the 16 member nations—which now number 19 with the addition of Poland, the Czech Republic, and Hungary—have signed to ensure interoperability during joint operations. In short, the adoption of NFPA 403 means that a NATO aircraft will receive the same level of fire protection in all countries that have ratified the agreement.

Although all countries are supporting the adoption of NFPA 403, it may take a few years before some members can fully implement the agreement, while others will implement it with reservations.

To have 16 nations support one standard is quite an achievement, attesting to the credibility of NFPA around the world.

■ New fire investigation training tool launched

by Lauren B. Siniarwer, Public Affairs Specialist, NFPA



A partnership of NFPA; the Bureau of Alcohol, Tobacco and Firearms; American Re-Insurance Company; and the U.S. Fire Administration will launch a national initiative to improve fire investigation skills and reduce fire losses this summer. At the forefront of the effort is an interactive CD-ROM, interFIRE VR, that uses virtual reality technology to train fire investigators.

The partnership developed interFIRE VR to reduce fire losses and increase successful arson prosecutions by raising the baseline knowledge and investigative skills of members of the fire service, law enforcement, and the insurance industry. It combines the best practices of the major groups involved in fire investigation and prevention, and delivers a consistent and systematic set of guidelines. These best practices include NFPA 921, *Guide for Fire and Explosion Investigations*, and NFPA 1033, *Professional Qualifications for Fire Investigator*.

Both NFPA 921 and NFPA 1033 are state-of-the-art documents developed through a consensus process, involving public and private partnerships, and NFPA 921 is an internationally recognized document on fire investigations.

Using photorealistic virtual reality technology, the topics covered in interFIRE VR include the fundamentals of fire scene examination, the correct procedures for identifying, documenting, and collecting evidence, and those for interviewing witnesses.

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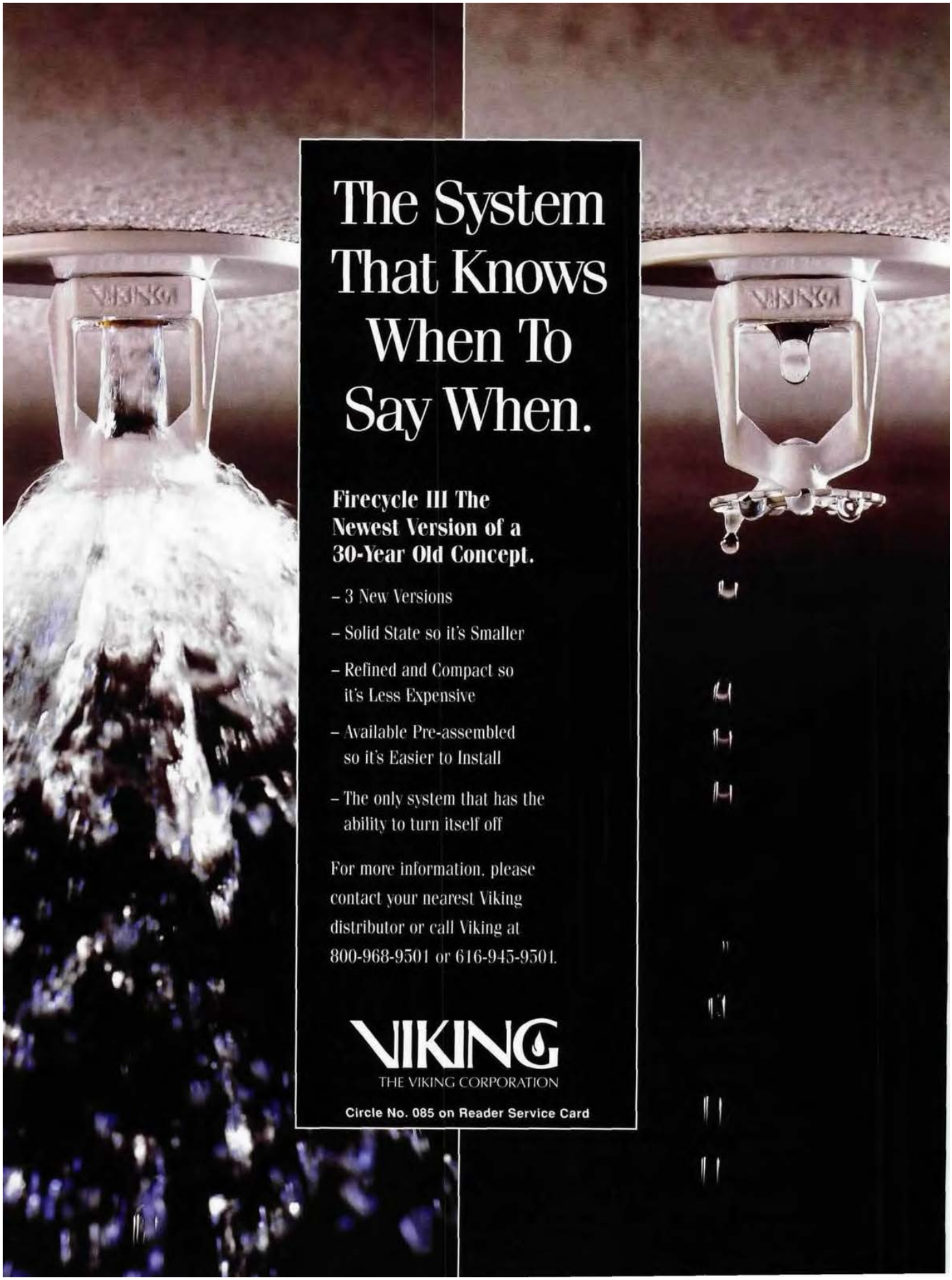
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training tool contains three sections. The "scenario" puts the user in the shoes of a fire investigator by presenting a single, 360-degree, navigable fire scene. With a mouse, the user can tour the entire scene, facing decisions critical to the success of the investigation. The computer keeps track of choices the user makes and compares them to those recommended by a panel of experts.

The "tutorial" section takes the student through a step-by-step process that can be applied to any fire investigation. It combines the best of investigative theory with a variety of real-world practices that have proven highly successful through years of actual fire investigations.

The "resource file" is a repository of additional information on a wide variety of fire-related topics.

The CD-ROM "allows users to progress at their own pace, so they can study the entire process or choose specific areas where they feel they need to hone their skills," says NFPA Fire Investigator Robert F. Duval.

During the summer of 1999, interFIRE VR will be available to U.S. fire and police departments, prosecutors, insurance organizations, and others with an interest in fire investigation. To find out more about interFIRE VR or to order the CD-ROM, visit www.interfire.org or call (877) interfire.

■ CO alarm recall

In March, the Consumer Product Safety Commission (CPSC) recalled one million KIDDE and Nighthawk (a KIDDE brand) carbon monoxide (CO) alarms.

Apparently, 650,000 Nighthawk units and 300,000 KIDDE Lifesaver units were contaminated by a chemical that came from the packaging. The Nighthawk units alarm too late, and the Lifesaver units don't alarm at all. Since the discovery of this problem, KIDDE has remedied the situation by installing a carbon filter in newly manufactured units.

The Nighthawk units affected were manufactured between November 8, 1998 and March 9, 1999. The Lifesaver units, model numbers 9CO-1 and 9CO-1C, were manufactured between June 1, 1997 and January 1, 1999. Manufacture dates are located on the back of the packaging.

KIDDE is asking consumers to call its toll-free number for recall instructions or to determine if their units are affected. KIDDE will send consumers a pre-paid envelope so they can return the alarm for repair. The turnaround time is approximately 30 days. KIDDE's toll-free number is (800) 880-6788, and its web URL is www.nhawk.com.

■ Fire protection for newlyweds

More and more couples are supplementing the traditional wedding registry of silver and china with more practical things, such as tools and garden equipment. The Home Depot, a home improvement retailer, has compiled a list of the top 10 wedding registry ideas. Number two on the list is a fire extinguisher. If you've got to give a gift, why not give the gift of fire safety?

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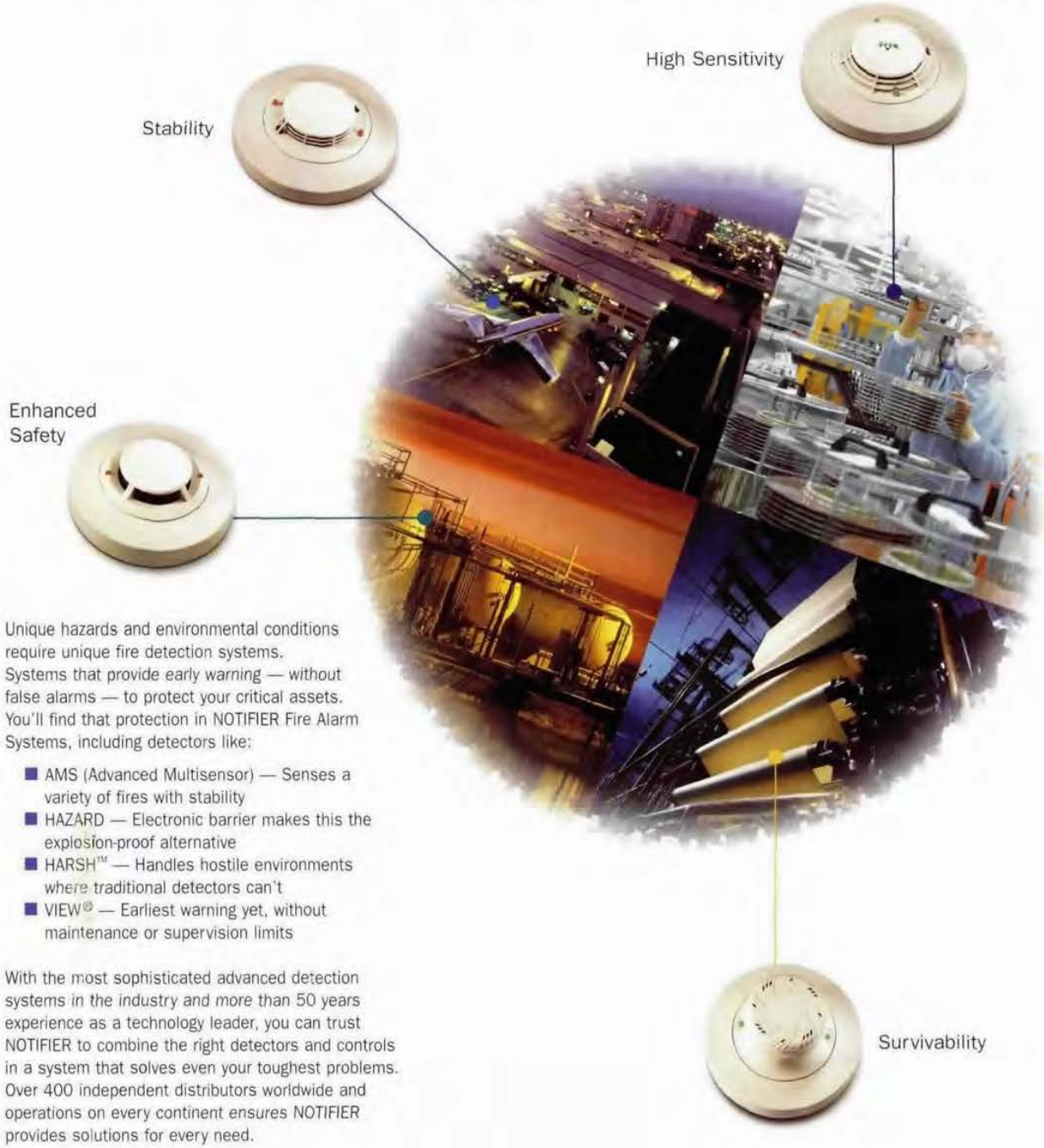
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From Our Files

Kenneth J. Tremblay

EDUCATIONAL

Fire Ignites in Chemistry Lab

WASHINGTON

A sprinkler extinguished a fire that started in the chemistry lab of a junior high school. Heavy smoke prevented custodians from entering the area with extinguishers.

The two-story school was constructed of concrete slabs on metal framing and masonry walls and had a built-up wood roof. It was protected by a wet-pipe sprinkler system and a smoke and heat detection system, both monitored by a central station.

School had recessed for the day, leaving the custodial staff alone in the building, when the fire department received a water flow alarm at 5:08 p.m. Arriving firefighters found that a sprinkler had extinguished a fire in the second-floor chemistry classroom. The fire had consumed a trash can, its contents, and a section of carpet and had spread to books and other materials on a nearby table.

Investigators determined that the blaze was the result of a science experiment conducted earlier that day involving sodium metal in a petri dish. The material had been disposed of in the trash can, where it gradually produced an exothermic reaction that ignited other rubbish. The sprinkler activated before the smoke and heat detectors could.

Damage to the building, valued at $1 million, and its contents, valued at $200,000, was estimated at $20,000 and $5,000, respectively. No one was injured.



Photo: ©Mike Jones Newspapers

Firefighters pull a hose into position as they prepare to battle the blaze that destroyed this multimillion dollar lumber warehouse.

MERCANTILE, BUSINESS

Fire Destroys Lumber Warehouse

NEW JERSEY

Employees unsuccessfully tried to contain a rapidly growing fire that destroyed a large combination lumber warehouse and retail hardware showroom.

The single-story, 31,800-square-foot (2,950-square-meter) structure was constructed of unprotected wood framing and heavy timber. The warehouse, which measured 100 by 240 feet (30 by 73 meters), was connected on its short side to a showroom and sales office that measured 60 by 130 feet (18 by 40 meters). A hard-wired smoke detection system protected the showroom and office, but the warehouse had no such system. Nor did it have sprinklers.

The building was open for business when an employee noticed a slight haze at the warehouse ceiling. Thinking that it was exhaust from an operating fork lift, the man dismissed it and entered a room where windows were stored at the opposite end of the warehouse from the showroom. Here, he saw flames traveling up the wall. He immediately returned to the office, and someone called the fire department at 10:56 a.m.

Several employees then went to the window room with portable fire extinguishers, but the flames had spread to the ceiling and smoke was filling the warehouse. Realizing that the fire had spread beyond their control, they began to remove stock from the warehouse using handcarts.

The first firefighter arrived in his own vehicle shortly after receiving a page. He ordered all the employees to evacuate when he saw that the fire had spread to a shed adjacent to the window room and to 30-pound (14-kilogram) propane cylinders used to power the fork lifts, which were exploding.

Several fire departments coordinated master streams, portable monitors, and hose lines to control the blaze, which spread throughout the warehouse and showroom. A water supply was established from a hydrant on the street side and from three drafting lines stretched to a nearby lake. Mutual-aid firefighters also controlled several brush fires and a dumpster fire that were ignited by flying embers.

The building, valued at $1 million, and its contents, valued at $3 million, were a total loss. No one was injured in the blaze. The cause of the fire was undetermined.

ASSEMBLY

Lightning Damages Historic Church

IOWA

A fire destroyed a historic church when lightning struck its steeple and ignited wood shingles and structural framing. Winds of more than 40 miles (65 kilometers) per hour helped fan the flames.

The single-story, wood-frame structure measured 40 by 30 feet (12 by 9 meters) and had no sprinklers or automatic detection systems. Located in a restored historic district along with a school and a barn, the church was a popular tourist attraction.

Storms had been passing through the area for about an hour, dumping more than an inch of rain, when a farmer noticed a light coming from the historic district. He drove toward the light until he saw flames coming from the church steeple. He then drove to a neighbor's house and called the county sheriff's office at 7:07 a.m. The sheriff's office notified the fire department, and

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firefighters arrived within five minutes to find that the fire had already engulfed the steeple and spread to the roof and attic. The ceiling was collapsing, and the wind was blowing sparks around, threatening exposures.

The first-arriving engine company attacked the fire and summoned additional units for water because there weren't any hydrants in the area. A second pumper arrived and began to wet down the wood-shake shingles of a nearby barn and provide a water curtain to keep sparks from igniting exposures.

Additional units set up dump tanks and began to shuttle water to the site.

Firefighters maintained a defensive attack as flames engulfed the church. Despite the high winds that intensified the fire, firefighters were able to protect the exposures.

The church, valued at $45,000, and its contents, valued at $20,000, were destroyed. More important, however, the local fire chief said, "we have lost...a piece of our history."

Drapes Ignite in Theater

NEVADA

When a fire broke out in the showroom/theater of a large hotel and casino, a sprinkler extinguished the blaze while employees safely evacuated the theater. Following the fire, an official noted that the safety evacuation plan worked exceptionally well.

The theater was part of a 17-story hotel and casino that was equipped with an automatic sprinkler system and a smoke exhaust system.

Staff watching a theatrical performance noticed flames spreading up drapes located approximately 12 feet (4 meters) off the ground near the stage. Two of the employees tried to pull the burning drapes to the floor, as others activated the safety evacuation plan. Security immediately notified the fire department at 8:30 p.m, and two engines, a ladder company, and a chief officer responded. While still en route 30 seconds later, the commanding officer upgraded the response to a full assignment to include two more engines, another ladder company, and a rescue squad.

Firefighters arrived within five minutes to find that the theater had been evacuated and the blaze extinguished by a sprinkler. Using the smoke exhaust system, they limited smoke damage to the theater and evaluated five employees for minor smoke inhalation.

Investigators determined that the fire began near a television monitor plugged into a wall-mounted electrical receptacle outlet. Neither the monitor, the cord, nor the plug showed signs of damage resulting from an electrical component fault or failure, however. Noting a similar monitor on the opposite wall of the stage, they found decorative drapes hanging over the monitor cord and electrical outlet. Like the fabric that had ignited, these drapes had a gold metal base, which later proved to conduct electricity. The investigators determined that the monitor's cord cap hadn't been completely inserted into the receptacle, exposing the blades, which energized the hanging fabric.

The hotel told the fire department that the drapes had been treated with a flame retardant. As a precaution, however, they were removed before the theater re-opened.

Damage to the theater, valued at $500,000, was estimated at $10,000.



Photo: ©Mark Vinci/Democrat-Herald

Firefighters pump water from a reservoir into pumper trucks to the scene of a fire that destroyed a seed cleaning warehouse.

STORAGE

Fire Destroys Seed Warehouse

OREGON

An early-morning blaze destroyed a 50-year-old seed cleaning warehouse where rye grass seed was processed for sale.

The two-story building, which measured 400 by 100 feet (120 by 30 meters), was constructed of unprotected heavy timber, wood framing, and concrete and brick walls. It had no automatic fire detection or suppression systems.

The warehouse was closed for the night when a passerby noticed flames coming from the second floor and called 911 at 1:14 a.m. Arriving firefighters found that the fire had spread from the machine loft to the entire building.

Investigators determined that a lack of maintenance and poor housekeeping had allowed dust and chaff to accumulate on the machinery. A hot bearing ignited the dust, which smoldered for hours before reaching open-flame stage. The fire then spread to flooring and other structural components.

The building, valued at $200,000, and its contents, valued at $1.3 million, were destroyed. There were no injuries.

BASIC INDUSTRY, UTILITY

Sprinklers Control Fire at Power Plant

PENNSYLVANIA

Sprinklers controlled a fire that broke out in a two-unit, coal-fired power plant when leaking hydraulic oil ignited. The sprinkler system and plant employees were so effective at extinguishing the blaze that the fire department wasn't called. An employee who brought this incident to NFPA's attention and documented it later said that the "wet-pipe sprinkler system prevented major damage and lengthy production loss."

The 10-story structure measured 588 by 132 feet (179 by 40 meters) and was of unprotected, noncombustible construction. A full-coverage, wet-pipe sprinkler system protected the building, and the plant had an emergency team that was trained to the incipient level to respond to internal fire alarms.

The plant and both of the 860-MV steam turbines were in full operation at 3:30 a.m. when operators noticed a large amount of smoke coming from an enclosed turbine deck. A supervisor investigated and discovered smoke and flames around a hydraulic coupling. He activated an alarm, which alerted the plant

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emergency team, and ordered a cut back in electrical production. Within three or four minutes, water from nine operating sprinklers brought the fire under control, and plant personnel used portable extinguishers to put out the remaining flames. The sprinklers were left on for about five minutes after extinguishment, and a fire watch was kept until repairs were made.

The fire started when a pipe failed at an oil reservoir sight glass, allowing the hydraulic oil to leak onto a hot steam pipe under one of the two operating turbines. The heat from the pipe ignited the oil.

One turbine was reduced in load for about 90 minutes while the damage to pipe insulation and metal lagging were repaired. Damage to the plant, valued at $150 million, was estimated at less than $5,000. There were no injuries.

Special thanks to Rick Schartel for his initiative and assistance in bringing us this report.

SPECIAL

Trailer Fire Kills Puppies

CONNECTICUT

A trailer transporting 68 puppies to pet stores in the Northeast caught fire, killing 57 of the animals.

The 7- by 20-foot (2-by-6-meter) trailer was constructed of steel and wood framing sheathed in steel and lined with plywood.



A police officer examines a trailer that was damaged in a blaze that began when burning plastic ignited leaking propane.



Of the 68 puppies being transported in the trailer, only 11 survived the blaze.

It had a roof-mounted air conditioner and a heater, neither of which was working at the time of the fire. The dogs' cages were built of dimensional lumber and had wire doors. An operating portable propane heater fueled by a 20-pound (9-kilogram) propane cylinder had been placed in a plastic crate that was secured to the floor of the trailer, which was beind pulled by a pickup truck.

The trailer was traveling on an interstate when a passerby saw a flash and a puff of smoke come from its roof. The passerby beeped his horn and flashed his lights to get the driver to pull over. When they opened the trailer, they found flames at the ceiling level. Using a fire extinguisher to put out the fire, the two men removed the heater and two propane cylinders.

The drivers managed to rescue 24 of the puppies from the trailer, and arriving firefighters used oxygen to revive some of the surviving dogs. The rescued animals were brought to a local veterinary hospital, but only 11 survived. The other 57 died of smoke inhalation.

Investigators determined that a plastic tray had fallen off a shelf onto the propane heater, causing a break of an undetermined type and releasing propane into the trailer. The tray was ignited by the heater, and eventually, the burning plastic tray ignited the propane.

The dollar amount of the loss wasn't reported.

RESIDENTIAL

Cooking Fire Kills 6-Year-Old Child

ALABAMA

A 6-year-old boy died and a single-family home was damaged in a fire that started when food was left cooking unattended.

The two-story, 2,100-square-foot (200-square-meter) home was of unprotected, wood-frame construction. It had no sprinklers, but there were operating smoke detectors on both levels.

The boy's father was cooking fish in the kitchen while his children slept upstairs, but he left the electric stove unattended while he went outside to talk to a neighbor. Once outside, he forgot about the cooking food. Eventually, the sound of an operating smoke alarm roused one of the children, who went downstairs and opened the front door. When he saw the fire, the child's father ran inside the smoke-filled house to rescue his remaining children. However, he could find only one child before he escaped to a second-floor roof.

Firefighters responding to a 5:00 p.m. call to 911 performed search-and-rescue operations, then used master streams to extinguish the blaze, which had spread up an exterior wall to the second floor and roof. They found the body of the 6-year-old in a downstairs bedroom, where he'd succumbed to smoke inhalation. Apparently, he had tried to escape but, instead, entered the bedroom.

Damage to the structure, valued at $140,000, and its contents, valued at $70,000, was estimated at $100,000 and $35,000, respectively.

Child Playing with Lighter Ignites Blaze That Kills Her Twin

ILLINOIS

A 3-year-old girl playing with a butane grill lighter ignited a fire that killed her twin sister and damaged their single-family home. Her 11-year-old sister, who was babysitting, called a relative next door before dialing 911.

The single-story home was of unprotected, ordinary construction and measured 30 by 25 feet (9 by 7.6 meters). Battery-operated smoke detectors were located in the kitchen and the hallway outside the bedrooms. There were no sprinklers.

The twins were in their bedroom watching television when one fell asleep on the top bunk of a bunk bed. The other girl was playing with the lighter and ignited clothing on her bed. As the fire grew, she left the bedroom, closing the door behind her. Her older sister, who was watching television in the living room, told her to go back to bed, but the little girl told her that she couldn't. A few minutes passed before the older sister led her back to the bedroom and discovered the fire. The 11-year-old girl immediately called her aunt, who lived next door, and the woman rushed over to rescue the trapped child.

The girl then called 911 at 10:49 p.m., and firefighters arrived three minutes later to find heavy smoke issuing from the house, with all four victims outside suffering from smoke inhalation. Firefighters advanced a 1 3/4-inch hose line through the

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front door to extinguish the blaze, then ventilated the house. The three girls and their aunt were brought to the hospital, but the twin who'd been asleep died of smoke inhalation.

Damage to the home, valued at $135,000, and to its contents, valued at $40,000, was estimated at $15,000 and $20,000, respectively. Fire officials reported that the smoke detectors did operate but that there was a 5- to 10-minute delay in detection because the bedroom door was closed.

Elderly Woman Dies When Clothing Ignites on Stove Burner

NEW YORK

An 88-year-old woman who used a walker died when an operating electric stove burner ignited her clothing. The woman, who received assistance from a home health aide, was alone at the time of the fire.

The single-family, one-and-a-half-story home was constructed of unprotected wood framing and measured 31 by 25 feet (9.5 by 7.6 meters). It wasn't sprinklered, and firefighters found two smoke detectors in their original boxes in a closet.

When the woman's home health aide arrived at 11:15 a.m. and opened the front door, she encountered smoke. She tried to call 911 from the living room, but couldn't tolerate the smoke, so she hung up and went to a neighbor's house to report the blaze. A police unit had already been dispatched following the hang-up call.

Arriving firefighters found the remains of a fire on and around the victim's body, which was sitting in a chair in a first-floor kitchen. They used a water pump can to extinguish a small area of carpet that was smoldering and then ventilated the building.

Investigators found that one of the stove's burners was still operating, as was the oven, which was open. Based on evidence found on the table and around the victim, the investigators determined that sometime after 6:00 a.m. she was heating dog food on the stove when the operating burner ignited her housecoat.

Damage to the home and its contents, valued at $80,000, was estimated at $3,000 in building loss and $8,000 in contents loss. At the time of the fire, arrangements were being made to place the woman, who often had to call the fire department for help when she fell, in an adult-care facility.

Smoking Fire Kills Elderly Woman

WASHINGTON

A 72-year-old woman who fell asleep while smoking died when the cigarette ignited a couch fire in her apartment.

The seven-story apartment building, which was of fire-resistive construction, contained 125 units occupied by 140 residents, most of whom were elderly. A supervised smoke detection system and a sprinkler system of unreported coverage were connected to a fire department fire alarm system. However, the sprinkler system wasn't a factor in the fire.

The occupants and an in-house manager were alerted to the fire when the fire detection system activated at 5:36 a.m. The manager ran from his apartment to the first floor to check the alarm panel, which indicated an alarm on the sixth floor. When he went to investigate, he found smoke on the sixth floor and relayed the information to the firefighters who had responded to the automatic alarm.

The fire was confined to the living room of a sixth-floor apartment whose occupant was found dead on a couch near the area of origin. Investigators determined that the woman, who was intoxicated, had been smoking and had fallen asleep, dropping a cigarette between the cushions. The fire smoldered for some time before reaching ignition and triggering the hallway smoke detectors.

Damage to the building and its contents, valued at $7 million, was estimated at $25,000 in building losses and $25,000 in contents loss.

Faulty Home Repairs Cause Explosion and Fire that Kill Elderly Couple

GEORGIA

A 73-year-old man and his 67-year-old wife died when he used gasoline-soaked charcoal and newspaper to ignite a fire in a gas-fueled water heater. The man was in the initial stages of Alzheimer's, and his wife suffered from advanced Parkinson's Disease.

The two-story, single-family home of unprotected, wood-framed construction with a brick veneer measured 70 by 40 feet (21 by 12 meters). It had no smoke detectors or sprinklers.

The husband had gone into the home's crawl space to ignite a fire in the gas-fueled water heater by filling it with gasoline-soaked charcoal and newspaper, then striking a match. The ensuing flames ignited not only the newspaper and charcoal, but a small amount of natural gas that was leaking from the gas line. The flash fire that resulted trapped the man in the crawl space, and the flames quickly spread to the upper floor through openings in construction. Portions of the bathroon and kitchen ceilings had been removed near the entrance of the crawl space, and replaced by a thin plastic material, which allowed the fire to rapidly spread to concealed areas.

Neighbors heard the explosion and called the fire department at 4:58 p.m. One of the neighbors then ran to help the injured woman, who had managed to escape to the front porch.

Firefighters arrived within four minutes to find heavy fire coming from all the first-floor windows. They advanced a 1 3/4-inch hose line, but they weren't able to enter the home to search for the husband. A ladder company was also forced to abandon second-floor search-and-rescue efforts as the fire flashed and engulfed the second story. Additional companies established a water supply and advanced two more hose lines, finally knocking down the fire.

Firefighters had completely extinguished the fire before they found the body of the husband in the crawl space during a secondary search.

Damage to the building, valued at $120,000, and its contents, valued at $80,000, was estimated at $176,000. The wife died six days after the fire from her injuries. Before she died, she told her relatives that she heard the explosion and tried to fight the blaze before escaping.

Firefighters believe the man may have been trying to heat the home's hot water supply. According to his neighbors, he had conducted unsafe and unusual home repairs in the past.

Kenneth J. Tremblay is a fire data assistant in NFPA's Fire Analysis and Research Division and a lieutenant with the Lexington, Massachusetts, Fire Department.

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Keeping an Eye on Sprinklers

With its recall of the Omega sprinkler, the CPSC has effectively established a standard of performance to which no other fire safety device has ever been held and has given notice that it will continue to demand the full reliability that's been established by sprinklers over the past century.

Russell P. Fleming, P.E.

August 1, 1999, is the deadline for building owners to participate in the class action settlement of the Omega sprinkler recall. The recall, as negotiated by Central Sprinkler Corporation and the U.S. Consumer Product Safety Commission (CPSC) in October 1998, affects an estimated 9 million sprinklers produced between 1982 and 1998, or somewhere between 1 and 2 percent of the estimated 600 million sprinklers currently in service in North America.

To some, the Omega incident is a black eye for the fire sprinkler industry, an indication that fire sprinklers aren't the magic bullet against unfriendly fire after all. But the CPSC's action can also be viewed as the ultimate affirmation of the important role automatic sprinklers now play in fire protection, and the federal government's commitment to preserving that role. The CPSC has effectively established a standard of performance to which no other fire safety device has ever been held and has given notice that it will continue to demand the full reliability—greater than 99 percent—that's been established by sprinklers over the past century. Less than complete reliability is simply not acceptable.

The CPSC's action on the Omega sprinkler has already had ramifications in related product areas. Underwriters Laboratories (UL) is now calling for sample testing of dry pendent sprinklers, suspecting that harsh environmental conditions may limit their useful life to less than the 50 years of service that currently constitute the first scheduled sampling date required by NFPA 25, *Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.* And the U.S. Department of Energy is starting to track the performance of other sprinkler models that may have exhibited problems.

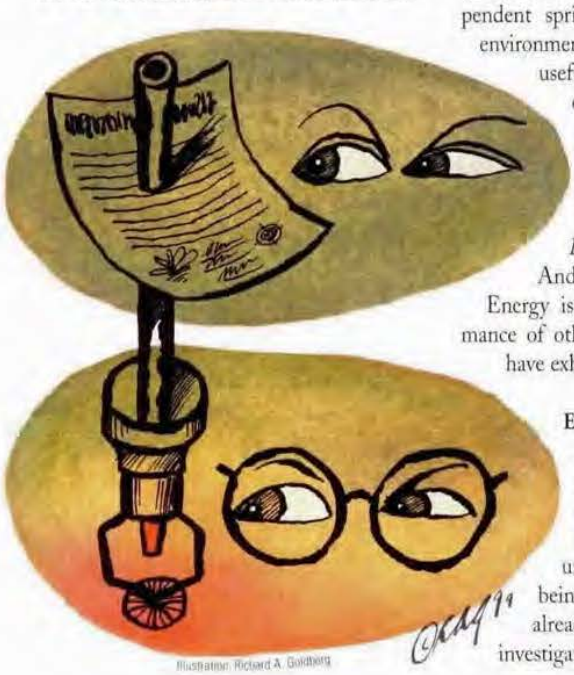


Illustration: Richard A. Goldberg

Even sprinkler product standards are under the microscope

Not only are sprinklers being scrutinized, but the standards under which they're listed are being examined, as well. UL has already changed its standards to investigate potential problems with contaminants to water supplies. Factory Mutual Research Corporation is concerned that the fire test method currently used to evaluate residential sprinklers is inadequate to provide repeatable confirmation of appropriate performance in line with the original residential sprinkler goals. As industry leaders heed the lesson of the Omega recall and product standards-writers try to ensure that all foreseeable applications and events are considered, virtually every sprinkler product standard is now under the microscope.

The Omega sprinkler, which was a breakthrough product in its melding of an aesthetically pleasing design with enhanced performance characteristics, now serves as a reason for the writers of sprinkler product standards to work even harder to ensure that every fire sprinkler can perform its expected task when needed. However, we should recognize that the field performance of automatic sprinkler systems has been phenomenal. The reported success record of residential sprinkler systems, for example, has exceeded the original expectations of the NFPA Committee on Automatic Sprinklers. Continued success is the goal.

In the meantime, it's important that all building owners participate in the Omega recall. Complete information, including the forms needed to apply for replacement sprinklers, is available on the Internet at www.omegarecall.com or by calling (800) 896-5685.

Russ Fleming is vice president of Engineering for the National Fire Sprinkler Association and a member of the NFPA Technical Correlating Committee on Automatic Sprinklers.

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Breezing Through the Codes

Gregory E. Harrington

NFPA 90A requires all smoke and fire dampers to be tested at least once every four years.

Q. *What's the difference between NFPA 90A,* Installation of Air Conditioning and Ventilating Systems, *and NFPA 90B,* Installation of Warm Air Heating and Air Conditioning Systems?

A. Both documents prescribe fire protection requirements for systems that move air in buildings. However, NFPA 90A applies to large, commercial air-handling systems that move environmental air and serve spaces greater than 25,000 cubic feet (708 cubic meters) in volume, as well as buildings of Type III, IV, and V construction, as defined in NFPA 220, *Types of Building Construction,* that are more than three stories high, regardless of volume. NFPA 90A also applies to any other applications not covered by other NFPA codes and standards. NFPA 90B applies to systems serving one- and two-family dwellings and other spaces that don't exceed 25,000 cubic feet in volume. Neither document is a general system design guideline. Such design guidelines are published by other organizations, such as the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE).

Q. *When does NFPA 90A require the installation of duct smoke detectors?*

A. Duct smoke detectors are required in supply air systems that handle more than 2,000 cubic feet per minute (cfm) (57 cubic meters per minute [cmm]) to shut the system down when smoke is detected to prevent it from circulating throughout the building. These detectors must be installed downstream of the air filters and before any branch connections. They're primarily intended to detect smoke from a fire originating in the air-handling unit itself or in the filters.

Smoke detectors must also be installed on the return sides of return air systems that handle more than 15,000 cfm (425 cmm) and serve more than one story. Detectors must be installed on each floor before the connection to a common return and before any recirculation or fresh air inlet connection. They're primarily intended to detect smoke from a fire originating in the space the system is serving, usually the building's occupied rooms. Open area detectors arranged to shut down the system are permitted in lieu of return duct detectors. Detectors aren't required in systems designed only to remove air from the building.

Q. *Must duct smoke detectors be connected to a fire alarm system?*

A. Smoke detectors required by NFPA 90A must be connected to a building's fire alarm to activate a supervisory signal at a constantly attended location, either on- or off-site. As long as somebody is aware that the detector has activated, there's no need to sound the building evacuation alarm since these detectors' primary purpose is to shut down the air-handling unit. Where the alarm system isn't monitored at a constantly attended location, the detectors must be arranged to activate the building evacuation alarm.

In buildings with no fire alarm system, the detectors must be arranged to cause an audible and visible signal at a normally occupied area when it's activated or when a trouble condition exists. The location of the normally occupied area should be approved by the authority having jurisdiction (AHJ). Again, this provision is intended to notify somebody of the alarm or trouble condition, not necessarily to evacuate the building.

continued on page 172



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Calculating Occupant Load in Assembly Uses

A structure's means of egress must be adequate for the uses to which it will be put.

William E. Koffel, P.E.

In many types of occupancies, the minimum number of exits that meet the minimum width requirements and are within the allowable travel distances is enough to meet the anticipated occupant load. Using code-mandated occupant load factors as a minimum, for example, a 28,000-square-foot (2,601-square-meter) office area would have a calculated occupant load of 280 people. Such a space would require a minimum of two exits with a minimum door width of 32 inches (81 centimeters), an exit size that can typically handle 160 people per door. The minimum stair width would be 44 inches (112 centimeters), which can typically handle 147 people per stairwell.

If that same 28,000-square-foot area were used as an assembly occupancy, however, it could hold as many as 4,000 occupants, and its means of egress would look very different. Calculating the occupant load for some assembly uses may be tedious, but it's critical that a structure's means of egress be adequate for all the anticipated uses to which it will be put.[1]



Illustration: Mikaël King

Changing use and configurations

The potential for changing configurations that accommodate a variety of uses can make for a time-consuming occupant load calculation, particularly when an assembly use is incidental to some other use. A typical cafeteria is normally calculated at 15 square feet (1.4 square meters), net, per person. If that space were also to be used for meetings at which attendees are seated in rows, however, the occupant load factor would typically drop to 7 square feet (0.7 square meters), net, per person. To put it another way, a 500-square-foot (46.5-square-meter) office space would have a minimum occupant load of five people. If that same 500-square-foot space were a conference room in an office, its occupant load would range from 34 to 72 people, depending on its use. In addition to capacity, such a change in occupancy use would have a significant impact on the code requirements for door hardware and door swing.

In a hotel ballroom or convention center, calculations are further complicated by the presence of movable partitions that can configure the space in a variety of ways for which the minimum number of exits, the arrangement of means of egress, the travel distance, the capacity, and the various door requirements must all be met. Since the space may be used in a variety of ways, the appropriate occupant load factors for each anticipated use must also be considered.

Of course, there are structures in which the original design doesn't adequately address all potential configurations. While typically not permitted by most codes, a number of hotel and convention center meeting rooms post a maximum load of 49 persons, even though the room can, and probably will, hold more. This is usually done either because the space is served by a single means of egress or because the door swings into the space. Most codes require two means of egress and doors that swing in the direction of egress travel whenever the occupant load is 50 or more people.

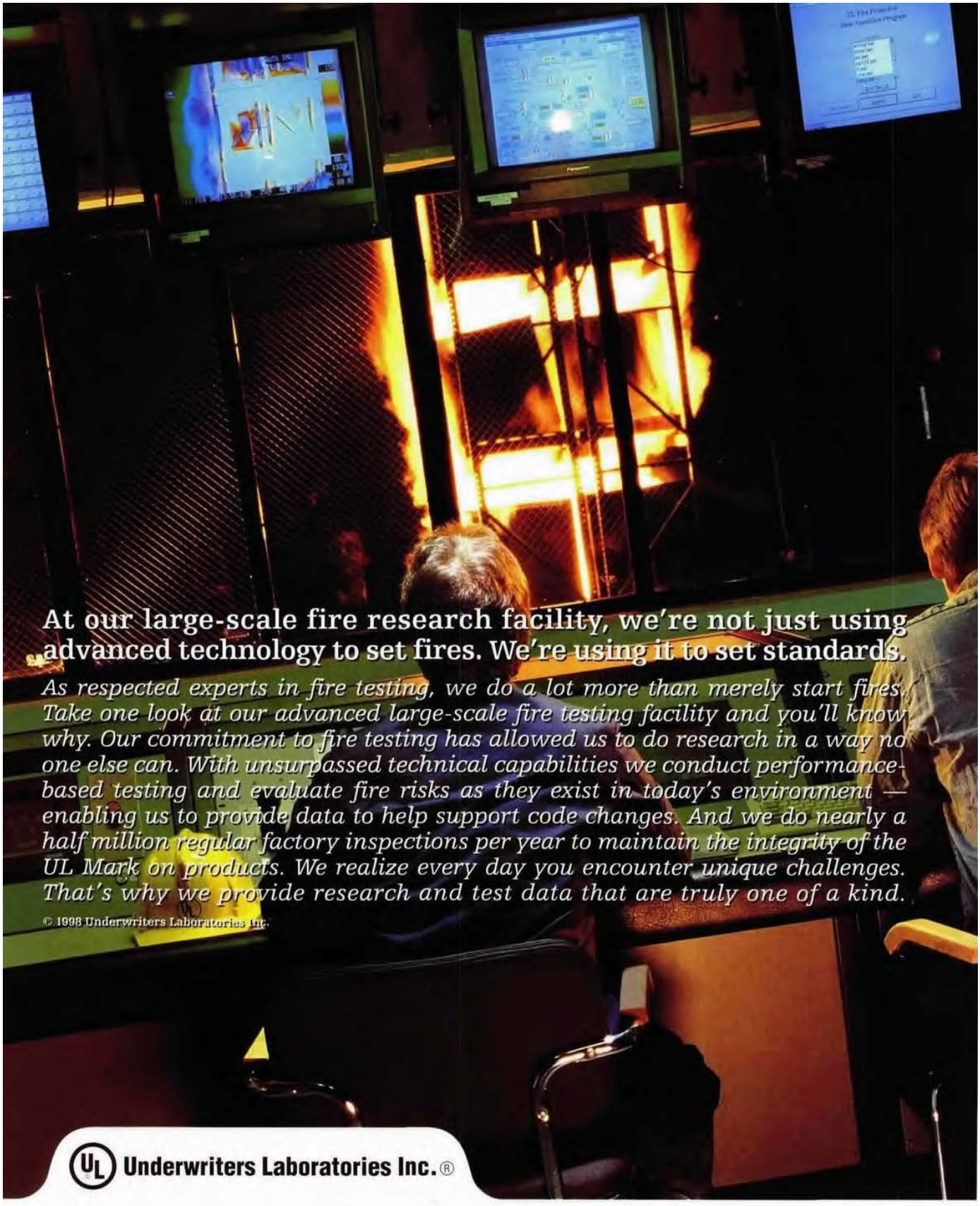
Typically, the codes don't permit designers to calculate occupant loads without considering simultaneous uses of adjacent spaces. However, design professionals and building owners may try to get around these restrictions by denying that two adjacent spaces will be used simultaneously. They may say, for example, that the prefunction area of a hotel ballroom won't be used when a meeting or banquet is going on in the adjacent space or that the registration area of a convention center won't be used while a meeting is in progress in the adjoining meeting space. Where such an argument is accepted, the means of egress may be inadequate if the spaces actually are used simultaneously.

Though it's an important aspect of any building design, occupant load calculations are more significant for assembly uses—even though they're more tedious to perform. Contrary to what's often done in posting the permitted occupant load, the maximum number of occupants who may reasonably be expected to occupy an area must be calculated during the design process because the application of other code requirements, including the means of egress, depends on an accurate occupant load.

William E. Kofffel, P.E., is president of Koffel Associates, an independent fire protection firm with offices in Maryland, Connecticut, and Tennessee.

1. These occupant load calculations are based on the 1997 edition of NFPA 101®, *Life Safety Code®*. Other codes may contain provisions that would result in slightly different occupant load or egress capacity values.

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Do as I Say, Not as I Do?

Not any more. Congress no longer exempts itself from key OSHA laws.

Anthony R. O'Neill

Since the 1970s, business and industry have complained about Congress' tendency to exempt itself and its employees from Occupational Safety and Health Administration (OSHA) and other employment laws imposed on the rest of the nation. The argument went along these lines: "How can Congress understand the impact these laws have on business if Congress itself isn't bound by them?"

Given this concern, it wasn't surprising to see a "do as I do" platform in the Contract with America when the Republicans took over the 104th Congress in 1994. In fact, the first law President Clinton signed in 1995 under the Contract with America was the Congressional Accountability Act, which made several laws applicable to the legislative branch of the federal government for the first time. Among these were the Age Discrimination in Employment Act of 1997, the Americans with Disabilities Act of 1990, the Occupational Safety and Health Act of 1970, the Civil Rights Act of 1964, the Fair Labor Standards Act of 1938, and the Family and Medical Leave Act of 1993.

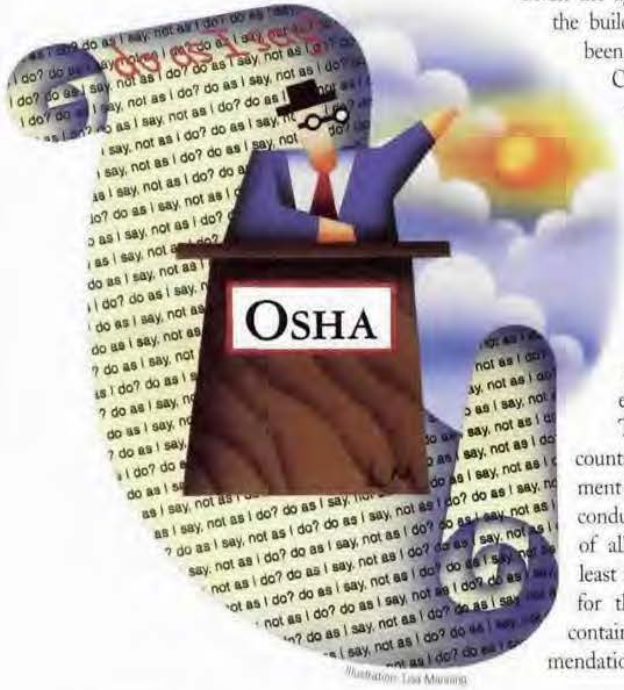


Illustration: Lisa Manning

Fire safety on Capitol Hill improves

With 17,000-plus employees working in the Capitol Hill complex, one of the biggest challenges has been meeting OSHA standards. Given the age and historical significance of the buildings on Capitol Hill, it hasn't been easy for the Architect of the Capitol (AoC) to upgrade the halls of Congress. Any NFPA member responsible for corporate or institutional fire safety can sympathize with the challenge of playing "catch-up" after years of on-again, off-again funding. But the AoC is making steady progress, and members of Congress, their staffs, and visitors are undoubtedly safer today than ever before.

The 1995 Congressional Accountability Act requires the Government Accounting Office (GAO) to conduct safety and health inspections of all legislative branch facilities at least once each Congress. The report for the 105th Congress, now out, contains a number of detailed recommendations, many of which reference NFPA codes and standards. For example, the GAO suggests that all Capitol Hill exit systems be brought into compliance with NFPA codes and recommends that NFPA codes and standards be followed to maintain the readiness of Capitol Hill's fire protection and life safety systems, including smoke detectors, alarms, and sprinkler systems.

Over on the House side of the Hill, the House Inspector General (IG) has completed his own fire safety review, identifying a number of weaknesses in the fire protection systems. The IG's report is even more explicit about the importance of complying with NFPA codes and standards to protect congressional employees and the public, in particular recommending compliance with NFPA 101®, *Life Safety Code®*; NFPA 25, *Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*; NFPA 13, *Installation of Sprinkler Systems*; and NFPA 72, *National Fire Alarm Code®*.

It's particularly significant that the IG used NFPA codes and standards to measure the risk of each House complex building as it existed at the time of the evaluation. In doing so, the IG stated, "The NFPA is the sole national organization which develops and establishes standards for the fire protection community for the protection of individuals and property from the dangers of fire."

Thank you, Mr. IG, on behalf of the 5,000 NFPA committee members who develop the 300-plus NFPA documents. We couldn't have said it better ourselves.

Anthony R. O'Neill is NFPA's vice president of Government Affairs, operating out of our Washington, D.C., office.

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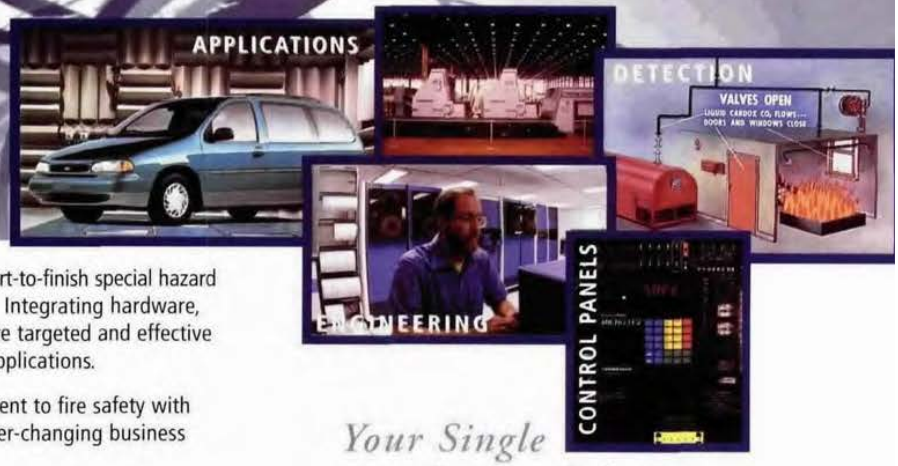
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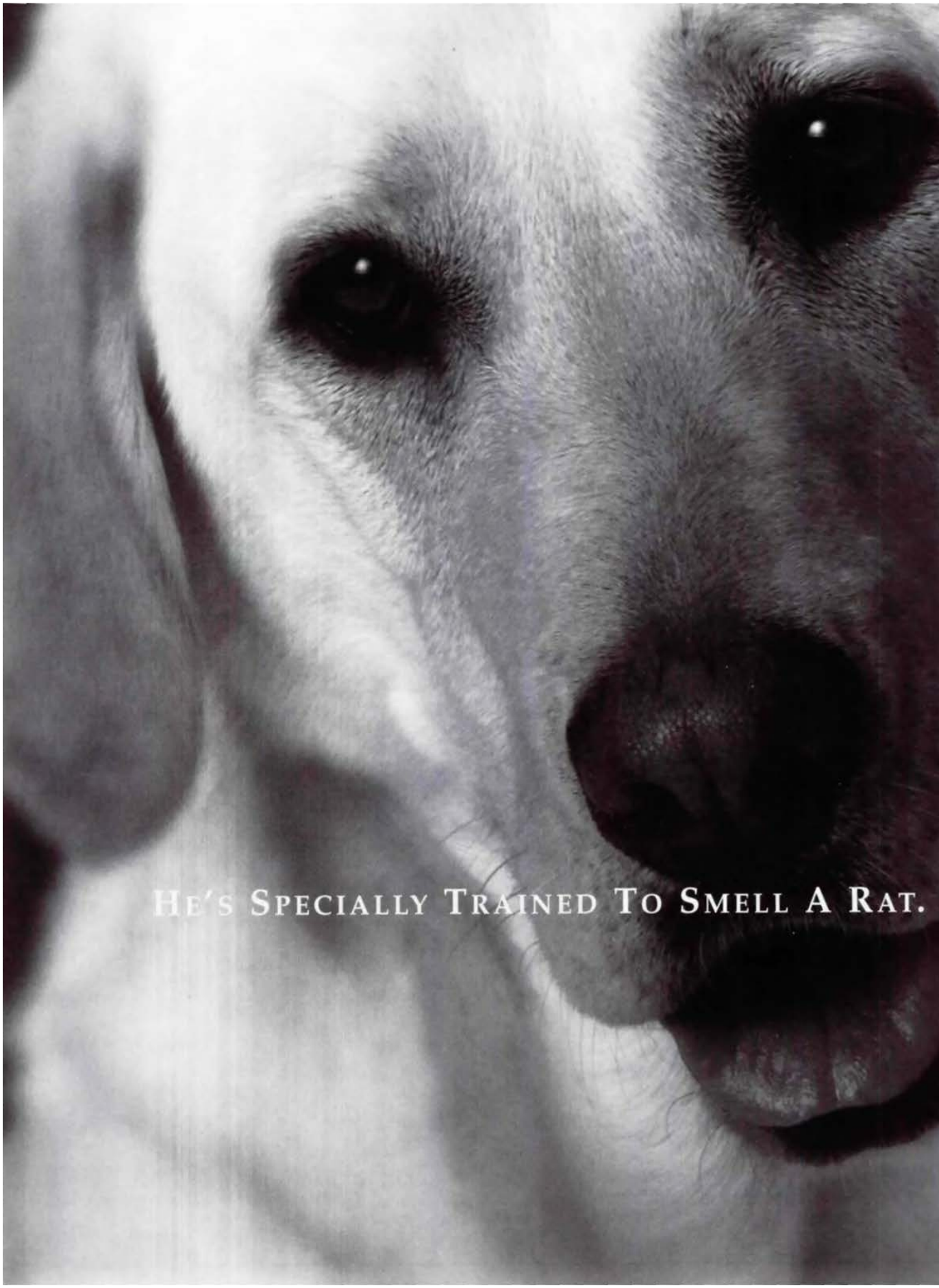
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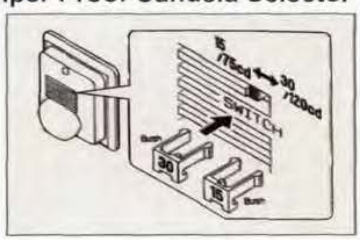
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Words to Live By

Every industry has "buzz words." Here are the alarm industry's.

Wayne D. Moore, P.E.

What buzz words do you use to describe a fire alarm system? I've picked some of the most important ones, words that allow me to discuss a variety of issues facing the fire alarm industry. While not new, these words are very important, and if they appear in your fire alarm systems discussions, you've probably moved close to the top of your profession.

The buzz words I've chosen are "commitment," "responsibility," "knowledge," "training," "cooperation," "dedication," "research," "quality," "craftsmanship," "code compliance," "communication," "ethics," "mission effectiveness," and "performance." You can't speak positively of a fire alarm system installation without them.

If you design, manufacture, install, test, monitor, or inspect fire alarm systems, commitment means you've dedicated yourself to ensuring that the installed system works as intended. But making a commitment to do things right is just a beginning.

Assuming responsibility for executing your involvement in the fire alarm system process correctly can prove just as important as your commitment to the business itself. Responsibility carries with it the commitment to do what's right in every situation. And being responsible means educating yourself and others about what constitutes a reliable fire alarm installation and instilling a spirit of cooperation in everyone involved.

If you're a manufacturer, you must ensure that all your employees can do their parts in the manufacturing process. To accomplish this, you have to provide training. You also have to support or sponsor research to ensure that the technology you develop will make buildings safer from fire.

As a manufacturer, your quality control department already ensures that your systems' components are reliable. But do those components provide what users need to ensure a fire-safe environment? Again, research can help provide the answers.



If you design fire alarm systems, you must know how they operate and are applied, as well as their effect on fire growth and life safety. You must also know how a fire will affect them. Will a system survive long enough to perform as expected?

Designers must not only understand the codes- and standards-making process to ensure compliance, but they must also understand what the system components can do. Designers must do their best to develop performance-based alternatives that equal or surpass the performance dictated by prescriptive codes and apply their craft to the design.

If you own an installation company, you must train your technicians to perform a quality installation. Not only do they need the mechanical ability to install a reliable fire alarm system, but they must be familiar with the applicable codes and standards, as well. You must instill in your technicians a commitment to doing it right the first time. And you must cooperate with the fire inspector to show that the systems complies with the appropriate codes and standards.

If you're a fire chief, you're responsible for maintaining the skills of your personnel by training fire inspectors, which will ensure that the fire alarm systems in your jurisdiction are thoroughly inspected. Thorough inspections will help ensure that those systems will operate properly when needed. Inspectors must be familiar with applicable codes and standards and with acceptable installation practices.

If you're a central station operator responsible for monitoring the status of fire alarm systems, you should also be concerned with the knowledge and skill levels of your employees. You should know whether they can recognize a fire alarm signal and respond appropriately and whether they're committed to providing reliable service. Knowing this will allow you to develop a strategy that will lead to code-compliant service.

All these buzz words really describe a commitment to perform ethically. And ethical performance will help guarantee that a fire alarm system meets the protection goals of the facility it's been installed to protect.

We sometimes forget that, although we may design and install fire alarm systems to minimum requirements, we can't shirk our responsibility to provide the quality each system needs to perform well. Maybe we should use these buzz words more often.

Wayne D. Moore, P.E., is chairman of the National Fire Alarm Code *Technical Correlating Committee and director of Operations for the New England office of Hughes Associates, Inc.*

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Fruit of Our Labor

Industry leaders gather in New Orleans to explore the key issues facing the urban fire service.

Robin F. Paulsgrove

Sir Isaac Newton, embarrassed by the notoriety of his achievements, humbly wrote, "If I have seen farther than others, it is by standing on the shoulders of giants."

The Metropolitan Fire Chiefs Section of the International Association of Fire Chiefs (IAFC) was founded in 1965 by farsighted fire service leaders—industry giants—to act as an advisory body to the IAFC on major issues that affect metropolitan fire departments. Currently, the Metro Chiefs Section has an active membership that includes most U.S. and Canadian metro departments, as well as many in the United Kingdom, Europe, Australia, New Zealand, and Asia. In 1997, the membership voted to become an NFPA section.



While the section is composed of fire service leaders who head departments with more than 400 members, chief executive officers who retire as metropolitan chiefs maintain their section memberships and actively participate in advancing its mission. One of these giants is Charlie Dickinson, the recently retired chief of the Pittsburgh Fire Department, who offered the keynote address at the 1998 Metropolitan Fire Chiefs Conference. In his speech, he tied together the important role of our retired chiefs in guiding, developing, and preparing us for the opportunity to lead the fire service.

The conference, which took place in New Orleans in April 1998, was built on the theme, "Standing on the Shoulders of Giants," and tracked what this group of chiefs views as the key issues facing the urban fire service as we move toward the new millennium.

Still critical but constantly changing is the fire service emergency medical mission. On hand were the chief operating officer of American Medical Response and the executive vice president of Rural/Metro Corporation to share their thoughts on the health and future competitiveness of the private medical services industry. Chief Robert Osby of the San Diego Fire Department and Chief Ray Barnes of the Aurora, Colorado, Fire Department provided updates on their innovative public/private partnerships with Rural/Metro, whose executives then joined fire service leaders, including New York City Fire Commissioner Thomas Von Essen, in a panel discussion.

In a separate terrorism module, Los Angeles County Chief P. Michael Freeman coordinated a discussion of developing issues. Among the speakers was Tom Kuker, the nation's newly appointed director of the new Domestic Preparedness Office.

Maintaining labor/management relations

In our dynamic industry, building and maintaining successful relationships between management and the fire service work force is critical. This year, the chiefs were pleased to host Alfred Whitehead, the general president of the International Association of Fire Fighters (IAFF), who participated in a critical session on labor/management relations. The 1999 chairman of the Metropolitan Fire Chiefs Section, Philadelphia Fire Commissioner Harold Hairston, facilitated a panel discussion that also included an update on the IAFF/IAFC Fitness Initiative.

The growing interest in international fire service issues was represented by presentations from both the United Kingdom and Canada. Discussions of diversity issues in the U.K. fire service and technology innovations in the Canadian fire service had the distinct flavor of their respective countries, but could have been issues faced by any U.S. fire department.

The conference closed by recognizing William McCrossen, retired chief of the New Orleans Fire Department, who retired in 1993 with more than 50 years of active service. He still shows up for work every day, guiding visitors through the New Orleans Fire Service Museum and regaling young and old with stories and anecdotes that evoke the heroic foundation of our industry. Those who follow in his footsteps are most assuredly "standing on the shoulders of giants."

Robin F. Paulsgrove is chief of the Arlington, Texas, Fire Department, chair of the IAFC's Metro Chiefs Section, and a member of NFPA's Board of Directors.

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Enersole System. Layers of specially engineered cushions and shock absorbers under the foot absorb impact from walking, bumps and bangs, and actually return energy to the foot. The result – far more comfort and less fatigue to the foot, leg, and lower back.

Features like Comfort Fit and Enersole recently prompted one firefighter to note, "I've been in the fire service for 12 years and never had a boot with as good a fit ... and comfortable." Black Diamond will keep you on your feet in total comfort ... so that you can focus on more important things.

For more information on Black Diamond footgear and our exclusive Comfort Fit/Enersole features, call toll-free 1-800-265-2760.

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The Great Escape *Works*

We're calling on the creativity and energy of every NFPA member.

Meri-K Appy

At the last NFPA Member Advisory Council (MAC) meeting, I was among the staff invited to listen in as the representatives talked about ways to strengthen NFPA's activities and impact. Kathleen Hadden, current chair of NFPA's Industrial Fire Protection Section, really caught my attention when she steered the conversation to "The Great Escape" Fire Prevention Week (FPW) campaign. Since 1994, the Industrial Section has sponsored a contest to recognize one of its member organizations for excellence in orchestrating a workplace-oriented FPW campaign that uses the NFPA theme and materials, communicates the message most effectively to employees and their families, and involves the local fire department and the community.

"You guys are missing the boat by not reaching out more to the business community to help support Fire Prevention Week!" Hadden exclaimed. "It's in the employer's interest to keep employees and their families safer from fire, if for no other reason than to minimize downtime. Many businesses sponsor annual FPW events, and we try to tie into NFPA's theme, but you really don't make it easy for us."



"What more could we do?," I asked. Not surprisingly, Hadden had her list ready:

1. Create materials relevant for distribution through the workplace.
2. Provide the opportunity to customize these materials with the company's name and logo.
3. Encourage every fire department to get on board. Nothing is more discouraging than calling the local station to offer support and being told, "I don't know what you're talking about," or "Sorry, we're not doing 'The Great Escape,' we've got our own thing planned," or worst of all, "We're not planning to do anything for FPW."
4. Remind the fire service that the larger the role of local business partners in planning and executing "The Great Escape," the greater their contribution is likely to be. This might take the form of free meeting space, publicity, duplication services, access to new distribution networks, volunteers to collect and assess the family escape grids, not to mention the potential for money, materials, and other direct donations to help plan and execute the campaign.

Whether it's time, talent, or resources, business and industry have much to offer the fire service as full participants in "The Great Escape."

"It makes sense for us to partner with our local fire departments in a unified campaign," Hadden explained. "As an assistant vice president for the Bank of New York, I'm responsible for fire and life safety and contingency planning coordination for 400 locations through the tri-state area, as well as other national and international locations. I want the information I distribute to our employees and customers to be professionally produced and consistent from location to location. NFPA's products are top shelf, and frankly, I want the best. After all, my reputation is on the line."

Much of this conversation occurred last June. Since then, NFPA's responded affirmatively to each of Hadden's suggestions, and to recommendations from fire departments we surveyed for feedback on "The Great Escape" to help us plan this year's campaign. FPW 1999 will debut a new line of products featuring Sparky's® new friend, Arthur, star of the number one children's TV show. One brochure will be specially designed with the workplace in mind, and all of the materials will include plenty of space on the back in which an organization can affix or stamp its logo.

This year, the Procter & Gamble Company joins KIDDE Safety and the USAA Educational Foundation as a national corporate sponsor of the FPW campaign, enabling NFPA to expand the resources we provide free of charge to nearly 40,000 fire departments in the United States and Canada. They're also underwriting the delivery of an educational Sunday newspaper supplement on October 3 that will be mailed to 50 million U.S. households, and they'll fund classroom materials for 135,000 teachers in collaboration with *Scholastic Magazine*. "The Great Escape" grand prize family vacation to Orlando, Florida, is back again, but this year, we've added a second grand prize category exclusively for firefighters who conduct a home fire drill with their families.

We heard the suggestions, and we're doing our best to encourage members from the private sector to contact their local fire departments and offer support for "The Great Escape." In fact, we're calling on the creativity and energy of every NFPA member. Each has something special to contribute. Our goal is nothing short of inspiring entire nations to move toward greater safety from fire, community by community, starting with yours.

Meri-K Appy is NFPA's vice president of Public Education.

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Lessons Learned

Corinne Broderick uses what she learned at NFPA to make national programs succeed.

Hallie Ephron Touger

Corinne Broderick learned a key lesson when she was on staff at NFPA, first in Public Affairs and later as manager of Public Education: You can't do it alone. Successful programs depend on partnerships and strategic alliances. Now senior vice president of the Massachusetts Medical Society, she applies that lesson every day.

How did you use your training in education when you came to work at NFPA?
I had a master's degree in curriculum and instruction. I'd heard about *Learn Not to Burn®* (LNTB), so I was very enthusiastic about working for an organization with a mission. I got involved right away during the field-testing of the curriculum in seven U.S. cities. Later, a few of us went around the country trying to do all the workshops ourselves. We got so burned out, we quickly realized we needed local partners.

How did you go about getting local support?
We worked through the U.S. Fire Academy to obtain grant money to begin our very first LNTB regional representatives network. I recruited the initial 10 reps for NFPA, and together, we developed an outreach and training network targeting interested locations around the country. We'd find an advocate in each area who'd be responsible for local implementation. It was a great way to extend a national association to the grass roots.

What did you learn from your work at NFPA?
For me, it was a great learning experience. I was the staff person responsible for organizing the Education Section in the early '80s, so I got to see how a section is formed, the governance procedures, the outreach needed to sustain it. I'm still a member of the section, and I'm still impressed by the group.

I also learned how important it is to understand your competition. You have to be able to strike up strategic alliances with other groups so you can carry out your goals in a meaningful way.

What role does education play in preventing fires?
Everytime I read about an LNTB save—how a child got his family out of a burning house, for instance—I'm heartened. I could just as easily read about kids running into a closet, shutting the door, and dying in the fire. The difference is education.

What makes LNTB effective?
When LNTB started, NFPA surveyed the public to find out how best to teach fire safety. We learned the same things then that are important now: Keep it short and entertaining. Show the right, not the wrong, thing to do. Teach, don't preach.

What are today's most pressing fire education issues?
High-risk areas. That's why I'm so pleased by NFPA's Center for High-Risk Outreach. Its mission is to reduce deaths and injuries from fire and burns among those at greatest risk—the very young, seniors, the undereducated, and the poor.

Employment
Massachusetts Medical Society, Senior Vice President

Organizations
NFPA
Board of Directors; Member, Presidential Advisory Committee for the Center for High-Risk Outreach; Member, Education Section

American Society of Association Executives

American Society of Medical Society Executives



Photo: ©Ed Quinn/SABA

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Having a Safe Stay

The safety of Starwood Hotels' guests is April Berkol's primary concern.

Hallie Ephron Touger

Employment
Corporate Director, Environment, Safety, Health, Fire and Life Safety, Starwood Hotels & Resorts Worldwide, Inc.

Organizations
NFPA
Principal Member, Fire Tests Committee; Past Chair, Lodging Industry Section; Vice Chair, Building Fire Safety Systems Section; Member, International Advisory Council; Member, Standards Council

Society of Fire Protection Engineers

American Society of Mechanical Engineers

Construction Specifications Institute

American Hotel & Motel Association

When you stay at a hotel, the last thing you want to think about are those sprinklers, emergency speakers, strobe alarms, and smoke detectors that are so well camouflaged in the pleasant decor. If you're staying at a Starwood Hotel (formerly ITT Sheraton, Four Points, The Luxury Collection, Westin, and Caesars World International) anywhere in the world, it's nice to know that April Leyla Berkol is thinking about them for you.

In your eight years at Sheraton and Starwood Hotels, what have you focused on in terms of fire safety?
We try to create a safe environment for guests and employees. When I joined Sheraton, now Starwood, there were established standards and guidelines, and the program to upgrade all the hotels was in place. But once a program's in place, it has to be maintained if you want it to work. My job is to make sure systems are in place for testing, inspection, and maintenance and to investigate new models and approaches to see if they'll work better in our hotels.



Photo: ©James Leynse/SABA

What kinds of new approaches have you adopted?
Since I've been at Sheraton, there have been several innovations in fire alarms and detection. And the sprinkler industry has developed newer, more effective quick response and early suppression sprinklers.

Do you ever encounter resistance to upgrading fire protection systems?
Architects and interior designers generally don't like to see anything but pictures on a wall. They vehemently object to strobe alarms, sprinkler heads, speakers—all those wonderful devices that alert people to a fire stick out like sore thumbs.

Fortunately, manufacturers have become more sensitive to the needs of those concerned with aesthetics. Now, you can get fire protection devices in different colors, and they can be recessed or concealed. Sprinklers cover larger areas, and they can be on the wall instead of hanging from the ceiling in the middle of the room. And we can retrofit sprinkler systems more economically because we can use plastic pipe, which is easier to work with than steel.

Is maintaining standards for an international organization difficult?
We have hotels in more than 70 countries. Can you imagine trying to deal with 70 different sets of codes and standards? Happily, our job is easier because NFPA standards are recognized in most countries worldwide. When we tell a local authority we'd like to install a sprinkler system to NFPA standards, they know it's acceptable.

NFPA's done an excellent job informing people about its codes and standards and seeking participation in their development. The codes and standards are tried and true, and they're being adopted by reference or by other means in different countries. The more fire safety systems are standardized, the better it is for trade worldwide.

Hallie Touger is a freelance writer in Milton, Massachusetts.

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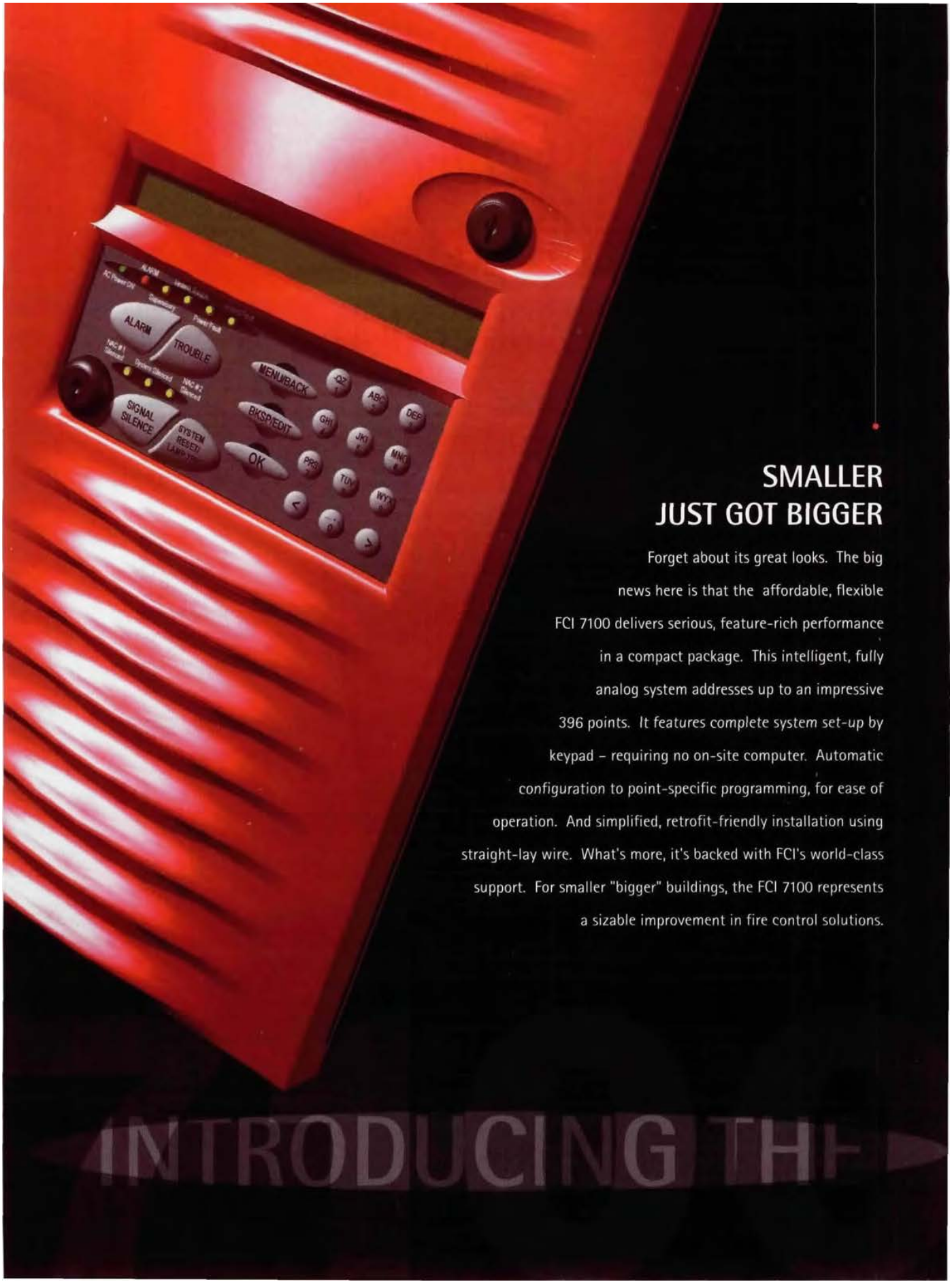
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Who's Got What

NFPA's recent survey gives us a clearer picture of aircraft rescue and firefighting resources across the United States.

Michael J. Karter, Jr.

Despite the crucial nature of aircraft rescue and firefighting (ARFF), no one really has a clear picture of the resources airports across the United States dedicate to these activities. Or they hadn't until late last year, when NFPA undertook a survey of airport fire departments throughout the country to help determine the size and operational levels of their ARFF resources.

The survey gave NFPA an opportunity to answer a number of questions about collective water tank capacities, the types of foam agent used, maximum discharge rates, auxiliary agent capacities, and response times of the first-arriving vehicle. It also allowed us to determine whether the airports met Federal Aviation Administration (FAA) or NFPA requirements for a given



Photograph: ©Keller and Peet, George Peet



Photograph ©Dallas Fort Worth International Airport, Dept. of Public Safety

ARFF equipment, such as this apparatus at the Dallas/Fort Worth International Airport, help keep the flying public safe in the unlikely event of an emergency.

Table 1
FAA and NFPA Airport Categories

Airport Category		Overall Length of Aircraft		Maximum Exterior Width	
FAA	*NFPA*	*Feet*	*Meters*	*Feet*	*Meters*
GA-1	1	30	9	6.6	2
GA-1	2	39	12	6.6	2
GA-2	3	59	18	9.8	3
A	4	78	24	13.0	4
A	5	90	28	13.0	4
B	6	126	39	16.4	5
C	7	160	49	16.4	5
D	8	200	61	23.0	7
E	9	250	76	23.0	7
	10	300	91	25.0	8

resource, such as vehicles. The final analysis of these resources was based on the 1993 edition of NFPA 403, *Aircraft Rescue and Fire Fighting Services at Airports*.

The results

Airports in the United States are categorized for rescue and firefighting purposes on the basis of the largest aircraft scheduled to land there. The FAA also factors in average daily departures. Thus, airports can run the gamut from those equipped to handle nothing larger than a Mooney M-20, which is not quite 25 feet (8 meters) long and has a fuselage 4 feet (2 meters) wide, to those that can accommodate an Antonov AN-225, which is more than 275 feet (84 meters) long and has a fuselage 20 feet (6 meters) wide. FAA regulations list 9 categories, labeled alphanumerically, from GA-1 to E, while NFPA 403 lists 10 categories, numbered from 1 to 10 (see Table 1). The NFPA

Table 2
A Comparison of FAA and NFPA Requirements by Airport Category

These requirements are based on NFPA 403 and FAA FAR Part 139.*Vehicles with 100 gallons (378.5 liters) of water with 450 pounds (204 kilograms) of potassium bicarbonate or 500 pounds (227 kilograms) of sodium bicarbonate or halon.

Airport Category		Water Capacity		Maximum Discharge Rate		Auxiliary Agent		Vehicles	
FAA	*NFPA*	*FAA Gallons/liters*	*NFPA Gallons/liters*	*FAA gpm/lpm*	*NFPA gpm/lpm*	*FAA lbs/kilograms*	*NFPA lbs/kilograms*	*FAA*	*NFPA*
A	4	100/378.5	1,200/4,542		390/1,476	*450–500/204–227	300/136	1	1
A	5	100/378.5	2,700/10,220		825/3,123	*450–500/204–227	450/204	1	2
B	6	1,500/5,678	3,450/13,059	500–1000/1,893–3,785	1,100/4,164	*450–500/204–227	450/204	1 or 2	2
C	7	3,000/11,356	4,550/17,223	600–1200/2,271–4,542	1,440/5,451	*450–500/204–227	450/204	2 or 3	3
D	8	4,000/15,141	7,300/27,633	600–1200/2,271–4,542	1,900/7,192	*450–500/204–227	900/408	3	3
E	9&10	6,000/22,712	9,000/34,068	600–1200/2,271–4,542	2,400/9,085	*450–500/204–227	900/408	3	4

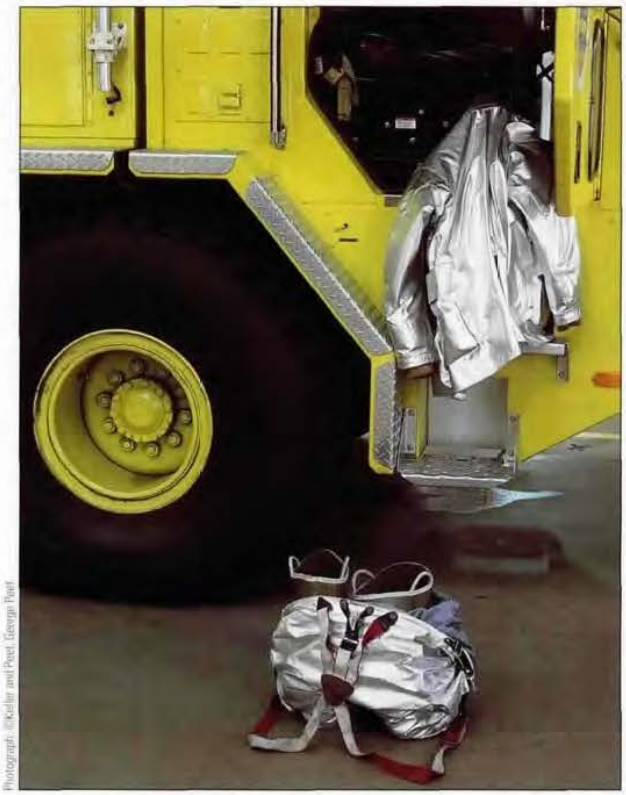
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How We Got Our Data

NFPA's survey form included identification data items, such as the type of airport, FAA index, and NFPA category. Questions about ARFF resources by vehicle included vehicle status, water tank capacity, type of foam agent, foam concentrate tank capacity, maximum discharge rate, auxiliary agent type, and auxiliary agent capacity. Response time information was collected by asking questions about the distance between the farthest runway and each fire station, which we later transformed into a response time.

The FAA supplied a mailing list that included 666 Federal Aviation Regulation-certificated airport fire departments. We sent the first mailing out the first week of June 1998 and a second mailing to departments that didn't respond to the first mailing the second week of July 1998. In all, 315 departments responded to the two mailings. We then contacted by phone 76 airport fire departments that hadn't responded and added their ARFF resource data to the survey file.

After the two survey mailings and extensive telephone follow-up, we were able to obtain data from 391 U.S. airport fire departments. Our preliminary analysis indicated that 26 of these departments protected military airports only, so these were excluded from the analysis because they're covered by different federal regulations. Another 12 airports were protected by municipal fire departments, and 7 were excluded because of their size. After all of these were excluded from the analyses, 346 surveys were available for further analysis.



Photograph © Keller and Peet, Georgia Peet

Table 3

Airports Meeting FAA/NFPA Code Requirements for Vehicles

"NA" refers to the fact that the vehicle requirements are the same for the particular category.

Airport Category		Neither Code Met		Met FAA but Not NFPA		Met Both FAA and NFPA		Total	
FAA	*NFPA*	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*
A	4	0	0	NA	NA	69	100.0	69	100
A	5	0	0	27	37.0	46	63.0	73	100
B	6	0	0	14	19.7	57	80.3	71	100
C	7	2	2.5	14	17.5	64	80.0	80	100
D	8	4	13.8	NA	NA	25	86.2	29	100
E	9	1	4.5	1	4.5	20	90.9	22	100

Table 4

Airports Meeting FAA/NFPA Code Requirements for Water Capacity

Note that these results are based on the fact that all airport departments (345) reported that AFFF was their primary agent, and the minimum water quantity requirements reflect that fact.

Airport Category		Neither Code Met		Met FAA but Not NFPA		Met Both FAA and NFPA		Total	
FAA	*NFPA*	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*
A	4	1	1.4	25	35.7	44	62.9	70	100
A	5	1	1.4	57	78.1	15	20.5	73	100
B	6	2	2.8	46	64.8	23	32.4	71	100
C	7	4	5.0	31	38.7	45	56.3	80	100
D	8	5	17.2	10	34.5	14	48.3	29	100
E	9	3	13.6	2	9.1	17	77.3	22	100

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Table 5

Airports Meeting FAA/NFPA Code Requirements for Foam Solution Maximum Discharge Rate

See Table 2 for maximum discharge rate requirements for FAA and NFPA standards.

Airport Category		Met Neither Code		Met FAA, but Not NFPA		Exceeded FAA, but Did Not Meet NFPA		Met NFPA, and Exceeded FAA		Total	
FAA	*NFPA*	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*
A	4	12	17.4	0	0	0	0	57	82.6	69	100
A	5	24	32.9	0	0	0	0	49	67.1	73	100
B	6	1	1.5	10	14.4	1	1.5	57	82.6	69	100
C	7	2	2.5	2	2.5	3	3.8	72	91.1	79	100
D	8	1	3.5	1	3.5	2	6.9	25	86.2	29	100
E	9	0	0	1	4.5	0	0	21	95.5	22	100

Table 6

Airports Meeting FAA/NFPA Code Requirements for Auxiliary Agent Capacity

*Five airports in Category 4 met the NFPA requirement but not the FAA requirement. This is the only category in which this result is possible, because the FAA requirement is higher than the NFPA's.

Airport Category		Met Neither Code		Met FAA, but Not NFPA		Met Both FAA and NFPA		Total	
FAA	*NFPA*	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*
A	4	2	3.3	NA*	NA*	58	96.7	60	100
A	5	9	13.8	0	0	56	86.2	65	100
B	6	2	3.1	0	0	62	96.9	64	100
C	7	3	4.1	0	0	71	95.9	74	100
D	8	1	3.7	4	14.8	22	81.5	27	100
E	9	0	0	3	15.0	17	85.0	20	100

Table 7

Airports Meeting FAA/NFPA Code Requirements for Response Time

For FAA, the response time requirement is 3 minutes or less from the farthest runway. For NFPA, the response time requirement is 2 minutes or less from the farthest runway. This analysis is based on 305 departments reporting distances from one station and 31 departments reporting distances from two or more stations. When departments reported distances from two or more stations, the average response time was used.

Airport Category		Met Neither Code		Met FAA, but Not NFPA		Met Both FAA and NFPA		Total	
FAA	*NFPA*	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*
A	4	0	0	6	8.8	62	91.2	68	100
A	5	0	0	2	2.8	69	97.2	71	100
B	6	1	1.5	1	1.5	66	97.0	68	100
C	7	4	5.1	5	6.4	69	88.5	78	100
D	8	4	14.3	1	3.6	23	82.1	28	100
E	9	6	27.3	6	27.3	10	45.4	22	100

ARFF Committee added Category 10 to NFPA 403 in anticipation of larger aircraft and larger airports, and the subsequent need for additional ARFF services. However, NFPA Categories 1 through 9 relate closely to the FAA indices for airports, so we'll refer in this article only to Categories 1 through 9.

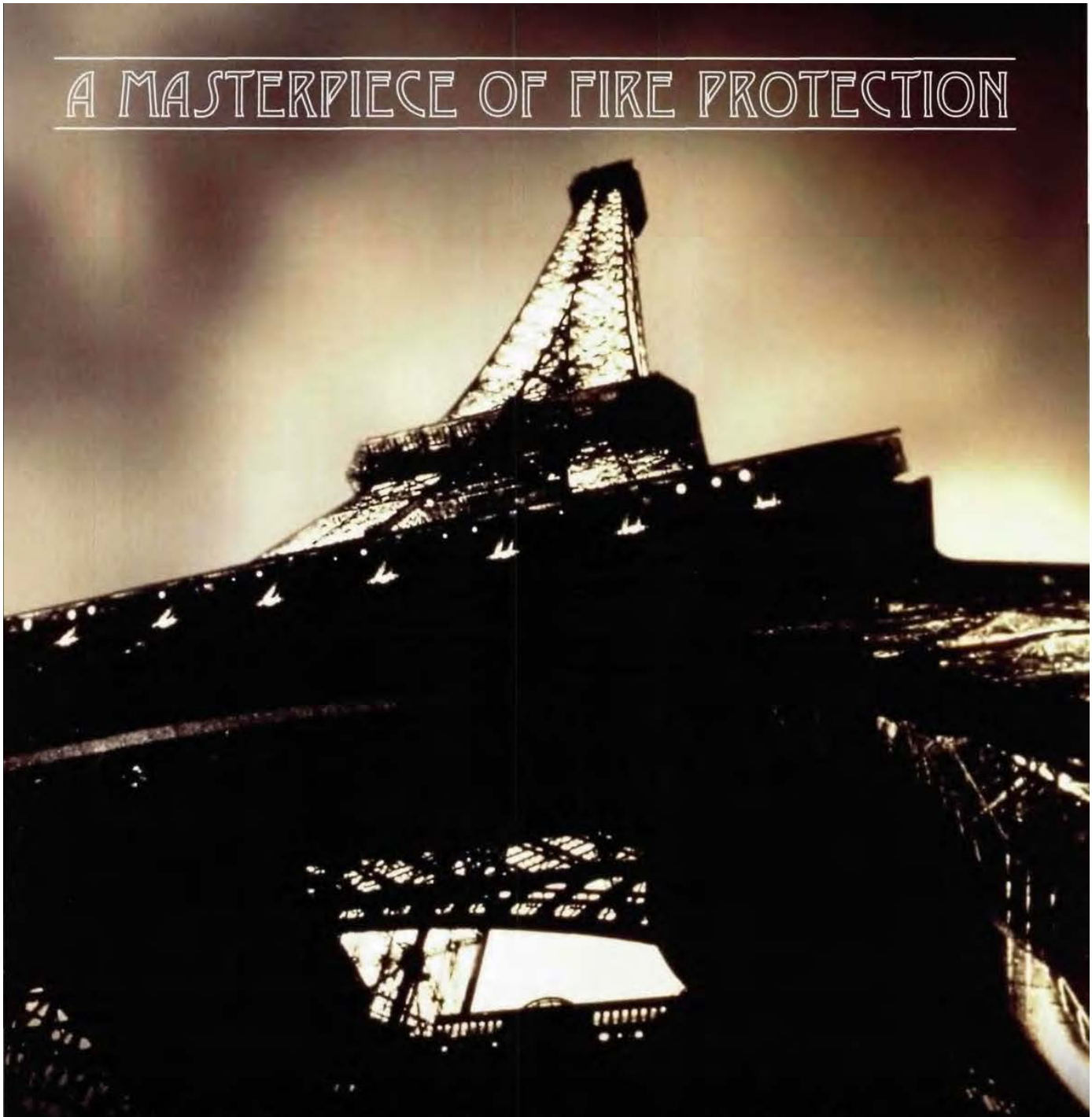
According to NFPA 403, U.S. airports in Categories 1 through 4, which handle aircraft that range from the smallest to those up to, but not quite, 78 feet (24 meters) long, must have at least one ARFF vehicle that has the tools and equipment needed to support rescue and firefighting operations (see Table 2). Airports in Categories 5 and 6, which handle planes from 78 feet (24 meters) long to those up to, but not quite, 126 feet (39 meters) long, must have two ARFF vehicles, while those in Categories 7 and 8, which handle planes from 126 feet



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NFPA 405 Addresses Ongoing ARFF Training Issues

A guideline for ongoing training among airport rescue and firefighting (ARFF) personnel will soon be published. At least, that's the hope of the 32 committee members who have spent the last several years developing NFPA 405, *Recommended Practice for the Recurring Proficiency Training of Aircraft Rescue and Fire Fighting (ARFF)*, a comprehensive 17-chapter document covering everything airport authorities need to know to ensure that their ARFF personnel remain highly proficient in dealing with airport emergencies. NFPA 405 will be presented at the NFPA World Fire Safety Congress and Exposition in Baltimore this May.

Authorities having jurisdiction over ARFF personnel will find NFPA 405 "easy to read and easy to follow," says Brian Boucher, an Air Canada pilot and volunteer firefighter who chairs the ARFF Technical Committee. "It's a document managers can pick up and say, 'This is going to work just fine. I can understand what I'm reading here and what we want the firefighter at the airport to know and do.'"

Currently, authorities in the United States rely on U.S. Federal Aviation Regulation (FAR) Part 139 for the information they need to keep their airport fire and rescue teams up to par. According to Boucher, however, "We needed something more explanatory to the airport fire chief or airport manager who wants ongoing training," says Boucher. "Ours will be a better document to use and will cover more areas than 139."

NFPA Senior Fire Protection Engineer Mark Conroy agrees.

"It fills a void and will establish criteria that'll be used by airports around the world," he says. According to Conroy, many international airport authorities are looking for uniformity among the standards used for ongoing ARFF training.

"People in the United Kingdom use Civil Aviation Publication (CAP)168, *Licensing of Aerodromes*, in a similar way to Part 139," said ARFF Committee member, Christopher Farnaby, of the United Kingdom Civil Aviation Authority Regulatory Branch. "What we're trying to do in the U.K. is introduce a competency-based training system, which is very much along the same lines as NFPA 405. As I see it, NFPA 405 is a competency 'best practice' training system, and that's what we in the U.K. are working toward. Our overall objectives are very much the same."

Farnaby notes that his counterparts in France and Switzerland have also expressed interest in NFPA 405.

Canadian Aviation Regulation 323.14, which is already in effect, largely mirrors NFPA 405, according ARFF committee member Bernard Valois of the Transport Canada Aerodrome Safety Branch.

"The substance is generally the same," he says, "with NFPA 405 being a little more complete in areas that aren't necessarily required in the Canadian context."

Remarkably, Regulation 323.14 became a regulation in a short six months.

"The reason is that most of the components of training were already carried out in Canada as part of the firefighter certification program," Valois said. "With the privatization of airports taking place, there was pressure to regulate requirements to ensure continuation [of the standards].

"Being the good document NFPA 405 is, it might even raise the interest of the ICAO (International Civil Aviation Organization)."

In fact, ICAO is already interested, according to Arun Rao, chief of the ICAO Aerodrome Air Routes and Ground Aids Section. Rao acknowledges that the ICAO's current manual is "very outdated" and that the agency is working on developing new training material.

"I admit we're nowhere near the finish line," Rao says. "We'd definitely be happy to consider [NFPA 405] along with the work that we are doing. Uniformity is what we're looking for."

Development of the standard

NFPA 405 has been in the works since 1993, when someone noted in a technical meeting that nothing addressing recurring ARFF training existed, recalls Conroy. A couple of years later, the document had been drafted.

After reviewing the scope, purpose, and title prepared by the NFPA 405 task group, the NFPA Standards Council agreed that nothing comparable existed and gave the committee approval to move forward.

Committee members thought they'd neared the finish line last May, only to be delayed one more year.

"At a joint meeting of key players of the ARFF Committee and the Professional Qualifications Committee, people aired their concerns for the first time," says Conroy, explaining that the committee responsible for NFPA 1003, *Airport Fire Fighter Professional Qualifications*, felt that NFPA 405 and NFPA 1003 covered the same territory. NFPA 1003 is the standard whose requirements firefighters must meet before joining an ARFF unit.

"We saw NFPA 405 as a companion document to NFPA 1003," Conroy says. "NFPA 1003 gets firefighters in the door. We want to make sure that once they're in, they stay up to speed."

"There was a need for discussion," says Boucher, "so that's what we've been doing for the last year—working with the NFPA 1003 Committee to incorporate some of their proposals."

"We took the comments from the NFPA 1003 Committee very seriously and asked what we needed to do," says Conroy. "They indicated that NFPA 405 would be better as a recommended practice and that it would be better if NFPA 405 didn't address the firefighter directly."

The compromise has been a cooperative effort, says Conroy.

The change from a standard to a recommended practice meant that every "shall" in the document has now become a "should," that nothing is directed at job performance requirements for the individual firefighter, and that all the written examinations have been removed.

Some committee members suggest that these changes may actually help increase acceptance.

"A recommendation is less threatening than a standard," says Valois. "If you adopt a standard, you have to adopt all of its elements. Liability-wise, you may be in trouble if you don't. With a recommendation, an airport operator can say, 'I'm going to aim at meeting all of the criteria, but I'm not obligated to.'"

"A lot of people thought that NFPA 405 as a standard was overzealous and that it would be too high a reach," says Farnaby. "As a recommendation, NFPA 405 is something to strive for as a best practice. Otherwise, all you end up with is minimum standards."

Hugh Pike, chairman of the NFPA 1003 Committee, says he's satisfied with the revisions and doesn't foresee any roadblocks in NFPA 405's approval this year. However, NFPA 405 and NFPA 1003 committee officers will meet again the first day of the May meeting to review the revised document before it's presented at the technical meeting. Although the document still has to be approved by the Standards Council at its July meeting, committee members are optimistic.

"It's a good document," says Boucher.

—Valerie D. Hershfield

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Firefighters at the Dallas/Fort Worth International Airport participate in a training exercise with their ARFF equipment.

(39 meters) long to those up to, but not quite, 200 feet (61 meters) long, must have three. The Bismark, North Dakota, and the Erie, Pennsylvania, airports are examples of Category 6 facilities, while the Norfolk, Virginia, and Tampa, Florida, airports are examples of Category 7 and 8 facilities, respectively. The largest airports in Category 9, which handle planes from 200 feet (61 meters) long to those up to, but not quite, 300 feet (91 meters) long, must have four ARFF vehicles. Airports that fall into these categories include Dulles International Airport outside Washington, D.C., O'Hare International Airport outside Chicago, and JFK International Airport in New York.

The FAA requirements for the number of ARFF vehicles for Categories 4 and 8 are the same as the NFPA requirements. For Category 5, the FAA requires one ARFF vehicle. The FAA requires that Category 6 airports have one or two ARFF vehicles, rather than two, and Category 7 airports must have two or three vehicles, rather than three. For Category 9, the FAA requires three vehicles, rather than four.

NFPA used the responses to our survey to determine how well airports in Categories 4 through 9 complied with the NFPA and FAA criteria. Airports in Categories 1, 2, and 3 were generally considered too small to include in the study. In all, NFPA analyzed 346 surveys from departments of various sizes. Seventy Category 4 airports and 73 Category 5 airports participated, as did 72 Category 6 airports, 80 Category 7 airports, 29 Category 8 airports, and 22 Category 9 airports.

According to the survey, 82 percent or more of the departments in all categories but 5 met both the FAA and NFPA requirements for in-service vehicles. Nearly 100 percent of responding airports in Category 4 met both FAA and NFPA requirements for ARFF vehicles, based on in-service vehicles only (see Table 3). Sixty-three percent of airports in Category 5 met both sets of requirements, while 37 percent met only the FAA requirements. In Category 6, 80.3 percent of airports met both sets of requirements, and 19.7 percent met only the FAA requirements. In Category 7, 80 percent of airports met both FAA and NFPA requirements, while 17.5 percent met only FAA requirements. Twenty-five percent of the responding Category 7 airports met neither set of requirements. In Category 8, 86.2 percent of airports met both sets of requirements, while 13.8 percent met nei-

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ther. And 90.9 percent of airports in Category 9 met both FAA and NFPA requirements. One airport in this category met only the FAA requirements, and one met neither set of requirements.

Extinguishing agents

NFPA 403 also requires that ARFF vehicles carry foam to fight fires involving hydrocarbon fuels. Airports can choose either aqueous film-forming foam (AFFF), fluoroprotein foam (FP) or film-forming fluoroprotein foam (FFFP), or a protein foam (P). Dry chemicals or Halon 1211 or both must also be available as an auxiliary agent.

Since foam is made by mixing 3 or 6 percent foaming concentrate with 97 or 94 percent water, both the NFPA codes and the FAA regulations specify how much water the airport must have available and the rate at which the mixture must be discharged. NFPA's standard calls for significantly more water capacity than the FAA regulations (see Table 2). For example, NFPA requires Category 4 airports to have 1,200 gallons (4,542 liters) of water on hand for use with AFFF, while the FAA requires only 100 gallons (379 liters). The same is true of the discharge rate. NFPA requires a discharge rate of 1,100 gallons (4,164 liters) per minute for Category 6 airports, while the FAA requires a rate of 500 to 1,000 gallons (1,893 to 3,785 liters) per minute.

The water capacity results are based on the fact that all airport fire departments from which we received completed surveys reported using MIL-SPEC AFFF (Military Specification MIL-F-24385 Aqueous Film Forming Foam) as their primary agent, and the minimum water quantity requirements reflect that fact.

The categories with the highest percent of departments failing to meet either code for water quantity were Category 8, in which 17.2 percent of the airports didn't meet the codes, and Category 9, in which 13.6 percent didn't (see Table 4). The categories in which the lowest percent of departments met both FAA and NFPA requirements were 5, at 20.5 percent; 6, at 32.4 percent; 7, at 56.3 percent; and 8, at 48.3 percent.

As for water discharge rates, the categories in which the highest percent of departments failed to meet either the FAA or the NFPA criteria were Category 5, in which 32.9 percent failed, and Category 4, in which 17.4 percent failed (see Table 5). Categories in which a high percent of departments met the NFPA code and exceeded the FAA requirement were Category 4, at 82.6 percent; Category 6, at 82.6 percent; Category 7, at 91.1 percent; Category 8, at 86.2 percent; and Category 9, at 95.5 percent.

The airports surveyed differed somewhat in their choice of auxiliary extinguishing agent. Most of them—201 airports—use potassium bicarbonate, while 34 use sodium bicarbonate, 23 use halon, and 57 use both potassium bicarbonate and halon. No matter which agent they use, however, they must have a certain amount on hand. The FAA requires that all airports, regardless of size, have available 450 to 500 pounds (204 to 227 kilograms). NFPA, on the other hand, requires that Category 4 airports have 300 pounds (136 kilograms) on hand; Category 5, 6, and 7 have 450 pounds (240 kilograms); and Categories 8 and 9 have 900 pounds (408 kilograms).

According to the survey, Category 5 had the highest percent of departments—13.8 percent—that failed to meet either the FAA or NFPA code (see Table 6). For Categories 8 and 9, about 15 percent of the departments met the FAA criteria, but not the NFPA criteria. In all categories, more than 80 percent of the departments met both FAA and NFPA requirements.

Response times

Our survey didn't actually include a question about response time. Instead, we asked the distance from each fire station to the midpoint of the farthest runway. When departments reported distances from two or more stations, we used the average. Then, based upon the assumption of several professionals in the field that an average of 30 miles per hour (48 kilometers per hour) was a reasonable speed under the circumstances, we converted the distances to minutes. The FAA response time requirement is three minutes or less for the first-arriving vehicle, while NFPA's response time requirement is two minutes or less to any point on the operational runway.

The highest percent of departments that didn't meet either criteria for response time were Category 8, with 14.3 percent, and Category 9, with 27.3 percent (see Table 7). In Category 9, another 27.3 percent of the departments met the FAA code, but didn't meet the NFPA requirement. For all categories except 9, more than 80 percent of the departments met both FAA and NFPA requirements.

Collecting data on ARFF resources serves two purposes. It will give the FAA a clear picture of the level of resources available, which will be important to the agency as it considers using NFPA standards to comply with the federal mandate to adopt private-sector national consensus standards wherever appropriate. And it will allow airports to compare their ARFF capabilities with those of other airports in their categories, providing a baseline for discussing needed improvements.

The goal of both the FAA and airport operators is to make airports safe, and the data collected by this survey will help both groups achieve their goal by assessing the appropriate ARFF response in the event of an aircraft emergency at an FAA-certificated facility.

Michael Karter, Jr., is senior statistician in NFPA's Fire Research and Analysis Division.

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What Went Wrong

Staying put may be the safest action to take in a high-rise fire, and keeping doors closed can keep fire from spreading. But recent high-rise apartment building fires show that most people don't know these basics. And ignorance can be deadly.

Alisa Wolf

Get out—fast. That's what fire safety experts have taught us to do if the fire alarm sounds. But for those who live or work in high-rise buildings, it isn't always a good idea to head down the stairs during a fire.

On December 23, 1998, four people who might have remained safe by staying in their apartments died in a widely publicized high-rise apartment building fire in Manhattan that started in one of the two 19th-floor apartments in which actor Macaulay Culkin's mother, Patricia Bentrup lived with her children. The fire marshal's office is still investigating but tells NFPA that the fire's cause was probably an electric heater. Fire spread is blamed, in part, on the fact that on her way out, Bentrup didn't remove the props holding the apartment doors open, allowing blustery winds that entered through a heat-shattered window to push flames into the hallway and through an open fire door into the stairwell. The four victims were found in this stairwell, between the 27th and 29th floors.

Less than one week before the Culkin family fire, three firefighters died when they were caught in the hallway of another New York high-rise apartment building during a fire on December 18. Again, an open door in the apartment of fire origin allowed a fireball to rip through the long hallway, trapping the three men shortly after they neared the unit. Investigators later found that the apartment door's self-closing device had been disabled.

According to the Fire Marshal's office, the cause of the December 18th fire was smoking, says NFPA's Fire Investigator Robert Duval, who traveled to New York to investigate the two fires. He also reports that one of the factors that may have contributed to this tragedy was the fact that the building's partial sprinkler system had been turned off, keeping the potentially lifesaving system from operating. The sprinkler control valves for most of the building were concealed behind ceiling panels that had been painted over.

"What prompted NFPA's investigation," says Robert Solomon, NFPA's chief building fire protection engineer, who joined Duval in New York, "was the fact that these fire occurred so close to one another and that three firefighters died in the first, which is very unusual. In the second fire, four people died in the exit stairwell, which is also unusual. Normally, people who die in residential high-rise building fires are found in corridors or apartments near the fire's origin, not in an exit stairwell 10 floors away."

These anomalies raise several questions about fire safety in high-rise buildings. What should people who live and work in them know about relocation or evacuation during a fire, and who's responsible for fire safety training? Who's responsible for teaching basic fire safety behaviors, such as keeping fire doors closed at all times and ensuring that other doors close when evacuating? Is it up to the landlord to provide tenants with fire-safety information, or is it up to the fire department? Should tenants be responsible for their own fire-safety education? In the December 18th fire, a partial automatic sprinkler systems was present but nonoperational. How could this have happened?

December 18, Brooklyn

Human behavior played a key role in this fire, which occurred in a 10-story, public housing apartment complex in Brooklyn, built in 1983 with government funding and managed by the city's Housing Authority. Units were made of concrete and compartmentalized to help contain fire to the apartment of origin, and doors were equipped with self-closing devices.

The fire began when 67-year-old Jacqueline Pinder fell asleep in her 10th-floor apartment while smoking and ignited her couch. When she awakened, she discovered a growing char spot on the couch, but instead of calling the fire department, she spent as long as 30 minutes trying to douse the fire herself by filling her tea kettle as many as six times and pouring water on the burning cushion. By the time the fire alarm panel at the security desk indicated a smoke detector activation

Photograph ©Daily News Photo



Know When to Go

by Susan Siegel-McKelvey

Until the past few years, NFPA's home fire escape planning and practice messages primarily addressed one- and two-story dwellings. However, the necessary actions for safe escape from a single-family, two-story home can be different from, or even contradict, what you need to do in a high-rise apartment building fire.

With large numbers of people evacuating at the same time, cooperation and precision are extremely important. The following steps apply to residential high-rise buildings and hotels:

In general...

- Familiarize yourself with the building's alarm system and evacuation plan.
- Make it a habit to count the number of doors between your apartment or hotel room and the two nearest building exits. If you have to evacuate in darkness, you will be able to count doors while feeling your way to an exit.
- If you discover a fire, sound the fire alarm and call the fire department.
- If the fire is in your unit, leave the area quickly, closing all doors behind you to slow the spread of fire and smoke. Take your key so that you can return to your apartment or room if you encounter smoke or flames.
- If smoke is coming into your unit or hallway, you must decide whether to stay or to go. Sometimes the fire department can give you instructions, or you can follow the building's voice communication system. If you decide to leave, remember to be alert to signs of worsening conditions that might prompt you to re-evaluate your situation. If you know the fire is well below you, stay put and follow the directions listed below.
- If you encounter smoke or flames, use your alternate escape route. Some evacuation plans require residents to go to a safe area inside the building and wait for the fire department to supervise evacuation.

If you stay...

- Remain calm. There are things you can do to protect yourself.
- If possible, go to a room with an outside window or balcony and a telephone.
- Close all doors between you and the fire. Use tape or a wet towel to fill cracks around doors and cover vents to keep smoke out.
- If there's a phone in the room in which you've taken refuge, call the fire department and tell them exactly where you are, even if you can see fire trucks on the street below.
- If possible, open the window at the top and bottom and signal to firefighters with a light cloth or flashlight. Don't break the window, and be ready to shut it if smoke rushes in.
- Be patient. It can sometimes take hours for the fire department to evacuate a multistory building.

In all fires, one constant remains: a quick, decisive response can mean the difference between life and death. Taking early warning signs seriously and knowing how to react to them immediately is crucial to life safety, regardless of occupancy type.

Susan Siegel-McKelvey is NFPA's Public Affairs manager.

in the elevator lobby on the 10th floor, says Duval, the fire had filled the corridor with smoke.

Pinder stumbled out of her three-room apartment into the hallway, where she fell, overcome by smoke inhalation and burns. A neighbor who lived with a bedridden woman next door heard her in the hallway and dragged her into their apartment.

About 15 minutes into the fire, water began leaking into a downstairs apartment. The tenant called the Housing Authority's 24-hour hot line, and the operator there began calling plumbers, suspecting a leaking water pipe. Later, fire investigators discovered that this call had come in at the same time Ms. Pinder was trying to put out her couch fire. Water overflowed her kitchen sink and leaked into the apartment below.

Meanwhile, the fire continued to grow until the security guard received an alarm on the lobby panel and took the elevator to the 10th floor to investigate, says Duval. When the elevator door opened, he saw smoke and retreated into the elevator. While traveling back down to the lobby, he used his cellular phone to call 911.

A neighbor across the hall from Pinder also called 911, and the fire department received the reports of fire at 4:54 a.m. When firefighters arrived, an engine company climbed the stairs to the 10th floor with fire hoses, which they began to connect to a standpipe. Soon afterward, a team of three from a ladder company began looking for Ms. Pinder, unaware that she'd already found refuge. As they neared the apartment of fire origin, the three men found flames shooting from its door. They radioed that they were in trouble just before they were overcome by heat and smoke.

It took 158 firefighters to bring the three-alarm blaze under control by 5:56 a.m. The heat of the fire was so intense that the pre-tensioned concrete roof panel above the room of fire origin spalled, says Duval, exposing the steel cables within the panels.

When it was all over, three firefighters—Lieutenant Joseph Cavalieri, 42, and firefighters Christopher Bopp, 27, and James Bohan, 25—were dead, and four others were hospitalized in stable condition. Two suffered second- and third-degree burns, another was treated for smoke inhalation, and the fourth suffered a back injury. Two injured residents, including Ms. Pinder, were hospitalized in critical condition, but they've since recovered. Three other residents were injured less severely.

In a press conference from his hospital bed, one of the burned firefighters, Lieutenant Michael Donovan, told reporters that he and his

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team would have been caught in the fireball that killed their colleagues had they not been slowed down on the stairs by firefighters carrying a woman in a wheelchair down the stairwell from the 10th floor.

Obviously, human behavior contributed to the growth of this fire and to delayed fire department notification. But after the fire, investigators also discovered that the building's partial sprinkler system hadn't been turned on.

Fire inspectors who'd checked the system regularly were only required to check the standpipe system, since it was equipped with a fire department connection, which they'd assumed fed directly to the sprinklers. In fact, the main valve for the sprinkler system fed five interior valves hidden behind ceiling access doors that had been painted over on the first floor. Building maintenance workers apparently had no idea the valves were even there. The fire marshal's office even speculated that the system, which was installed when the building was constructed in 1983, might never have been turned on.

When the apartment building was constructed with funding from the U.S. Department of Housing and Urban Development, the federal agency required sprinklers, which accounts for the partial system, according to information the Fire Marshal's office gave NFPA investigators. NFPA 1, *Fire Prevention Code*, also requires sprinklers in high-rise apartment buildings such as this one. However, until Mayor Guiliani signed a new bill on March 25, 1999, the New York City Housing Authority didn't require sprinklers in high-rise apartment buildings it funded. In fact, most of the high-rise apartment buildings it oversees don't have sprinkler protection.

As it happens, this building's sprinklers, supplied by common domestic plumbing pipe, were only installed in the public corridors, not inside individual apartments. As a result, says Solomon, they wouldn't have protected the occupants or contents of the apartment of fire origin, though they might have made a difference in the public areas. He adds that the sprinkler system didn't meet any recognized design practices for sprinklers required by NFPA 101®, *Life Safety Code*®, or NFPA 13, *Installation of Sprinkler Systems*.

Perhaps the most important issue arising from this fire is not the lack or presence of the sprinklers themselves, says Solomon, but the lack of formalized inspection, testing, and maintenance for the sprinkler system.

"The *Life Safety Code* says that even nonrequired systems have to be installed and maintained as if they were required, or else removed," he says.

December 23, Manhattan

The second blaze started on the 19th floor of the unsprinklered apartment building in the Culkin family's unit, which was fashioned from two separate units that had been combined. At 9:55 a.m., the housekeeper saw flames in the living room and screamed, alerting Bentrup, who was in the kitchen cooking breakfast.

Bentrup called 911 while the housekeeper soaked a blanket that had caught fire in the tub. When the housekeeper went back to the living room, however, she saw that the couch had already become involved. The two women then roused three children from the apartment of fire origin and one from the unit across the hall.

The front doors to the two adjoining apartments were habitually propped open when people were home. When they evacuated, they neglected to remove the props and close these doors, allowing heat and smoke to enter the hallway and spread through an open fire door into a stairwell. Wind also ripped through a window in the apartment of origin that had shattered from the heat, driving heat and smoke into the stairwell, and trapping four people evacuating from the upper floors. Hundreds of people were stuck in their apartments for hours, and some braved the cold on their balconies, waiting for rescue.



Photograph: (AP/Wide World Photos)

The thick black smoke that killed four people in a stairwell billows from the 10th floor of this high-rise apartment building in New York City on December 18, 1998.

By the time it was over, nearly 200 firefighters and fire trucks from 48 companies had arrived on the scene. The four people trapped while evacuating from upper floors died in the stairwell, and 8 other residents and 14 firefighters suffered minor injuries. According to information the fire marshal's office gave NFPA investigators, the fire was probably caused by an electric heater.

The building was unsprinklered, says Solomon, because the New York City building code didn't require sprinklers in high-rise apartment buildings, either new or existing. To his knowledge, New York was the only U.S. city that allowed new high-rise apartment buildings to be built without sprinklers.

"After much discussion following these fires, the city passed what I'd call a long-overdue change requiring sprinklers in residential construction," he says. "The new bill also includes provisions for retrofitting sprinklers in existing apartment buildings under some conditions.

"The *Life Safety Code* clearly requires sprinklers in new high rise apartment buildings, and, in most cases, in existing ones," Solomon says, adding that, in most large U.S. cities, "you'd be hard-pressed to find even a new six-story apartment building without sprinklers."

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Photograph: ©AP/Wide World Photos

During a fire in this high-rise apartment building in Baltimore, one woman died of cardiac arrest on the 23rd floor of a smoke-filled stairway as she tried to escape.

Stay or go, how do you know?

To stay or not to stay, that's the crucial question for people caught in high-rise building fires. But, says Duval, the decision isn't as easy as it is in most single-family dwellings.

"If the fire's 10 floors below you, you're better off staying put, notifying the fire department of your location, and waiting for instructions, especially in what they call a fire-resistant building of steel and concrete like the one in Manhattan," Duval says. "But if the fire's in the apartment directly below yours, you don't want to stay where you are. You might want to try the stairs or take refuge elsewhere."

If you open your door and see smoke in the hallway, however, chances are you won't know where the fire's coming from, says Duval. And without that information, where do you turn?

According to Solomon, the first thing to remember in a high-rise building fire is that it's not always necessary to leave the building.

"If you do decide to leave," he says, "be vigilant. If you see smoke, retreat or go to another floor. If that floor looks clear, stay there. You have to keep re-evaluating your situation."

The *Life Safety Code* requires that emergency instructions be available and given to each resident of a high-rise apartment building, Solomon says.

"It's the assumption that this would come from the building manager," he adds.

In reality, however, it often falls to the fire service to play a leadership role in getting that information to the proper people.

"People at the community level look to the fire service for guidance," says Meri-K Appy, NFPA's vice president of Public Education. "That's not to say that fire departments are the only ones that can make a difference. We're big believers in having fire departments team up with others in the community who have connections to audiences they're trying to reach."

In big cities, this should include building managers, who, Appy says, "might not have a clue about the real consequences of fire."

The recent high-rise apartment building fire fatalities have alerted NFPA to the need for better fire-safety training in such buildings, says Appy, who believes the Association can do more. That's why "The Great Escape" of 1999, the second in a three-year Fire Prevention Week campaign to encourage people to practice home fire drills, will include specific messages on planning for fire in multifamily dwellings, ranging from four- to five-story structures to high rises.

The other half of the training equation is making sure people understand basic fire safety rules, such as closing doors behind you and not walking through smoke. According to Rita Fahy, NFPA's manager of Fire Databases and Systems, studies of human behavior in fire have shown that people will move through smoke, defying what fire safety experts had believed until the World Trade Center Fire of 1993.

"In the World Trade Center fire, we found that people would not only move through smoke, they'd continue through worsening conditions, even while aware they were headed into the fire," Fahy says. "We need to make sure that people in high-rise buildings understand the dangers of smoke and that they realize they have another option to evacuation. They need to know they may be safer if they stay put, and they need to know how to make a safe decision."

Avoiding tragedy

On February 5, 1999, less than two months after the two New York fires, there was another fatal fire, this one in an unsprinklered high-rise apartment building in Baltimore, Maryland.

According to Baltimore City Battalion Chief Hector Torres, the 30-story building had 2 commercial floors and 28 residential floors. Torres says that the fire, which the Fire Investigations Bureau found was caused by smoking, originated on the 15th floor, and flames involved floors 14 through 19.

During the evacuation, some residents above the 14th floor were directed to the roof to await air-lifted firefighters to help them down stairwells. Early in the fire's progress, however, an 86-year-old woman died of cardiac arrest on the 23rd floor as she descended a smoke-filled stairway. Over the course of the evacuation, nine other residents and one firefighter were injured, says Torres, but none seriously. The building was unsprinklered because it had been built in 1967, before sprinklers were mandatory in Baltimore.

Tragedies such as these might have been avoided in the first place if sprinklers had been retrofitted and basic fire safety procedures understood and followed. That's why NFPA targets populations at highest risk with programs such as *Learn Not To Burn®*, *Risk Watch™*, and "Remembering When," its new curriculum for seniors.

And as it did last year, NFPA will send materials for "The Great Escape" to every fire department in North America. Each package will include a new educational video produced by the USAA Educational Foundation that firefighters can use in elementary school classrooms. The video follows three children, one of whom lives in a high-rise apartment building, as they plan and practice their home escape plans.

Updated information on the campaign will appear on the NFPA web site, www.nfpa.org, says Appy, "to educate folks so they can do a better job at the local level, where lives lost to fire are most keenly felt."

Alisa is editor of NFPA Journal.

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MYTHS of Codes and Standards



In pursuing strategic initiatives related to our codes and standards, we keep bumping into misconceptions about them.

John R. Hall, Jr.

Four years ago, I wrote an article about the various myths associated with fire. These myths were widely held misconceptions, involving common errors of fact that arise for understandable reasons. The article proved quite popular.

My impression from talking to people is that part of the fun wasn't so much seeing all the myths I described as it was in reflecting on why and how they'd taken hold. In the long run, we're all fire safety educators of one sort or another, and if we understand why people make mistakes, we may be better able to steer them toward the truth.

Earlier this year, the idea surfaced for a similar article on the myths of codes and standards. NFPA's been pursuing a number of strategic initiatives related to our codes and standards over the past several years, and we find we keep bumping into some common misconceptions about them. This article is an opportunity to spend a little time looking at some of these underlying misconceptions.

Let me recap a few ground rules from the previous article before we start. First, I use the term "myth" to refer to a statement about a question of fact that's either provably false or far outside the range of possibility, given the relevant evidence. Given the nature of the topic, I'll discuss some related value questions that are at the very core of what NFPA stands for, but I won't try to confuse philosophical differences over values with conflicts over myths versus truths.

You may say, for example, that poor people are no more likely to die in fires than rich





people. That's a myth, and I can show you the evidence. If you say you don't care whether poor people die in fires and you don't think our codes and standards should try to protect them, that's a value judgment, and I wouldn't consider it within the scope of this article.

Second, I won't be surprised if some of you agree with some of the statements I'll label as myths. If you do, don't get mad, get in touch. I'd like to talk with you about any such points, and *NFPA Journal* would be happy to print your views in a letter to the editor.

Third, I proposed six types of myths in my first article. This time, however, I couldn't find examples for more than two types: oversimplification and myths with an agenda. Or, to sharpen the comparison, inadvertent oversimplification and deliberate oversimplification.

That said, let's get into the real stuff.

Who decides? Who runs the show? What is power?

Who writes codes and standards at NFPA? All the technicalities of NFPA's process and system aside, who really has the power to dictate the content of NFPA's codes and standards? The largest number of myths, by far, were some kind of answer to these questions.

Many people think they know who "really" controls NFPA's codes and standards. I'll say more later about some common suspects, but I'll tip you in advance on the right answer: Nobody does—not the fire service, not the insurance industry, not manufacturers, not enforcers, and certainly not the staff.

That's an answer many people just can't imagine. They might listen to arguments about who's in charge but not about whether some small group calls the shots. So before discussing the "suspects," let's talk about the basic idea that somebody always has the power.

Suppose you and three other drivers all arrive simultaneously from four different directions at a four-way intersection with no traffic lights or stop signs. In most states, the driver on the right has the right of way. In this case, however, every driver is on someone else's right and has someone on his or her right, so no one has the overall right of way. Who has the power to go through the intersection first?

On the face of it, no one does. There is no rule or ritual for the drivers to go through to reach a consensus on who's entitled to go first, and if any two drivers decide to act on their separate presumptions that they're entitled, the result is likely to be a collision. A driver might be willing to accept a collision as an outcome, but would any of them point to a car wreck as proof of their power over the situation? Very doubtful.

"Power" means the degree to which you can act to produce the effects you want. So in the situation I've described, none of the drivers has enough power to seize his or her most preferred outcome, without regard for the others' wishes.

This is just one example of the many situations in which any answer to the question of who has the power is a myth. Yet many people believe those myths because they believe there's always a specific answer to the question of power.

In the context of codes and standards, this oversimplification translates into this kind of logic: My group's views are always right, and everybody who disagrees with my group's views is part of The Opposition. My group often loses in deliberations on provisions of codes and standards. Therefore, I know my group doesn't have the power, or else we'd be calling the shots. The power must reside with The Opposition, because power must reside somewhere (the myth), and the system must be stacked in its favor.

This flawed logic isn't always wrong, as there are codes- and standards-development processes in which one group does have the power. More generally, however, there will be situations in which one group has somewhat more influence than another, no matter how carefully balanced the process is. You can design a process to prevent any one group from dominating the outcomes, but you can't hope to eliminate all differences in influence. Anyone with better skills in group discussion and decision-making can tilt things in the direction of his or her group and interests.

But this is getting too far away from our myths. Let's get into another common one.

I work for the National Fire Protection "Agency?"

Nearly every month, I see NFPA cited in the press as the "National Fire Protection Agency." And if you've been an NFPA member long, you've probably heard some variation of the same from someone who isn't familiar with fire safety or the world of codes and standards.

For the average person, it must seem a very subtle distinction between NFPA's model codes and standards and the state and local laws based on those codes and standards. NFPA and other private codes and standards developers write the rules we all agree on, but adoption into law is only one way of getting everybody to act on the rules, and enforcing the rules isn't NFPA's job.

If NFPA isn't a government agency, a variation of the myth goes, it must be a QUANGO, one of the great-sounding acronyms of my professional life. It stands for QUAsi-governmental Non-Governmental Organization, and it's a category of half-private, half-public organizations now recognized in federal procedures. Nothing wrong with QUANGOs, but that's not NFPA, either. Writing model rules for everyone to live by isn't automatically a governmental function.

Members of the criminal justice system sometimes run into a similar oversimplification myth. We all know people who divide the world into one group called criminals and another group of ordinary people. The criminals are bad people, so they must do a lot of bad things, and the police should arrest them for something—it doesn't matter what—and the prosecutors should put them in jail. Ordinary people are good people, so even if they break the law, they shouldn't be arrested. To someone pursuing this line of reasoning, every arrest is a judgment by the police officer on the virtue of the arrestee.

This kind of oversimplification is dangerous. Unless the rules we live by are set by a consensus process in which everyone affected has a

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voice and a vote, we're headed down the road to tyranny. Unless the enforcers of the rules ensure compliance with the rules, not simply raise up or hold down favored or disfavored groups, we're headed down the road to oppression. So it's important to teach people not only that NFPA isn't a government agency but also that it's a good thing NFPA isn't a government agency.

Of course, this same logic also says it's a bad thing for the rules we live by to be written by a narrowly based *private* organization. Regulated industries shouldn't be able to write weak rules for themselves, then ram them through the legislature, but that's not what NFPA and like groups do. The essential concept here is consensus, and there's only one way to get consensus: Give everybody a voice and a vote.

From the point of view of writing the rules, the people who enforce the rules are an interested party. That's why the rules won't represent a broad consensus if they're written exclusively by those who'll enforce them. It isn't a myth to believe enforcers should write the rules, but it's an absolutely crucial value judgment, one that sharply distinguishes a consensus developer of codes and standards such as NFPA from a code developer like the International Code Council (ICC), in which one specific group—in that case, enforcers—does have all the power.

And this is where the myth part becomes important. Some of those who favor an ICC-type process sincerely believe that one specific group always has the power in any code-development process. They wave aside the checks and balances of true consensus processes like NFPA's or ASTM's as smoke screens and distractions.

And it's this myth that makes them hard to refute. If you oversimplify the world in that fashion, it won't be hard to line up a large majority behind an enforcers-only process. But if you break through the myth that any process must inevitably give one interest group the power to write the codes and standards they want, no matter what anyone else thinks, then popular opinion is likely to swing back in favor of a true consensus process.

NFPA: the quiet, good-hands company under the umbrella?

Second only to the myth that NFPA is a government agency is the myth that it's a support organization in the insurance industry. This myth at

TABLE 1

AN OVERVIEW OF MYTHS ABOUT CODES AND STANDARDS

Myth(s) About NFPA	Underlying Larger Myth(s)	Associated Values or Preferences
NFPA documents are dominated by industry. NFPA documents are dominated by the fire service. NFPA documents are dominated by group X.	Consensus is a sham; there is always some small group that dominates.	Codes and standards should be written by my group -- the people who work in my field, the people who share my values.
NFPA is a government agency.	Codes and standards are laws, and all laws are written by government bodies.	Codes and standards should be written by enforcers; only they should have a vote.
NFPA is an insurance support group.	Any private organization interested in fire safety and not limited to a single industry must be an insurance group.	Codes and standards should be written from a financial, risk management point of view.
NFPA writes standards but not codes.	Codes are written by groups where only enforcers or other government officials vote.	Codes are value judgments on safety which should come from the enforcers responsible for community safety.
NFPA documents are incompatible with ICC documents.	Compatibility is only possible when a single organization produces all documents.	All codes (or all codes and standards) should be written by the ICC.
NFPA documents are not international documents.	International documents can only come from a group whose members are nations.	All codes and standards in the world should be issued by the ISO and IEC. The world should always follow Europe's lead.
NFPA documents are already performance-based.	Any use of testing, calculation, or measurement is enough to make something performance-based.	Fully performance-based documents are undesirable -- too hard to understand and enforce, too disruptive of current settled markets, not sufficiently proven.

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least has some historical basis: NFPA was founded by a number of organizations, nearly all of them from the insurance industry. However, few people interested in fire were alive when NFPA was so tightly connected to the insurance industry, so why does that perception persist?

Maybe it's the fact that insurance companies are the best-known example of private entities that write rules related to risk, safety, and health as conditions for access to their services. Maybe it's a variation on that mythical search for the one specific group with the power.

Someone who sees that NFPA is a private organization may infer that the one group with the power must also be a private-interest group. If that person gets past the idea that the entire private sector is one monolithic interest group, then a specific group with a scope of activity broad enough to match NFPA's is the insurance industry.

A variation on this myth is the theory—often voiced by so-called investigative reports—that the group controlling an organization must be the group providing most of the organization's funds. That's not a bad theory in general, but for an organization like NFPA, no group comes close to being a majority funder. It's like trying to decide who controls a grocery store chain by asking who buys most of the groceries. Of course, that doesn't keep some people from asking how much money NFPA gets from government contracts and grants or from the fire sprinkler or detection and alarm industries. And we've got the answers, but they don't always show that the group in question is a minor source of NFPA funding.

An organization funded primarily by one interest is probably controlled by that interest. At least the burden of proof can be reasonably shifted to the organization to prove that's not the case. But the idea that every dollar changing hands is a magic wand conveying absolute control is crazy.

In fact, the truth is more complex. At some point, a financial relationship creates a larger relationship, and influence grows to constitute power. It's naive to think this never happens, but it's cynically foolish to think it always does. The reason for airing these myths is to encourage us all to insist on complex truths over misleading simplifications and to demand evidence for even the most plausible-sounding propositions.

The myth that NFPA is a government agency is a factual error closely aligned with the value judgment that NFPA *should* be a government agency. The myth that NFPA is part of the insurance industry is also a factual error, aligned with the value judgment that NFPA should operate on insurance-type principles.

If you hang around enough committee meetings, you'll eventually hear someone say that codes and standards are all ultimately about money. How much of our money will we spend to protect our valuable stuff—that is, our money? Which building features and systems, each of which makes money for a different industry, will we use to protect everyone else's money? Which companies will be kept from making money because the stuff they make is too likely to lead to a fire that destroys someone else's money? And by the way, how much money do we spend to save one life or prevent one injury?

There's no question that all these points are relevant and important in the development of codes and standards. A substantial number of our fire safety codes and standards have to do with spending money to protect money, and we should be sure the balance between the two makes financial sense. And even though no one likes to think of trading money in any amount for a human life, it's also true that everyone makes judgments daily on acceptable risk and the value of life or health.

However, it's also true that society can't condone having one person or group do serious, avoidable harm to another person or group, even if the first person or group will gain a great deal of money by doing so. At some level, we all know that safety isn't entirely reducible to a balance between spending and losing money. So we can't simply turn over the process of codes and standards development to some big actuarial model, however sophisticated. We need a consensus of choice among people with different values for what economists call "incommensurable goods"—that is, desirable things that can't be readily compared to one another.

A particularly nasty variation of the myth that codes and standards are just about money is that NFPA's actions on them are all about maximizing NFPA's profit. Fellow staff members tell me they've heard people claim that NFPA introduces new documents that aren't needed because they'll make money for NFPA. Some have even heard it said that NFPA staff receive royalties on the introduction of new standards.

I could make a joke here about how I'm still waiting for my first royalty check, but really, this is too ugly a myth to be treated so lightly. The facts are these: Anyone can propose a new code or standard, but the all-volunteer Standards Council has to agree to give the go-ahead, not NFPA staff. If the Standards Council members agree, that still doesn't guarantee a new document. It only creates a project to draft a proposed document. A new code or standard doesn't exist until the committee, also composed of volunteers, votes to propose one and the members, not the staff, approve it after they review the proposal, the comments for and against it, and the committee's responses to those comments.

Once it's on the books, a new code or standard will produce costs and revenues like any other document. There's no royalty system. In fact, most codes or standards barely break even. If NFPA introduced or revised documents solely on the grounds of profitability, our body of codes and standards would be a lot smaller than it is. You may not like a particular code or standard, but if it's an official NFPA document, it got there because a great many people, none of whom are paid by NFPA, said they wanted or needed it.

NFPA develops standards, not codes?

If you're a student of semantics, you may have noticed that nearly every time I refer to NFPA or the NFPA process, I refer to it in terms of codes *and* standards development. There are people who believe that NFPA only develops standards. On the other hand, there are people who think codes and standards are just different names for the same thing, and still others who think there's an

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You Can't Have Myths Without Facts

A myth about codes and standards is a belief that runs counter to the facts, but the first myth may be that most people know the facts. Just to make sure, here's a brief overview of NFPA's codes and standards process.

An NFPA document begins with a proposal, which anyone can submit, to the Standards Council, a 13-member group of volunteers appointed by NFPA's Board of Directors. NFPA members elect the board, which then chooses the Standards Council to represent the diverse interests concerned with codes and standards. After receiving a proposal, the Standards Council uses NFPA publications to solicit comments from anyone about the interest and technical resources available to support the document.

If the Standards Council, based on the comments received, says the proposal can go forward, and if the proposal isn't assigned to an existing technical committee, a new committee is formed from a pool of people identified from the solicitation as interested in serving on the committee. The Standards Council selects individuals for committee membership to achieve balance among nine categories of interests: enforcers, manufacturers, consumers, users, labor, insurance, installers and maintainers, researchers and testing laboratories, and special experts. No one group may have more than one-third of the seats on the committee.

The committee prepares a draft document, then a public notice is issued asking for proposals from anyone. The committee holds a meeting to consider the proposals, including its own, and to hear from people who want to address the committee. Every proposal must then be individually acted upon, and the actions collectively form the committee's *Report on Proposals* (ROP), which goes forward only if the committee approves it by a two-thirds vote. The published ROP is followed by a 60-day period for comments, again from anyone. Every comment must be individually acted upon, and the actions collectively form the committee's *Report on Comments* (ROC), which goes forward only if the committee approves it by a two-thirds vote.

Together, the ROP and ROC form the committee's report to the NFPA membership, leading to a floor vote at an NFPA World Fire Safety Congress or Fall Meeting. That floor vote is preceded by yet another opportunity for comment by any attendee, but voting on the disposition of the document is limited to NFPA member attendees who joined at least 180 days earlier. (The time lag is designed to prevent any group from packing the hall with instant members recruited solely to stuff the ballot box.) After the floor vote, the committee is balloted to establish its view on any changes the floor vote recommended.

After the floor vote, individuals can appeal the members' action to the Standards Council or otherwise complain about what's taken place to that point. The Standards Council makes the final decision to issue the document or not, based on all the available information, including those appeals. A final appeal can be made to the NFPA Board of Directors, which will rule only on whether the document-development procedure has been followed correctly.

Note that the two groups with the most influence in the process—the technical committee that distills all the statements into a proposed document and the Standards Council, which makes the final decision on issuance—are both volunteer groups selected to ensure balance among a number of separately identified interested parties.

Contrast that situation to the approach of the ICC and its member organizations, in which the two groups with the most influence—the committee and the voting membership—represent limited interests and have voting membership that consists only of enforcers, and often only of building officials. This is why NFPA calls its process "broad consensus," "true consensus," or "real consensus," in contrast to any process that may achieve consensus only among the members of a narrowly defined group.

Good documents can come out of a flawed process, and bad documents can work their way through even the best process. But that's not where the smart money is betting, as the saying goes. Process matters because it's the only check we have on might-makes-right decision-making. Know the facts, and the myths can't mislead you

unambiguous difference between them. All of these views are myths.

In simplified terms, a standard is like a user's manual. It tells you how to proceed to achieve a purpose, but it doesn't define the purpose. A code defines a purpose, then refers to standards for guidance on achieving that purpose. In this relationship, the code is the higher-level document, and the standard is useful only if it says how to achieve a purpose, as stated in the code, if there is a relevant code.

This should dispose of the idea that codes and standards are essentially the same. In practice, however, the distinction is often like the distinction between heads and tails on a coin: You can talk about them separately, but you can't separate them. The detailed guidance appropriate to a standard inevitably clarifies the purpose being sought. And a code, in order to have some level of clarity in stating goals and objectives, usually has to say something about how the purpose is to be achieved, if only by setting out alternatives.

To the extent that codes and standards differ sharply—with codes setting out value judgments and acceptable levels of risk and safety, and standards providing technical guidance on achieving externally specified goals—it could make sense to develop them using different processes. The code-development process would capture community value judgments, and the standards-development process would capture the best science and the latest technical expertise.

The latter search could even lead one to a document-development process very different than any discussed to this point, such as that seen in work on the Society of Fire Protection Engineers' guide for performance-based design. This approach has not only bypassed the consensus of the NFPA process—only fire protection engineers can participate—but it's also less formal than the NFPA or ICC processes.

In many ways, this third process is modeled after the peer-review process of approving scientific articles for publication. Authorship of a peer-reviewed document attaches to a few individual authors, at most, and a single editor gives approval. Comments are solicited, also from a

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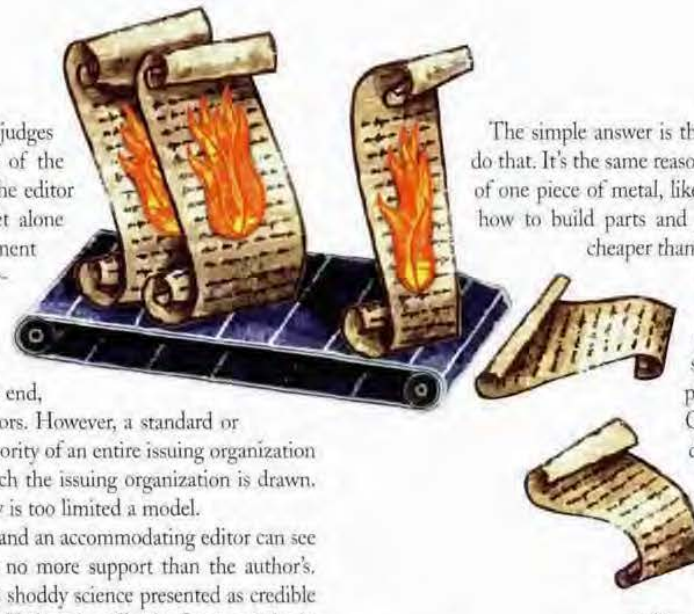
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The peer-review process works well to ensure scientific quality in documents that, in the end, carry the authority of their authors. However, a standard or code is expected to carry the authority of an entire issuing organization or a larger community from which the issuing organization is drawn. For such a document, peer review is too limited a model.

In peer review, a single author and an accommodating editor can see a document to publication with no more support than the author's. That's bad enough if the result is shoddy science presented as credible and reliable. But such an article is likely to be offset by future articles in the normal self-correcting process of science. Before those future articles arrive, no one has to follow the dictates of the bad article. But a bad standard isn't as likely to be offset by contradictory standards emerging in the normal operation of the process, and professional practices can be widely and severely affected while the bad standard is on the books. Real people can be hurt, and real money can be wasted.

To summarize, codes and standards are different, but the line between them is blurry, and it's a rare document that's a pure example of either concept. NFPA develops and publishes both types.

The myth that NFPA doesn't write codes—or, more often, the value judgment that NFPA shouldn't write codes—goes back to the view that any organization doing what NFPA does ought to be a government agency or an association of agencies. It's yet another variation of the idea that values should emerge not from consensus, which people holding this viewpoint may regard as a sham concealing power in the hands of the wrong people, but from the enforcers, extending their public-service role of enforcing community rules to the separate—and, I would argue, inappropriate—role of writing the rules they enforce.

What's compatible?

If the myth that says NFPA shouldn't write codes because its process is wrong doesn't sell, another myth may be advanced. This myth says that NFPA shouldn't write codes because its codes won't be compatible with other codes for the built environment, written by other groups whose solution for the incompatibility problem is to have one group issue all the codes. Once again, this can be put forward as a preference—I'd like to get all my codes from one source—or as a myth—codes from one source are compatible, and codes from multiple sources aren't. To unravel this myth, we need to examine what makes two sets of rules consistent and compatible.

If the line between code and standard is so blurry, why write two types of documents? Why not put all the requirements in one big, organically connected, internally consistent document? And why have separate documents for building, plumbing, mechanical, housing, fire, and electrical codes? Why not issue "The Rules," covering everything you need to know and do about any built environment?

The simple answer is that we aren't smart enough to do that. It's the same reason we don't build airplanes out of one piece of metal, like a giant sculpture. We know how to build parts and join them better, faster, and cheaper than we know how to build everything at once. But as soon as we decide to build our requirements in pieces, the stage is set for potential compatibility problems.

Once you have two or more documents, you set yourself up for less than perfect compatibility. It's inherent in human nature. The task of minimizing incompatibility is a variation on quality control. It can be done well or badly, and it's never easy, but no matter how far apart two documents start, you can always make them compatible, so long as you can modify one or both documents.

Of course, that's where the myths of compatibility start flying. If you take a building code prepared by one of the model code organizations of model building officials and compare it to NFPA's *Life Safety Code®*, you'll find some inconsistencies. Elevating those inconsistencies to incompatibility, though, implies that there's no good way to modify the two documents to make them consistent.

Maybe there's a good modification approach, and maybe there isn't. But asserting as an unqualified generalization that two documents issued by the same organization are always compatible and two documents issued by two different organizations are always incompatible is a myth or, at best, an unproven, unsubstantiated assertion.

Everything is compatible with a little work. The burden of proof is certainly on the manufacturers to show you, the user, that it's just a little work and that you'll be pleased with the end result. But it's a myth to say that the burden of proof can't be met.

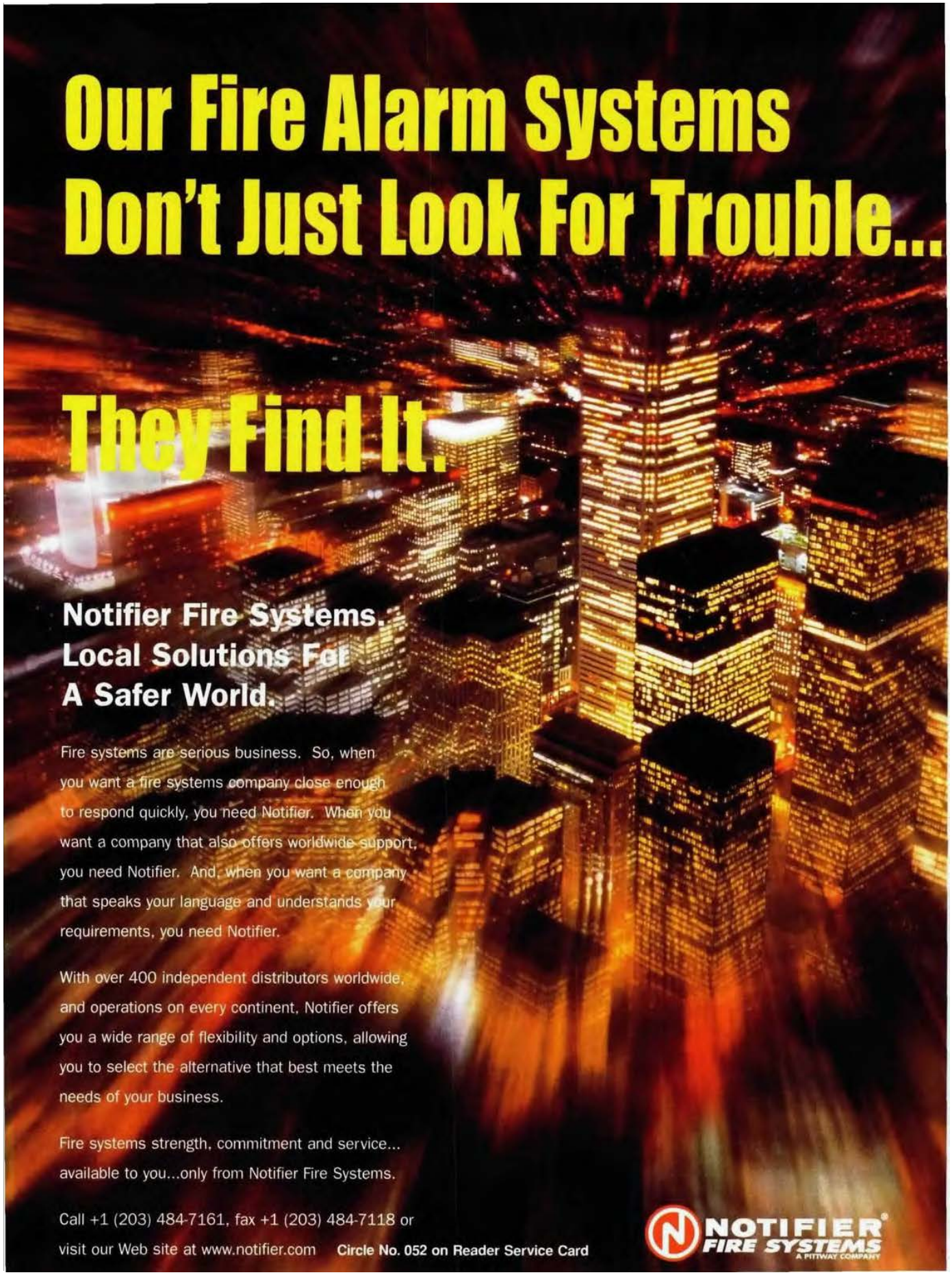
What's an international standard?

This seems like a no-brainer: An international standard is a standard that's recognized and used internationally. What else could it be? But some people think it's more important to have multinational involvement in the development or approval of a standard than it is to have international usage. And a surprising number of organizations seem to think that a standard becomes international just by labeling it as such.

The International Council of Building Officials (ICBO) has "international" in its name, even though its codes are adopted only regionally in the United States. At least the International Code Council has adoptions around the whole country, but its codes are no closer to being used around the world than ICBO's are. And just to show that no one is immune from the naming game, NFPA's full name is National Fire Protection Association, International, Inc. If one organization can be both national and international, anything's possible. But certain NFPA's codes are adopted worldwide.

What about the International Standardization Organization (ISO)

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and the International Electrotechnical Commission (IEC), which are so often portrayed as the only sources of truly international standards?

ISO and IEC operate on a one-country, one-vote basis. This means that China, with 1.2 billion people, carries no more weight than Liechtenstein, with 31,000 people. It means that the United States, with a gross national product of more than $7 trillion, carries no more weight than Tanzania, whose gross national product is about $4 billion. In terms of a body's ability to present its documents as a global consensus, this highly imbalanced voting situation is bad enough, but in practice, only about one-fifth of the world's nations ever participate in ISO deliberations. And that one-fifth is highly unrepresentative.

For the documents related to fire or electrical safety, European nations usually have an absolute majority of the votes cast. If you think of Europe as an interest group, then ISO and IEC voting rules and member participation patterns effectively give one interest group control of the results. That doesn't make their documents inferior in some absolute sense. It just means they can't reasonably be characterized as a global consensus. They're more a continental, regional consensus.

The NFPA *National Electrical Code*® is the basis of the Mexican electrical code and is regularly harmonized with the Canadian electrical code. For those reasons alone, the *NEC* is as international as any document from the IEC.

As I write, there are about 6 billion people in the world. The United States has 4 to 5 percent of the total, and Europe has 8 to 9 percent. That leaves most of the world's population to be heard from. The United States and the European Union each have roughly a quarter of the world's total gross national product. That leaves half the world's commerce in need of codes and standards, with no built-in reason to favor documents from the United States or Europe.

The myth that ISO and IEC documents are the only international standards is, of course, a myth with an agenda, because any group that can position itself as the only "true" source of something everybody wants has assured its success. If the push for global commerce is leading to a clamor for harmonized standards, and if two groups can claim to be the *only* legitimate sources of such standards—a popular myth—then those two groups needn't worry about differences in technology, quality, user-friendliness, global value consensus, or anything else. All around the world, the mountains will have to come to Mohammed—or to Brussels or Geneva, as the case may be.

I thought this *was* a performance-based code

I'll end this review of myths of codes and standards with a somewhat more exotic subject, which is the myths about performance-based codes and standards. I'm not going to claim that there's some universally accepted definition of "performance" against which any use of the term can be measured. But I will argue that the concept of "performance-based" has some bedrock structure to it and that that structure is enough to knock down some widely held notions and shake others.

Codes and standards are requirements for something. That something may be a building, a system, a product, or anything else susceptible to alternative design and to a meaningful concept of better and worse. Performance-based codes and standards are built around the concept of directly measuring better versus worse, then qualifying a design on that basis, which prescriptive codes and standards don't do.

If I prescribe a steel door of a certain width because I know from fire tests and field experience that such a door will do the job, my reasons are performance-based, but my standard isn't. I've prescribed not just the job to be done but also the method by which to do it. Most people recognize that this example is outside the realm of performance-based standards and that a standard calling for a one-hour door, for example, can be called a performance-based standard.

But suppose I write a code for a building based on a series of features, systems, and components, each of which has a performance-based standard. Is the result a performance-based code? No, it isn't, but the idea that it's a performance-based code is a persistent myth in the current discussions about performance-based documents.

A performance-based document is based on measuring performance for the subject of the document, not just for all the pieces that make up the subject of the document. You need overall performance, or what you have is a kind of intermediate document—call it a prescriptive code with performance-based reference standards.

A truly performance-based code is much more flexible than this kind of hybrid document, because it allows you to be creative not only in producing the elements but also in choosing which elements to include. That may make everybody more nervous and a lot more determined to make sure that the code's measures of performance are comprehensive, sound, and conservative. In the end, a hybrid document may be the only way to use performance-based concepts that a committee or the public will be comfortable with, for now. But in the context of myths, you need to call a spade a spade, and not claim your spade is really a backhoe.

The myths of codes and standards are few, compared to the myths about fire, perhaps because everyone knows about fire, but relatively few people know codes and standards even exist. But for the relative handful of us who not only know they exist but actually work in the codes and standards field, any myths we believe endanger more than just ourselves. Also affected are all the people who trust us to sort through the complex facts and difficult value judgments regarding safety in a way that respects their wishes as they would voice them if they understood the subject as well as we do.

Codes and standards are decision-making tools produced in a decision-making system, and any group decision-making activity raises questions about power and influence. But to be accurate, any characterization of codes and standards or of the organizations that produce them must respect the specifics of the development process the organization uses. Advocate what you like and criticize what you don't, but don't simplify a process or system you don't like into a distorted caricature that's easy to knock down. You're only kidding yourself if you knock down straw men and think you've defeated an army.

We at NFPA know that we produce model international codes and standards by a true consensus process and that we're moving toward greater use of performance-based principles in those documents. We know there are other organizations doing the same thing and even more organizations doing some things the same and some differently. It's a complex subject, and we're confident that people will make the right choices when they know the truth. Toward that end, this discussion of myths in the field of codes and standards may help. I had fun writing it, and I hope you had fun reading it. Let me know.

John R. Hall, Jr., is NFPA's assistant vice president of Fire Research and Analysis.

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Landmark Church Lost to Fire

When a multimillion dollar blaze destroyed a small Illinois town's century-old church, firefighters managed to avoid serious injury and learned some valuable lessons.

Char McLear

At mid-day on October 28, 1998, the quiet town of Barrington, Illinois, was rocked by the loss of one of its most cherished landmarks to fire. Sixteen fire departments were needed to fight the multimillion dollar blaze, which severely damaged a century-old church. Fortunately, no one was seriously injured, and the Barrington Fire Department came away with some valuable lessons.

Barrington, a small, affluent suburb of Chicago, lies about 40 miles (64 kilometers) northwest of the city. Like most suburbs that developed along rail lines, the village began as a small residential and business community. Today, although home to only about 10,000 residents, its business district provides commercial, educational, and social facilities for another 25,000 to 30,000 residents in several surrounding communities. These facilities include 7 of the area's 11 schools, the library, a park district, a train depot, and 10 of the area's 15 churches.

The Barrington Fire Department provides fire and EMS service to the town and its surrounding communities, which encompass approximately 54 square miles (140 square kilometers). The combination department employs 27 full-time firefighter/paramedics and 35 paid-on-call firefighters.

Throughout the years, Barrington has taken great pride in preserving its historical atmosphere, in both its commercial and residential sectors. Residents painstakingly restore century-old homes, while strict appearance ordinances help preserve the historical flavor of the business district. One of the finest examples of these efforts was the Barrington United Methodist Church.

The church was founded in 1840 and moved to its current site in 1880. Sitting on a small hill just south of the village center, the Victorian structure, with its 80-foot (24-meter) steeple, gave the town a Christmas card appearance. In addition to serving its parishioners, the church also served as a community center of sorts, hosting numerous scouting and youth programs, and providing a home for a number of community organizations.

As can be expected with any century-old structure, the church had been renovated numerous times over the years. By 1998, the complex included a timber-truss, balloon-construction sanctuary that connected at its east end to a large L-shaped brick structure that housed meeting rooms, classrooms, and offices. A full basement under the sanctuary provided another large meeting room with an adjoining kitchen. The kitchen had recently been renovated and retrofitted with sprinklers, but these were the only sprinklers in the building.

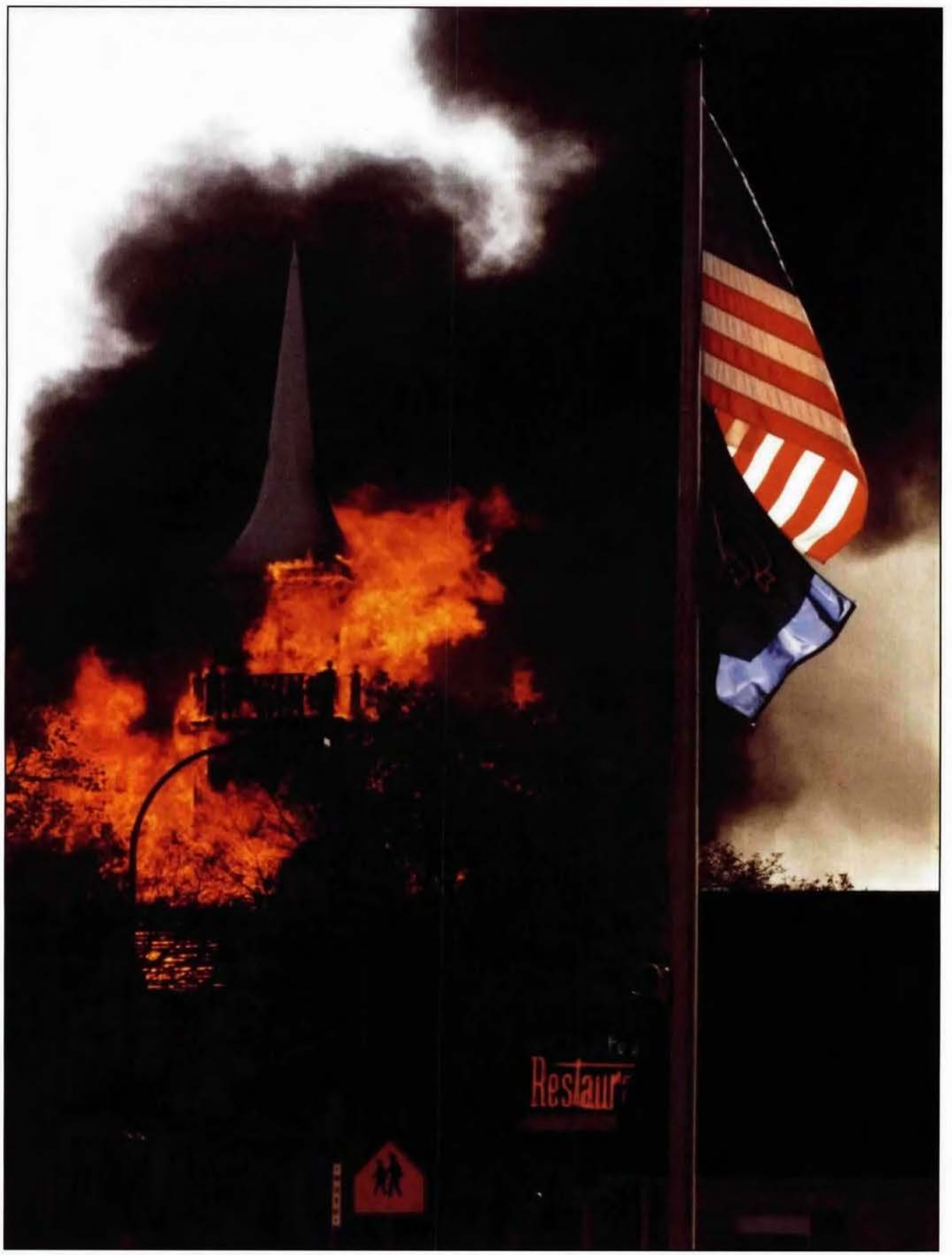
The fire

At 12:06 p.m. on October 28, a church staff member called the Barrington Fire Department to report smoke in the building. While the employee was still on the line with the dispatcher, the church's fire alarm system sent a full-fire signal to the station. In the meantime, a church custodian investigated the smoke and, finding a fire in the sanctuary wall, notified the fire department. The fire department responded with a general alarm assignment, which included an engine from Station 1, located less than a block from the church, and an engine and ambulance from Station 2. The chief and fire prevention officer headed to the scene in their own vehicles, and callback and paid-on-call staff responded, manning the aerial tower, the squad truck, and a third engine.

The chief arrived first and reported heavy smoke showing from the steeple. When Station 1's engine arrived, the crew pulled a 1¾-inch line in the front door of the sanctuary and up the stairs to the bell tower. Within minutes, conditions deteriorated, and it became apparent that this wasn't merely a steeple fire but a large attic fire that had broken through to the steeple. The chief ordered the interior crew out of the building and requested a second alarm. Within 10 minutes of the initial call, the entire roof of the sanctuary was fully involved, sending flames some 100 feet (30 meters) into the air.

While awaiting the arrival of mutual-aid companies, firefighters began a defensive attack on the sanctuary. Station 1's engine repositioned its handline to protect a nearby home and used its deck gun to attack the front of the steeple. When Station 2's engine arrived, it used a monitor nozzle and more handlines to control the exterior

Photographs: Barrington Fire Department


Restaur



Here, arrows indicate the flame spread through concealed spaces, which initiated two backdrafts late in the fire. Red signifies the first backdraft, green the second.

spread to the south end of the building. Firefighters positioned the aerial ladder in front of the sanctuary and focused its streams on the steeple and the sanctuary's roof.

By this time, firefighters were concerned about the direction in which the 80-foot (24-meter) steeple might fall. To reach the fire, crews had to place virtually all of their equipment in front of the building, within the steeple's collapse zone. An elementary school across the street was also in jeopardy.

To keep the steeple from falling on these exposures, firefighters allowed the blaze to burn on the back side of the structure while using master streams to cool the street side and push the steeple back. It eventually fell into the center of the sanctuary.

Although the school was no longer threatened by the steeple, school officials evacuated it anyway because heavy smoke was being pulled into the building. The evacuation also helped prevent some of the traffic problems they were afraid might occur as parents arrived to pick up their children.

As the second alarm companies arrived, crews positioned two additional trucks along the rear of the building and turned their efforts to saving as much of the brick structure as possible. The main entrance to all areas of the church but the sanctuary was at the south end of the building, where a large porch provided access to the chapel on the left and entry to the office and meeting rooms on the right. Immediately inside the right door was one of two stairways to the second floor, as well as the main stairway to the basement.

A sector officer quickly searched the south end of the building and found all floors clear of smoke and heat. At this point, the incident commander authorized the sector officer's decision to open the second-floor ceiling to try to cut off any extension to this area through the attic. The fire had already vented the sanctuary end of the attic. The chief requested that an engine from staging be positioned in front of the south doors, and an additional water supply was established.

While waiting for the engine to be set up, a Barrington crew performed a second search to assess the changing conditions and to determine the best plan of attack. When the firefighters entered the building, they noted light smoke at the top of the stairs. Because the smoke was so light, they started up the stairs without donning their facepieces, then stopped and put them on as a precaution. Reaching the second floor, they noted that the smoke was still extremely light and that there was no heat. They quickly searched the second-floor offices, never approaching the connecting hallway to the sanctuary wing. In the last room they checked, a storage room located directly over the south doors, the crew discovered black smoke pushing in a narrow stream from the strike hole in the door jamb.

Alarmed by the smoke, which was apparently pressurized in the walls, the firefighters immediately turned to leave the building and found themselves immersed in floor-to-ceiling black smoke. Fortunately, they remained oriented and were able to feel their way to the stairs. They'd been on the second floor for about 45 seconds.

Immediately after the crew left the church to report the conditions to the sector officer, a backdraft occurred on the second floor over the porch, surprising fire crews, who had seen no external signs of extension. The backdraft blew facia boards into the street, snapped ceiling joists over the porch, and blew an 8- by 15-foot (2.5- by 4.6-meter) section of wire-mesh plaster ceiling weighing some 1,400 pounds (650 kilograms) onto the porch. The sector officer immediately went to emergency traffic, and a roll call was performed. All firefighters were accounted for.

Thinking that the backdraft had vented the space, making it safe to proceed, a crew from the Palatine Fire Department advanced a 1¾-inch line to the second floor, assisted by the Barrington crew. Encountering thick smoke but no heat, the Palatine crew had advanced about 8 feet (2.5 meters) down the north hallway when a second backdraft occurred, sending a fireball at them from somewhere down the north hallway. The explosion pushed the first Barrington firefighter down several stairs and blew the second out the door.

Seeing the firefighter pushed out the door, the south sector again went to emergency traffic to report a second backdraft with a crew inside and to request that the rapid intervention team (RIT) report to the sector. Fortunately, the Palatine crew had been crawling down the hall when the backdraft occurred because visibility was poor and thus avoided most of the blast. Crew members reported that the backdraft was immediately followed by total darkness but still no heat. All the firefighters managed to leave the building without help or serious injury, and all were accounted for in the second roll call. One Palatine firefighter received minor burns when the fireball blew the Nomex® hood off the sides of his face.

At this time, all interior operations were abandoned. Firefighters eventually extinguished the blaze using a defensive attack, but not before the entire roof was destroyed.

The investigation

Investigators determined that a restoration contractor started the blaze with a heat gun he was using to strip paint from the exterior of a stained glass window in the sanctuary. They believe the heat gun started a small, hidden fire sometime before the contractor left the site for lunch and that the fire spread quickly through the balloon construction to the attic, where it burned undetected for as long as an hour before a church staff member smelled smoke and notified the fire department.

Investigators also tried to determine the cause of the backdrafts. The

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