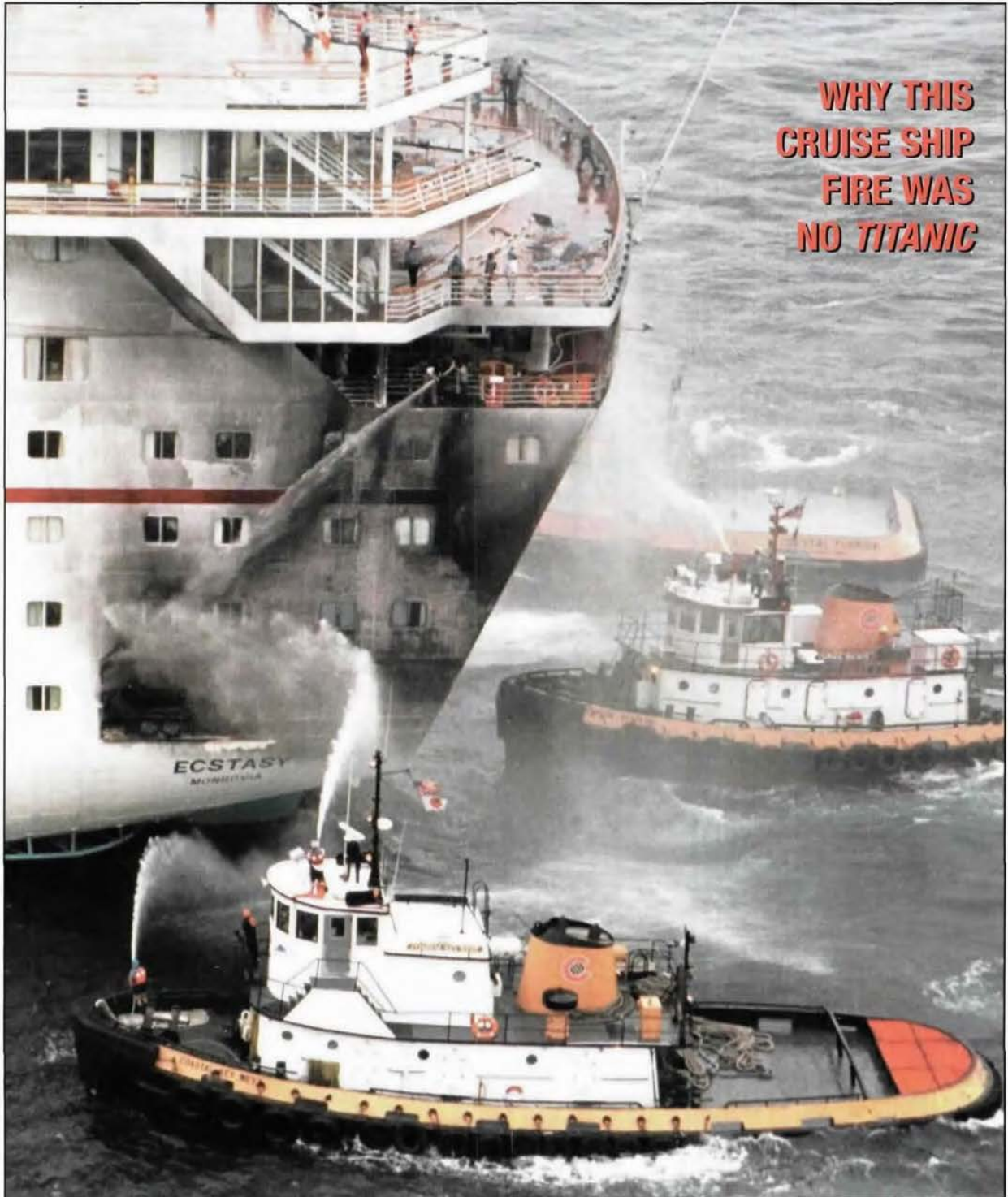


# NFPA JOURNAL

THE OFFICIAL MAGAZINE OF THE NATIONAL FIRE PROTECTION ASSOCIATION

January/February 1999

10-Year Battery Debate ■ A Fire-Safe Dorm ■ High-Risk Behaviors



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**Smoke on the Water**

*Alisa Wolf*

Last summer, a dramatically smoky fire 2 miles from the Miami shore played on one of people's worst fears: fire at sea. Fortunately, the fire may have appeared more sensational than it actually was.



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**Risky Behavior**

*Marty Abers*

Several patterns become apparent when we examine the various factors that lead to fire ignition. Perhaps the most obvious is that many people are simply oblivious to the fact that the way in which they interact—or fail to interact—with various items in their environment can lead to fire.



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**The 10-Year Battery**

*Alisa Wolf*

A senate bill in Oregon has given the 10-year smoke alarm battery a push forward in the marketplace. But before other states adopt similar laws, they need to explore the implications more fully.



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**Playing With Fire**

*Don Porth*

Using the results of a study done for the Portland, Oregon, Fire Bureau as a guide, the author tells us that the youth firesetting problem in the United States has reached an unacceptable level and that it won't go away by itself. Fortunately, we can help change the situation by following a program of assessment and education with proven results.



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**Building a Fire-Safe Dorm**

*Eileen Mongeau*

A 222,000-square-foot (20,600-square-meter) dormitory currently under construction at Northeastern University in Boston, Massachusetts, will combine fire and life safety to protect a particularly challenging population. Read how the project team, which consisted of representatives of many of the school's internal departments, worked with the architect and general contractor on the building's design.

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**Changing for the Better**

*Matt O'Connor*

NFPA's annual meeting gets a new name and new format that includes educational tracks and the opportunity to earn CEUs. Here's a preview of some of the changes that are in store for you at this year's World Fire Safety Congress in Baltimore, Maryland. We're also proud to announce our Opening General Session speaker, Mike McCurry.

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**A Clean Sweep**

*Matt O'Connor*

Recent changes to carbon monoxide detector design standards should improve their reliability and performance, but it will take time. And the new NFPA 720, *Recommended Practice for the Installation of Carbon Monoxide (CO) Warning Equipment*, explains how and where to install these detectors.

Volume 93/Number 1

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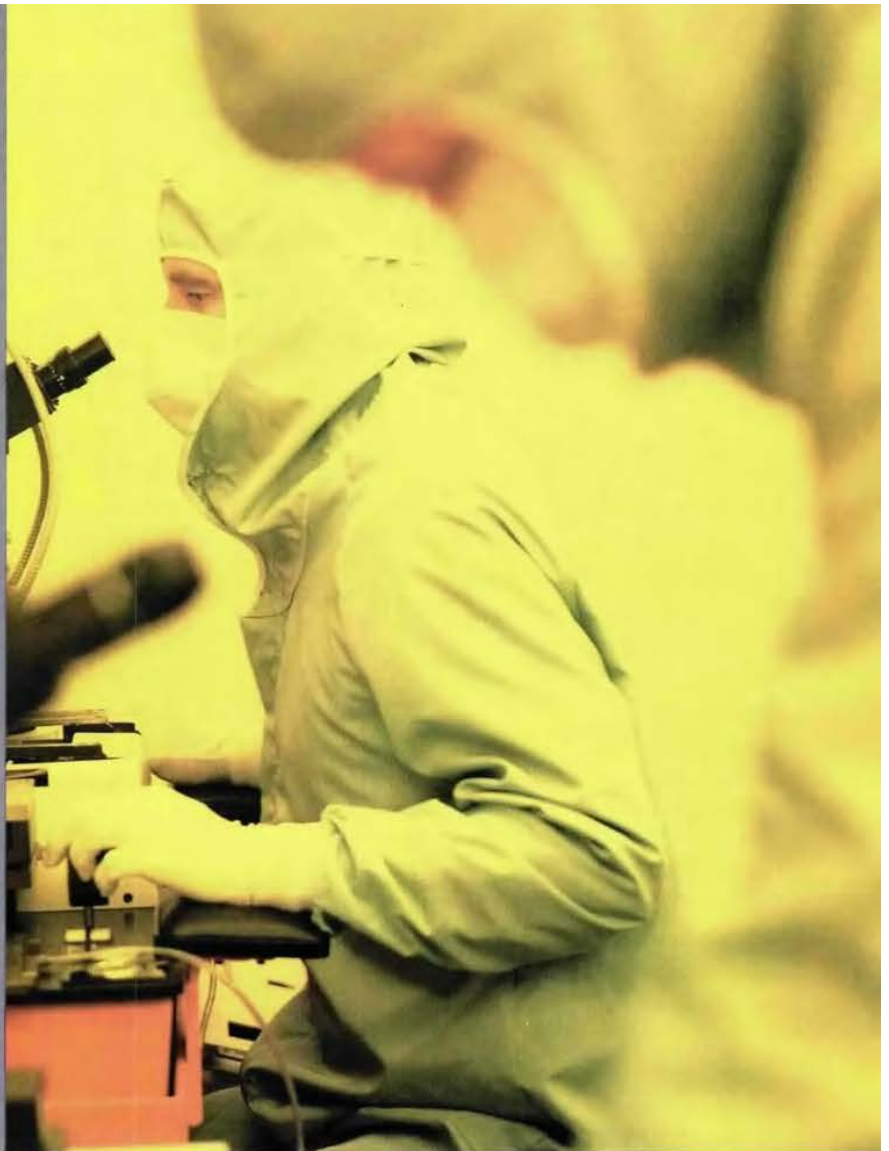
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**ABOUT NFPA**

The National Fire Protection Association (NFPA) is a nonprofit voluntary membership organization founded in 1896. It is a clearinghouse for information on fire prevention, firefighting procedures, and methods of fire protection. Membership is open to all those interested in promoting the science of fire protection and prevention. Full details on membership are available from the NFPA, P.O. Box 9101, One Batterymarch Park, Quincy, Massachusetts 02269-9101. Or call our toll-free number (800) 344-3555 or fax (617) 770-0700.

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Columns

**Firewatch**

**Kenneth J. Tremblay**

A review of recent U.S. fires in various occupancies.



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**Heads Up**

**Russell P. Fleming, P.E.**

The truth behind five of the most common sprinkler misconceptions.



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**Just Ask**

**Stephen Foley**

A look at the codes and standards designed to keep firefighters healthy.

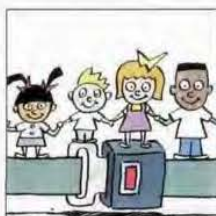


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**In Compliance**

**William E. Koffel, P.E.**

The performance-based design criteria we develop now will support our future efforts in this area.



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**Inside the Beltway**

**Anthony R. O'Neil**

The federal government turns to NFPA for assistance.

**Buzz Words**

**Wayne Moore**

Sometimes, preventing nuisance alarms falls on system installers.

**Leadership**

**Robin F. Paulsgrove**

When heroes are rare, firefighters serve as our children's role models.

**Outreach**

**Meri-K Appy**

We examine motor vehicle crashes.

**Hot Seat**

**Hallie Ephron Touger**

Profiles of NFPA members Edward C. Lawry and New York City Fire Commissioner Thomas Von Essen.

**Burning Issues**

**Judy Comoletti**

After the school shootings of 1998, some U.S. students were afraid to participate in school fire drills.

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**About the cover:** Tugboats cool the deck on a Carnival cruise ship 2 miles (1.2 kilometers) off the Miami shore. Photo: ©Colin Braley/Reuters

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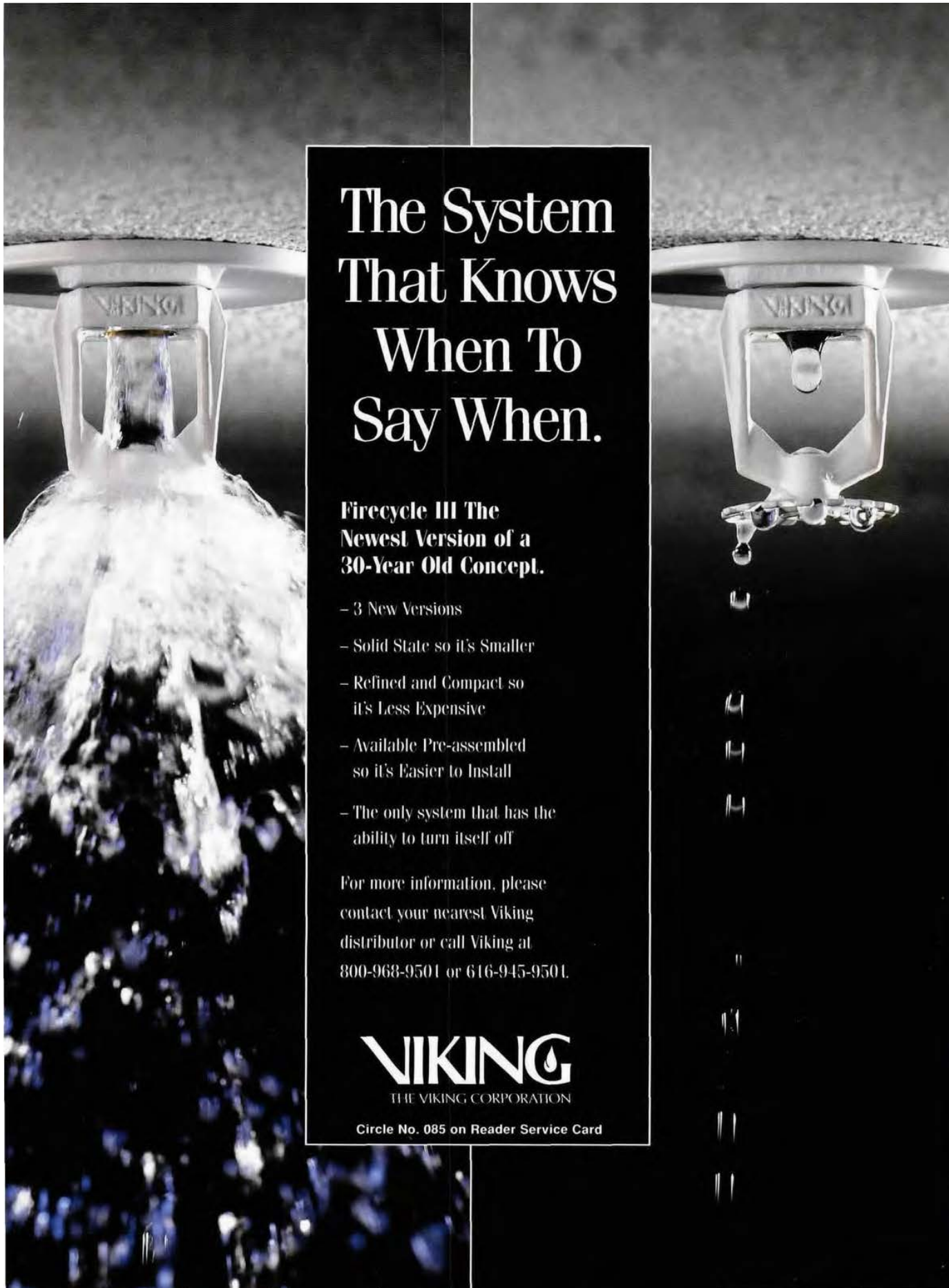
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**Date Book**



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# Millennium Fever: Let's Not Go Overboard!



When the first millennium ended, many people expected the world to end with it. In many quarters of Europe, a kind of religious hysteria gripped the populace. Not a few people decided that the time for repentance was at hand, while others scanned the sky for telltale signs of the universe's collapse. Others just sat back to wait for the end.

A thousand years later, the only signs of cosmic doom so far have been two movies about a meteor colliding with earth, though I expect there will be many a telescope pointed skyward as this year comes to an end.

The one substantial threat we face with the coming of the new millennium is the now-familiar Y2K problem: computer software that doesn't recognize the year 2000 and so reverts to counting the year as 1900. In an idle moment, I wondered what would happen if the Y2K problem occurred in such a way that we not only had to count the next 100 years as the 1900s all over again, but actually had to relive the century.

It would make an interesting ledger. In one column, two world wars, the cold war, Korea, Vietnam, Northern Ireland, Africa. Racial, ethnic, and religious persecution and violence around the globe. Global terrorism and weapons of mass destruction. In many ways, the 20th century hasn't been mankind's finest hour.

In the other column, we can tally advances in technology, science, and medicine, increased economic prosperity, a growing awareness of the importance of preserving our environment, and a revolution in communications that's brought people around the globe closer to one another, if not always comfortably so.

Naturally, I can't help but think about some events that affected NFPA. The Triangle Shirtwaist fire, the Cocoanut Grove, Our Lady of the Angels School, and too many other fires and explosions that killed too many people. At the same time, I think of the impact NFPA codes and standards have had, the critical changes that came in the wake of those terrible events, and the gradual decline in fire deaths. Where our codes and standards haven't been able to make an impact, we've undertaken vigorous education programs to reach those at risk.

Of course, our work isn't done yet. The current millennium will end, but the world won't. Nor will our mission. I am confident that NFPA members will see the new millennium as a time not to sit back and assume that our job is done but to renew our commitment to a future safe from fire.

George D. Miller, President  
National Fire Protection Association

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### ■ Another opinion about smoke alarm batteries

In response to Mr. Martinez's letter in the March/April 1998 issue, I was a youngster just starting out in the retail building materials business selling electrical and plumbing supplies when residential smoke alarms were becoming mandatory. At that time, the batteries were of a special type that homeowners never replaced because they weren't readily available at any grocery checkout stand. As I recall, those in the building and life safety industries applauded the day detectors became available with 9-volt, standard, transistor radio batteries. Maybe special-style batteries that are obtainable at any checkout stand are the answer, but I suspect we're up against human nature.

**Ronald R. Greenman**  
Code Consultant  
The Safety Team, Inc.

### ■ Was it really chlorine, or was it some other chemical?

"Scooping chlorine from its container into a 1-gallon (3.8-liter) bucket" ("Chemical Reaction Injures Five," *NFPA Journal*, September/October 1998, p.18) seems an impossible task, unless the ambient temperature was below -29°F (-34°C), the boiling point of chlorine. Even then, the task of putting this highly volatile, toxic chemical into a bucket would be

exceedingly difficult, at best. I suspect that a hypochlorite salt or some other chlorine-containing compound was the actual material being "scooped."

**Robert E. Tapscott, Ph.D.**  
Director, Center for Global Environmental Technologies  
University of New Mexico  
Albuquerque, New Mexico

In the September/October 1998 *Journal* in "Firewatch," there is an item titled, "Chemical Reaction Injures Five." Since I do chemical safety, I was particularly interested in this. Unfortunately, one of the chemicals is listed only as "chlorine." Since it describes a worker as "scooping" chlorine—which is a gas at ambient temperatures—it is clear that this description is incorrect. It would be most instructive to know what chemical was involved.

Sorry to quibble, in light of the wonderful *Journal* you normally produce.

**C. Alec MacLean**  
Manager, Safety Technology  
Applied Materials

**NFPA response:** You're both right: The report from which the narrative was taken referred to a brand-name water additive, not to chlorine per se. The chemical was actually calcium

hypochlorite, which, when dissolved in water, releases chlorine gas.

David Nugent, the author of "Oxidizing Pool Chemicals," on page 44 of the July/August 1998 issue of *Journal*, also contacted us about this incident. Noting that the employees first tried to control the chemical reaction with dry chemical fire extinguishers, he emphasized how dangerous using dry chemical fire extinguishers on this type of fire can be, warning that explosions can result.

### ■ America is still burning

I would like to commend Meri-K Appy for her excellent column, "America Still Burning," in the September/October issue of *NFPA Journal*. The article provided an important reminder that the U.S. still has a major fire problem.

I appreciate her keen insight as to the value of the original report and its ability to provide a road map to what we need to do today if we are to implement more effective solutions to reduce the toll fire takes in North America....Many in the fire service have treated the *America Burning* report as out of date. As Meri-K correctly stated, "Its message is as new as tomorrow." There is no question that *America Burning's* original message, saying fire safety education is the most single important factor in reducing injuries and deaths from fire, is still very important.

Today, the majority of fire service budgets are still in suppression. Hopefully, through a renewed educational thrust by national fire service leaders, we can renew our focus on getting priorities where they should be: giving prevention and education an increasingly greater role in our priorities in protecting people from fire.

**H. Wayne Boyd**  
President  
U.S. Safety & Engineering Corp.

### ■ Gypsum Association initiative

I just received my copy of the September/October 1998 issue of the *NFPA Journal* and read with great interest Meri-K Appy's article, "America: Still Burning," on page 28. The thesis of her piece...happens to parallel a unique program the Gypsum Association recently established in concert with certain residential builders in

#### From the editor:

Happy New Year! And I suspect that we're in for *some* year. Although it's technically not the last year of the millennium, I don't think that's going to stop many people from reacting as though it were. If you're anything like me, you're more than a little tired of hearing about the Y2K problem. We may be in for quite a few bumps along the way, but it's *not* the end of civilization as we know it. In his editorial on page 6, NFPA President George D. Miller reflects on the fire losses we've experienced in the last century and the strides we've made as fire safety professionals.

At the *Journal*, we thought, "What better way to celebrate the new year than with two new columns?" Russ Fleming, vice president of Engineering at the National Fire Sprinkler Association and former chair of the NFPA Standards Council, brings us "Heads Up" on page 20, which focuses on sprinkler issues. And Wayne Moore, chair of the National Fire Alarm Code Technical Correlating Committee and director of Operations for the New England Office of Hughes Associates, fills us in on the latest in alarms in "Buzz Words" on page 29. We're excited about these additions, and we hope you will be, too.

Here's wishing you a safe and joyous new year.

*Kriston L. Welch*



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North America. One of the goals of the Gypsum Association's new "Home Upgrade Program" is to make the built environment safer from fire.

Home builders participating in the Home Upgrade Program are beginning to offer 5/8-inch-thick type-X gypsum board on inside walls and ceilings as an upgrade over the standard 1/2-inch-thick gypsum board.

Upgrading the walls and ceilings makes as much sense as upgrading the bathroom, carpet, or other amenities. This 25 percent increase in gypsum board thickness costs the builder very little but boosts the level of resistance to fire within the home; added sound control is also a benefit of this upgrade. Though there is little in the codes that requires 5/8-inch-thick type-X gypsum

board to be used in single-family home construction, promoting this good measure of additional safety and system integrity is the Gypsum Association's grass roots way of educating the public on building with greater fire safety in mind.

Let me take this opportunity to say that the Gypsum Association is always interested in supporting and participating in fire/home safety related programs. To use a familiar phrase, we are just a phone call away.

**Stephen H. Meima**

*Director of Promotion  
Gypsum Association  
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### Time to educate the public about residential sprinklers

My [whole]-hearted respect to Meri-K Appy [for] relating to the need for public education and Dr. Phillip's vision of a national fire safety education initiative....

Many authorities having jurisdiction pushing fire sprinklers are one- and two-person offices. We have small, unimportant voices individually in the eyes of the press, our town leadership, and the home builders' associations across America. I know because I lost my local residential sprinkler ordinance, [which] was the first in Tennessee. The restaurant [fire in] "Firewatch" on page 18 [of the September/October 1998 issue of *Journal*] was mine. [It was also] the third restaurant fire in my town extinguished by a single sprinkler head. With my ordinance, I've seen a family of three saved in the multifamily setting. My neighboring fire department, which adopted [a similar] ordinance relating to multifamily [dwellings], has also seen a family saved, both with a single sprinkler head.

We all see the episodes identified in "Firewatch" repeated daily in our own communities. We see them first-hand, read [about] them in...trade publications, or view them on the television....We shake our heads at the death and destruction we know can be prevented, many by a single sprinkler head.

One analogy for fire sprinkler education is...that of a medicine manufacturer. These companies do not prescribe the medicine for the patient. The [manufacturer's] representative educates the doctor or the doctor's nurse [about] the effectiveness of the med-

ication. I also notice...articles in...magazines relating to those medications...[and] commercials on television during prime time....This is done to increase the profit for the business....in a multibillion dollar [industry] whose focus is on educating the end-user. I've never seen commercials or advertising relating to fire sprinklers in anything other than trade magazines for the fire service or sprinkler industry....We are already supposed to be educated....We don't need to read that another fire was extinguished by a sprinkler head or see an advertisement for a sprinkler...that has been around for years....

I believe the NFPA 13D 1/2-inch non-metallic grid system...is coming, though [this is] not believed by others in my area, including AHJs. It does work, and it will make fire sprinkler protection available for all. Many in the fire service do not understand the system....Once approved, education of the AHJs and the public will have to occur. I hope someone will...lead the rally, because many of us have been beat up carrying the banner and are tired of working alone.

NFPA, the National Fire Sprinkler Association, the American Fire Sprinkler Association, and Operation Life Safety all...offer superior support and information on residential fire sprinklers. But until those in their homes realize, through public education, that death and destruction by fire is real [and] can visit them...at any time, America will continue to burn.

**Chris Burchfield**

*Fire Marshal*

*Germantown, Tennessee*

**NFPA response:** Your last sentence regarding public education certainly hits the mark. And it's the exact reason the American Fire Sprinkler Association, NFPA, and the National Fire Sprinkler Association founded the Home Fire Sprinkler Coalition in 1996. Our focus is increasing the consumer awareness and demand for residential fire sprinklers in new one- and two-family dwellings.

Currently, we're conducting public education campaigns in Connecticut, Oregon, and Illinois. As resources allow, we hope to expand this campaign substantially in the

United States and Canada over the next three years.

It's very clear that one of the main reasons for the low success rate of new residential fire sprinkler ordinances (and the unfortunate repeal of some existing ordinances, as in your case) is the lack of consumer awareness and support for this technology. Hopefully,

the work of the Home Fire Sprinkler Coalition, the fire service, and other interested organizations will help raise the level of consumer awareness. Once consumer awareness and demand increases, the market will respond accordingly, and ordinances requiring residential fire sprinklers will be easier to achieve.

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This is obviously not an easy task. But it is one we must take on to improve the fire protection in the one place where we're all most at risk: our own homes.

**Gary Keith**

Assistant Vice President  
NFPA Regional Operations  
Chair, Home Fire Sprinkler Coalition

■ **Can you help?**

I am presently working with members of a volunteer fire department located in an area where winters produce a snowfall which amounts to an average depth of 20 to 25 feet. Roads in the community are not plowed but are compacted and groomed. Wheeled vehicles cannot drive to the residences during the winter months. Access to the residences is by snowmobile, walking, or skiing.

Our present response method is through the use of snowmobiles and a larger, very slow-moving "Snowcat." The fire department's goal is to develop a method to reduce their response time to structural fires.

I would appreciate information from any

readers who...experience similar winter conditions and who can offer suggestions or recommendations on the type of "across the snow" equipment used for structural fire-fighting. Thank you.

**Stuart Farwell**

1134 Solana Drive  
Mountain View, CA 94040

■ **Investigator safety questioned**

In the November/December 1997 issue of the *NFPA Journal* is a picture (page 92) that is somewhat disturbing. The article references a respiratory protection project to determine what level of respiratory protection is needed for fire investigators. The photo shows personnel in a burned structure with instrumentation, and no one is wearing respiratory protection.

If there is a perceived need to conduct the experiments, and there is, then the individuals involved should have exhibited the use of some type of respiratory protection while conducting the tests—at least for the purpose of the photograph. This is another example

of poor safety techniques [that are] reinforced through industry publications.

I find it interesting that fire investigators don't think OSHA regulations pertain to them. Almost all structure fires generate toxic gases which remain after extinguishment.

**J. D. Turley**

Jdturley@aol.com

**NFPA Journal responds:** You have a good point: The investigators should indeed have been wearing protection—although we're not sure you can really conclude that fire investigators don't think OSHA regulations pertain to them on the basis of one photograph.

■ **Fire department supports FPW**

The staff and firefighters at the Liberty, Missouri, Fire Department have long supported the efforts of NFPA in its nationwide goal of reducing the incidence of deaths and injuries from fire. We have done this by spreading the message of fire safety throughout our community using



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some NFPA videos and printed materials. In the last few years, we have added several selections from the video library to our library, specifically the video *Fire Power*. We were able to receive our copy the week before Fire Prevention Week and put it to good use at a presentation in our local middle school (grades 6, 7, and 8), with very positive results.

We are most proud, this year, to announce that we were able to get the *Learn Not to Burn* [curriculum] started in one of our elementary schools. We are using the resource books in the presentation of the program. In the next three years, we hope to have the program on line in all of our six elementary schools. Although the program is in its early phases, we are receiving good reports back from the teachers involved.

New programs and new materials are an asset to us—but we would like to give you some information regarding a program which we have been using for many years. This is one that we feel would help other departments to spread the message of fire safety throughout their communities....With the help of Mr. Jim Tracy, who is the owner of our local Price Chopper store, we have been able to get [the Fire Protection Week theme poster printed] on 576,000 [brown grocery] bags, which were distributed to 31 stores in the Kansas City metropolitan area. This year's bag is all in one color, but usually the image is printed in the colors of the Fire Prevention Week poster.

We are sending you this information in the hope that [it will] show other departments one simple way to get a fire safety message out in front of the public.

**Myron Schmitt**  
Division Chief, Fire Prevention  
Liberty Fire Department  
Liberty, Missouri

#### ■ Correction

A technical glitch resulted in two headlines merging on page 17 of the November/December issue, making it appear as if Oklahoma State University (OSU) is somehow related to the University of Maryland, which, of course, it isn't. Sorry for the confusion.

#### How to reach us

If you wish to comment on anything you've read in *Journal*, please send your letter to *NFPA Journal*, NFPA, One Batterymarch Park, Quincy, MA 02269. You may also fax us at (617) 984-7090 or E-mail us at [nfpa-journal@nfpa.org](mailto:nfpa-journal@nfpa.org).

#### In the next issue

- The 1998 Wildland Fire Season
- Roundtable Discussion of New Alarm Technology
- Fire Department Responses to False Alarms
- Australian Refinery Disaster

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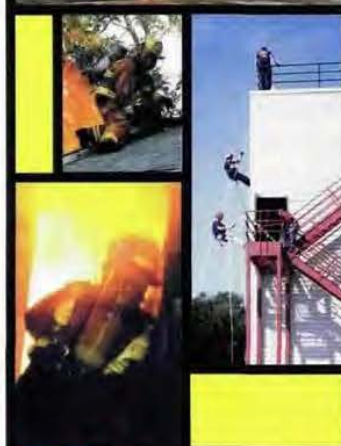


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## Award Nominations ■ New International Fire Organization ■ Fire Safety Trailer

## ■ New International Fire Organization

Last August, the Society of Fire Protection Engineers (SFPE), the Australian Society of Fire Safety (SFS), and the U.K. Institute of Fire Safety (IFS) established the International Fire Safety Engineering Institute (IFSEI). The Institute's purpose is to provide a forum for international co-operation among organizations representing fire safety engineers, scientists, and related practitioners from around the world.

The inaugural meeting of the IFSEI Board of Directors, consisting of leaders of SFPE, IFS, and SFS, was held in October. Agreement was reached to exchange publications and educational programs at member discounts and to foster the concept of the global fire protection engineer through the exchange of information on licensing procedures in each country.

IFSEI will co-sponsor the third International Conference on Performance-Based Codes and Fire Safety Design Methods in Sweden in June 2000.

For more information about IFSEI, contact the secretariat at

SFPE headquarters by fax at (301) 718-2242 or by E-mail at [sfpe-hqtrs@sfpe.org](mailto:sfpe-hqtrs@sfpe.org).

## ■ 1998 NVFC Awards



The National Volunteer Fire Council (NVFC) recently named the recipients of the Firefighter of the Year Award and the Marc Mueller Fire Prevention Award of Excellence.

William Wurtz of Williamsville, New York, received the Firefighter of the Year Award, recognizing his 54 years in the fire service. Doug Rodenbeck of Ft. Wayne, Indiana, was the recipient of the Marc Mueller Fire Prevention Award, created to attract attention to the heroes of prevention. Among other projects, Rodenbeck speaks to about 4,000 children each year through his "Fireman Doug" show.

The deadline for nominations for the 1999 Firefighter of the Year Award is July 1, 1999. The nomination deadline for the 1999 Marc Mueller Fire Prevention Award is March 15, 1999.

For information on

the NVFC, the awards, or the nomination process, call (888) 275-6832 or visit [www.nvfc.org](http://www.nvfc.org).

## ■ Smoke Detector Monitor and Accessories Standard

Underwriters Laboratories, Inc. (UL) announces the publication of the third edition of the *Standard for Safety for Smoke Detector Monitors and Accessories for Individual Living Units of Multifamily Residences and Hotel/Motel Rooms*, UL 1730.

UL 1730 covers electrical smoke detector monitors intended to be used in ordinary indoor locations in accordance with NFPA 70, *National Electrical Code*; NFPA 101, *Life Safety Code*; and Chapter 2 of NFPA 72, *National Fire Alarm Code*.

As covered by these requirements, a smoke detector monitor provides for the connection and supervision of initiating circuits that are, in turn, to be connected to smoke detectors. The smoke detectors, which may be single- or multiple-station devices, are installed in individual living units of multifamily residences or hotel or motel rooms. The monitor provides

alarm or trouble indications at an attended central monitoring location as a supplement to the signal given at the location of the smoke detector. These units aren't intended for use as protective signaling control units.

To order the standard, call Global Engineering Documents at (303) 397-7956 or (800) 854-7179. The company can also be reached on the Internet at <http://global.ihs.com>.

## ■ Fire Safety Trailer Donation



Simplex President E.G. Watkins (right) is pictured with Gardner Mayor Charles J. Manna in front of the Fire Safety House.

Simplex Time Recorder Company has donated a fire safety and prevention trailer to the city of Gardner, Massachusetts. The Fire Safety House, which uses interactive, hands-on technology, has been specially designed to prepare children and adults for unexpected fires. Safety features include an escape ladder from the second level, a heated door, a nontoxic smoke

system, and a 911 phone system.

## ■ IAFC Foundation Scholarships



The International Association of Fire Chiefs (IAFC) Foundation awarded 25 scholarships in 1998 that amounted to more than \$20,000.

Funding for the awards came from a trust made possible through the sale of Ben Franklin memorial medals and the generosity of several companies and individuals.

For information on this program and application forms for the 1999 awards, write to Sue Hawkins, IAFC Foundation, 1257 Wiltshire Road, York, PA 17403; telephone (717) 854-9083.

## ■ Declaration of Cooperative Action in Caribbean/Central America

At the close of the two-day Forum on Building Codes and Economic Development held last October, representatives from 31

Caribbean and Central American nations issued a "Declaration of Cooperative Action."

The declaration calls for the nations in that region to work together to reduce the loss of lives and property during disasters and to enhance public safety and economic development.

The goals of the participants are to develop and adopt uniform construction codes throughout the region, to train enforcement and construction personnel to enforce these codes, and to design and construct affordable disaster-resistant housing and effective insurance programs.

### ■ Sjölin Award Call for Nominations



The FORUM for International Cooperation on Fire Research wishes to encourage and reward individuals or small teams who've made significant contributions to fire safety in the global community through outstanding work or a significant breakthrough in the fields of fire science, fire technology, fire safety engineering, or fire safety education. The work should also exem-

plify the FORUM's goal of international cooperation.

The Sjölin Award recognizes work done, results published, or significant achievement realized in recent years. The award, which consists of a plaque and a \$5,000 honorarium, will be presented at the IAFSS International Symposium on Fire Safety Science.

Nominations are open to all individuals and organizations. Employees of FORUM members require the additional endorsement of two members or one nonmember. Nominations may be submitted by any individual or organization. Sufficient documentation to substantiate the nomination should also be submitted.

Send nominations and supporting documentation by March 30, 1999, to Dr. John R. Hall, Jr., Chairman of the Nominations Committee, NFPA, One Batterymarch Park, Quincy, MA 02269, USA.

### ■ Sprinkler recall update

The nation's second-largest manufacturer of fire sprinklers will recall more than 9 million sprinkler heads under a settlement approved in October 1998.

Central Sprinkler Corp. agreed to the deal, which would settle two class-action lawsuits

filed in Los Angeles and Santa Clara, California. The agreement mirrors the terms of a federal recall order that requires Central Sprinkler to replace Omega model sprinkler heads at no charge to customers.

The agreement is limited to the replacement of the sprinkler heads and associated costs. Attorneys reached agreement with the company, but they didn't announce the deal until it was approved by Superior Court Commissioner Bruce Mitchell. Final approval will be considered at a hearing in February.

In March of last year, the Consumer Product Safety Commission (CPSC) asked a judge to order a national recall of Omega sprinklers, which are used nationwide in apartment buildings, hospitals, hotels, schools, prisons, office buildings, private residences, and in the White House and U.S. Capitol.

Omegas have failed to activate in 17 fires since 1990, injuring at least four people and causing more than \$4.3 million in property damage, the CPSC said. The sprinklers also have high failure rates in laboratory tests.

The company agreed to the recall and took a \$38 million charge against its third-quarter earnings to replace heads and settle lawsuits.

### ■ Teamwork, Texas-Style



*Members of the Texas Rangers, including (from right to left) Head Coach Johnny Oates, Jerry Narron, Larry Hardy, Dick Bosman, Bucky Dent, Rudy Jaramillo, and Ed Napolean, encourage Arlington residents to buckle up for safety.*

The Arlington, Texas, Fire Department teamed up with the Texas Rangers to produce a series of posters that feature the eight risk areas contained in NFPA's *Risk Watch*<sup>TM</sup> curriculum. The posters, the brainchild of Arlington Fire Chief Robin Paulsgrove, who's also a member of NFPA's Board of Directors, and Lts. Curtis Dunn and Pat English, combine Texas Rangers players, local firefighters, and police officers with a touch of humor to make a serious point about safety.

According to English, 40,000 posters were printed, thanks to a generous grant from the Fleetwood Foundation, and the support of Texas Rangers' president Tom Schieffer. The posters were distributed to the three Arlington schools currently pilot testing *Risk Watch*, as well as local PTAs and each mem-

ber of the Arlington Fire and Police Departments. Twenty thousand posters were also distributed during "Firefighter and Police Appreciation Night" at the ballpark. For more information, call Lt. English at (817) 459-5511.

### ■ FPW Essay Contest Winner



*Jeff Wells, general manager of Hartford Fire Equipment, congratulates Samantha Punt, the Plainville, Connecticut, FPW essay contest grand prize winner.*

Last year, a Connecticut fire marshal came up with a creative way to support fire safety awareness and NFPA-sponsored Fire Prevention Week (FPW). Bill Chamberlin, fire marshal of Plainville, Connecticut, asked local kids from 8 to 11 years old to write an essay explaining why every home should have a fire extinguisher.

Samantha Punt, 9, won the grand prize of two fire extinguishers and a smoke alarm. The seven runners-up each received a fire extinguisher. Prizes were donated by Hartford Fire Equipment. 🗑️

*Compiled by Jenna Padula*

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# From Our Files

Kenneth J. Tremblay

## RESIDENTIAL

### Man Dies Refueling Kerosene Heater

#### INDIANA

A 75-year-old man died of burns and smoke inhalation after refueling a portable kerosene heater when the open flame he was using to restart the heater ignited kerosene and fire spread to his clothes. The man was handicapped, but the report didn't elaborate on his condition.

The house in which the fire occurred was a single-story, two-family dwelling constructed of unprotected wood framing that measured 58 by 26 feet (18 by 8 meters). It had no smoke alarms or sprinklers, although investigators did find a carbon monoxide detector.

A neighbor noticed the fire and called 911 at 9:11 p.m. Firefighters arrived three minutes later to find the victim face down in the living room, having fallen through the partially collapsed wooden floor. They also found a portable kerosene heater, a small fuel container, and a box of wooden matches nearby.

Investigators later discovered a faulty seal on the heater's fuel cell. When kerosene was placed on the heater, the seal failed to operate properly.

Fire damage was limited to the room of origin, but smoke damaged the entire dwelling. Damage to the structure, valued at \$20,000, was estimated at \$10,000. The contents, valued at \$5,000, were completely destroyed.

### Fire Kills Two Unattended Children

#### FLORIDA

Two girls, ages 8 and 5, died of smoke inhalation when a fire broke out in their first-floor apartment. Their mother, her boyfriend, and her two youngest children had left the girls sleeping in their beds while the boyfriend drove the mother to work.

The two-story apartment building was constructed of concrete block walls over a poured concrete slab. It had a wood roof covered with asphalt shingles. A hardwired smoke alarm with battery backup was located in the hallway in the unit of origin, near the bedrooms. There were no sprinklers.

Firefighters received a 911 call reporting the fire at 7:21 a.m. and arrived six minutes later to find fire coming from an entry door. Fire crews advanced hose lines inside and found the two girls in their bedrooms, dead of smoke inhalation.

Investigators determined that the fire originated in a sofa in the living room. Smoke and flames filled the living room and smoke and heat spread through the apartment. Neighbors reported smelling smoke and hearing a faint smoke alarm, but they couldn't pinpoint the fire's location until flames vented through a front door.

Based on tests and witness statements, investigators believe the smoke alarms operated correctly, but they couldn't determine whether the children had responded.

Fire damage in the unit of

origin was confined to the living room and kitchen, while smoke damage extended down the hall to the bedrooms. Adjacent apartments were damaged when smoke and flames spread through an open door and a picture window that failed. Damage was estimated at \$20,000.

### Man Ignites Blaze to Commit Suicide

#### MICHIGAN

A 50-year-old man with a history of mental illness died of smoke inhalation after he ignited a fire in his second-floor apartment in a building that consisted of public housing for older adults.

The 10-story apartment building was of unprotected, ordinary construction. Hardwired smoke detectors were located in each unit and in the hallways. There were no sprinklers.

Before setting the fire, the man locked the apartment door and stacked materials in front of it, sealed the windows, and piled papers and other com-



Residents of this apartment building called 911 after smoke alarms sounded.

bustibles in front of the kitchen cabinets. He then ignited the combustibles with a match and lay down on the floor. Other occupants of the building called 911 after the smoke alarms sounded.

Damage to the building, valued at \$10 million, and its contents, valued at \$2 million, was estimated at \$21,500 and \$2,750, respectively.

### Firefighters Rescue Seven from Apartment Building Fire

#### MASSACHUSETTS

Firefighters rescued seven people from an apartment building when a fire that broke out in a second-floor laundry room prevented them from escaping.

The three-story building, which was of unprotected, ordinary construction, measured 50 by 57 feet (15 by 17 meters). There was a tavern on the first floor, which was closed at the time of the fire, and apartments on the upper floors. A hardwired smoke detection system protected the hallways and common



Firefighters responded to this apartment building when a man committed suicide by setting a fire in his apartment.

areas. There were no sprinklers.

An occupant discovered the fire and called 911 at 1:30 a.m. Several arriving firefighters advanced hose lines up the interior stairs to the second floor, while others used ground ladders and a 100-foot (30-meter) aerial ladder to rescue seven occupants through second- and third-floor windows. Firefighters eventually controlled the blaze, but overhaul was extensive because the fire had entered and spread through construction voids.

Investigators determined that the fire started in a second-floor laundry room when exposed wiring on a 220-volt cable feeding an electric clothes dryer came into contact with the appliance housing. The wiring arced, showering the area with sparks and igniting nearby combustibles.

The dollar loss to the property wasn't reported. Five civilians suffered smoke inhalation injuries, and one firefighter was injured.

### Propane Leak Ignites Deadly Blaze

#### MISSOURI

A 73-year-old man died of smoke inhalation in an explosion and fire that destroyed his one-room cabin.

The man had just opened the 20-by-20-foot (6-by-6-meter) seasonal cabin, which was of unprotected, wood-frame construction. He lit a fire in the fireplace, unaware that a propane-fired gas stove used to heat the cabin had a leak in its gas supply line and was filling the structure with propane. Once the LP-Gas reached the fireplace, it ignited, causing an explosion and fire.

Because the cabin, which had no smoke alarms or sprinklers, was located about 2 miles (3

kilometers) from the road, it was approximately two hours before a passerby discovered the blaze.

The building, valued at \$15,000, and its contents, valued at \$3,000, were destroyed.

### Man Dies Trying to Rescue Wife from Blaze Started by Unattended Cooking

#### MARYLAND

A 71-year-old man died trying to rescue his disabled 63-year-old wife from a fire that started when he left food cooking unattended on the stove. The wife suffered smoke inhalation.

The one-story, single-family house was constructed of unprotected wood framing. A smoke alarm was located near the bedrooms in the hallway, but its operation wasn't determined. There were no sprinklers.

The husband returned from church to find fire spreading through his home. He immediately went to the master bedroom where his non-ambulatory wife was located. He called 911 from the bedroom at 12:01 p.m. Arriving firefighters rescued



*Relatives peer inside the damaged home following the blaze that killed a 71-year-old man.*

the couple, but the man succumbed to smoke inhalation injuries.

The fire began when food left cooking on an electric stove ignited, and the heat eventually ignited combustible wall coverings. Flames then spread through the kitchen to other rooms.

The kitchen and the rest of the east end of the house sustained heavy fire damage, while the bedroom sustained only minor smoke damage. Damage to the structure, valued at \$70,000, and its contents, valued at \$25,000, was estimated at \$40,000 and \$10,000, respectively. One firefighter's face was burned in the blaze.



*An investigator searches for clues inside the gutted living room of this single-family home, which was damaged when food left cooking unattended on an electric stove ignited.*

### Careless Smoking Kills Two

#### GEORGIA

An 11-year-old boy and his disabled father died as the boy tried to rescue the man from a fire that began when he ignited a sofa while smoking. The boy's father, who suffered from a muscle disease, was confined to a wheelchair and wasn't supposed to smoke unless supervised.

The family had recently moved into the one-story, single-family house of unprotected wood framing with a brick veneer. The structure had no smoke alarms or sprinklers.

The only two people home at the time of the fire were the father, who was sitting on the sofa, and his son, who was in his bedroom. Evidently, the father unintentionally ignited the sofa when he tried to light a cigarette, and flames spread to his clothes. When the boy discovered the fire, he tried unsuccessfully to rescue his father.

The blaze consumed all the oxygen in the house and eventually burned itself out. By the time other family members returned home, the father and son were dead of smoke inhalation.

Damage to the building, valued at \$55,000, and its contents, valued at \$20,000, was estimated at \$30,000 and \$10,000, respectively.

### SPECIAL

### Vacant Building Set Afire in Act of Revenge

#### ILLINOIS

A homeless man seeking revenge against another homeless man set fire to a vacant tavern, killing the transient and destroying the building.

The two-story building was of

protected, wood-frame construction and measured 100 by 30 feet (30 by 9 meters). It had no alarms or sprinklers. The two homeless men had been living illegally in the building, which was scheduled for demolition.

One of the homeless men used a lighter to ignite ordinary combustibles in a below-grade exterior stairwell. The resulting fire engulfed the entire structure, killing an intoxicated 44-year-old man who was still inside. The firesetter fled the scene, but he was later arrested and charged with arson and murder. He awaits prosecution.

The building, valued at \$50,000, was a total loss.

### Heater Ignites Trailer

#### MICHIGAN

A 64-year-old man died when fire consumed his travel trailer, which was parked in the parking lot of a used tire store owned by his son.

The 12-by-6-foot (3.7-by-1.8-meter) travel trailer was constructed of lightweight wood framing and covered with an aluminum skin. An extension cord supplied electricity to the vehicle. The man had been living in the trailer illegally for more than a year.

Occupants of a doughnut shop across the street saw fire coming from the trailer at 4:34 a.m. and called 911. Firefighters arrived and extinguished the blaze, which had spread to three nearby vehicles. They found the man's body inside the trailer.

Investigators determined that a portable electric heater that had been placed under the bed ignited a cotton towel that was in contact with the heater, and flames spread vertically to a plywood bed platform and mattress. The fire eventually involved other com-

combustibles in the trailer before venting through the windows.

The occupant, who had a history of alcoholism, was intoxicated at time of the fire. According to his son, the man was stubborn and refused to live with him, so this living arrangement had been worked out to keep the man from becoming homeless. Damage to the trailer and the three vehicles, valued at \$6,500, was estimated at \$3,200.

## MANUFACTURING

### Sprinkler Controls Blaze

#### MASSACHUSETTS

A sprinkler and employees using a standpipe hose line controlled a suspicious fire at a plastic products manufacturing facility.

The single-story building of unprotected, noncombustible construction was protected by a sprinkler system of unreported type. It had no smoke detectors.

Only a few employees were working during the evening shift when a forklift operator noticed a fire involving palletized plastic products stored in cardboard containers. As light smoke filled the building, two employees used a standpipe hose line to control the flames. A sprinkler also activated, as did the water flow alarm, which activated the municipal fire alarm system at 11:04 p.m.

Firefighters arrived within three minutes and were met by the building supervisor, who told them that the fire was in the warehouse section of the building. Fire crews advanced additional hose lines from the standpipe and relieved the employees who were fighting the fire. They completed extinguishment and used ventilation fans to remove smoke.

During the investigation, it was determined that a temporary

worker was the only person who'd been seen in the area of origin before the fire broke out. He left while it was being extinguished. Having eliminated most potential causes of unintentional ignition, the fire department considers the blaze suspicious.

Investigators determined that the fire originated in a palletized carton of product located within feet of an internal concrete-block fire wall. Damage to the property was estimated at \$5,000. There were no injuries.

## STORAGE

### Explosion Kills Employee

#### NEW JERSEY

A flash fire and explosion quickly overcame a sprinkler system at a recycling facility, destroying the building and killing an employee.

The single-story recycling center, which was of unprotected, noncombustible construction, measured 120 by 120 feet (37 by 37 meters). A wet-pipe sprinkler system monitored by a private alarm company protected the building. There were no smoke detectors.

The plant had been in operation for half an hour when an explosion and flash fire occurred,



*This recycling facility employee was injured in the explosion.*

quickly overcoming the fire protection system. Employees called 911 at 7:30 a.m. after the automatic alarm failed to transmit the signal to the alarm company.

Investigators determined that thousands of aerosol cans containing hair paint released their isobutane-propane propellant as they were crushed by the compactor. The propellant vapors were ignited when a propane-fired fork lift truck was started, and flames spread to nearby combustibles, causing a flash fire that activated more than 50 sprinklers.

The building, valued at \$1.5 million, and its contents, valued at \$500,000, were a total loss. A 36-year-old employee was killed and three other employees and a firefighter were injured. ♦

*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.*



*A firefighter hoses down bales of cardboard after an explosion that killed an employee at this recycling facility.*

# Myths and Misconceptions

*Here's the truth behind five of the most common sprinkler activation misconceptions.*

**Russell P. Fleming, P.E.**

**A**lmost everyone involved in fire protection recognizes that an automatic sprinkler performs two vital functions: It responds to heat to detect a fire, then acts to distribute water to control or suppress it. When it comes to the finer points of sprinkler activation, however, many people have misconceptions. Here are five of the most common.

## **1 Fast response sprinklers are five times faster than standard sprinklers.**

This oversimplification of sprinkler sensitivity was born in the late 1970s during the development of the pioneer among today's fast response sprinklers, the residential sprinkler.

To maintain tenable conditions during a fire in small residential compartments with limited water supplies, sprinklers need a higher degree of thermal sensitivity. In one set of standardized test conditions, this amounted to a five-fold increase in the measure of thermal sensitivity. But the degree to which a fast response sprinkler is faster than a standard response sprinkler depends on many factors, including the fire's heat release signature, such as sprinkler characteristics as temperature rating and internal conductivity, and the geometry of the sprinkler as installed in the space.

In some fire scenarios, fast response sprinklers may be five times faster; in others, they may be less so. But all other factors being equal, they will be faster.

## **2 Quick response equals fast response.**

There continues to be confusion between the terms "fast response" and "quick response." As agreed by sprinkler manufacturers, listing laboratories, and standards writers, "fast response" is the umbrella term for all sprinklers that use the more sensitive operating mechanisms first brought to the public in the residential sprinkler. These include the quick response sprinkler, created when the fast response operating mechanism is inserted into an otherwise standard spray sprinkler.

The early suppression fast response sprinkler was developed in the late 1980s to help suppress highly challenging fires. Another family member is the quick response extended coverage sprinkler, which is a quick response sprinkler listed with coverage areas of up to 400 square feet (36 square meters). Like the residential sprinkler, the quick response sprinkler is a type of fast response sprinkler.

## **3 All quick response sprinklers are equal.**

NFPA 13, *Installation of Sprinkler Systems*, now requires quick response or residential sprinklers in new light-hazard applications. These tend to be the occupancies in which life safety is a concern.

All things being equal, fast response sprinklers will operate earlier than standard response sprinklers when the fire is smaller and less threatening. However, things aren't always equal. High ceilings, dry-pipe systems

in which water isn't immediately available, expanded sprinkler protection areas, and types of sprinklers that don't optimize the collection of heat may all influence the time it takes to apply water to a fire.

In general, pendent sprinklers are most sensitive when their heat-responsive elements are placed 1 to 4 inches (25 to 100 millimeters) below the ceiling. For fire modeling purposes, recessed sprinklers can be considered as sensitive as pendent sprinklers when their heat-responsive elements are 8 inches (200 millimeters) below the ceiling, and concealed sprinklers as sensitive as pendent sprinklers when their heat-responsive elements are 12 inches (300 millimeters) below the ceiling, the maximum permitted by NFPA 13.

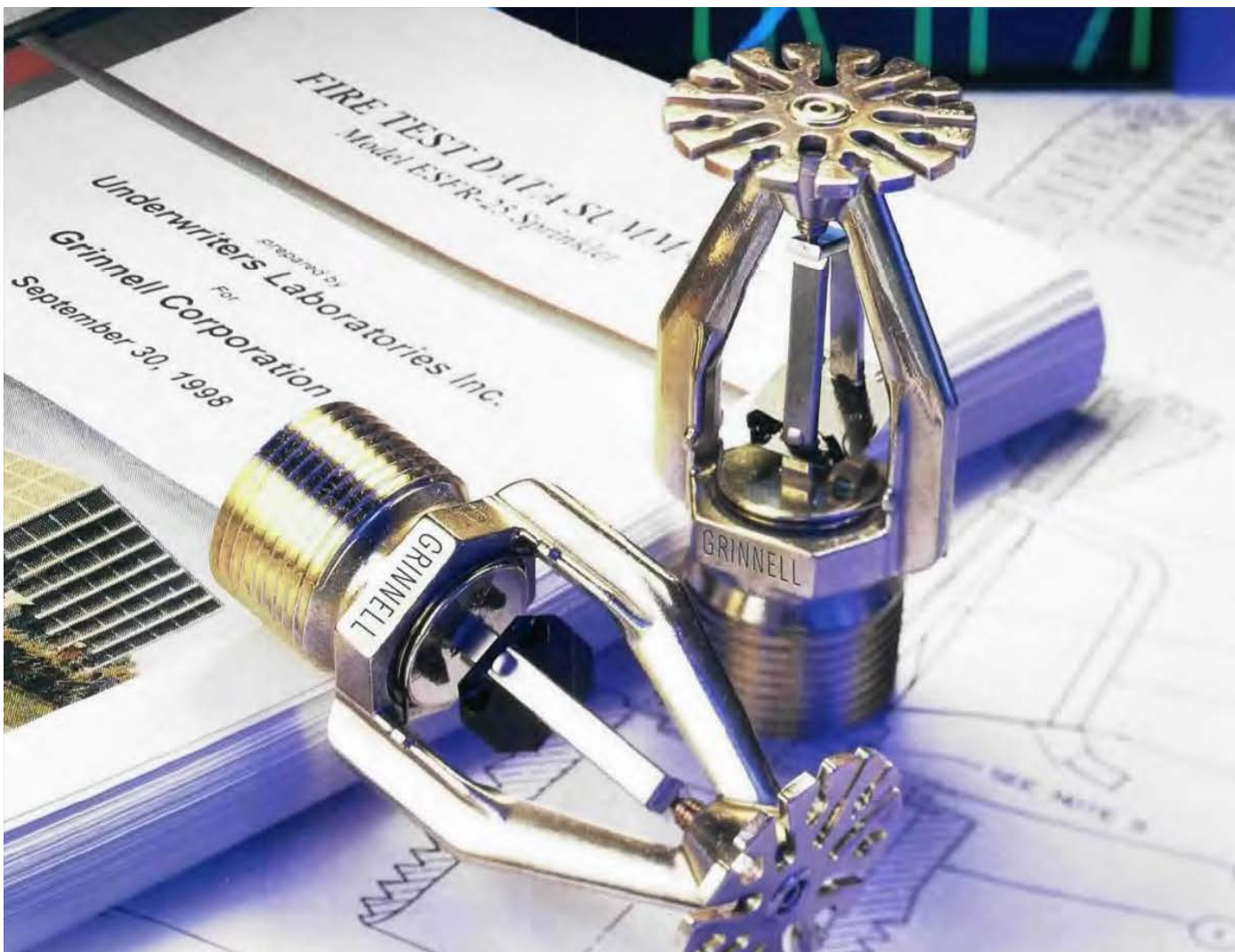
To get the "quick response" designation from Underwriters Laboratories, however, all sprinklers must pass a room response test based on the response of the original residential sidewall sprinklers positioned 4 to 6 inches (100 to 150 millimeters) below the ceiling. For this reason, some extended coverage sprinklers with maximum protection areas don't receive the quick response designation, or are designated as quick response only with lower temperature ratings.

## **4 Heat collectors enhance performance.**

Heat collectors, which usually take the form of round or square metal baffles, or "pie

*Continued on page 79*





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|-----------------------------|-----------------------------|----------------------------------|---------------------------------------|
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| 35 (10,7)                   | 40 (12,2)                   | 40 (2,7)                         | 25 (1,7)                              |
| 30 (9,1)                    | 35 (10,7)                   | 30 (2,1)                         | 20 (1,4)                              |
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# Keeping Firefighters Healthy

Stephen N. Foley

The fire department physician doesn't need to be a member of the fire department.

**Q.** Do the medical requirements in NFPA 1582, *Medical Requirements for Fire Fighters*, apply to both candidates and incumbents?

**A.** Yes. The requirements are outlined in Chapter 2, "Medical Process," specifically in Section 2-3, "Preplacement Medical Evaluation," and Section 2-4, "Periodic Medical Evaluation." These requirements pertain to suppression firefighters.

**Q.** NFPA 1582 has two categories of medical conditions, Category A and Category B. What's the difference?

**A.** The standard defines Category A medical conditions as medical conditions "that would preclude a person from performing as a member in a training or emergency operational environment by presenting a significant risk to the safety and health of the person or others."

A Category B medical condition is defined as "a medical condition that, based on its severity or degree, could preclude a person from performing as a member in a training or emergency operational environment by presenting a significant risk to the safety and health of the person or others."

**Q.** How can a fire department afford to hire a fire department physician?

**A.** The fire department physician doesn't need to be a member of the fire department, but he or she must meet the standard's requirements. This means that he or she must be a licensed doctor of medicine or osteopathy and must understand the physiological and psychological demands placed on firefighters, as well as the environmental conditions under which they perform. The fire department must provide the physician with a current job description for all fire department positions and ranks.

**Q.** How much does it cost to implement NFPA 1500, *Fire Department Occupational Safety and Health Programs*?

**A.** The cost varies from one jurisdiction to another. The standard contains a checklist that jurisdictions should use to determine their departments' compliance. The checklist also serves as an excellent planning tool both for operating and capital budget planning.

**Q.** I belong to a combination fire department. Am I allowed representation on the fire department occupational safety and health committee?

**A.** Yes. Section 2-6, "Occupational Safety and Health Committee," says that an occupational safety and health committee shall be established and serve the fire chief in an advisory capacity. The committee must include the designated fire department health and safety officer, representatives of fire department management, and members or representatives of member organizations. The committee should also



be permitted to include other people. Representatives of member organizations must be selected by the organizations, but other committee members should be appointed by the fire chief.

**Q.** If my department provides station work uniforms that meet NFPA 1975, *Station/Work Uniforms*, do I meet the requirements of NFPA 1500?

**A.** Yes. NFPA 1500 requires the use of station work uniforms that meet NFPA 1975, which specifies how they are manufactured and tested.

**Q.** Can I have a beard and do structural firefighting, and still meet the requirements of NFPA 1500?

**A.** No. NFPA 1500; NFPA 1404, *Fire Department Self-Contained Breathing Apparatus Program*; and NFPA 1981, *Open-Circuit SCBA for Fire Fighters*, don't allow facial hair, which may keep a face piece from sealing properly. The U.S. Department of Labor's Occupational Safety and Health Administration doesn't allow for facial hair in 29CFR1910.134, either. NFPA 1500 doesn't allow firefighters with beards or facial hair to use SCBA whose facepiece is designed to seal with the face, or with hair that could interfere with the operation of the SCBA to use respiratory protection at emergency incidents or in hazardous or potentially hazardous atmospheres. These restrictions apply regardless of the fit test measurement that can be obtained under test conditions.

**Q.** NFPA 1500 addresses the issue of a rapid intervention crew (RIC). When should that first be established?

**A.** When the first four members are assembled on scene, and one team of two members enters an Immediately Dangerous to Life and Health (IDLH) environment, the two remaining firefighters are the initial RIC team. NFPA 1500 requires the establishment of at least one dedicated RIC team as other members and units arrive on the scene. In some departments, these teams are known by other acronyms, such as a FAST team or a RIT team.

**Q.** Does NFPA 1500 address the issues of the so-called two in/two out rule?

**A.** Yes. Chapter 6 covers the assembly of four personnel on scene and describes how they may deploy. The technical committee added the following examples to the appendix of the standard to show how a department might deploy a team of four at the scene of a structure fire, regardless of the way the team members are assembled:

- a. The team leader and one firefighter could advance a hose line into the IDLH atmosphere, allowing one firefighter and the pump operator to become standby members.
- b. The team leader could designate the pump operator as the incident commander. The team leader and one firefighter could then enter the IDLH atmosphere, and the third firefighter and the pump operator could remain outside as standby members.
- c. Two firefighters could advance the hose-line in the IDLH atmosphere, and the team leader and pump operator could remain outside as standby members.

**Q.** Does NFPA 1521, *Fire Department Safety Officer*, define when an incident scene safety officer shall be appointed?

**A.** Yes. NFPA 1521 was revised in 1997 to address the positions of a health safety officer and an incident safety officer (ISO), two distinct positions dealing with firefighter safety. The standard includes the requirements for both positions and National Fire Academy courses expand on these requirements.

Section 2-1.4.1 of NFPA 1521 says that the incident commander may appoint an ISO as activities, size, or need warrant. If the designated ISO isn't available, the incident commander should appoint one. ♦

*Stephen N. Foley serves as an NFPA senior fire service specialist and staff liaison for the Technical Committee on Fire Service Occupational Safety (NFPA 1500, 1521, and 1561) and the Technical Committee on Fire Service Occupational Medical and Health (NFPA 1581, 1582, and proposed 1583).*

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# Performance-Based Design in NFPA 101®

*The criteria developed today to address performance-based design serve as the foundation for all future efforts in this area.*

William E. Koffel, P.E.

Over the past several years, various codes- and standards-writing organizations in the United States have begun to address the concepts of performance-based fire safety codes and fire protection designs. The result of one such effort is a proposed new chapter for NFPA 101®, *Life Safety Code*®, which is now available for public comment in NFPA's *Report on Proposals* (ROP) for the 1999 Fall Meeting.

## Design objective

The new chapter's design objective is to calculate how long it takes a person to become incapacitated during a fire. While alternative design calculation procedures are permitted, the primary methodology proposed is to calculate the time it takes occupants to reach a fractional effective dose (FED) of 1.0, calculated in accordance with NFPA 269, *Standard Test Method for Developing Toxic Potency Data for Use in Fire Hazard Modeling*. NFPA 269 describes a test method for predicting the lethal toxic potency of smoke produced by a material exposed to a specific fire. Data are obtained on carbon monoxide, carbon dioxide, oxygen (vitiation), and, where present, hydrogen bromide, hydrogen chloride, and hydrogen cyanide. The values derived from the test method need to be adjusted for post-flashover fires, as indicated in the standard.

The proposal references specific portions of the prescriptive sections of the *Life Safety Code* that must be met because the proposed methodology doesn't address the safety concerns those sections do. For example, the stair geometry provisions of the *Life Safety Code* must be met since smoke toxicity calculations aren't related to stair geometry. However, the

proposal allows for alternative methods to demonstrate equivalency with the prescriptive requirements.

## Assumptions

Design professionals must clearly document any assumptions they make, including conditions upon which their calculations are based, such as occupants' characteristics, expected emergency personnel response, and building use. Such assumptions then become conditions of occupancy, which the owner has to certify annually, as required by a related proposal to the *Life Safety Code*.

The design documentation must also note clearly that the building was approved using a performance-based approach and indicate that the building must be re-evaluated and re-approved anytime it is modified, is used for a different purpose, or deviates from the original conditions of the assessment.

Although the method of compliance is more specifically identified here than in the prescriptive code, the proposed assumptions are no different than those made using the current code requirements. Design professionals routinely make assumptions, based on information provided by owners, about the way a space will be used to determine occupant load, occupancy classification, and the appropriate design criteria for fire protection systems.

## Scenarios

The proposal also requires that a series of design fires be considered when determining whether design objectives have been met. Most cases require nine specific scenarios, including measurement of various fire

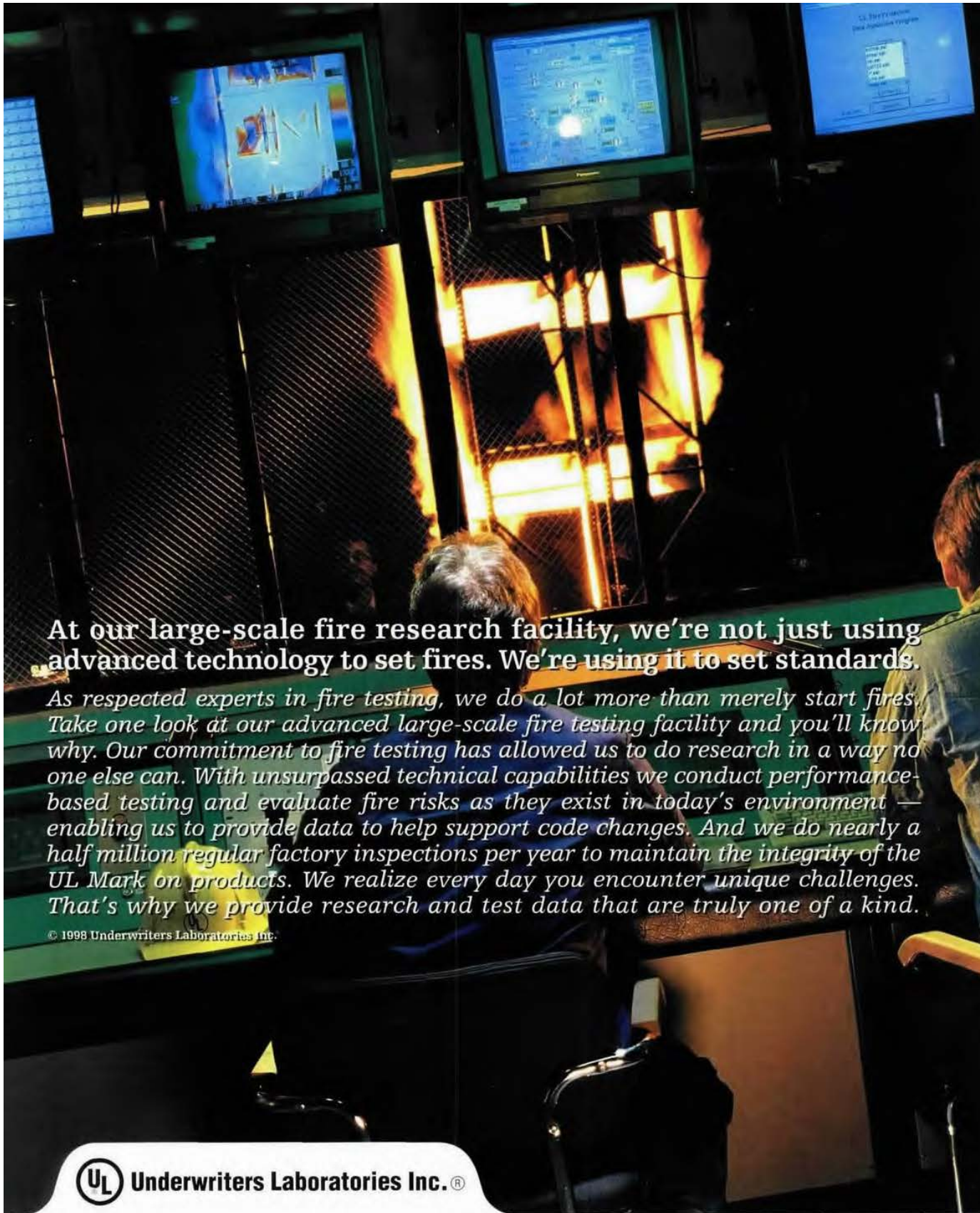


growth rates and locations, assessment of the fire protection systems' ability to respond to the fire, and other factors as appropriate. Design professionals then use the scenarios as input for the calculation method or fire model used.

If specific scenarios are omitted or modified due to limitations of the test methods or calculation procedures, a sensitivity analysis must be performed to determine the consequences. The assessment should include safety factors based on the uncertainty of the assumptions made, the reliability of the data used, and the limitations of the calculation methods.

As the 21st century approaches, the various codes- and standards-writing organizations are developing specific criteria to address performance-based designs. Everyone affected by these criteria should consider them carefully because they'll be the foundation for all future efforts in this area. ♦

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



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# Reinventing Government

*The federal government increasingly turns to NFPA for assistance.*

Anthony R. O'Neill

**T**he federal government employees with whom we in the Washington office work on behalf of NFPA are, for the most part, dedicated and highly talented professionals. It never fails to amaze me when I hear unfounded criticism of these hardworking people. As in many other institutions, both private and public, the obstacles to performance are often institutional. Fortunately, many of these institutional obstacles are crumbling as both the congressional and executive branches of the federal government get serious about reinventing government.

On the congressional side, the *Government Performance and Results Act of 1993* P.L. 103-62 requires strategic planning and performance measurements by all federal agencies. On the executive side is Vice President Al Gore's National Performance Review (NPR). Both are good news for the United States.

## Feds turn to NFPA

Recently, the Washington-based Brookings Institution released its five-year report card, which gives the Clinton Administration a solid "B" average for substantial progress towards revitalizing our federal bureaucracy. The report on the NPR begins with the observation that "no executive branch reform in the 20th century—indeed, perhaps in the Constitution's 210 years—has enjoyed such high-level attention over such a broad range of activities for such a long period of time."

What does this have to do with NFPA and our consensus codes- and standards-making system? In a word, plenty!

Faced with downsizing and the challenge of "doing more with less," and encouraged by the Office of Management and Budget (OMB), federal agencies are increasingly turning to NFPA for help in developing new standards and updating existing regulations. Movement in this direction has been accelerated by the *Technology Transfer Act of 1996*, which requires federal agencies to use voluntary consensus standards developed by the private sector wherever possible—or tell OMB why they didn't.

Of course, federal agencies have used NFPA codes and standards for decades, but there's a renewed commitment as NFPA responds enthusiastically with several projects. For example, the Department of Transportation's Office of Pipeline Safety is gearing up to adopt, by reference, NFPA 59A, *Liquefied Natural Gas*, to replace much of the existing and sometimes outdated federal regulations. NFPA 59A provides a greater degree of design flexibility without lowering safety.

In addition, the Nuclear Regulatory Commission (NRC) has asked NFPA to develop a new "risk-based" performance fire safety standard for nuclear power plants. NFPA is busy working on the new standard with both NRC and the nuclear industry.

The United States Coast Guard also asked NFPA to work with them to develop a code, this one dealing with life safety on merchant vessels such as cruise ships. The project has resulted in NFPA 301, *Safety to Life from Fire on Merchant Vessels*, which was adopted at the 1998 Annual Meeting.

OSHA, too, is working on several projects that are expected to reference the latest editions of NFPA standards. Among these are updates of several fire safety standards, including *Means of Egress* and *Dip Tanks*. OSHA's standards on flammable liquids and spray finishing are reportedly in the regulatory pipeline, as well.

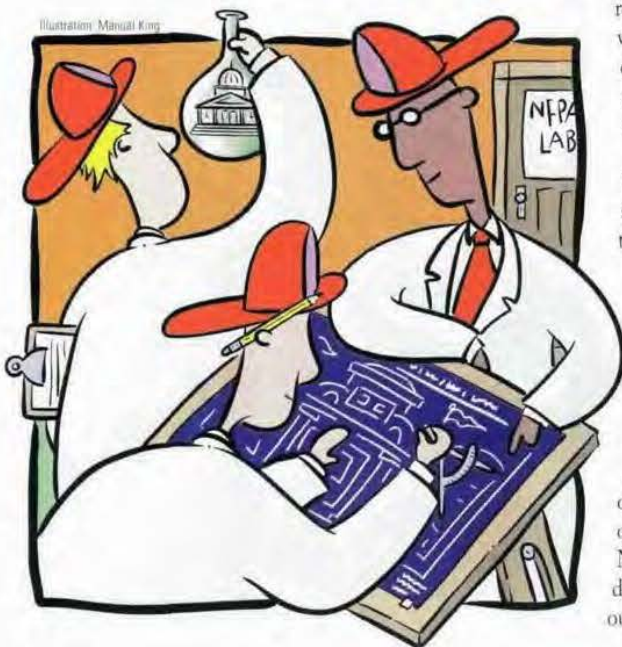
However, the most significant recent event probably occurred last June, when the Department of Housing and Urban Development (HUD) turned to NFPA to update HUD's manufactured housing standards.

## Catching up with the states

In reality, the federal government is reinventing itself by recognizing what states and local municipalities have known for some time: Government can't possibly replicate the expertise and timeliness of the private-sector codes- and standards-making processes. For some time now, state and local governments have routinely adopted consensus codes and standards developed in the private sector as the technical basis for their regulations.

Overall, the NPR's report card average might be a B, but the federal government's partnership with NFPA certainly deserves a solid A+.

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



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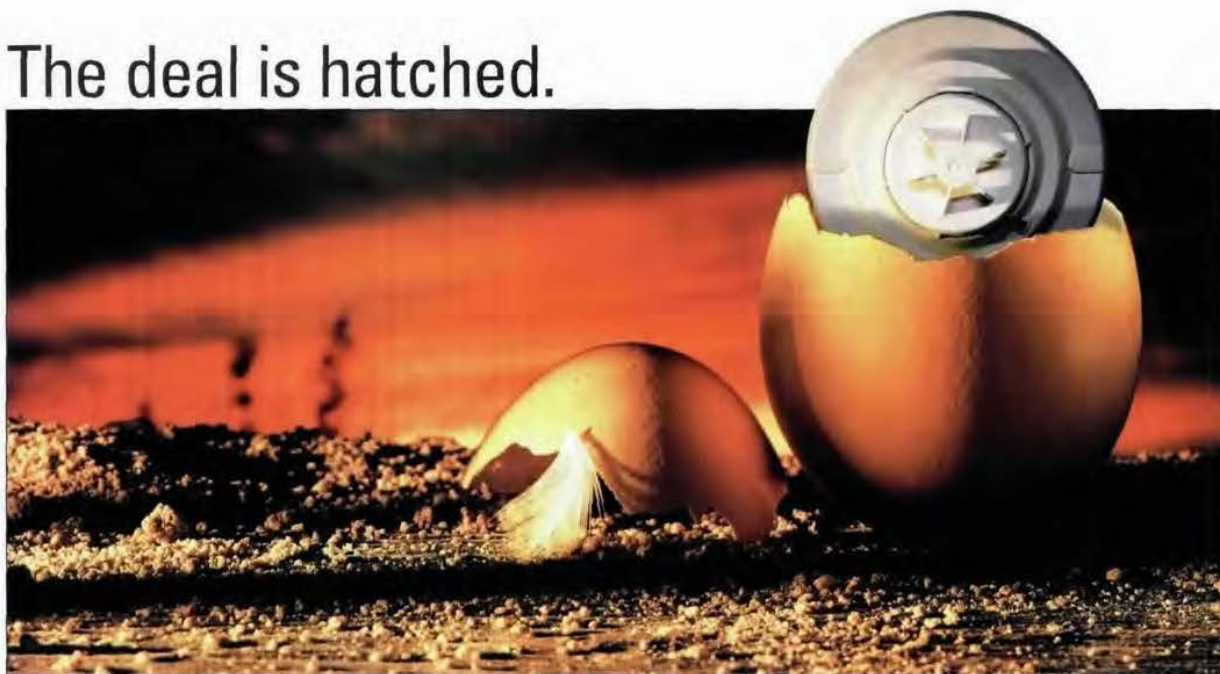
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# How To Guarantee a False Alarm

*If fire alarm system installers don't take certain steps, nuisance alarms can't be prevented.*

Wayne D. Moore, P.E.

As a fire alarm system installer, you do your best to ensure a reliable, stable installation. As a fire alarm system inspector, you have an interest in accepting and approving fire alarm systems that remain stable after the initial installation. Either way, you assume that a system that conforms to the design and installation requirements of NFPA 72, *National Fire Alarm Code*, will operate reliably. Not a bad assumption, especially if you both do your jobs as expected.

But consider this scenario. The owner has financial reasons for trying to occupy his or her building earlier than originally planned. He or she finds clients to lease the space, but the clients need to move in sooner than expected. The owner gets the general contractor to finish the now-leased space, then approaches the inspector for a temporary occupancy permit.

As an inspector, you want to accommodate the owner's request, so you approve it. Then the owner directs the installer to put in the fire alarm system because the inspector has

"authorized it." As the installer, you also want to please the owner. You have a crew available, so you install the system.

If both you and the inspector participate in this scenario without explaining to the owner the danger of installing a fire alarm system too early, you virtually guarantee a fire alarm system that's prone to nuisance alarms.

## The main causes of nuisance alarms

Nuisance alarms have many causes, but poor installation and early installation of fire alarm systems lead the list. Of the two, early installation of smoke detectors is the primary cause of nuisance alarms. Because this commonly occurs during the construction of a building and the installation of its fire alarm system, Subsection 5-3.6.1.3 of the 1996 edition of NFPA 72, *National Fire Alarm Code*, requires that detectors not be installed "until after the construction clean-up of all trades is complete and final," except where required by the authority having jurisdiction for protection during construction. Detectors that are installed before final clean-up by all trades have to be cleaned or replaced.

The committee inserted this subsection into the code to give the authority having jurisdiction (AHJ) some control over nuisance alarms. By simply enforcing it, you can ensure a more stable, more reliable fire alarm system.

## Preventing contamination

Should the AHJ decide to permit the early installation of a system, the installer must direct the owner's attention to this subsection of the code and explain that, if the smoke

detectors are installed before the construction clean-up of all trades is complete, the detectors will have to be cleaned or replaced. Otherwise, the owner will blame the installers for putting in poor quality equipment when the nuisance alarms occur!

What about the covers packed with the new smoke detectors today? Does using these during the installation negate Subsection 5-3.6.1.3?

The answer is "no." Manufacturers now ship these covers with every smoke detector to provide physical protection during shipping and installation, nothing more. They'll keep out the big stuff, but they won't do a thing to hinder the entry of contaminants such as plaster dust.

The requirements of Subsection 5-3.6.1.3 allow the AHJ to decide whether there's a concern about smoke detector contamination and provide the requirements for cleaning smoke detectors should the AHJ choose to allow early installation or desire protection during construction. The requirement also ensures that installers know the pitfalls of early installation and know that they must take the appropriate precautions.

This same requirement applies to renovations, as well. And remember—covering one smoke detector in the area being worked on isn't enough. Any other detector can be contaminated, and any contaminated detector can produce a false alarm. When you plan any construction work, you should either remove all the smoke detectors from the area or properly protect them from contamination.

You can ensure stable and reliable fire alarm systems. Just don't install them before their time! ♦

*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.*

Photograph © Mark Campitelli, Fire Alarm Consultation and Training, Inc.



*Early installation of smoke detectors is the primary cause of nuisance alarms.*

# Where Have All the Heroes Gone?

*At a time when heroes are rare, we need to look no further than our own backyards to find firefighters who serve as role models to our children.*

**Robin F. Paulsgrove**

As the decades roll by, we mark them with distinctive footnotes in world history—wars, assassinations, a man on the moon. As we begin this final year of the millennium, we're older but still searching for answers to timeless questions. At a time when our national news is dominated by graphic details of a crippling lapse in leadership judgment, we may find ourselves asking "Where have all the heroes gone?" And the terrible truth is that the erosion of trust and respect isn't limited to a single party or ideology.

Still, 1998 provided a few historic highlights. On the baseball diamond, two mighty warriors stepped up to the plate. With their captivating achievements, they momentarily eased our disappointment in the athletes who haven't fulfilled our expectations as role models to our youth.

I know something of heroes. I work with them every day. I know of Arlington firefighter Bruce Caldwell, whose career-long efforts to collect food for the homeless are legendary in Arlington. Of Mike Shoemaker, who's been among the department's leaders as a Big Brother volunteer. Of the crew of Engine 15-B, who tried desperately to save a man trapped in his burning home. And I know of Larry Brawner, who overcame adversity and stayed the course to become the Arlington Fire Department's highly respected assistant chief of operations.

You know them, too, but by different names and different stories. These community heroes are ordinary men and women, certainly imperfect, but together, they perform extraordinary deeds.

As cities across the United States survey their citizens, they've found that the fire service has a favorable rating of more than 90 percent and is, invariably, the most respected city service. While our nation's youth might

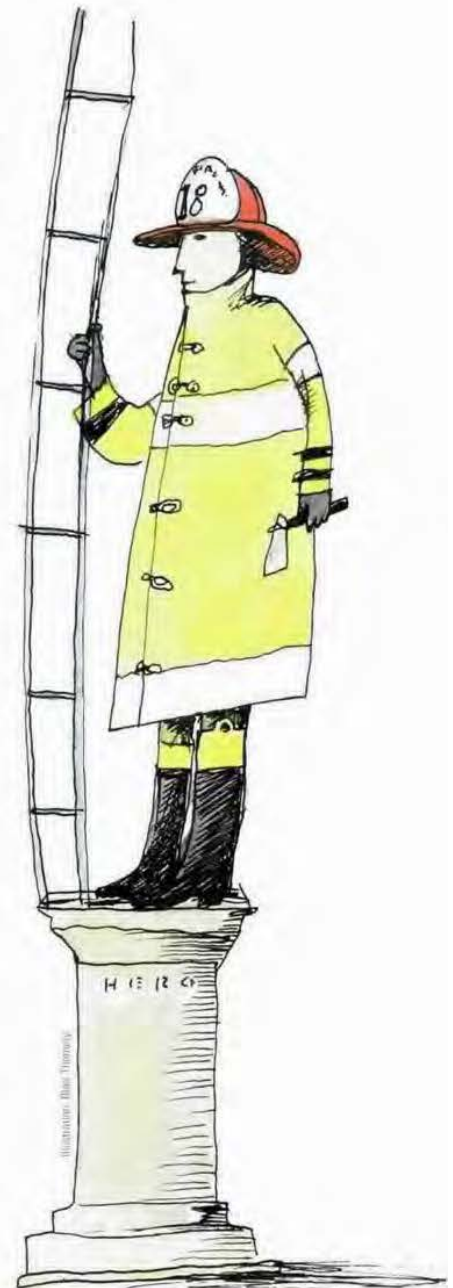
not maintain their child-like fascination with big red trucks, the fire station will always be a place of refuge for children seeking shelter. Our firefighters, reading in classrooms, responding to emergencies, and leading community service, will always be role models—the enduring kind of heroes.

None of us in today's fire service charted this course of honor. Yet it's the most valuable compensation any of us could ever hope to receive. When new members of the Arlington Fire Department take an oath of office, we connect them to our values with this charge:

*We extend to you the superior reputation of the Arlington Fire Department. It is not ours to give away. It is on loan to us. We are its caretakers. It was built through the courage, compassion, and commitment of those who came before us. It is ours to enjoy and our responsibility to maintain. We extend it to you, charging you with the responsibility to preserve and enhance that reputation, returning it intact to those who follow us. Each of us is accountable.*

I have examined the chapters in management texts that discuss a new generation of employees with different motivations and expectations. As progressive fire service leaders, we must capture the best of what these individuals have to offer. From Baby Boomers to Generation Xers, it's a never-ending cycle. Our challenge is to cling tightly to our foundation, a rich history built by the lifesavers and life-givers who came before us, to hold fast to that which has earned the trust of nations, while adjusting to meet the challenge of the future. And through our actions, to be the heroes that we'll forever be in a child's eyes. ♣

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





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# Making the Connection

*Lately, I've thought a lot about a safety issue  
that may seem to have little to do with fire: motor vehicle crashes.*

**Meri-K Appy**

Many of us have devoted years of our lives to the advancement of universal fire safety. It's a cause that demands the highest level of personal and professional commitment. But lately, I've been thinking a lot about another safety issue that on the surface may seem to have little to do with fire: protecting children from motor vehicle crashes.

According to the National Highway Traffic Safety Administration (NHTSA) and Transport Canada, crashes are the number one cause of death to children in North America. In the United States, 6 out of 10 children who die in crashes are unrestrained. In Canada, about 10,000 children ages 12 and under are injured, some fatally, in traffic collisions.

If you think riding without a seat belt puts only you at risk, think again. Unbelted occupants become projectiles in a crash and can seriously, even fatally injure other people in the vehicle. And adults who don't wear seat belts have a lethal influence on kids. Research shows that more than 70 percent of children who ride with unbuckled drivers are unbuckled themselves.

So what does all this have to do with fire safety? Everything. Fire departments respond nearly six times as often to medical emergencies as they do to fires. This means firefighters bear the burden of responding first to these needless tragedies. And we all pay a price: NHTSA reports that Americans pay \$14.3 billion in higher insurance premiums, public assistance, and taxes to subsidize those who don't buckle up. Employers lose

\$55 billion a year in higher insurance premiums, taxes, and lost productivity for employees involved in car crashes—costs passed on to consumers.

Having generously contributed their time and expertise to NFPA's *Risk Watch*<sup>™</sup> curriculum, NHTSA has asked NFPA to lend our support to their Buckle Up America campaign. They need our help increasing seat belt use from 68 to 85 percent and reducing child passenger fatalities 15 percent by the year 2000.

What can NFPA do? We can start by getting our own houses in order. You may be shocked to learn that 4 out of 5 car seats in the United States are used incorrectly! This means that even conscientious parents who think their children are safely restrained are dangerously mistaken. I was one of these parents, and I suspect many of you may be, too.

NFPA can also contribute by doing something we do extremely well: working with local communities to teach people to understand and practice safer ways of doing things. Just as *Learn Not to Burn*<sup>®</sup> and other NFPA programs have contributed to the downward trend in North American fire deaths in the past quarter century, *Risk Watch* promises to make a measurable difference in protecting children and their families from unintentional injuries, as well as fire. In fact, getting the word out to parents about the best way to protect children—buckled up in the back seat until they're at least 13—is an important piece of *Risk Watch*.

But education alone, though a critical piece of the strategy, can't solve this problem,

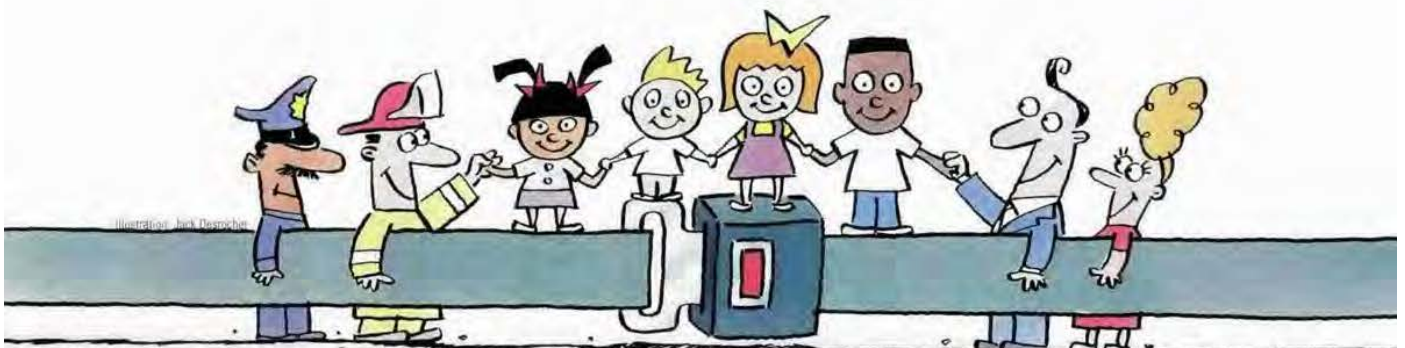
especially with males ages 16 to 25—the age group least likely to buckle up. Data suggest that neither education nor fear of injury is strong enough to motivate this tough-to-reach group. It takes stronger seat belt laws and high-visibility enforcement campaigns to get them to buckle up.

So here are four important things NFPA members can do to save lives on North America's roadways:

1. Organize or join a state or community partnership to pass stronger seat belt legislation.
2. Generate visibility for the Buckle Up America campaign and speak from your perspective as a fire and life safety advocate about the importance of seat belt use.
3. Work to pass primary seat belt laws in every state and close the gaps in child passenger safety laws to ensure that all children are covered in all seating positions.
4. Support local law enforcement's efforts to comply with your state's seat belt and child passenger safety laws. Publicize your support of these efforts.

Lending our support to Buckle Up America is in NFPA's best interest. Through partnerships like this one with NHTSA, the law enforcement community, and safety advocates outside the fire field, we'll expand our credibility and access at the community level. This not only furthers our fire safety goals, but it makes the world safer for ourselves and those we care about. ♦

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





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**Circle No. 023 on Reader Service Card**

# Making Codes Easier to Use

*Edward C. Lawry puts his years of code-making experience to work, making the NEC® more user-friendly.*

Hallie Ephron Touger

If the 1999 *National Electrical Code*® (NEC®) is easier to understand than past editions of the code, blame Edward Lawry—he headed the task force responsible for making the NEC more usable. Look beyond the larger pages, the two-column text, and the larger print, and you'll find a code that's been reorganized to make it easier to find what you're looking for and rewritten in simple, straightforward sentences. Such changes are essential to Lawry, who believes an electrical code must be comprehensible, as well as comprehensive.

## *How did you get involved with the NEC?*

I first joined an NEC panel in 1968. From 1975 to 1992, I was the chief electrical inspector for the state of Wisconsin. My job was enforcement, and part of it involved developing the *Wisconsin State Electrical Code*, which included portions of the NEC. So it was natural to become involved with code panel activities.

## *How were you involved in the 1999 NEC?*

I chaired the NEC Task Group on Usability. A lot of changes were incorporated into the 1999 NEC because of our work. A lot more people have become aware that a code should be user-friendly, and I think this is carrying over today into proposals—looking at proposals to see if they make the NEC easier to use.

## *What do you mean by usability?*

I like to look at usability in terms of readability. You ask yourself, "Is it easy to read? Do I understand the sentences?" We also try to write the code in positive language, as opposed to having a lot of negatives and exceptions to the rules. We try to use simpler language, shorter sentences. What it boils down to is this: Can you read it, and does it make sense?

## *Did some areas need more work than others?*

NFPA staff told us that they get more questions on grounding than any other subject, and I know from experience that grounding generates lots of ques-

tions at seminars and inspector meetings. With so many questions on grounding, we realized that people found that area of the code hard to understand. So the task group looked at Article 250 on grounding. Though there were few major changes in the requirements, the article was revised, reorganized, rearranged, and renumbered. This may be a challenge for people who've used the code for years, but it flows better and it's easier to understand.

## *What should the next edition of the NEC address?*

One new topic is arc fault circuit interrupters, a device that detects arcing in wires and opens the circuit before a fire starts. These replace regular circuit breakers, providing over-current protection in addition to arc fault protection. From a fire-safety standpoint, they appear to be a major advance. They're available now, though not currently mandated by code. They're intended to be required for specific circuits, as of January 1, 2002. ♦

## **Edward C. Lawry, P.E.**

### **Employment**

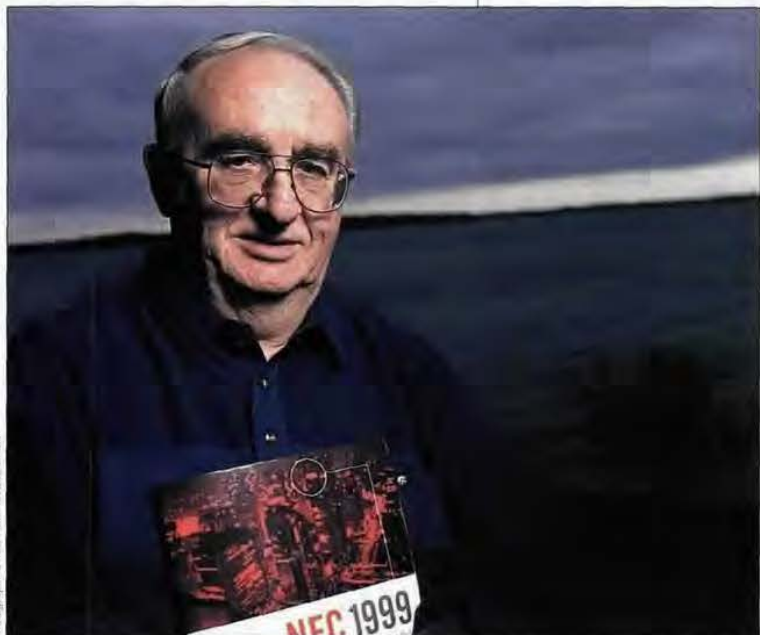
Code Consultant, International Association of Electrical Inspectors

### **Organizations**

NFPA, Member, Standards Council, NEC Correlating Committee; Past Chairman, NEC Code Panels and Task Group on Usability

International Association of Electrical Inspectors, Member; Past International President; Western Section Secretary-Treasurer

Underwriters Laboratories, Inc., Past Member, Advisory Committees



Photograph ©Staff from Hesint/SABA

# Taking Firefighter Safety Personally

*Once president of the Uniformed Firefighters Association, NYC Fire Commissioner Thomas Von Essen makes firefighter safety his mission.*

Hallie Ephron Touger

## Thomas Von Essen

### Employment

Fire Commissioner, Fire Department, City of New York

### Organizations

NFPA

Uniformed Firefighters Association (UFA), Past President

New York City Fire Department Pension Fund, Chair; Industry Advisory Board, Chair

New York Fire Safety Foundation Board

New York State Fire Advisory Board

International Association of Fire Chiefs

NYC Fire Museum Board of Trustees

Fire Department Welfare Fund, Chair

Photograph: ©James Leynse/SABA



**F**ive years ago, Thomas Von Essen was fighting fires in the Bronx. Today, he's fire commissioner of the city of New York. As commissioner and as the former president of the Uniformed Firefighters Association, his goal is to make firefighter deaths a thing of the past.

*You started your career in New York's most fire-prone area, the South Bronx. What was that like?*

I found the experience overwhelming—the poverty and the tragedy you saw every time you went to work. Every tour of duty had at least one horrible fire, often two or three. The terrible devastation was physically challenging and emotionally upsetting.

I was just out of the service when I started, and I had no idea what I was getting into. I thought I'd try the job, finish school, and move on to something in the private sector. But the experience was so exciting and challenging that I decided to stay on when I finished school. I've been here ever since.

*Last year, New York had the lowest number of civilian fire deaths since 1959. What made the difference?*

One reason is the economic revival. Property's more valuable, homes are being taken care of. And driving

back crime has made a big difference in arson. The fire department deserves a lot of credit, too. We have better protective clothing and excellent medical training. Ambulance service is now part of the fire department, and we've driven down ambulance response times by more than a minute. And we've more than tripled our fire-safety education efforts.

*What kind of fire education makes a difference?*

We've tried to attack this problem from every angle. We've accelerated firefighter training in every area, and I have a Fire Safety Education Bureau that has the resources it needs. We figure out where there's a problem and send a task force into that neighborhood. We give flyers out to every home, and we go to every school and nursing home. I'll go myself and stand at a subway station to give out smoke alarm batteries and fire-safety tips.

*Have firefighter deaths dropped, as well?*

We had one horrible fire in which two firefighters died, but that's all in the 30 months I've been commissioner. I don't like to think about an "average" number of firefighter deaths. I want to make it zero.

As for injuries, bunker gear's made a big difference. For years, the union pressed the fire department to do something about upper leg burns. In 1993, the department finally concluded that bunker gear was necessary, but budgetary reasons kept them from buying it. Shortly after his election, however, Mayor Giuliani saw the tragic results of such burns and authorized the \$12 million expense.

*Has your experience as union president affected you as commissioner?*

It's given me a heightened concern for firefighters' health and safety. When I became commissioner, I vowed I'd do everything I could to keep firefighters from dying due to a lack of training or resources. ♦

*Hallie Ephron Touger is a freelance writer living in Milton, Massachusetts.*

# HOT

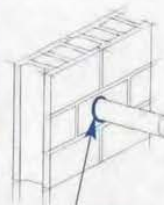
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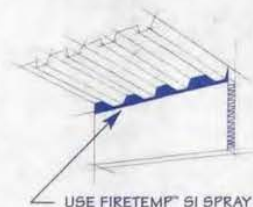
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# SMOKE ON THE WATER

*A dramatically smoky fire 2 miles from the Miami shore  
played on one of peoples' worst fears: fire at sea.*

Alisa Wolf



Judging by the box office success of the movie *Titanic*, shipboard emergencies hold a special fascination, which might also account for what some say was a glut of media coverage given last summer to the fire aboard a Carnival cruise ship, the *Ecstasy*. Dramatic pictures showed black smoke billowing from the stern of the ship, which had just left Miami on its way to Key West and was 2 miles (1.2 kilometers) from shore. Fortunately, the fire may have appeared more sensational than it actually was. Though 54 people, mostly crew, were treated for smoke inhalation and 20 were taken to hospitals, there were no serious injuries or deaths.

In the end, says Guy Colonna, NFPA's chief chemical and marine engineer, the most baffling question of all might be how a fuel load that seemed to consist almost solely of polypropylene rope on the open-air, aft mooring deck, where docking maneuvers are conducted, could burn for so long and produce so much thick, black smoke.

"There was hardly anything on that deck but winches for line and piles of coiled polypropylene rope, which melts—it doesn't

burn like manila rope would," Colonna says. But apparently, this rope was responsible for most of the heavy smoke and fire spread. It was the only material capable of burning for so long on a steel deck that carried little else that could burn.

NFPA's Fire Investigations Department sent Colonna and Fire Investigator Robert Duval to examine the ship after the blaze. They collaborated with investigators from the National Transportation Safety Board (NTSB); the U.S. Coast Guard; the Bureau of Alcohol, Tobacco, and Firearms (ATF); the Florida State Fire Marshal's Office; the Metro-Dade Fire Rescue and Police Departments; and consultants.

#### PRELIMINARY REPORT

According to information gathered during the investigation, the fire started on Monday, July 20, 1998, at approximately 5:10 p.m. on the Liberian-registered passenger ship, which had left Miami approximately a half hour before. The U.S. Coast Guard saw the smoke issuing from its stern on their video display monitors and radioed the *Ecstasy* to instruct the master to anchor. The master turned the ship to direct smoke away from passengers on deck, but the vessel lost



Photograph: ©Sun-Reporter/Carl Seibert



Photograph: ©Reuters/Peter Taylor

propulsion and steering, and the *Ecstasy* began to drift before he could anchor it. With help from responding tugs, firefighters on board the vessel brought the fire under control and extinguished it by about 9:09 p.m.

Once the fire was out, the ship returned to its berth in Miami, where, at 2:20 a.m. on July 21, the passengers disembarked. They spent the night in Miami hotels courtesy of the cruise ship line. According to newspaper reports, they also received refunds and free tickets for another cruise.

What observers didn't see in the papers or on television, says Tom Gallagher, Carnival Cruise Line's safety director, was the effort going on inside the ship, where up to 50 Carnival firefighters were working in passageways and corridors. Television commentators, who know little of firefighting, characterized crew members on exterior decks cooling down bulkheads and spraying down the sides of the ship as engaged in "a futile attempt to put out the fire."

"We weren't trying to put it out," Gallagher says. "We were trying to keep the decks cool to allow them to approach the fire and to keep the fire from spreading." Contrary to how it might have looked on camera, says Gallagher, fire crews were working according to a well-conceived plan.

The firefighting suppression equipment and the ship's fire boundary isolation design all worked as they were supposed to, Gallagher says, and though there was some smoke and fire spread on floors below and above the mooring deck, neither flames nor smoke penetrated the fire boundary, which effectively kept flames from spreading forward.

"Most of the damage was attributed to water damage from our own sprinkler system," he said, noting that there were also some areas of smoke damage. In preliminary reports, the extensive structural damage and other damage to the vessel was estimated at \$30 million. The ship was back in operation in September, after repairs were made.

### Fire origin

But the question remains: How did the rope on an open deck catch fire and burn for so long? The aft mooring deck on Deck 4 was the area of heaviest fire damage, but investigators found visible signs that smoke and hot gases had spread through vent ducts below the mooring deck. When the ship's fire alarm system on the bridge sounded, it indicated that a manual alarm had been activated in the laundry room.

Did the fire originate on the mooring deck, or somewhere below it? At this writing, investigators are still working to locate the point of fire origin. It could have started in the laundry room, where two mechanics were working before the fire on the laundry's mangle, a machine used to iron linens and prepare them for the folder. A large exhaust vent over the mangle removes heat and steam from the machine and from the laundry.

One of the mechanics said he broke a bolt, which he decided to weld back in place. Directly after the fire, the two men claimed that the flames broke out before they had a chance to use the welding equipment. When the mechanics were questioned again a few weeks later, however, they said that, though they had not yet begun working, they had turned on the equipment. One of the mechanics said he inadvertently allowed a dangling welding electrode to come into contact with the metal on the mangle. 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. At that point, they each grabbed a fire extinguisher and discharged it on the fire in the vent. However, they couldn't extinguish the flames, and more and more fire and smoke began to issue from the vent.

Meanwhile, the assistant laundry manager and a cabin steward broke the glass on local alarm boxes. When everyone had cleared the laundry room and the passageway outside it, the assistant manager closed the laundry room's watertight door, and the laundry manager closed the fire doors.

Soon afterward, members of the shipboard fire crew entered the laundry, which they found hot and smoky, but they saw no flames. They checked the dryers and the room's perimeter but found no sign of fire. Though the smoke was so thick they couldn't see any of the vent pipes above the rollers on the mangle, none of the laundry room's sprinklers had activated. There was no electrical power in the room.

The crew also found smoke on Deck 1, one floor below the laundry, and up to Deck 5, as well as flames on the mooring deck on Deck 4, two decks above the laundry (see Figure). The fire seemed to be coming from a pile of rope.

### Fire extension

Though the investigation continues, a safety recommendation issued by the NTSB states that accumulated lint in the vessel's exhaust ducting and laundry plenums served as a fuel source that enabled the fire to spread. After examining the laundry rooms on the *Ecstasy's* sister ships, the *Fantasy* and the *Imagination*, investigators determined that lint had probably also accumulated on the aft mooring deck, which was the exit point of the exhaust plenum. It appears that flames shot out of the metal-covered louvered vents on this deck, where they ignited the polypropylene rope that was wound on three large winches and stored on large pallets.

According to Carnival's Gallagher, the fire would have been easier to contain if it had been in the laundry room rather than the vent.

"We would have closed the damper to eliminate the flow of oxygen, and the fire doors and sprinklers would have activated," he says.

In actuality, watertight doors did block lateral fire spread from the mooring deck to the cabin passageways on both the port and starboard sides of the ship. However, flames leapt upward from the partially open and unsprinklered mooring deck on the stern. Aside from burned and bubbled paint on the mangle's two exhaust stacks, very little fire damage was found in the laundry room, where the fire's heat didn't even reach the necessary intensity to activate the room's automatic sprinklers.

Investigators did find the deck plating on the aft mooring deck severely warped, with damage increasing in intensity from starboard to port. On the starboard side, large areas of paint were still visible, and ropes stored there showed only moderate heat damage. However, pallets of rope reported to have been stored in the center of the deck were completely destroyed.

The stern thruster room on Deck 1, one deck below the laundry, was the lowest level to show fire damage. The fire evidently spread through ventilation ducts into the stern thruster room, uniformly covering the ceiling and most of the horizontal upward-facing surfaces of

the room with black soot, and melting its light fixtures, diffusers, and smoke alarms.

In other areas of the ship, investigators studied water discharge patterns and pipe debris on the sprinkler deflectors, which gave ample evidence that the automatic sprinklers in areas exposed to sufficient heat had activated and discharged water. Sprinklers activated on Decks 3 through 7, with the heaviest activity on Deck 5, one deck above the mooring deck. Almost all of the 40 to 50 sprinklers on Deck 5 activated, many more than is called for by the design area required by the International Convention for Safety of Life at Sea (SOLAS), a treaty that applies the regulations maintained by the International Maritime Organization to vessels on international voyages. These regulations don't require sprinklers on the mooring deck, where the *Ecstasy* fire was heaviest, because it's considered an open deck.

#### Lessons learned

The fire aboard the *Ecstasy* had a satisfactory ending, thanks to sprinklers and a fast response by fire crews on the vessel. But any fire at sea gives the fire protection community an opportunity to examine what happened and to determine what might be improved.

The most obvious lesson learned from this particular fire is that hot work is dangerous, no matter where it's conducted. A hot work permit and a fire watch are required on cruise ships before welding is done. On the *Ecstasy*, an electrical arc occurred while the mechanics were setting up, before they had a chance to call the engineer for a permit or fire watch.

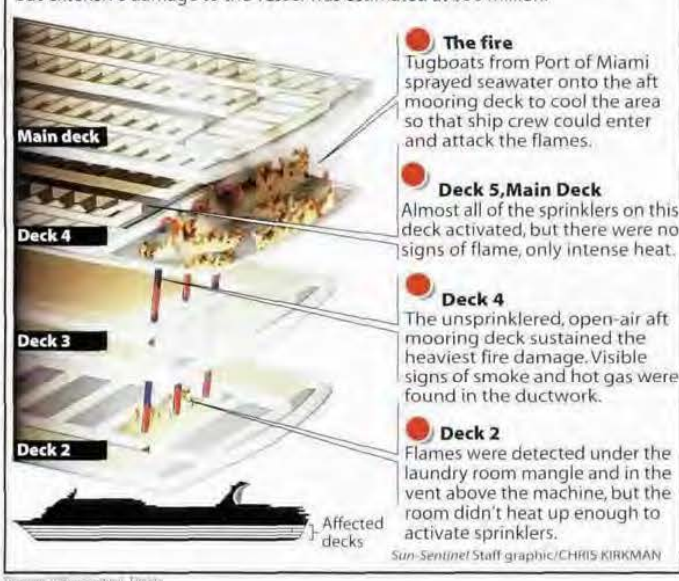
The *Ecstasy* fire also raises the issue of sprinkler coverage. Neither NFPA's new marine safety standard, NFPA 301, *Safety to Life from Fire on Merchant Vessels*, nor the SOLAS regulations require sprinklers on the mooring deck, which is considered an open deck.

According to Lt. Andrew Grenier, fire protection engineer for the Office of Design and Engineering Standards, Lifesaving and Fire Safety Standards Division of the U.S. Coast Guard, this fire may also raise questions about whether the mooring deck should be considered an open deck.

"We have to be careful when designating space categories," says Grenier. "In fact, many mooring decks are only partially open around their perimeter and are totally enclosed from above. In light of this fire, we have to question the level of protection provided in and around this space. Perhaps it should be treated differently within the existing regulations."

## Fire and Water

The blaze aboard the *Ecstasy* on Monday, July 20, 1998, left no one seriously injured, but extensive damage to the vessel was estimated at \$30 million.



Another issue this fire raises is maintenance of shipboard laundry rooms. The *Ecstasy* fire is the third cruise ship fire over the past two years to start in or near the ship's laundry. On July 27, 1996, five crew members died of smoke inhalation from a laundry room fire aboard the *Universe Explorer*, a Panamanian-flagged cruise ship that was about 25 miles (40 kilometers) from Juneau, Alaska. And on the Bahamian-registered *Vistaford*, which had left Fort Lauderdale, Florida, for the Azores on April 6, 1997, one crew member died of smoke inhalation when fire broke out in a storage area next to the laundry room. Six other

crew members and four passengers were injured in that fire.

In light of these incidents, Carnival Cruise Line voluntarily instituted an inspection of the laundry ventilation duct and plenum system on all of its vessels. And on October 20, 1998, the NTSB sent a letter to all cruise ship owners and operators recommending that they immediately do the same. The board also recommended that vessels institute a maintenance program to keep laundry ventilation systems clean and clear.

Ironically, the *Ecstasy* fire was the least severe of these three cruise ship fires in terms of life loss and injuries, but, because flames broke out close to shore, it was in easy reach of cameras. According to Gallagher, the presence of tugboats with hoses around the ship led many observers to conclude that these tugs were putting out the flames, when, actually, they were helping to cool the area. Ultimately, he says, two Carnival firefighters went out a starboard fire door when it was cool enough to do so and extinguished the fire on the aft mooring deck.

Fires on the open sea pose a greater life safety risk than those on ships near shore, since ships far from land are more vulnerable than those close to onshore resources. But, as Gallagher notes, the cruise line takes fire seriously and is prepared for it, no matter where it breaks out.

"We plan for it, train for it, and the end result in this instance shows that we were ready to deal with it," he says. "Had we been 300 miles at sea," he adds, out of reach of the tugboats, "we would have had the same result," except, perhaps, that fewer images of the billowing smoke would have been printed and televised.

Cruise ship disasters make good movies, and footage of real smoke on the water gets peoples' attention. But such images are only entertaining for those watching. They're quite another matter for the passengers and crew members on board. ♦

Alisa Wolf is editor of the NFPA Journal.



*Several patterns become apparent when we examine the various factors that lead to ignition. Perhaps the most obvious is that many people are simply oblivious to the fact that the way they interact with various items in their environment can lead to fire.*

Marty Ahrens

## Risky

Several years ago during Fire Prevention Week, I was working a booth at a state office building when a woman approached me about halogen lamps, which were receiving considerable media attention at the time. I agreed that halogen bulbs burned hotter than incandescent bulbs and that halogen lamps could start a fire in nearby combustibles more quickly than ordinary lamps could. She was surprised to hear that even an ordinary light bulb was hot enough to start a fire. She was also surprised when I told her that you didn't need an open flame to start a fire.

"Are you telling me I shouldn't let my curling iron warm up on the bed?" she asked.

This woman was interested enough in fire safety to stop by a booth devoted to the subject and to follow fire-related news, and she was smart enough to differentiate among types of hot items. Yet she was completely unaware that her unattended curling iron was a heat source, that her bedding was just waiting to catch fire, and that her own behavior was an ignition factor. She truly had no idea that something she probably did every day was incredibly risky.

### Ignition factors

According to NFPA 901, *Uniform Coding for Fire Protection*, which is the data classification system used by the National Fire Incident Reporting System (NFIRS), an ignition factor is something that allows the heat of ignition to combine with the material first ignited. By looking at this factor, we may be able to examine home fire safety more holistically, thus helping predict more accurately how new prod-

ucts can be misused. If we can do that, we may be able to target our fire-safety messages more effectively.

Among the many behaviors—and thus, ignition factors—that contribute to home structure fires are leaving products unattended, failing to maintain them, abandoning or discarding them, leaving combustible products too close to a heat source, falling asleep while using a product, and accidentally turning a product on or failing to turn it off. Other contributors are the inadequate control of open fires; cutting or welding too close to combustible products; spilling or releasing fuel accidentally; improperly storing or disposing of materials containing combustible liquids, which can result in spontaneous heating or chemical reactions; improperly starting or shutting down equipment; and overloading such equipment as electrical outlets, dryers, or incinerators. Other factors include thawing items such as frozen water pipes; colliding with, overturning, or knocking down lamps, candles, and other such items; being careless while washing parts or cleaning, painting, or refinishing products; putting products in the wrong containers; using the wrong type of fuel or fueling process; using a flammable liquid to kindle a fire; or being physically or mentally impaired or under the influence of drugs or alcohol when using a heat source.

Together, these ignition factors accounted for almost half, or 44.4 percent, of the 437,070 home structure fires reported to U.S. fire departments between 1992 and 1996. These fires caused 43.8 percent of the civilian fire deaths, 48.7 percent of the civilian fire injuries, and 28.7 percent of the direct property damage during that period (see Table 1).

Obviously, there are too many ignition factors to consider individu-

**TABLE 1 Home Structure Fires, by Selected Ignition Factors, 1992–1996 Annual Averages**

DATA SOURCES: 1992–1996 NFIRS, NFPA SURVEY

| IGNITION FACTOR                                   | FIRES                  | CIVILIAN DEATHS     | CIVILIAN INJURIES    | DIRECT PROPERTY DAMAGE IN MILLIONS |
|---------------------------------------------------|------------------------|---------------------|----------------------|------------------------------------|
|                                                   |                        |                     |                      |                                    |
| Unattended items                                  | 63,040 (14.4%)         | 160 (4.3%)          | 2,977 (14.9%)        | \$241.1 (5.6%)                     |
| Lack of maintenance                               | 37,140 (8.5%)          | 43 (1.2%)           | 240 (1.2%)           | \$98.5 (2.3%)                      |
| Combustible too close to heat                     | 24,670 (5.6%)          | 255 (6.9%)          | 1,403 (7.0%)         | \$226.6 (5.2%)                     |
| Accidentally turned on or not turned off          | 6,250 (1.4%)           | 20 (0.5%)           | 303 (1.5%)           | \$53.4 (1.2%)                      |
| Fuel spilled or released accidentally             | 2,870 (0.7%)           | 36 (1.0%)           | 372 (1.9%)           | \$38.5 (0.9%)                      |
| Improper storage                                  | 1,860 (0.4%)           | 10 (0.3%)           | 87 (0.4%)            | \$25.0 (0.6%)                      |
| Improper startup or shutdown procedure            | 1,600 (0.4%)           | 7 (0.2%)            | 92 (0.5%)            | \$9.4 (0.2%)                       |
| Collision, overturn, or knockdown                 | 1,100 (0.3%)           | 16 (0.4%)           | 96 (0.5%)            | \$13.4 (0.3%)                      |
| Washing parts, painting, cleaning, or refinishing | 1,090 (0.3%)           | 9 (0.2%)            | 222 (1.1%)           | \$11.2 (0.3%)                      |
| Improper container                                | 1,070 (0.2%)           | 4 (0.1%)            | 45 (0.2%)            | \$9.9 (0.2%)                       |
| Improper fueling technique                        | 800 (0.2%)             | 18 (0.5%)           | 96 (0.5%)            | \$10.1 (0.2%)                      |
| Flammable liquid used to kindle fire              | 600 (0.1%)             | 16 (0.4%)           | 105 (0.5%)           | \$7.4 (0.2%)                       |
| <b>Included ignition factors</b>                  | <b>142,070 (32.5%)</b> | <b>594 (16.0%)</b>  | <b>6,038 (30.2%)</b> | <b>\$744.6 (17.2%)</b>             |
| <b>All home fires</b>                             | <b>437,070 (100%)</b>  | <b>3,682 (100%)</b> | <b>19,937 (100%)</b> | <b>\$4,343.5 (100%)</b>            |

ally here, so we'll concentrate on six of the most significant, based on their frequency or consequences: unattended items, such as operating electrical equipment, cooking equipment, heaters, and candles; lack of maintenance; combustibles placed too close to a heat source; abandoned materials, such as lit cigarettes; falling asleep; and being impaired or unconscious.

#### Stating the risks

Quantifying risk is difficult under the best of circumstances, and sometimes, particularly when we look at behavior, the data we need simply don't exist. We don't know how often the specific causal factors occur, so we can't definitively state the risk of a fire starting. For example, we know that unattended or poorly maintained equipment may lead to a fire. In fact, the leading cause of all home structure fires is unattended items, which led to 14.4 percent of the fires. Fires caused by lack of maintenance ranked second. We also know that thousands of households suffer fires caused by unattended or poorly maintained equipment each year. But we can't say that "X fires result for every Y incidents of unattended equipment."

Based on the number of fires reported, however, we *can* tell whether certain scenarios occur more or less frequently. In this analysis, ignition factors that accounted for at least 5 percent of the reported home fires were considered high-frequency factors. Those that accounted for 1 to 5 percent were considered moderate-frequency factors, and those that caused less than 1 percent of the fires were considered low-frequency factors.

After identifying the relative frequency with which an ignition factor leads to a fire, it makes sense to examine the severity of the consequences of that type of fire (see Table 2). We can do this by examining death rates, injury rates, or average direct property loss per fire. For our purposes, we consider fires that result in more than 20 deaths per 1,000 fires high-consequence fires and those that result in 5 to 20 deaths moderate-consequence fires. Fires that result in fewer than 5 deaths per 1,000 fires are low-consequence fires. It's important to remember that high-frequency, low-consequence fires, such as unattended fires, cause more deaths every year than most of the low-frequency, high-consequence fires, such as those caused by improper fueling techniques (see Table 3).

The ignition factors involved in fires with the lowest death rates were

"lack of maintenance" and "unattended items." The factors involved in fires with the highest death rates were "unconscious, mental, or physical impairment, or drug or alcohol stupor," "flammable liquids used to kindle fire" and "improper fueling technique." "Washing parts, painting, cleaning, or refinishing" produced the highest injury rate.

Obviously, "unattended" and "lack of maintenance" as ignition factors usually involve equipment. In some cases, however, no equipment was involved in the ignition; the NFIRS data classification system captures items such as matches, lighters, and candles under the form of heat of ignition. Some fire officials are reluctant to list equipment that functioned properly as having been involved in ignition, so they report "no equipment." For our purposes, most of the equipment identified as having been involved in a fire is listed as some type of fueled or electrical equipment or appliance.

#### Home structure fires caused by abandoned materials

From 1992 through 1996, abandoned materials caused an average of 27,540 home structure fires annually and were responsible for 617 civilian fire deaths per year, more than any other ignition factor in the group in this study. Such fires also resulted in 1,998 civilian injuries and an estimated \$256.1 million in direct property damage. This represents 6.3 percent of the home structure fires, 16.7 percent of the civilian deaths, 10 percent of the civilian injuries, and 5.9 percent of the direct property damage.

What exactly is an abandoned item? In almost two-thirds of these fires, it was a lit cigarette. Stoves were involved in 8.3 percent of the abandoned material fires, and hot embers or ashes from tobacco products, fireplaces, wood stoves, barbecues, and so on provided the heat of ignition in 7.7 percent.

Because cigarettes, stoves, and ashes were responsible for so many fires, it follows that mattresses, bedding, upholstered furniture, rubbish, and cooking materials were often the items they ignited first. In 18.8 percent of the abandoned material fires, mattresses and bedding were the first things that caught fire. Rubbish, trash, and waste products caught fire first in another 18 percent, while upholstered furniture ignited first in 16.4 percent of the fires and cooking materials ignited first in 9.9 percent.

Many fire-safety messages focus on the need for care when smok-

**TABLE 2 Ignition Factors by Frequency and Consequence**

|                                           |      |                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| F<br>R<br>E<br>Q<br>U<br>E<br>N<br>C<br>Y | HIGH | <b>High Frequency<br/>High Consequence</b><br>Abandoned material                                                                                                                      | <b>High Frequency<br/>Moderate Consequence</b><br>Incendiary or suspicious<br>Short circuit or ground fault<br>Combustible too close to heat<br>Child playing                                                                                                                                                                                                                                                                                                                                                                                                    | <b>High Frequency<br/>Low Consequence</b><br>Unattended<br>Lack of maintenance                                                                                                                                                                                                                                                                                                                                                        |
|                                           |      | <b>Moderate Frequency<br/>High Consequence</b><br>Falling asleep                                                                                                                      | <b>Moderate Frequency<br/>Moderate Consequence</b><br>Other electrical failure<br>Unclassified misuse of heat<br>Unclassified ignition factor<br>Inadequate control of open fire<br>Unknown-type mechanical failure or malfunction                                                                                                                                                                                                                                                                                                                               | <b>Moderate Frequency<br/>Low Consequence</b><br>Part failure, leak, or break<br>Unclassified operational deficiency<br>Property too close<br>Accidentally turned on or not turned off<br>Rekindled from a previous fire<br>Lightning                                                                                                                                                                                                 |
|                                           | LOW  | <b>Low Frequency<br/>High Consequence</b><br>Unconscious, mental or physical impairment, drug or alcohol stupor<br>Improper fueling technique<br>Flammable liquid used to kindle fire | <b>Low Frequency<br/>Moderate Consequence</b><br>Overloaded<br>Installed too close to combustibles<br>Unknown-type misuse of heat<br>Unclassified misuse of material ignited<br>Fuel spilled or released accidentally<br>Spontaneous heating<br>Unknown-type operational deficiency<br>Improper storage<br>Unknown-type misuse of material<br>Collision, overturn, or knockdown<br>Washing parts, cleaning, painting, or refinishing<br>Unknown-type design, construction, or installation deficiency<br>High wind<br>High water, including floods<br>Earthquake | <b>Low Frequency<br/>Low Consequence</b><br>Automatic control failure<br>Cutting or welding too close<br>Unclassified mechanical failure or malfunction<br>Construction deficiency<br>Other installation deficiency<br>Improper startup or shutdown procedures<br>Thawing<br>Improper container<br>Unclassified design, construction, or installation deficiency<br>Backfire<br>Animal<br>Design deficiency<br>Manual control failure |
|                                           |      | HIGH                                                                                                                                                                                  | CONSEQUENCE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | LOW                                                                                                                                                                                                                                                                                                                                                                                                                                   |

ing, and it remains an important issue. As these statistics indicate, a cigarette left burning on upholstered furniture or bedding often results in tragedy.

#### Combustibles too close to heat

Combustibles placed too close to heat sources caused an average of 24,670 home structure fires between 1992 and 1996, resulting in 255 civilian deaths, 1,403 civilian injuries, and an estimated \$222.6 million in direct property damage per year. These fires represent 5.6 percent of the home structure fires, 6.9 percent of the civilian deaths, 7 percent of

the civilian injuries, and 5.2 percent of the direct property damage.

A wide variety of equipment was involved in these fires. For example, stovetops were responsible for 18.5 percent of the ignitions, fixed-area heaters for 10.1 percent, water heaters for 8.3 percent, light bulbs or light fixtures for 7.8 percent, portable heaters for 6.2 percent, and ovens or microwaves for 5.3 percent. Although portable heaters were involved in only 6.2 percent of the fires, they caused 31.5 percent of the civilian deaths, 12.7 percent of the civilian injuries, and 12.4 percent of the direct property damage.

Properly operating electrical equipment provided the heat of ignition in a quarter of the fires started by combustibles placed too close to heat sources, while heat from gas-fueled equipment ignited combustibles in another quarter of the incidents. Electric lamps were responsible for the heat of ignition in 7.2 percent of the fires, solid-fueled equipment such as wood stoves in 5.3 percent, and candles in 5 percent.

Three materials were disproportionately responsible for deadly home structure fires caused by combustible materials that were too close to heat sources. These were mattresses and bedding, which were first ignited in 6.3 percent of the fires but caused 15.7 percent of the civilian deaths; upholstered furniture, which was first ignited in 2.8 percent of the incidents but caused 12.2 percent of the deaths; and clothing that was being worn, which was first ignited in only 0.7 percent of these fires yet accounted for 16.2 percent of the deaths. Clothing that wasn't being worn was first ignited in 10.3 percent of these fires, and cooking materials were first ignited in 12.8 percent.

#### Unattended items

From 1992 through 1996, unattended items caused an average of 63,040 home structure fires annually, resulting in 160 civilian deaths, 2,977 civilian injuries, and an estimated \$241.1 million in direct property damage per year. These fires represent 14.4 percent of the home structure fires, 4.3 percent of the civilian deaths, 14.9 percent of the civilian injuries, and 5.6 percent of the direct property damage.

Most of these fires involved unattended cooking equipment. Stove-

**TABLE 3** **Casualty and Loss Rates for Home Fires with Specific Ignition Factors 1992–1996 Annual Averages (Sorted by Death Rate)**

Data sources: 1992–1996 NFIRS, NFPA survey

| <b>High consequence</b>                                               |            |             |              |
|-----------------------------------------------------------------------|------------|-------------|--------------|
| Unconscious, mental or physical impairment, or drug or alcohol stupor | 89.7       | 175.8       | \$7.9        |
| Falling asleep                                                        | 28.5       | 117.7       | \$7.0        |
| Flammable liquid used to kindle fire                                  | 26.8       | 176.2       | \$12.5       |
| Improper fueling technique                                            | 22.6       | 120.8       | \$12.7       |
| Abandoned or discarded material                                       | 22.4       | 72.6        | \$9.3        |
| <b>Moderate consequence</b>                                           |            |             |              |
| Collision, overturn, or knockdown                                     | 14.6       | 87.7        | \$12.2       |
| Fuel spilled or released accidentally                                 | 12.5       | 129.6       | \$13.4       |
| Combustible too close to heat                                         | 10.3       | 56.9        | \$9.2        |
| Overloaded                                                            | 9.8        | 35.1        | \$9.1        |
| Washing parts, painting, cleaning, or refinishing                     | 8.2        | 202.9       | \$10.2       |
| Inadequate control of open fire                                       | 6.4        | 46.3        | \$8.8        |
| Spontaneous heating                                                   | 5.4        | 33.3        | \$10.5       |
| Improper storage                                                      | 5.4        | 46.8        | \$13.5       |
| <b>Low consequence</b>                                                |            |             |              |
| Cutting or welding too close                                          | 4.6        | 44.1        | \$19.0       |
| Improper startup or shutdown procedures                               | 4.4        | 57.6        | \$5.9        |
| Thawing                                                               | 4.1        | 22.8        | \$12.0       |
| Improper container                                                    | 3.7        | 41.9        | \$9.2        |
| Accidentally turned on or not turned off                              | 3.2        | 48.5        | \$8.6        |
| Unattended items                                                      | 2.5        | 47.2        | \$3.8        |
| Lack of maintenance/worn out                                          | 1.2        | 6.5         | \$2.7        |
| <b>Included ignition factors</b>                                      | <b>8.4</b> | <b>50.1</b> | <b>\$6.4</b> |
| <b>Total</b>                                                          | <b>8.4</b> | <b>45.6</b> | <b>\$9.9</b> |

DEATHS PER 1,000 FIRES

INJURIES PER 1,000 FIRES

AVERAGE DOLLAR LOSS IN THOUSANDS

estimated \$98.5 million in direct property damage annually. These fires represent 8.5 percent of the home structure fires, 1.2 percent of the civilian deaths, 1.2 percent of the civilian injuries, and 2.3 percent of the direct property damage.

Heating equipment was involved in more than half of these fires. Unmaintained equipment includes fixed-area heaters, which were involved in 23.7 percent of the incidents; chimneys or gas vent flues, which were involved in 17.6 percent; dryers, which were involved in 10.7 percent; fireplaces, which were involved in 9.4 percent; and stovetops, which were involved in 6.6 percent.

The heat of ignition in almost half of these fires was provided by solid-fueled equipment, generally wood stoves or fireplaces, while properly operating electrical equipment was the heat source in 9.4 percent of the incidents. Heat from gas-fueled equipment was responsible for 8.6 percent of the fires, and hot embers or ashes provided the heat in 6.4 percent.

In many, if not most, of the other fires in this category, lack of maintenance means lack of cleaning. Rubbish, trash, and waste products, including creosote, were the items first ignited in half of the fires; cooking materials were first ignited in 8.7 percent; and dust, fiber, or lint was first ignited in 7.8 percent. Clearly, people need to monitor their appliances and other equipment for residue and follow the manufacturers' recommended maintenance schedules.

tops were the culprit in 64.4 percent of the incidents, and ovens or microwaves were involved in 6.8 percent.

In half of the fires started by unattended items, the item was a piece of properly operating electrical equipment. In another quarter of the fires, the heat of ignition was provided by gas-fueled equipment. Heat from improperly operating electrical equipment was blamed in 2.3 percent of these fires, while candles provided the heat in 2 percent. However, unattended candles caused 9.7 percent of the deaths, 4.2 percent of the injuries, and 6.4 percent of the direct property damage resulting from unattended items.

Given the fact that most of the fires involving unattended equipment were started by cooking equipment, it's hardly surprising that cooking materials were the item first ignited in four of every five fires caused by unattended products. Cabinets were first ignited in 2.6 percent.

#### Lack of maintenance

Although very frequent, fires caused by a lack of maintenance had the lowest death and injury rates, and the lowest average dollar loss among the ignition factors we studied. Between 1992 and 1996, a lack of maintenance caused an average of 37,140 home structure fires per year, resulting in 43 civilian deaths, 240 civilian injuries, and an

#### Falling asleep

Between 1992 and 1996, people who fell asleep while using some type of heat source allowed that source to ignite a combustible material in an average of 7,300 home structure fires, resulting in 208 civilian fire deaths, 860 civilian injuries, and an estimated \$51.4 million in direct property damage per year. These fires represent 1.7 percent of the home structure fires, 5.7 percent of the civilian deaths, 4.3 percent of the civilian injuries, and 1.2 percent of the direct property damage.

Public fire educators have long advised against smoking in bed or while drowsy, and for good reason: Cigarettes provided the heat needed for ignition in 29.8 percent of these fires and in 73.9 percent of the civilian deaths caused by falling asleep. Not surprisingly, a mattress or bedding was the item first ignited in 20.7 percent of these fires, and upholstered furniture was ignited first in 9.8 percent.

Cooking and using other heat sources when overtired is also dangerous. In fact, cooking materials were first ignited in half the fires caused by falling asleep, and stoves were involved in 43.3 percent of these fires. Ovens or microwaves were involved in another 4.3 percent. Properly operating electrical equipment provided the heat in 26.1 percent of these fires, gas-fueled equipment in 23.9 percent, and candles in 4.5 percent.

### Unconsciousness, impairment, or drug or alcohol stupor

People who were unconscious, mentally or physically impaired, or unable to function because of drugs or alcohol caused an average of 1,090 home structure fires per year between 1992 and 1996, resulting in 98 civilian fire deaths, 192 civilian injuries, and an estimated \$8.6 million in direct property damage annually. These fires represent 0.2 percent of the home structure fires, 2.7 percent of the civilian deaths, 1 percent of the civilian injuries, and 0.2 percent of the direct property damage.

Cigarettes provided the heat of ignition in 23.6 percent of these fires and 45.8 percent of the civilian deaths, while matches provided the heat in another 9.4 percent of these fires and lighters in 4.9 percent. Properly operating electrical equipment provided the heat in 22.9 percent.

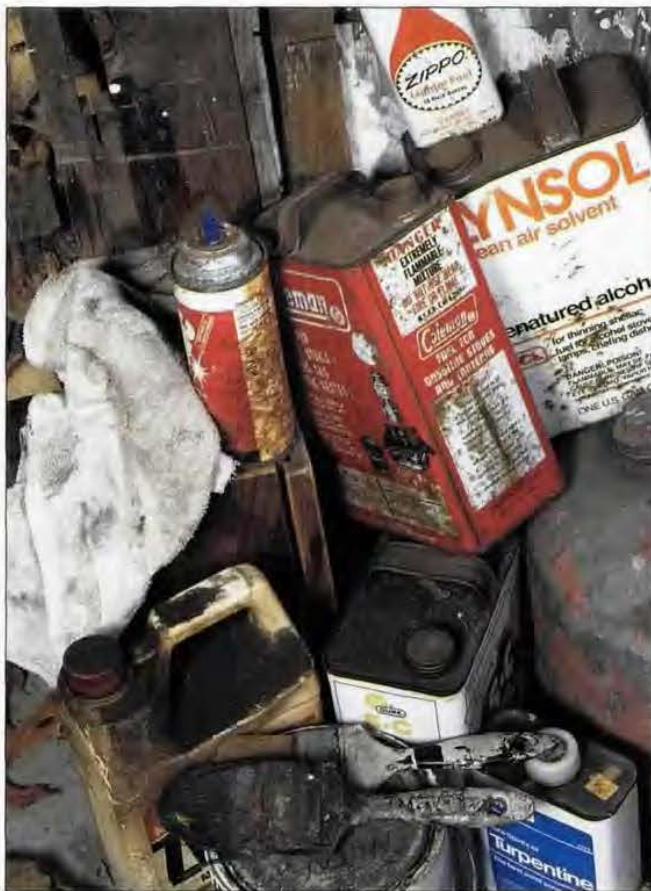
Mattresses or bedding were the items ignited first in 15.1 percent of these fires, and upholstered furniture was ignited first in 11 percent. Stoves were involved in 32 percent of these fires, and cooking materials were first ignited in 30.2 percent.

Members of the fire service are often reluctant to document suspected substance abuse without medical documentation, so it's possible that it's credited more often for serious fires than minor ones. However, the death rate for this ignition factor is higher than it is for any other. It stands to reason that someone who can't handle a heat source safely is at increased risk of dying in a fire, as is someone who can't escape or take corrective measures in the event of a problem. Smoking or cooking while drunk can have the same tragic results as driving under the influence.

### The moral of the story

Several patterns become apparent when we examine our six ignition factors. Perhaps the most obvious is that many people seem to be unaware of their surroundings and the way in which the different aspects of their environment interact. It's easy to forget that a wide variety of our possessions can catch fire and that numerous appliances we use every day produce enough heat to start a fire.

When heat is used to cause a change—to bring cooking oil up to sauté temperature, for example—the change will occur whether or not



anyone is paying attention. Most fires in our study were caused by items people simply forgot about.

To improve our home safety, we should ask ourselves a number of questions. What objects or equipment produce heat or flame or, more simply, get hot? We may not think of lamps or dryers as producing much heat, yet they're right there on the list of equipment involved in ignition.

And what objects or substances in the home can catch fire? Are the items that produce heat or flame a safe distance from such combustibles? What would happen if the candle you were burning was accidentally knocked over onto a pile of discarded newspapers? Or your child turned up the flame under that pan of cooking oil you'd left on the stove?

It's also easy to forget to have your appliances serviced or to check them for residue. What types of waste products

are associated with your heating equipment? How do you dispose of the ashes from your fireplace or the lint in your dryer? Could these waste products get hot enough to catch fire or start one?

And where and how do you use solvents, fuels, and other flammable liquids? Before you do, do you check for heat-producing objects nearby?

Are you likely to be distracted when you're using heat-producing equipment? How will you remember that you've turned your stove on? Does everyone in your family know the proper way to use your space heater?

We hope you'll find these questions—and this analysis—useful in your efforts to model fire scenarios. Clearly, most of these fires could have been prevented if those using the equipment or supplies had only paid attention to what they were doing. Or followed the directions. Or used their common sense.

To that woman who stopped by my booth during Fire Prevention Week all those years ago, I want to say thanks for the insight. It inspired me to look more closely at the gaps in people's understanding of their fire risk. I hope that, after talking to me, she stopped letting her curling iron warm up on her bed. And I hope that this message reaches others. ♦

*Marty Ahrens is a fire analysis specialist with NFPA's Fire Analysis and Research Division. To order a full copy of the report from which this article was adapted, call Nancy Schwartz at (617) 984-7450.*

# The 10-Year

*A viable new technology gets a push from a state senator  
before its implications have been fully explored.*



# Battery

Alisa Wolf

State Senator Randy Leonard, a lieutenant with the Portland, Oregon, Fire Bureau, was fired up about smoke alarms. Twenty years of firefighting had taught him that if people were standing outside a burning home, chances were it had working smoke alarms. By the same token, empty sidewalks often indicated that the home probably didn't have working alarms and that residents were trapped inside. When the Consumer Product Safety Commission (CPSC) released the results of a study in January 1995<sup>1</sup> that determined why 20 percent of residential smoke alarms don't sound during fires, Lieutenant Leonard was, by all accounts, shocked by its findings, which showed that the power source in 60 percent of such nonworking alarms is disconnected. The lieutenant decided it was time to do something to reduce the number of disconnected detectors and bring down the toll of injuries and deaths due to residential fires. And the senator went to work.

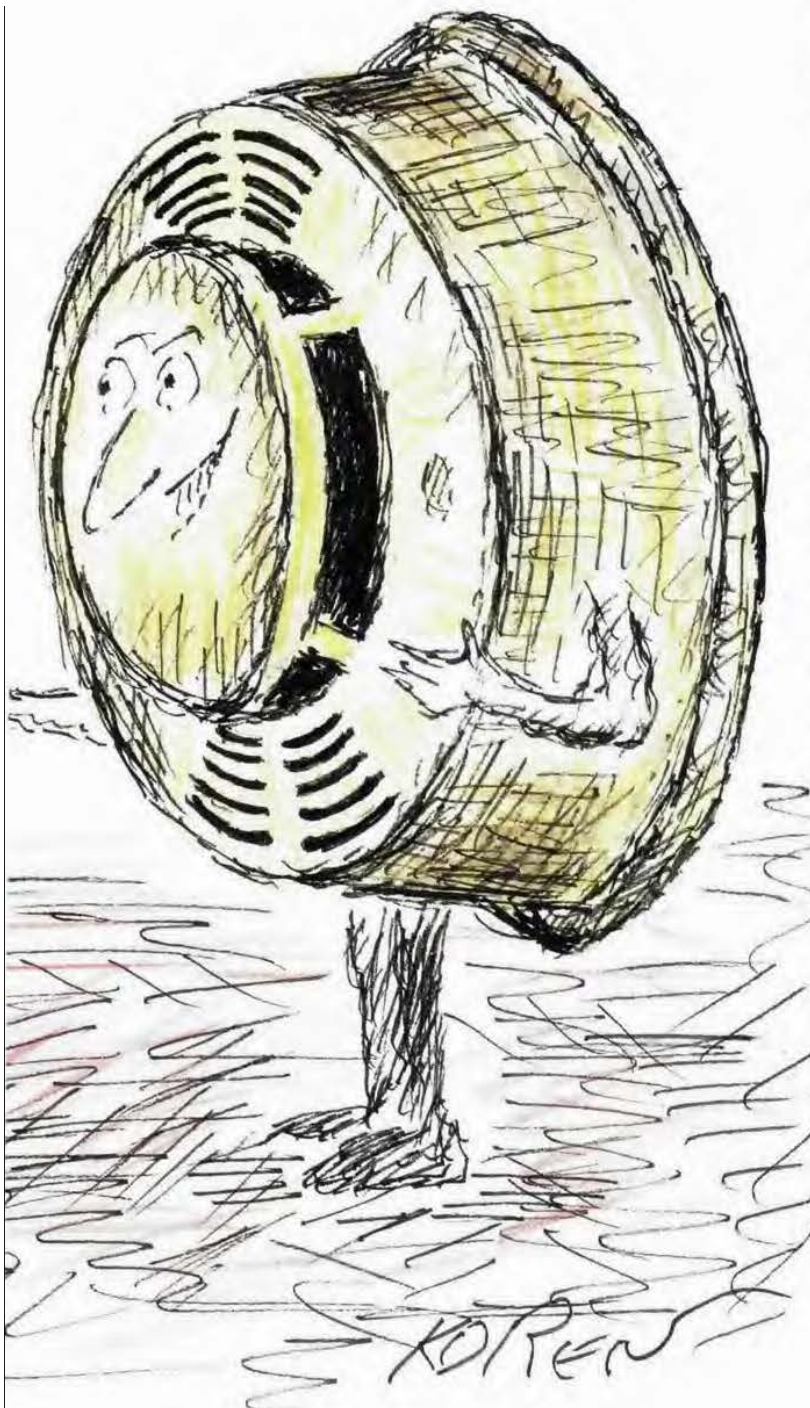
In 1997, according to Chief Deputy Bob Garrison of the Oregon State Fire Marshal's office, Senator Leonard proposed legislation that would have required hard-wired smoke alarms in all tenant-occupied housing. Landlords and other stakeholders thwarted the senator's efforts because of cost concerns, among them the price of retrofitting wiring to comply with NFPA 70, *National Electrical Code*<sup>®</sup>. The bill was debated until the final hours of the legislature's session.

"The bill went through three or four transmutations," Garrison says, "and we thought it had died." But in September, when the legislature reconvened, "we learned that the bill had gone forward in the closing hours in session." The substance of the bill, however, had changed considerably.

Rather than hard-wired smoke alarms, Senate Bill 874 had two new criteria for all residential smoke alarms in multifamily and single-family dwellings. First, the bill stated that all smoke alarms sold in Oregon, if solely battery-powered, had to have a 9-volt lithium battery. These batteries look just like the rectangular, 9-volt alkaline and zinc carbon batteries that fit residential smoke alarms, but they last longer—10 years, the manufacturer claims. The rationale behind the bill is that if people don't have to replace their batteries so often, they'll have fewer nonworking detectors.

But this won't stop people from pulling out batteries when their alarms are triggered by burnt toast or shower steam. The second requirement of Senate Bill 874 addresses this problem by requiring that each smoke alarm sold in Oregon have a hush feature that will automatically reset up to 15 minutes after it's

Illustration: Ed Kores



activated, allowing occupants to silence the alarm until the presumably harmless smoke clears.

In its intent, the bill tackles the two most common reasons for non-working smoke alarms: missing batteries due to the owners' failure to replace them when they wear out and alarms whose batteries have been pulled out in response to nuisance alarms.

According to Oregon's State Fire Marshal, Jim Crawford, the concept is sound.

"We should be looking for an alarm as low-maintenance and tamper-proof as possible, and with the 10-year battery, we don't have to worry about the battery being replaced, so there's less chance of it being inoperable," he says. "And the hush feature during false alarms makes it less likely that a person will disable the alarm permanently or yank the battery out."

But he admits that the legislation, as originally written, had some flaws.

As the Oregon fire protection community scrambled to comply with the new bill by January 1998, its main concern was keeping the shelves stocked with smoke alarms equipped with both a 10-year battery and a hush button. Only one company, Ultralife Batteries, Inc., manufactures a warrantee 9-volt lithium battery, and many, if not most, smoke alarms on the market don't have hush buttons. According to Chief Deputy Garrison, however, these issues were more easily overcome than he'd feared.

"We had no problem at all keeping competitively priced alarms on the shelf," he says.

As more states consider legislation similar to Oregon's, however, keeping the marketplace competitive becomes a more pressing issue.

"There could be a problem creating a market demand that industry has to catch up with," Crawford says.

He's referring to the fact that other manufacturers don't seem eager to compete with Ultralife, perhaps because the 9-volt battery market itself is limited. Stakeholders nationally are concerned that, should the 10-year battery become mandatory elsewhere in the country, Ultralife could find it difficult to keep up with demand.

#### How the technology stacks up

New York-based Ultralife Batteries, Inc., has been selling this product since 1992, according to Greg Smith, the company's marketing manager. But it wasn't until 1995, he says, that "we started seeing results that showed it would last 10 years in a typical ionization-type detector." These results were based on accelerated-life, elevated-temperature life span tests.

Only one alarm that runs on the lithium battery currently carries a conditional Underwriters Laboratories (UL) listing, based on technical information submitted during the listing process and on confirmation testing over 2 years, according to Paul Patty, associate managing engineer at UL. This is First Alert's 10-Year Detector, which is powered either by a built-in 9-volt lithium battery that can't be removed from its housing or by three built-in lithium battery cells. Since the battery won't activate until the alarm's installed, it won't run down while it sits on the shelf. And UL continues testing the unit, which also has a hush button, to make sure that the battery does, in fact, keep going for 10 years.

Ratifying the 10-year claim isn't a safety issue as much as it is a mar-

keting one, says Patty, because even if the battery runs down before its 10 years are up, the alarm will give the low-battery chirp to alert the user.

"In the case of the 10-year battery, the worst thing that's going to happen is it's not going last 10 years," Patty says. "At the end of its life, whether it lasts 7, 10, or 12 years, the battery trouble signal will sound. It's more of a marketing and warranty issue. Our safety concern is that at the end of the battery's life, there's a low-battery trouble signal."

Other smoke alarms packaged with the 9-volt lithium battery may also carry the UL mark, but that doesn't mean UL lists them for 10-year use.

"UL's requirements for a general purpose smoke detector, based on NFPA standards, is that, with a fresh battery, it will last one year," says Patty. "Others may be marketing alarms with a longer-life battery, but they've not asked us to confirm that they'll last 10 years."

As for hush buttons, UL considered and rejected a requirement that all smoke alarms have them, acknowledging, in essence, that hush buttons can be a useful consumer tool, but not in every case. According to Ric Erdheim, senior manager of Government Affairs at the National Electrical Manufacturers Association (NEMA), a hush button can be deadly in the wrong hands.

"You could push it in a real fire," he says, noting that this could be a real problem for people with impaired judgement, especially if they've been awakened in the middle of the night. For this and other reasons, hush buttons may not be the best choice for every room.

"You can make a good case for a hush button near a kitchen, a weaker case on an alarm in a bedroom," Erdheim says.

And for someone who can't reach the alarm, such as a person confined to a wheelchair or someone who can't distinguish the hush button from the test button, which may differ only subtly in appearance, a hush button is virtually useless.

The pros and cons of these new technologies might have been debated and settled through the NFPA consensus codes- and standards-making process like other new technologies, but the Oregon law and others like it now being considered in states such as New York and New Jersey have added urgency to the discussion. While opponents of the legislation don't object to the 10-year battery or the hush button as options, they worry that legislation mandating their use constrains the marketplace to the detriment of the consumer. Even more importantly, they wonder whether 10-year smoke alarms with hush buttons truly address the problems they were created to solve.

#### The best solution?

Is the 10-year smoke alarm the best solution to the problem of non-working smoke alarms?

According to Erdheim, the issue of nonworking detectors itself may be the wrong one to focus on, the CPSC study notwithstanding. He points out that a 1997 NFPA smoke alarm study<sup>3</sup> concludes that the majority of fire deaths occur in the 7 percent of homes without any smoke alarms at all, and he argues that we should be most concerned about getting smoke alarms into these homes.

This isn't to say that nuisance alarms aren't a concern. But, says Erdheim, even if a 10-year battery reduces the relatively small number of cases in which consumers fail to replace dead batteries, it won't stop nuisance alarms.

*Oregon's bill has inadvertently created marketplace issues  
that may also bear on life safety.*

"In fact," Erdheim says, "if you put a detector with a 10-year battery near a kitchen or bathroom, or if you smoke, you're going to have nuisance alarms. The bottom line with nuisance alarms is that if you put alarms in the wrong places, if you don't clean them and you don't replace them after 10 years, you're going to have them. Clearly, there's a need for education. Consumers have to assume some responsibility. If people don't act safely, that's probably the biggest problem."

Oregon's Fire Marshal Crawford, on the other hand, defends the use of legislation to further life safety.

"I'm a big believer in public education," he says, "but I recognize that we also have legislation and enforcement as part of our prevention tools, and I don't think it's inappropriate to consider legislation that would deal with this problem."

Unfortunately, Oregon's bill has inadvertently created another marketplace issue that may also bear on life safety: It's effectively abolished sales of single-station photoelectric alarms, which use too much power to run the 9-volt lithium battery for as long as 10 years. Pat Coughlin, director of Operation Life Safety, an advocacy group for residential fire safety, believes that, by inadvertently keeping photoelectric smoke alarms from the marketplace, the Oregon law might, in fact, be blocking the key technology for reducing nuisance alarms.

"The biggest reason people disable their alarms is because cooking sets them off, and we already have a reasonable solution to this problem in photoelectric alarms," he says. "They don't cost that much more, —you can get them for under \$20—and to prevent sales is ludicrous."

Long-life batteries in photoelectric alarms are currently being tested, but, according to Coughlin, they show that a photoelectric-type alarm may require two batteries to run for 10 years.

"The additional battery might make it cost-prohibitive," Coughlin says. "I don't know how much it would sell for."

Many experts believe that photoelectric-type smoke alarms are a better choice for residential alarms since they react better than ionization-type alarms to the smoldering phase of fires. Many fatal home fires begin with an extended smoldering phase, and an alarm during that phase would provide additional time for safe escape. Photoelectric-type alarms also resist unwanted alarms caused by cooking vapors or bathroom moisture slightly better than ionization-type detectors. However, ionization-type alarms respond quickly enough in all types of fires to permit safe escape, and NFPA doesn't endorse one over the other.

"The important thing is to have one that works," says Merton Bunker, NFPA's chief electrical engineer.

In most states, the choice of detectors is left up to the consumer or to the fire marshal's office. Deputy Fire Chief Joseph Fleming of Boston, Massachusetts, for example, supports a requirement for photoelectric-type alarms in certain rooms.

"In the new state building code, photoelectrics are required if smoke alarms are installed a certain number of feet from the kitchen and bathroom," Fleming says. The law doesn't rule out ionization-type alarms in other parts of a home.

In Oregon, however, ionization-type alarms have been elbowed off the shelves by the new law. David Christian, who represents Gentex Corporation, a maker of photoelectric-type alarms and a member of NFPA's Household Fire Warning Equipment Committee, says he has no problem with the 10-year battery technology, but he doesn't feel it should be the only choice.

"When you begin to require certain technologies, you take the ability of consumers to make choices out of their hands by dictating what they can and cannot buy," he says. "In many experts' opinions, there are better technologies in the marketplace."

Other types of residential alarms also suffer under the Oregon law. Like photoelectric-type alarms, combination carbon monoxide and smoke alarms use too much power for the 10-year battery. The same is true for combination photoelectric- and ionization-type smoke alarms. Until more testing clearly points the industry in the direction it should take to improve detection and reduce nuisance alarms, it's premature, argues Fleming, to promote one technology over another.

"I don't think we have enough information to look at in terms of risk analysis and cost benefit to absolutely decide which route to go in terms of improvement," says Fleming. "Different people in different parts of the country are taking different routes. Do I think there's a best one? Yes. But I'm not sure which route that is."

In Oregon, retailers, manufacturers, legal counselors, fire officials, retailers, and legislators are coming together to work within the boundaries of the 10-year battery mandate and iron out the kinks in Senate Bill 872 in time for the 1999 assembly.

"While there are some flaws," says Crawford, "it's incumbent on us to try to work this out without destroying the whole thing."

#### 10-year alarms vs. 10-year batteries

According to some safety experts, however, the mandatory use of 10-year batteries introduces new safety issues that legislation can't adequately address. For example, components in existing alarms running on 10-year batteries may wear out before the battery does. In this way, 10-year batteries might encourage owners of smoke alarms that are more than 10 years old to hold onto them when they should be replaced.

"Smoke alarms should only be used for 10 years," explains Dick Bukowski, senior research engineer at the National Institute of Standards and Technology and chairman of the Household Fire Warning Equipment Committee. Based on years of testing and the application of estimation techniques to determine how long a residential smoke alarm should last, NFPA recommends a general 10-year replacement program along with regular testing.

"It's not an easy question, 'how long will a smoke alarm last,'" Bukowski says, "but we came up with a failure rate of about 3 percent a year and then asked what total fraction having failed is acceptable. Ten years seemed reasonable—you may be replacing some alarms that are still functioning, but given the low cost of most alarms, it's better to replace them than wait until they die."

*The 10-year battery has its supporters both within and outside Oregon.*

Alarms with 10-year batteries built in make it easy for consumers to follow these guidelines, Bukowski points out, since they can throw the whole unit away 10 years after they install it. On the downside, a 10-year warranty might bring with it a sense of complacency. Like any other smoke alarm, the 10-year built-in battery unit should be tested—the manufacturer suggests it be tested weekly—and it should also be cleaned regularly.

"If you do not have to replace the battery," says UL's Patty, "you might not test and clean that alarm."

But Oregon's Chief Deputy Garrison points out that "if you're not testing your smoke detector regularly, it doesn't matter if you have a 1-year, a 10-year, or no battery." The 10-year battery, he contends, "isn't intended to eliminate the need for testing your smoke alarm. People should be testing it regularly."

Garrison also says that the 10-year recommendation is just that.

"The alarm may work for 13 years or more," Garrison says. And if a user tests it weekly, as instructed, safety shouldn't be an issue.

Another issue that concerns some experts is cost. In most parts of the country, people can buy a residential smoke alarm for around \$7, whereas First Alert's smoke alarm with a built-in battery and a hush button costs from \$22 to \$30. Consumers, at least in Oregon, may also choose to spend around \$15 for the 9-volt lithium battery sold in a residential smoke alarm with a hush button. And Garrison says that in Oregon, "every big box store in the state carries 10-year alarms for less than \$10."

The argument for the long-term cost effectiveness of the 10-year battery may make it an attractive option for certain consumers. Over time, the cost of replacing an alkaline or zinc carbon battery every year for the 10-year life of an alarm outstrips the initial outlay for a 10-year battery.

NEMA's Erdheim is concerned that even a slight cost increase may hamper efforts to ensure that low-income homes have adequate smoke alarm coverage. In a letter to Senator Leonard, he explained that "NFPA recommends that homes have alarms on every level and outside each sleeping area. More costly batteries with smoke alarms will discourage rather than encourage alarm use." (In new construction, NFPA requires alarms in every sleeping room.)

Those opposed to the 10-year legislation acknowledge that, conceptually, the 10-year battery is a good idea, but practically, its use may be limited. Any battery that can be removed from a smoke alarm, even a 10-year battery, does little to solve the problem of missing batteries due to nuisance alarms. Hush buttons on alarms with built-in batteries might keep some users from disabling their alarms, but they introduce their own risks. Finally, by limiting the products available, legislation like Oregon's restricts the marketplace, and it may inadvertently deprive low-income consumers of even the most basic protection.

#### Process

These are the issues NFPA's consensus codes- and standards-making process is designed to address. H. Wayne Boyd, who represents U.S. Safety and Engineering on NFPA's Household Fire Warning Equip-

ment Committee, opposes the Oregon law because it jumps ahead of NFPA standards.

"It's a unique law that doesn't lend itself to the product they're trying to require," says Boyd, who points out that there isn't any standard for 10-year battery protection in smoke alarms.

If a proposal for the next edition of NFPA 72 passes, the *National Fire Alarm Code* will require smoke alarms to be replaced every 10 years. A provision allowing 10-year smoke alarms wherever AC is required is also being considered, with the caveat that the technology must have an interconnect capability, which it currently doesn't.

But the committee hasn't even considered recommending the 10-year battery-powered smoke alarm over other choices for general residential use, says Bukowski.

"It's not a matter of blocking the technology," he says. "But there's not much consensus on any technical committee at this time about its advantages."

The technology has its supporters, both within and outside Oregon. Jim Hoebel, CPSC's chief engineer for fire hazards, believes that the 10-year battery takes smoke alarm technology in a productive direction.

"It's a good example of technology being developed to meet a perceived need," he says. "Basically, the CPSC report focused on the problems of lack of power in single-station smoke alarms. The long-life battery is at least one possible way of avoiding that kind of loss of power."

Focusing on alternative batteries in traditional alarms may also represent too narrow a focus. NFPA codes already require interconnected, hard-wired smoke alarms in new homes, an approach that eliminates the missing battery problem. And "smart detectors" with software and multiple sensors that can distinguish fires from nuisance alarms accurately are already well-established in commercial markets and could become affordable for home use in the future. States that legislate alarms to the extent that Oregon has may inadvertently keep such new applications off the shelves.

While acknowledging its limits, Hoebel still believes the long-life battery is a positive development. In fact, CPSC is working on 10-year battery and 10-year smoke alarm giveaway programs with the Centers for Disease Control. Significantly, though, CPSC hasn't taken a position on legislating long-life battery use.

Stakeholders in Oregon continue to address the shortcomings of Senate Bill 872, and stakeholders nationwide weigh in on code requirements for residential alarms when developing NFPA 72. Until one technology clearly answers the issues raised by different studies of residential smoke alarm use, the 10-year smoke alarm battery will remain one of many options on the national market. ♦

*Alisa Wolf is editor of NFPA Journal.*

1. Smith, L. E., *Fire Incident Study: National Smoke Detector Project*, U.S. Consumer Product Safety Commission, Bethesda, Md, January 1995.
2. Hall, John R., Jr., "U.S. Experience with Smoke Alarms and Other Fire Alarms: Who Has Them? How Well Do They Work? When Don't They Work?," *NFPA Journal*, Vol. 91, Number 5 (September/October 1997).

# IMPORTANT SAFETY RECALL AND CLASS ACTION SETTLEMENT

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Central Sprinkler Company ("Central") and the United States Consumer Product Safety Commission are announcing a settlement involving the recall and replacement of approximately 8.4 million Omega brand fire sprinklers manufactured since 1982 by Central. Plaintiffs in two suits representing a nationwide class have preliminarily settled their suits and are also announcing the availability of a remedy. Omega fire sprinklers are installed in homes, offices, hospitals, schools and other buildings around the country.

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Building owners and consumers are urged to take immediate action and call the Omega information line to learn more about the recall, how to identify Omega sprinklers, obtain a Proof of Claim form, and obtain further information about the Settlement, including how to participate in the Settlement and how the Settlement may affect their legal rights.

### SPRINKLER REPLACEMENTS

For consumers to get replacement sprinklers and any reimbursement towards installation costs, they must submit the Proof of Claim and Release Forms

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Until free replacement sprinklers are provided, consumers need to protect themselves against fire, have working smoke detectors and have adequate escape plans.

### CLASS ACTION

**If you are an owner or operator of a building that is or was equipped with Omega fire sprinklers, your legal rights may be affected by the proposed Class Action Settlement which, if approved by the Court, will result in the release of certain claims.**

Complete information about your rights as a Class Member, the Settlement Approval Process, how to exclude yourself from the Settlement Class, how to object or comment on the Settlement, and how to make a claim for replacement sprinklers and costs, including important dates and deadlines, is available in the Full Notice of Settlement.

**FOR FURTHER INFORMATION AND A COPY OF THE RECALL AND FULL NOTICE OF CLASS ACTION SETTLEMENT,**

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**OR WRITE: PO Box 1555; FARIBAULT, MN 55021-1555**

**OR VISIT: <http://www.omegarecall.com>**

PLEASE DO NOT CONTACT THE COURT. DATED: October 27, 1998 COMMISSIONER BRUCE E. MITCHELL.

The lawsuit and Settlement are under consideration in Hart v. Central Sprinkler Corp. No. BCL 78727 (Cal. Super Ct.). It is pending before Commissioner Bruce E. Mitchell in the Los Angeles County Superior Court.

# PLAYING WITH FIRE

Don Porth

*The youth firesetting problem  
has reached an unacceptable level,  
and it won't go away all by itself.*

I recently received a phone call from a reporter at a major television network who was trying to decide whether to do a story on the youth firesetting problem in the United States. He wasn't really convinced there was a problem—perhaps the fire service had made up the whole issue to gain support for its cause. His question was simple: “How do you know that youth firesetting is truly a problem?”

As I considered my answer, I realized that the only reason I know there's a problem is because my organization has taken the time to face the issue, explore it, and formulate solutions. But many organizations don't.

I don't know if I convinced the reporter that youth firesetting was a problem, but I do know that we can't continue to ignore it. The youth firesetting problem, which leads to the destruction of millions of dollars in property and the loss of hundreds of lives each year, has reached an unacceptable level, and it won't go away all by itself.

However, we might be able to reduce it by shedding a little more light on the subject. After all, information is our greatest weapon in the battle against ignorance. The discussion that follows is based on the results of a study done for the Portland, Oregon, Fire Bureau by SOS FIRES, a non-profit organization specializing in youth intervention programs.

## Defining the problem children

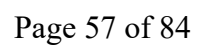
Children's behavior is influenced by the environment in which they live and play, and their understanding of that environment is limited by their ability to comprehend what's going on around them. Their limits can usually be gauged by their age.

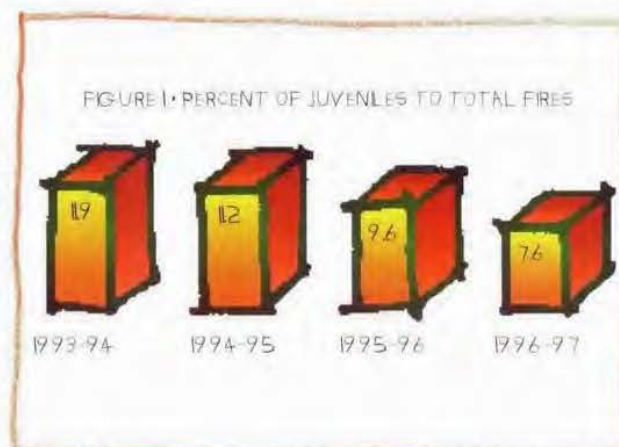
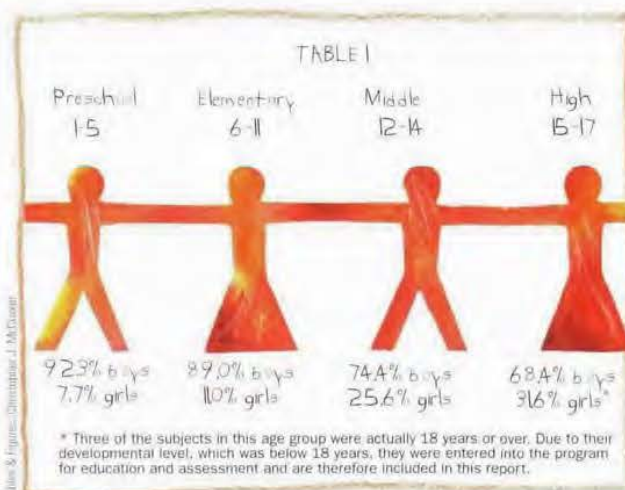
Drawing on the categories used in school systems across the United States—which, admittedly, aren't perfect—this study clustered children into four age groups: preschool, which consisted of children ages 1 to 5; elementary, consisting of children ages 6 to 11; middle, with children ages 12 to 14; and high, with children 15 to 17 years old.

The children were also separated into three groups sorted by the level of concern they presented to those interested in juvenile firesetting. These labels—“little concern,” “definite concern,” and “extreme concern”—were taken from the juvenile firesetter assessment tool developed by the U.S. Fire Administration.

“Little concern” refers to a child whose firesetting behavior, which is probably a result of curiosity or lack of information about fire and its con-

Illustrations: Andy Brown





sequences, can generally be resolved by teaching the child about the dangers of fire.

"Definite concern" refers to what's known as reactionary firesetting. In other words, the child's firesetting behavior is a reaction to some type of stress, crisis, or dysfunction in his or her life. Education, while important, probably won't put a stop to the behavior. What's needed is some type of behavior modification, which may require mental health intervention, medical treatment, or parental intervention.

The term "extreme concern" extends beyond "definite concern" to encompass children who immediately need some type of intervention beyond education. The behavior of children who are setting fires is of extreme concern when the firesetting is likely to persist while their families struggle to get qualified help. Urgency is the key criterion for this category.

### The juvenile firesetter program

The subjects of this study were drawn from the database of the Portland Fire Bureau's Juvenile Firesetter Program. Cases were taken from fiscal years 1992-93, 1993-94, 1994-95, and 1995-96, during which 551 children were interviewed, assessed, and categorized (see Figure 1).

Thirteen percent of the sample consisted of girls and 87 percent consisted of boys (see Figure 2). Of note is the gender distribution among age groups. In the preschool group, 92.3 percent of the children were boys, and 7.7 percent were girls. In the elementary group, 89 percent were boys, and 11 percent were girls. In the middle group, 74.4 percent were boys, and 25.6 percent were girls. And in the high group, 68.4 percent were boys, and 31.6 percent were girls (see Table 1).

Of the 551 children seen, 63 percent were classified as being of little concern, 34.1 percent were of definite concern, and 2.9 percent

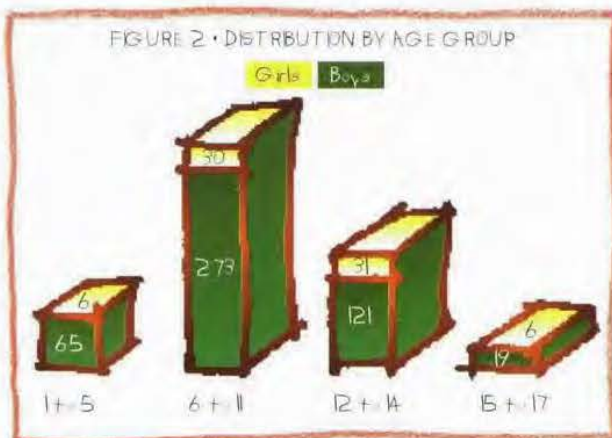
were of extreme concern (see Figure 3). In the group of little concern, 84.3 percent were boys, and 15.7 percent were girls. In the group of definite concern, 85.4 percent were boys, and 14.6 percent were girls. And in the group of extreme concern, 85.7 percent were boys, and 14.3 percent were girls. This would seem to show that the age of a child in a firesetting group is a strong indicator of gender, with girls becoming more likely to be involved as they get older. While boys are more likely than girls to exhibit firesetting behavior, girls are consistently represented within the different groups.

The study also looked at nine different firesetting behavior points, including the day of the week the incidents occurred, the time of day they occurred, the ignition sources, the first items ignited, and the locations of the fires. Researchers also took into account the children's access to matches or lighters, whether any of the children's associates were also involved in the incident, whether anyone who lived in the children's homes smoked, and whether the children had been referred to the firesetter program before.

Although the exploration of a single behavior point is unlikely to lead to a solution to a child's firesetting problem, the availability of matches and lighters may be the single most significant factor in child firesetting, particularly among preschool children whose knowledge is limited and whose desire to explore and learn is intense. Lighters are the easiest ignition source to operate, and their size and color make them attractive to younger children. Match use is very rare in children ages 1 to 4, although matches become a significant ignition source beginning at age 5.

The prevalence of an adult smoker in preschool firesetter's homes occurs at about the same rate as match and lighter accessibility. It's difficult to examine each family individually, but we can say that children typically set fires in the early afternoon when they get home from preschool, are put down for a nap, or become bored. Early afternoon may also be a time of low supervision.





Because preschoolers tend to be less mobile, they generally set fires, regardless of their level of concern, in areas to which they have regular access, such as their bedrooms and yards. This same group of children has a high level of bedding and clothing fires, which is also consistent with the fire's place of origin.

Less than 8 percent of the children in the preschool group are girls. Whether boys or girls, however, most children this age act alone in their firesetting.

#### The power of peer pressure

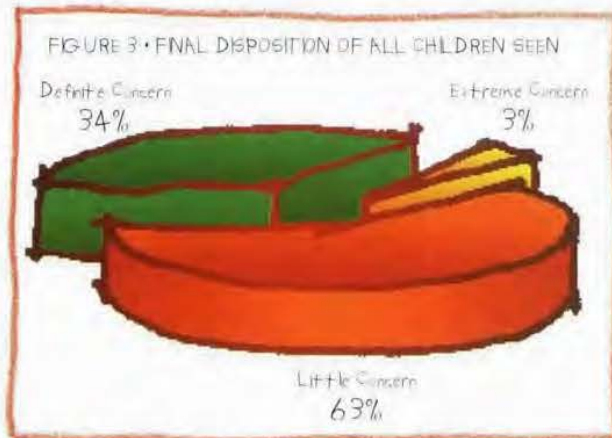
From ages 6 to 11, the number of girls setting fires increases to 11 percent, but they continue to act alone in most cases. In the "little concern" category, match play exceeds lighter play for the first—and only—time in the study. Access to matches and lighters remains high for children in this age group, as does the prevalence of adult smokers in the home.

Their firesetting still centers around the home, but it shifts to later in the day, around dinner time, when adults are typically busy and supervision may be low. It also moves to the yard, which is the most common location for firesetting by children of this age. This is consistent with their increased mobility and independence.

Kids this age should be receiving fire safety education in school, but that may not always happen. And even if it does, the lessons may focus on fire survival skills, such as "stop, drop, and roll," rather than active concepts, such as "matches and lighters are tools, not toys." While kids are literally "learning sponges" at this age, they must be taught the appropriate behavior before they can exhibit it.

The profiles of children in the middle and high age groups are similar to each other, so we'll discuss them collectively.

The number of girls setting fires continues to grow as children get older, until girls make up more than 25 percent of the sample in the middle group, which runs from 12 to 14 years old, and almost 32 per-



cent in the 15-to-17 age group. Girls also begin to set more fires in the company of others, a pattern that's strong among boys this age, too. Peer pressure and the need for affiliation become powerful forces at this age, which probably accounts for this change.

Children of this age also have a propensity for daring and exciting activities, such as "huffing," which involves inhaling butane from a lighter, then blowing it out and igniting it. The result is a torch-like effect from the mouth. This can also be replicated by capturing butane in the hand and igniting it as it's released.

As might be expected, lighters are by far the ignition source of choice at this age, and the items lit tend to be paper, trash, or articles of little or no value. However, this doesn't mean that the fires don't get out of control and lead to criminal charges, such as reckless burning or arson. Arson was intentionally omitted from this study because it's a criminal definition that only applies to a certain age range, usually around 10 to 12 years old. However, the age may differ in different states. In itself, the definition of arson doesn't necessarily indicate motive. Nor does it get us any closer to solving the problem of juvenile firesetting.

While the study doesn't indicate whether the children in these age groups smoke, they're at an age where they can buy smoking materials if they choose. Thus, personal choice is also a factor in their behavior.

So is independent activity. Children now set fires most frequently at school during the times normally associated with lunch, which may be when kids of this age are left to their own devices.

#### Firesetters of little, definite, and extreme concern

The gender distribution of firesetters of little concern is the same as the entire sample, about 85 percent boys and 15 percent girls. The elementary school children in this category are the only ones who choose matches over lighters as their primary ignition source. Matches, while



less efficient for purposeful firesetting, are probably more fascinating for the curious young child.

At any age, the children in this category rarely repeat the behavior once they've received the appropriate educational intervention.

The gender breakdown among kids in the "definite concern" category remains the same as that among children in the "little concern" category. They tend to ignite ordinary trash most frequently, then clothing and bedding. They're also more likely to be recidivists: About 16 percent of the children in the sample that received appropriate educational intervention set fires again. These children need intervention beyond education, and their parents must follow through if the training is to be successful.

The sample of children in the extreme concern category was very small, so definitive problem-solving strategies are impossible. However, we can say that, even after appropriate educational intervention, approximately 50 percent of these children can be expected to repeat their firesetting behavior. These children need much more than educational intervention, and it's incumbent upon their parents to follow up on the recommended treatment.

#### An educational opportunity

The majority of the children in this study—63 percent—were deemed to be firesetters of little concern who set fires primarily out of curiosity or because they didn't realize what fire could do. These children would probably never have engaged in firesetting behavior in the first place had they been given appropriate and accurate information, and a lot of firesetting behavior can be eliminated if such kids participate in aggressive and comprehensive educational programs.

The Youth Education Program delivered by the Portland Fire Bureau illustrates how effective fire-safety education can be. At the end of fiscal year 1993-94, Portland's youth fire problem represented 11.9 percent of



all fires in the bureau's response area. The following year, a focused campaign to provide more comprehensive education was implemented. This included the primary components of a program that was designed to increase the presence of firefighters in the schools, as well as the distribution of the NFPA's *Learn Not to Burn*® Curriculum and the implementation of additional educational programs in schools that serve communities in which the risks of youth firesetting are greatest.

By the end of fiscal year 1996-97, Portland's youth fire problem had dropped 36 percent to 7.6 percent of the total fire problem. During this same time period, not one fire death resulted from a fire set by a child. In

the previous eight years, 16 people had died in fires set by children.

Youth firesetting is a dangerous behavior, and we can't afford to ignore it. Though it may seem mysterious and difficult to combat, kids actually give many clues that can lead the interventionist to solutions. However, approaching youth firesetter intervention without understanding the audience is a little like throwing darts blindfolded—you may hit your target, but only by chance.

Education can help stem the youth fire problem, but only if it's properly targeted, designed, and delivered. And to do this, educators have to consider not only how best to reach the child but why the child is acting as he or she is. Finding out what motivates a child's behavior will allow an educator to tailor a program for that child, which is the surest way to solve the youth firesetter problem. ♦

*Don Porth is director of Public Education for the Portland, Oregon, Fire Bureau and president of SOS FIRES: Youth Intervention Programs, a nonprofit organization specializing in youth intervention programs. This article is adapted from the full report, which can be accessed on the Internet, without supporting graphs, at [www.sosfires.com](http://www.sosfires.com). To obtain a copy of the report with supporting graphs by mail, send \$4.00 to cover printing and postage to SOS FIRES at 55 SW Ash Street, Portland, Oregon 97204 or call (503) 823-3615.*



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# Building a Fire-Safe Dorm

*A Northeastern University dormitory currently under construction will combine fire and life safety to protect a challenging population.*

Eileen Mongeau

In theory, fire protection in a residential facility such as the West Campus Residence Hall, now under construction at Northeastern University in Boston, Massachusetts, is similar to that in a commercial apartment building. However, college students present special challenges to fire safety professionals.

"The majority of our students are 17- to 21-year-olds who are living away from home for the first time," says Jim Ferrier, associate director of Public Safety at Northeastern. "For the most part, they're not safety- and security-conscious.

"For example, they may cover up a smoke detector so that they can smoke a cigarette or try to use an unauthorized exit as a short-cut to get to class," he explains. In addition, horseplay and pranks may accidentally set off a fire alarm or render a fire extinguisher useless.

"Because we're ultimately responsible for their safety, we have to impose systems on them," says Ferrier. "And we need to have checks and balances so that if one system fails, there's a backup system in place to ensure safety at all times."

Because of its urban location in the heart of downtown Boston, Northeastern maintains a very strong commitment to fire safety, personal safety, and physical security on campus. The school has its own full-service Public Safety Division that includes a full-time fire safety officer and 40 full-time armed police officers who have full law-enforcement authority on campus. The police officers, who are also trained as emergency medical technicians, operate the school's own Class I ambulance. Another 20 full-time unarmed security officers and a handful of co-op students employed as uniformed police cadets supplement the police officers' nonenforcement activities. Together, these public safety officers patrol the campus' 80 buildings and provide a

comprehensive program of police, security, crime prevention, fire safety, and emergency medical services for Northeastern's students, residents, and staff.

Northeastern is Massachusetts' fourth largest university—nearly 27,000 students were enrolled in full- or part-time undergraduate and graduate programs last fall. Established in 1898, Northeastern attracts students from throughout the United States and more than 100 foreign countries to its dynamic, cooperative learning environment that combines terms of paid, professional work experience with traditional classroom instruction in a unique five-year program. The school grants degrees through seven colleges and nine graduate and professional schools, including arts and sciences, business administration, criminal justice, computer science, engineering, nursing, journalism, and law.

Approximately one-third of the nearly 12,000 full-time undergraduate students live in 1 of 25 residential facilities on Northeastern's main Boston campus. Two-thirds of the university's residence halls are either traditional dormitories or suite-style living units, with shared bedrooms, bathrooms, and common areas. Upperclassmen, who rotate their classroom time with semesters of full-time employment, live in apartment-style buildings that also include kitchens.

## New residence facility under construction

In response to an increased demand for on-campus housing for upperclassmen, Northeastern broke ground in 1998 on a new residential facility, the West Campus Residence Hall. Currently under construction, the 222,000-square-foot (20,600-square-meter) facility will be ready for occupancy in the fall of 1999. Similar to a traditional apartment



Graphic: William Beaton Associates Architects, Inc.

Graphic: Northeastern University

building, the completed structure will house 600 students in 165 units. Each apartment will consist of two to four bedrooms, a bathroom, a living room, and a kitchen, and will house four to six students.

The new building represents the first new residence hall Northeastern has built in 20 years. From the beginning, a project team that includes representatives of many of the college's internal departments, including the physical plant, maintenance, fire safety, public safety, and residence life, have been working with the architect and general contractor on the building's design.

"It's important to get everyone's input early on so that we can design systems and processes for fire safety and security that meet the needs of everyone who needs to access the building," says Nancy May, project manager for Northeastern's Physical Plant Department.

"When it comes to residence halls, in particular, we have the most comprehensive safety and security systems of any urban campus in the country," adds Ferrier. "In the past, we've gone back and retrofitted our other facilities. This is the first time we've been able to integrate our ideal system into the construction of a new residence hall."

#### **Building design**

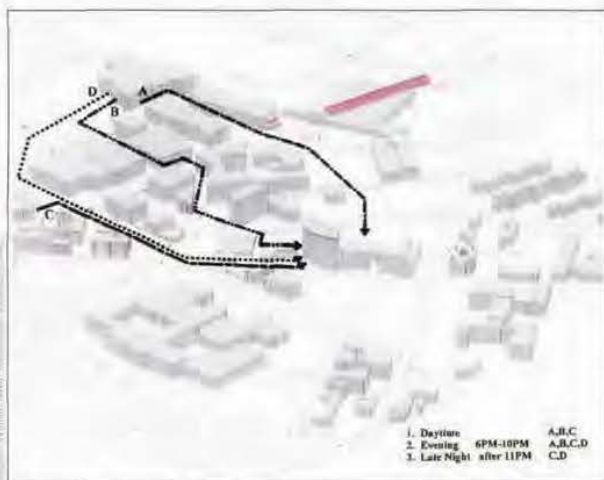
The design of the new, co-ed residence hall—a combined 13-story high-rise and six-story low-rise building—is unique. Although it will look like one building from the outside, it will function, for a variety of reasons, including fire safety, as two buildings, thanks to a separating wall that prevents access between the low-rise and the high-rise sections.

"The reason for the wall is to manage the volume of students in and out of the building," says Jack Niven, associate director of Facilities and Planning in Northeastern's Residence Life Division. Northeastern has very strict systems in place to control access, particularly to residence facilities. Trained community receptionists are in the lobby 24 hours a day to make sure only residents with a valid ID and their guests are allowed to enter the building using an electronic access control system.

"Although certainly more labor-intensive and expensive than a strictly electronic system, our philosophy around public safety has always been to protect people with people, and to supplement that with technology," explains Ferrier.

"It wouldn't have been feasible for proctors to check IDs of 600 stu-





*This analysis of traffic flow at Northeastern University helped architects and fire officials determine the shape of the dormitory and where to place exits.*

dents entering the facility numerous times on a daily basis," says Niven. For this reason, the building is designed to house 200 students in the low-rise part of the building and 400 students in the high-rise section.

"The fact that fire safety and security fall under the same Public Safety Division ensures that the two functions are integrated so that the needs of one are balanced with the needs of the other," says Ferrier.

For security reasons, for example, students in Northeastern's new residence hall, as in all of its residential facilities, will only be allowed to enter and exit using the building's main entrance—in this case, either the low-rise or the high-rise. All other exit doors will be locked 24 hours a day and will be equipped with crash bars with a local alarm, as well as magnetic contacts hooked into the main fire alarm system.

"To prevent students from using unauthorized exits, some doors will be equipped with electromagnetic locks," explains Ferrier.

When someone tries to leave through one of these doors, an audible alarm will sound, and there will be a 15-second delay before the door opens.

"However, to ensure fire safety, when a fire alarm goes off, the delayed egress will automatically be canceled, and the door will unlock immediately," he adds.

Likewise, it's important that smoke doors, which open into corridors or stairwells, automatically close in the event of a fire. In reality, however, students often prop open the doors with barrels or bricks, preventing this type of system from working properly.

"So we're designing a system in which the doors will be held open magnetically; when a fire alarm is activated, the magnetic hold-back will automatically release," Ferrier explains.

#### **Fire detection and alarm system**

Northeastern University is recognized by the city of Boston as an authorized central station that monitors its own fire detection and alarm system. Full-time, trained communications officers answer calls 24 hours a day from Northeastern's Police Operations Center, the central station that monitors fire and burglar alarms in all of the buildings on campus. When any type of security or fire alarm is activated, a sig-

nal is sent to this central station, and a police officer is immediately dispatched to investigate the situation.

In addition, the operations center has direct phone lines to both the Boston Police and Fire Departments so that the university dispatcher can provide detailed information, ensuring prompt and effective assistance and support.

In designing the fire safety system for the West Campus Residence Hall, Northeastern chose a Notifier AM2020® Intelligent Fire Alarm and Detection System.

"This is an intelligent, addressable fire alarm control panel with the capacity for up to 1,980 individually identifiable and controllable detection/control points," explains Peter Rizzi, Northeastern's fire safety officer. These include smoke, duct, and heat detectors; beam detectors; waterflow and tamper switches; and manual pull stations. The analog system is sensitivity-adjustable and has maintenance-alert features.

A diesel-fueled emergency generator will provide back-up power to the fire alarm system, fire pump, elevators, and emergency lighting system.

#### **Sprinkler and smoke evacuation systems**

Like any commercial high-rise apartment building, Northeastern's new residence facility will be fully sprinklered throughout with an automatic, wet-standpipe sprinkler system assembled by TMP Consulting Engineers, Inc. The fire protection system will be fully integrated with the fire alarm system and when any of the nearly 100 water flow alarms, tamper alarms, or pressure switches activate, the campus's police operations center and the Boston Fire Department will be notified. An automatic, electric, 1,000-gallon-per-minute fire pump from Patterson Pump will serve the facility.

"Because the building will be completely sprinklered, students actually are safer than they are in a private residence," says Rizzi. Each apartment will be equipped with a dry chemical fire extinguisher, manufactured by Laresen's Manufacturing, but "because not everyone is trained or is comfortable using this equipment, we encourage students to activate the fire alarm and evacuate the building in the event of a kitchen fire," he adds.

Northeastern's fire protection system will also have a mechanism for detecting and controlling smoke, including smoke vestibules in one of two stairways in the high-rise building. When a pull station, smoke detector, or water flow switch is activated, the heating, ventilation, and air conditioning system will automatically start the stairway pressurization fans. 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.

#### **Smoke detectors in the living areas**

Northeastern is also installing Notifier smoke detectors with battery backup throughout the new building, as required by state fire codes. Even within the living areas the University has chosen to install system smoke detectors with battery backup (up to 72 hours), all powered and monitored by the main fire alarm panel.

"Although this type of system is more expensive to install than single-station smoke detectors with local battery backup, it offers a



*The new dorm, which will house 600 students, will be fully sprinklered and will contain smoke alarms in both the public areas and the individual units.*

number of advantages, and we believe that it will be more cost-effective in the long-run," says Rizzi. "First of all, we'll be able to respond to a situation more quickly because we'll know the exact location of the smoke detector in alarm. By designing the system so that it's monitored centrally rather than having the students responsible for notifying us, we make it a safer environment for them," he adds.

Maintenance will also be easier and more efficient.

"Maintenance of local smoke detectors, particularly on a college campus, can be a nightmare," explains Rizzi.

Students, annoyed by the sound of the device going off unnecessarily, may unplug it or remove the battery backup, jeopardizing the safety of the building's occupants.

"Even with regular inspections, it's difficult to ensure that all devices are fully operational at all times," he adds.

This problem will be eliminated in the new building, since the main control panel will receive a trouble signal if a smoke detector has been disabled or needs cleaning.

In addition, the smoke detectors in the living areas will be equipped with a local sounder base that will notify local occupants of the situation, but won't set off an alarm that may cause all of the building's occupants to evacuate unnecessarily.

"This is a unique application," says Rizzi. Most systems are designed

so that any device going into alarm sets off a building-wide horn or other alarm-indicating device.

"However, we didn't want to evacuate the entire building because of smoke in one apartment. Because we're already installing wiring to monitor the fire detection equipment, it makes sense to program the system for selective alarm notification, as well," he adds.

#### **Alarm-indicating devices**

The residence hall's fire alarm system will have more than 500 speaker-only alarms, mainly in the living areas, and nearly 200 speakers with synchronized ADA visual alarm strobes in the lobbies, stairwells, and corridors. Years ago, speakers weren't typically installed in the individual rooms or units of an apartment building, hotel, or dormitory, according to Rizzi. However, there were problems hearing a fire alarm originating in the hallway.

"In a college environment, students are often taking showers and playing loud stereos, and they may not be able to hear a fire alarm in the corridor. Because of this, we felt it was particularly important to install speakers in the rooms, as well," he says.

There will also be special features in place in the half-dozen apartments specially designed for students with disabilities.

"These units will have visual indicators for fire alarm appliances,



Credit: Northeastern University

*Although the West Campus Residence Hall looks like one building from outside, it will function as two buildings for security reasons.*

including a fire alarm strobe that's distinguishable from strobes that signal the doorbell and telephone," says Rizzi.

In addition, the Public Safety Division can program the fire detection/alarm system with the room numbers of students with disabilities.

"If a fire alarm goes off in a building in which a disabled student lives, a special police or security officer is dispatched to ensure that the student gets out of the building safely," says Rizzi.

#### **Fire protection in common areas**

The smoke detectors in the individual apartments will be programmed to send a signal to Northeastern's police operations center, rather than the local fire department. When a smoke detector, pull station, or other addressable device is activated in a common area, such as a lobby, corridor, or stairwell, however, it will set off the building's fire alarm system. This, in turn, will sound alarm and evacuation tones, automatically recall the elevator, and send alarm signals to both the on-campus police operations center and the local fire department.

"A prerecorded message will sound throughout the building to inform occupants that there's been a report of an emergency in the building and that they should only evacuate the building if the floor evacuation signal sounds after the recorded message ends," explains Rizzi.

The system will be programmed so that the evacuation alarm itself will be activated only on the floor of the incident, and on the floors immediately above and below. In addition, elevators in the building will be automatically recalled to the first floor, or to an alternate floor if the first floor is the one in alarm.

At the same time, a signal will be sent to Northeastern's Police Operations Center, indicating the type of device and location in alarm—for example, a smoke detector on the sixth floor—and a police officer will be dispatched immediately to investigate. An alarm will also be sent directly to the Boston Fire Department. Exterior strobes or beacons, located at the entrances to both the high-rise and low-rise

portions of the building, will plainly indicate to fire department personnel the part of the building in alarm.

Upon arrival at the building, both the campus police and the fire department will be able to get more detailed information, such as the exact room number, from the LCD panel in the fire command room on the ground floor of the new residence hall. In addition, remote fire alarm annunciators in the lobbies of both the high-rise and low-rise buildings will be equipped with one-way microphones to allow the response team to override the alarm signal tone and make an evacuation announcement either to the entire building or to selected floors.

Because two-way radios don't always operate in concrete buildings, the new residence hall will also be equipped with addressable, two-way telephones in the stairwells and elevator lobbies, enabling firefighters to communicate with the university's Police Operations Center dispatcher.

#### **Regular inspections and testing**

To augment the school's computerized fire detection and alarm system, Northeastern's fire safety unit administers an aggressive program of regular inspection, testing, and maintenance to ensure compliance with applicable fire- and life-safety codes and standards. In addition to two full-time people in the fire safety office, 180 student employees assist with weekly building inspections, monthly fire extinguisher inspections, and quarterly fire drills. The department also provides a variety of education and training programs in fire safety and prevention techniques for students, faculty, and staff.

Everyone involved in the construction of the new building agrees that the West Campus Residence Hall is a state-of-the-art facility—and not just because of its internet hook-ups for every student. ♦

*Eileen Mongeau, principal of Innovative Marketing Solutions, is a freelance writer living in Newton, Massachusetts.*

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# CHANGING FOR THE BETTER

*NFPA's annual meeting gets a new name and a new format that includes educational tracks and the opportunity to earn CEUs.*

Matt O'Connor

**F**ar-reaching changes are in the works for NFPA's 1999 annual meeting and exhibition, to be held May 16 to 20 at the Baltimore Convention Center in Baltimore, Maryland. Most noticeably, the event will no longer be called the NFPA Annual Meeting. Instead, it'll be known as the World Fire Safety Congress and Exposition.

According to Albert Sears, assistant vice president of Meetings at NFPA, the new name reflects a change in emphasis from a meeting of NFPA members to an international conference and exposition.

"The conference has long dealt with fire- and life-safety issues beyond the code development and dissemination we're best known for,"

Illustration: Susan LeVan, LeVan/Barbee



explains Sears. "But the name 'Annual Meeting' made it sound limited in scope and gave the impression that the conference was open only to NFPA members. We wanted to send a clear signal that the event is changing and that all members of the fire protection community are welcome. Our goal is to provide the foremost forum worldwide for education and information in the fire protection industry."

Besides the name change, there will also be a new conference schedule, educational tracks, the opportunity to earn continuing education units (CEUs) for all educational sessions, and more advance information about session content, as well as session handouts and other supplementary materials.

#### New schedule

This year's schedule includes eight periods dedicated to educational sessions, two general sessions featuring keynote speakers, several Sunday afternoon seminars, two technical reports sessions, and an evening networking event featuring a performance by the Capitol Steps, a comedy troupe that specializes in political humor. NFPA will continue the schedule introduced in 1998 for the Exposition, with exhibit hours on Sunday, Monday, and Tuesday.

NFPA's new educational tracks were created in response to suggestions made by attendees at past annual meetings. According to Sears, the educational tracks reflect NFPA's increasing emphasis on education in current fire protection topics.

Proposed tracks include life safety education, codes and standards, fire safety engineering, fire prevention, firefighting operations, research and testing, electrical safety, and management/professional development.

NFPA member sections are sponsoring many of the sessions, which will focus on specific issues and will offer participants the opportunity to meet and exchange ideas with other attendees who share their interests or work in the same field.

All educational session participants will receive CEUs accredited by the International Association of Continuing Education and Training. NFPA has offered CEUs at educational seminars in the past and introduced CEUs at the 1997 Fall Meeting, but the 1999 World Fire Safety Congress and Exposition marks the first time CEUs will be offered as part of the NFPA's May conference.

In February, NFPA will mail an advance registration brochure that provides detailed descriptions of each educational session offered at the conference. The brochure outlines specific topics and speakers, and includes a brief synopsis of each session's content. These synopses are similar to the course descriptions found in college course catalogues.

NFPA will distribute printed supplementary materials at each session that will highlight major points and summarize the information presented during the session. They're intended to help attendees follow along and take notes during sessions and to provide a reference for follow-up research after the conference.

According to Sears, NFPA's primary goal in introducing all these changes was to increase the attendees' return on their investment and to offer them a better value for their registration fee.

Another goal, says Sears, was to make the conference more "user-friendly." He points to the forthcoming advance registration brochure, noting that it will help attendees quickly and easily find information in their fields of interest and avoid sessions that are less pertinent to them,

### McCurry to Speak at Opening General Session

NFPA is pleased to announce that Mike McCurry, former press secretary and assistant to President Clinton, will be our featured speaker at NFPA's World Fire Safety Congress & Exposition.

McCurry began his career on the staff of the U.S. Senate as press secretary to the Senate Committee on Labor and Human Relations from 1976 to 1981, then served as press secretary to Senator Daniel Patrick Moynihan. McCurry has served as spokesman and political strategist in the Democratic presidential campaigns of Senator John Glenn, Governor Bruce Babbitt, and Senator Bob Kerrey. He ran the press and communications operations at the 1988 Democratic National Convention. From October 1990 to April 1993, he was senior vice president in the Washington, D.C., office of the public relations consulting firm of Robinson, Sawyer, Lake, Lehrer, and Montgomery.

McCurry received his B.A. degree from Princeton University's Woodrow Wilson School of Public and International Affairs, and a Master of Arts degree from Georgetown University.

McCurry will speak Monday morning, May 17, at the Opening General Session.

#### Registration Information

- \* To register for the 1999 NFPA World Fire Safety Congress & Exposition, call 1-800-344-3555.
- \* To reserve a room, please call the NFPA Housing Bureau at 1-888-797-2237.

thereby enabling them to make the best use of their time at the event.

Finally, Sears adds that the NFPA wanted to increase the diversity of attendance at the conference, so conference planners decided to add a broader range of fire and life safety issues in order to attract attendees from various segments of the fire protection community. As it has for several years, the Society of Fire Protection Engineers will hold its annual meeting in conjunction with the 1999 World Fire Safety Congress and Exposition, and will sponsor several of the event's educational sessions.

#### More changes to come

According to Sears, more changes are in store for next year's event, based on market research and feedback from this year's attendees.

Throughout the conference, attendees will have the opportunity to evaluate educational sessions, speakers, and the conference in general. Their comments will then be reviewed by the task force responsible for the changes at this year's conference to determine the need for future modifications.

"We may adjust the educational tracks, session content, and speaker selection to meet the needs of our constituents more effectively," says Sears. "Our plan is to fine-tune this year's changes for the 2000 World Fire Safety Congress and Exposition in Denver." ♦

*Matt O'Connor is a writer and editor specializing in business and technical communications. His work has appeared in Digital News, Kids Fashions, and The Small Business Advisor.*

# A CLEAN SWEEP



*Recent changes to standards on carbon monoxide detector design should improve reliability and performance, and the new NFPA 720 tells how and where to install these detectors.*

**Matt O'Connor**

**T**his winter, millions of homeowners are doing everything they can to keep their homes warm and their energy bills low. They're caulking their windows. They're covering kitchen vents. They're firing up their wood-burning stoves, gas furnaces, and fireplaces. Little do they know, they also might be pumping poisonous carbon monoxide gas into their homes—and trapping it there.

Carbon monoxide (CO) is a poisonous gas that's produced when any fuel is burned, including gasoline, propane, oil, natural gas, wood, and coal. An estimated 600 to 700 Americans die every year from unintentional exposure to gas and vapors, principally CO. Another 1,500 to 2,000 die of suicide from motor vehicle exhaust, and 350 to 450 die of suicide involving other exposure to gases. About 100 more die each year from exposure to gas, either unintentional or deliberate.

Three traits of CO make it particularly dangerous. First, it's colorless, odorless, tasteless, and nonirritating, so it's impossible for humans to detect. Second, low levels of exposure usually result in flu-like symptoms, including weakness, sleepiness, headaches, dizziness, and nausea. As a result, poisoning can easily go undiagnosed in the early stages, while there's still time to act. Even at low levels of exposure, victims can become too disoriented to save themselves by seeking fresh air or calling 911 for help. And third, it's only slightly lighter than air, so it doesn't stratify. That means it can accumulate in a basement or garage just as easily as in a second-story bedroom. For all these reasons, it's often called "the silent killer."

#### **The silent killer at work**

Like oxygen, and, unfortunately, in preference to oxygen, CO combines with hemoglobin—the oxygen-carrying agent in red blood cells—in the lungs and is carried in the blood stream to the rest of the body. When this happens, CO effectively starves human tissue by inhibiting the blood's ability to absorb oxygen and carry it to the heart, brain, and other major organs.

Low-level exposure for short periods generally won't lead to death for otherwise healthy adults. But breathing high concentrations of CO can cause brain damage or death in minutes. And even prolonged exposure to low levels of the gas can lead to serious health problems. Everyone's susceptible, but infants, the elderly, pregnant women and their unborn babies, and people with heart and lung conditions are at greatest risk.



All fuel-burning appliances, including fireplaces, furnaces, gas water heaters, and kitchen ranges, can produce CO in varying concentrations, and CO levels increase when combustion is particularly inefficient. This can occur when there's not enough oxygen mixed with the fuel, and the carbon and oxygen bonds in the flames aren't properly broken. The less efficient the flame, the more CO will be emitted during a fire.

Properly installed and ventilated appliances in good working condition pose little health risk because the lethal fumes are vented outside. But even an apparently minor defect, such as a cracked or corroded vent pipe or a blocked chimney flue, can lead to a deadly buildup of CO fumes in the home. Vehicles running in attached garages can also produce dangerous levels of CO in a house.

The risk of CO poisoning rises during the winter, when homeowners close their houses up for the season and begin using fuel-burning appliances more often. Weather-tight homes may have insufficient air to support complete combustion in fuel-burning appliances, thereby increasing the amount of CO produced.

Homeowners can protect themselves by having their heating systems, vents, chimneys, and flues inspected and cleaned every year; regularly checking their appliances for loose connections, as well as visible rust, soot, and corrosion; and being aware of certain danger signs, such as decreased hot water supply and yellow or orange flames in gas appliances. They should also install one or more listed CO detectors, particularly in the vicinity of every sleeping area.

#### **Three technologies to choose from**

Most commercially available CO detectors for home use fall into one of three technology categories: electrochemical, biometric, or MOS-type.

In electrochemical detectors, CO is allowed to diffuse into a cell, causing a chemical reaction that generates a current, which flows through a circuit. The rate at which the current flows through the circuit corresponds with predicted levels of CO in the outside air. A microprocessor in the detector then measures the CO concentration in the air, based on the current in the circuit. Electrochemical detectors are generally regarded as the most reliable of the three residential detector technologies.

Sometimes referred to as "gel cell" detectors, biometric detectors use

PHOTO: JEFFREY M. HARRIS



*To reduce the risk of CO poisoning, homeowners should have their heating systems inspected and cleaned every year.*

a sensing process in which a chemically treated filter changes color when exposed to CO. The color, which is read by a photoelectric eye, changes slowly, to mimic absorption of CO by the human body.

When CO levels return to 0 parts per million (ppm), the filter is supposed to "reset" itself by turning white. However, the November 1996 issue of *Consumer Reports* magazine notes that, in tests, the filter didn't always revert to white as quickly as it should. Consequently, the photoelectric eye may read the sustained color change as an alarm condition.

MOS-type detectors function much like electrochemical detectors, except that they use metal oxide semiconductors rather than fuel cells to detect CO. MOS detectors can't predict low concentrations of CO as well as electrochemical detectors, and their tolerances are wider. In chamber tests conducted by the Gas Research Institute (GRI), however, MOS detectors were found to be more reliable—and more reliable over time—than biometric detectors.

#### **The early '90s: Too many detectors, not enough information**

Public awareness of the silent killer sparked robust CO detector sales in the early 1990s, a phenomenon that caused problems for the fire service. Shortly after residential CO detectors were introduced to the consumer market in 1994, for example, the Chicago Fire Department responded to more than 6,000 calls over a three-month period. The majority involved biometric detectors.

While the Chicago case was extreme, many other fire departments across the country have also struggled with high rates of false CO detector alarms. Not only do false positives present a major cost concern for the fire service, but several firefighters have lost their lives while en route to emergency calls that resulted from false alarms.

"Detectors manufactured in conjunction with earlier editions of UL

2034, the primary standard affecting CO detector design, often alarmed at a CO level that was a nonemergency for most people," explains Art Black of the Carmel-by-the-Sea, California, Fire Department. "When a smoke detector alarms, there's an emergency. But CO detectors are set to alarm at such low levels that when they first begin alarming, there typically isn't an emergency."

The problem was compounded by the fact that earlier editions of UL 2034 had no guidelines as to what CO detectors should look and sound like. Some manufacturers made detectors that looked much like smoke alarms and sounded a lot like fire alarms. As a result, homeowners were calling in CO alarms as fire alarms.

#### **GRI study confirms problems**

In an attempt to gather reliable data on CO detector performance, the GRI conducted chamber tests on 96 biometric and MOS CO alarms—24 each of 4 different brands—all purchased in Chicago-area retail stores. Disturbingly, many of the units failed to alarm until carbon monoxide concentrations had reached unacceptably dangerous levels. Even worse, brands and models that had a significant share of the market were found to have some of the most serious performance problems.

Furthermore, performance varied significantly depending on the brand and model of the detectors, as well as the technology used. Of the two technologies tested, the MOS detectors yielded fewer false readings and remained more reliable as they aged. Both technologies performed less reliably in low humidity.

The GRI also surveyed fire departments and utility companies to see how their records corresponded with the findings of the chamber tests. The survey revealed that nearly three-quarters of unventilated alarm-activation calls received during the survey period weren't emergencies. In fact, 73 percent of the calls showed indoor carbon monoxide levels of less than 10 ppm. According to Steve Wiersma, health and safety program leader at GRI, this indicates that "some brands pick up, or are influenced by, contaminants in the home. They're responding to the cumulative effects of both CO and other fumes, such as cleaning agents."

The survey also revealed that daily alarm rates were "statistically correlated to outdoor carbon monoxide levels," which could indicate that the detectors were alarming due to atmospheric CO, rather than faulty appliances or car exhaust in the home.

#### **UL takes action to correct problems**

In an effort to reduce nuisance alarms and improve the performance and in-service reliability of detectors, especially in low humidity, the two industry standards that affect residential CO detectors, UL 2034 and International Approval Supplement (IAS) 6-96, were updated last year. All residential CO detectors manufactured after October 1, 1998, must comply with the new standards.

One major modification to UL 2034 was a change in the alarm set points along the carbon hemoglobin curve. When CO combines with hemoglobin in the blood, it produces carboxyhemoglobin (COHb), a red blood cell carrying carbon monoxide instead of oxygen. COHb reduces the amount of oxygen available in the bloodstream, thus affecting all major organs. The amount of COHb in the blood increases in relation to the amount of CO in the air and the length of exposure. The carboxyhemoglobin curve is a graphic

## A Quick Look at NFPA 720

Released in 1998, NFPA 720, *Recommended Practice for the Installation of Household Carbon Monoxide (CO) Warning Equipment*, is the first document providing guidelines for the installation of residential CO alarms. Here's a synopsis of the document's major recommendations,

### Location

The document recommends that a CO alarm or detector be installed in any living unit that contains a fuel-burning appliance or fireplace or has an attached garage. The alarm or detector should be centrally located outside each separate sleeping area in the immediate vicinity of the bedrooms or sleeping rooms.

### Alarm signals

The alarm signal should have a minimum rating of 85 dBA at 10 feet (3 meters). It should consist of four cycles of 100 milliseconds "on" and 100 milliseconds "off," followed by 5 seconds "off" (all times are +/- 10 percent). The signal should repeat until the alarm resets or is manually silenced.

### Power source

For alarms or detectors using AC power, the power should be supplied from either a dedicated branch circuit or the unswitched portion of a branch circuit that's used for power and lighting. There should be a visible "power on" indicator, and a power outage shouldn't cause an alarm signal.

For battery-powered alarms or detectors, a distinctive signal should sound when the battery can no longer power the device for alarm purposes. Initially, the signal should sound for at least 12 consecutive hours, then at least once every minute for the following seven days. Also, there should be a visible "power on" indicator.

### Testing

Alarms, systems, and all connected notification appliances should be tested at least once a month. The test signal should be identical to an actual alarm signal. Homeowners should have systems tested by a qualified professional at least once every three years.

### Special considerations

In a household occupied by hearing-impaired persons, the alarm or detector should be connected to a visible alarm signal with a minimum rating of 110 candela for a maximum room size of 14 by 18 feet (4.3 by 5.5 meters). For larger rooms, the signal should be placed within 16 feet (4.9 meters) of the pillow.

representation of how much COHb will build up in the blood at different concentrations over time.

Detectors manufactured in conjunction with earlier editions of UL 2034 were designed to alarm when CO levels measured 100 ppm for 90 minutes, 200 ppm for 35 minutes, or 400 ppm for 15 minutes. Detectors manufactured after October 1 must be designed to alarm at

levels of 70 ppm for 189 minutes, 150 ppm for 50 minutes, and 400 ppm for 15 minutes.

This change will make detectors less sensitive to low concentrations of CO over short periods, but more sensitive to low levels of exposure for sustained periods, which should reduce the number of nuisance alarms while making alarms more sensitive to low-level dangers. It'll take several years to see the full impact of the changes, however, since units currently installed in the homes will last, on average, about five years.

### A look toward the future

Considering that residential CO detectors have been on the market for only a few years, most would agree that the fire protection community has done a tremendous job of addressing problems that have arisen. Manufacturers have developed more reliable technologies. The fire service has embarked on aggressive campaigns to train personnel how to respond to CO alarms safely and effectively. And standards-makers are moving quickly to produce guidelines for their manufacture and installation.

However, there are still some outstanding issues that must be resolved in the short term. For example, GRI's Wiersma points out that the UL certification doesn't always ensure in-service reliability because UL doesn't buy detectors off the shelf and test them. Instead, manufacturers choose which detectors to send UL for testing—so they could conceivably pretest units and send the ones that perform well. Wiersma says a change must be made to ensure in-service reliability for the entire lifetime of the product.

Another issue is whether decreasing detector sensitivity in an attempt to cut down on alarm frequency will unnecessarily put people at risk, especially children, the elderly, pregnant women, and people with cardiac and respiratory illnesses. Pat Coughlin of the International Association of Fire Chiefs believes that many of the nuisance alarm problems of the early '90s weren't, in fact, the result of oversensitive detectors, but rather a result of the fire service's lack of training in dealing with CO alarms.

"The fact is, the number of detectors that hit the market took the fire service by surprise," says Coughlin. "I thought the early warning was reasonable, and with proper training, the fire service could have learned to live with this benefit."

Finally, the UL and IAS standards deal only with product manufacturing, not with installation. In 1998, NFPA published the first document that provides guidelines for the installation of CO detectors, NFPA 720, *Recommended Practices for the Installation of Household Carbon Monoxide (CO) Warning Equipment*.

CO detectors are saving lives, but the industry is still in its infancy, and there are some glitches that must be worked out. While technology, training, and information are improving, CO detectors should be viewed as a last line of defense against CO poisoning. Homeowners should continue to take preventive measures against dangerous situations, rather than relying solely on CO detectors to save them in an emergency. ♦

Matt O'Connor is a writer and editor specializing in business and technical communications. His work has appeared in *Digital News*, *Kids Fashions*, and *The Small Business Advisor*.

# CO Alarms & Detectors

**W**hen choosing a carbon monoxide (CO) detector, one should consider how it will be used and which technology and features will work best for that situation. For example, detectors may be used by homeowners for household protection, or by the fire service to survey homes after alarms occur, or by scuba divers to monitor underwater CO levels. Each of these applications serves very different needs which, to a large extent, determine the technology and features that will work best.

The following list provides a sampling of the products currently available, as well as their capabilities and basic features. However, it's by no means comprehensive. There are literally hundreds—perhaps even thousands—of CO detectors being manufactured for different applications.

To find out which detector best suits your needs, call the manufacturers and suppliers and ask them for product literature. Research articles in magazines such as *Consumer Reports*. And look for information on the Internet.

## AMERICAN BRISTOL INSTRUMENTS, INC.



Product: Lightning Electronics  
Application: Industrial  
Sensor type: Electrochemical  
Alarm point: Self-programmable  
Sensitivity: 1 ppm  
Lifetime: Guaranteed two years

## BASCOM-TURNER INSTRUMENTS



Product: Gas-Sentry CO 150  
Application: Survey  
Sensor type: Electrochemical  
Alarm point: Adjustable  
Measuring range: 0 to 5,000 ppm  
Lifetime: Three years

## BACHARACH, INC.

Product: Snifit  
Application: Survey  
Sensor type: Electrochemical



Alarm point: N/A  
Measuring range: 0 to 1,999 ppm  
Sensitivity: 1 ppm  
Lifetime: Three years



Product: Sniffer with breath analysis module  
Application: To measure COHb in the body  
Sensor type: Electrochemical  
Alarm point: N/A  
Measuring range: 0 to 1,999 ppm  
Sensitivity: 1 ppm  
Lifetime: Three years  
Special: Measures breath CO in less than one minute, so personnel can determine the need for immediate treatment and action.

## AIM SAFETY USA, INC.



Product: SAS (Safe Air System)  
Application: Residential  
Sensor type: Electrochemical  
Alarm point: 10 percent COHb  
Sensitivity: 1 ppm  
Lifetime: Five years  
Special: Provides actual COHb levels calculated on real time, as well as an ongoing record of peak and accumulated COHb readings.



Product: 600 Series  
Application: Industrial  
Sensor type: Electrochemical  
Alarm point: 35 ppm  
Measuring range: 0 to 1,500 ppm  
Sensitivity: 1 ppm  
Lifetime: Two years



Product: Logic 400 Series  
Application: Personal  
Sensor type: Electrochemical  
Alarm point: 35 ppm  
Measuring range: 0 to 900 ppm  
Sensitivity: 1 ppm  
Lifetime: 18 months

## CONTROL INSTRUMENTS CORP.



Product: SNR472  
Application: Industrial  
Sensor type: Electrochemical  
Alarm point: Adjustable  
Measuring range: 0 to 100 ppm or 0 to 1,000 ppm  
Accuracy: +/-3 ppm  
Lifetime: Two years

## ENMET CORP.

Product: Spectrum Series  
Application: Survey/Industrial  
Sensor type: Electrochemical



Alarm point: One adjustable alarm/nonadjustable alarm at 200 ppm  
Measuring range: 0 to 1,000 ppm  
Sensitivity: 1 ppm  
Lifetime: Two to three years



Product: Smart Logger Series  
Application: Survey/Industrial  
Sensor type: Electrochemical  
Alarm point: 35 ppm  
Measuring range: 0 to 1,000 ppm  
Sensitivity: 1 ppm  
Lifetime: Four years  
Special: Provides continuous gas monitoring in a digital readout.

#### KIDDE SAFETY

Product: Nighthawk Premium/Premium Plus  
Application: Residential  
Sensor type: Electrochemical  
Measuring range: 0 to 999 ppm  
Sensitivity: 1 ppm



Lifetime: Five years  
Special: Offers a continuous digital display of CO levels, which gives homeowners time to find

the source of potential problems before an emergency develops.

#### FIREBOY/XINTEX

Product: CMD-2M  
Application: Marine  
Sensor type: Electrochemical  
Alarm point: Time-weighted average (TWA) alarm at 20 percent COHb or 400 ppm  
Lifetime: Nine to 10 years  
Special: The CMD-2M uses a time-weighted average to determine alarm levels. This feature



was designed to avoid nuisance alarms in the marine environment, where CO levels can quickly rise and fall.

#### GAS TECH, INC.



Product: 600 Series  
Application: Personal  
Sensor type: Electrochemical  
Alarm point: Adjustable  
Measuring range: 0 to 500 ppm  
Sensitivity: 1 ppm

#### HAZCO SERVICES, INC.

Product: CO262  
Application: Survey  
Sensor type: Electrochemical  
Alarm point: 35 ppm factory set,



adjustable to 0 to 300 ppm  
Measuring range: 0 to 1,999 ppm  
Sensitivity: 1 ppm  
Lifetime: 4,000-hour battery life

#### INTERSCAN CORP.



Product: 1000 Series/4000 Series  
Application: Industrial  
Sensor type: Electrochemical  
Alarm point: Usually 35 ppm.  
Systems are customized to fit customer needs.  
Measuring range: Varies, depending on model; 0 to 3,000 ppm  
Sensitivity: 1 ppm

#### SIERRA MONITOR CORP.



Product: Model 4101-04  
Application: Industrial  
Sensor type: Electrochemical  
Alarm point: Adjustable  
Measuring range: 0 to 500 ppm  
Sensitivity: 1 ppm  
Lifetime: Two years

#### LUMIDOR



Product: MicroMax  
Application: Industrial  
Sensor type: Electrochemical  
Alarm point: 35 ppm  
Measuring range: 0 to 800 ppm  
Accuracy: +/-10 percent of reading  
Lifetime: Two years

#### Product: CO Verifier



Application: Survey/Industrial  
Sensor type: Electrochemical  
Alarm point: N/A  
Measuring range: 0 to 800 ppm  
Accuracy: +/-5 percent of reading  
Lifetime: Two years

#### SENSOR ELECTRONICS CORP.



Product: PortaScan Portable Gas Detector  
Application: Survey/Monitor  
Sensor type: Electrochemical  
Alarm point: Factory-set but customer-adjustable  
Measuring range: 0 to 200 ppm  
Sensitivity: 1 ppm

—Matt O'Connor

## The Latest in Fire Protection Products

### TWIST LOCK REMOTE LIGHT HEAD



A new 3-by-4-inch twist lock remote light head by *Sound Off, Inc.*, is available in strobe and halogen. This new light head gives you premium optics with a polished, wide-angle lens, which gives a greater degree of visibility, especially at critical intersection angles. Strobe tubes and halogen bulbs are field-replaceable so you no longer need to replace whole assemblies.

Circle Reader Service Card No. 100

### MANAGING FIRE SAFETY INSPECTIONS

SPAN•FM™ FIREPROOF® for Windows® by *Peregrine Systems* helps you manage your fire safety equipment and document inspections quickly, easily, and without paperwork. SPAN•FM FIREPROOF uses hand-held data collection devices in conjunction with Windows-based software to take inventories of fire safety equipment, document inspections, and generate work orders and management reports.



Circle Reader Service Card No. 101

### INTERACTIVE SPRINKLER CD

A new interactive CD that provides self-paced training for on-site staff in automatic sprinkler system inspecting, maintenance, and testing is now available from *The Hartford's* loss control department. This loss prevention program can be used by any business, school, or other organization whose property is protected by sprinkler systems.

Circle Reader Service Card No. 102

### INTEGRATING SAFETY SYSTEMS

*Notifier Fire Systems* introduces Uni-Fire-Net™, a simple and complete way to integrate diverse, multibrand, multitechnology fire and security building systems into a unified, graphics-oriented platform. The

Uni-Fire-Net allows the user to set up, modify, and adapt systems to match specifically a facility's unique business needs.

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### CONTAINMENT SYSTEM



The new HardTop P2 Containment System™ by *Safety Supply Illinois* features a hinged, lockable

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Missing FDC caps invite vandalism. The vandal-resistant Knox FDC Cap™ assures clean fire sprinkler connection lines and undamaged threads when you arrive at the scene. Your department controls the Knox Keywrench™ that easily releases the Knox FDC Cap.

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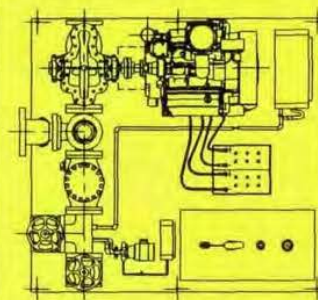
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## FIRE PUMPS



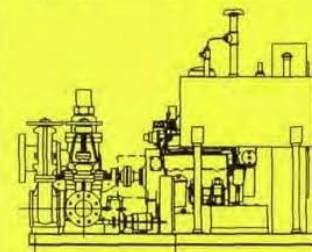
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#### FULL-FEATURED AIR COMPRESSORS



Industrial-grade air compressors of cast iron construction, oversized bearings, and long-lasting valves are featured in *Saylor-Beall Manufacturing Company's*

eight-page, full-color catalog. Built for total reliability under the toughest environmental conditions, the cast-iron pump components include the cylinder head, finned intercooler, crankshaft, and crankcase. Circle Reader Service Card No. 105

#### PLASTIC PALLETS



*Cookson Plastic Molding Corp.* announces its new pallet, the AdvantEDGE™, featuring GE Plastics' NORYL® and XENOY™ resins. This pallet rep-

resents a breakthrough in material and technology. Since it's made from NORYL resin, the switch from wood to the AdvantEDGE pallet is transparent from a code standpoint. Circle Reader Service Card No. 106

**DIGITAL GENERATOR DISPLAY**  
*Fire Research Corporation* introduces the FROG-D for status meters on generators of 8kW or larger. This small, waterproof digital meter displays voltage, frequency, and current draws on two separate lines. The FROG-D can be used to monitor 110



volts or 220 volts. It also functions as a warning system. An audible alarm is optional. Circle Reader Service Card No. 107

#### FOAM FIRE PROTECTION SYSTEMS

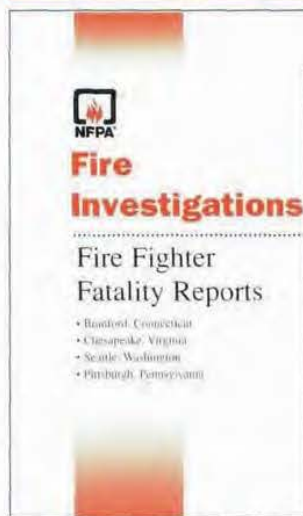
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**Board and Care Fires** contains five reports on fires in a variety of facilities that all had tragic outcomes. This collection of reports on what may be a growing problem not only outlines the incidents, but offers detailed analysis of what went wrong based on current NFPA documents.

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# Flashback

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## A SINGLE EXPLOSION CAN THREATEN MORE THAN ONE PROCESS!

When an industrial explosion occurs, it looks for a way out. Unfortunately, this could be the next process down the production line. That's why NFPA Standard 654 requires that interconnected vessels have flashback protection in the form of mechanical or chemical isolation.

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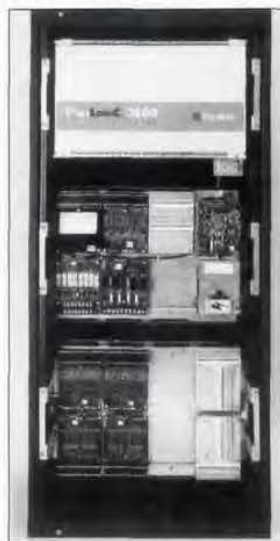
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high-pressure equipment. The Viking Corporation introduces deluge, preaction, and flow control systems rated to 250 psi. These systems join Viking's other high-pressure sprinklers, alarms, and check valves.

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### INTEGRATED LOGIC CONTROLLER



Simplex introduces the ProLogiC 3600 integrated logic controller, a truly integrated logic control system with advanced capabilities for coordinating door locking, access control, CCTV, intercom, and alarm functions. The Pro-LogiC system is fully integrated for enterprise-wide control of multiple systems and equipped to respond instantaneously to operator commands.

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### INTUMET GLAZING SYSTEM

A breakthrough intumescent glazing tape developed by Zero International has been tested successfully with 1/4-inch wire glass for positive-pressure fire performance. Zero's INTUMET Glazing System supports a wide range of design solutions for fire-rated door lites. Similar

to typical systems for standard lite kits, it's also designed for convenient application using double-faced tape.

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### ZONE CONTROL

Wheelock's ControlPath MZC-144 is an expandable zone control that performs the central control, switching, and signaling required to provide selective zone paging, zone group paging, programmable zone group paging, and all-call. The MZC-144 provides 3 zones of paging and is expandable to 12 zones by installing up to three MZEM-3 zone expansion modules.

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### SELF-CONTAINED ROLL GROOVER



Victaulic Tool Company introduces another self-contained roll groover with an integral motor, safety foot switch, and power plug. The new Vic-Easy® Series 270FSD uses a 110-volt, 15-amp power source. A unique pivot arm permits roll changes without changing shafts. Patented tracking rolls help prevent the pipe from walking off the tool during grooving.

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NFPA doesn't endorse any of the products mentioned in "Hot Stuff." Readers can get additional information by circling the corresponding numbers on the reader service card in this issue. ♦

### NFPA Automatic Sprinkler System Seminars

**Dates and Places:** March 1-3, 1999, Houston, Tex.; March 22-24, 1999, Irvine, Calif.

**Description:** Attend all three days for a comprehensive review of the basics, the latest technologies, and the code requirements of both NFPA 13 and 25 (2.4 CEUs). Or take the two-day option for a briefing on the latest automatic sprinkler installation standard (1.6 CEUs).

### NFPA Seminars on 1997 Life Safety Code®

**Dates and Places:** March 1-4, 1999, Houston, Tex.; March 22-25, 1999, Irvine, Calif.

**Description:** Review the fundamentals of the *Life Safety Code*® and focus on the latest requirements and essential revisions. Cover the entire *Code* in four days (3.2 CEUs), or take the three-day option for a solid introduction to the *Code* (2.4 CEUs).

### NFPA 1998 National Electrical Code® Seminars

**Dates and Places:** March 2-5, 1999, Houston, Tex.; March 23-26, 1999, Irvine, Calif.

**Description:** Gain the knowledge you need to work with *NEC* requirements, and learn how to interpret and apply vital provisions and perform calculations with ease.

### NFPA Fire Alarm Systems Seminars

**Dates and Places:** March 3-5, 1999, Houston, Tex.; March 24-26, 1999, Irvine, Calif.

**Description:** Get a complete overview of today's alarm sys-

tems, from the fundamentals, to reducing false alarms, to acceptance testing. You'll learn effective plans review, with special emphasis on the latest technologies and code requirements (2.4 CEUs).

*For registration, further information, or a complete list of NFPA's continuing education seminars and workshops, contact the Continuing Education Department, NFPA, One Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101; telephone (800) 344-3555.*

### Fiscal Management in Fire Protection

**Date:** February 8-12, 1999  
**Place:** Monmouth, Ore.

**Description:** This fiscal management course is being offered by the Fire Service Administrators Institute.

**Contact:** Sheri Barber; telephone (503) 378-2100, ext. 219

### EduCode International

**Date:** February 9-12, 1999  
**Place:** Las Vegas, Nev.

**Description:** The Southern Nevada Chapter of ICBO will host EduCode International, its second annual code education program.

**Contact:** Ellen Quiroz or Greg Franklin; telephone (702) 455-7410

### Disaster '99

**Date:** February 11-14, 1999  
**Place:** St. Petersburg, Fla.

**Description:** This conference will be hosted by the Florida Emergency Medicine Foundation.

**Contact:** Disaster '99 Registrar, Florida Emergency Medicine

Foundation, 3717 South Conway Road, Orlando, FL 32812-7607; telephone (407) 281-7396 or (800) 766-6335; fax (407) 281-4407

### Ninth Annual Construction Safety Conference

**Date:** February 10-12, 1999  
**Place:** Rosemont, Ill.

**Description:** The theme of this year's conference is "Innovations," which was chosen to reflect the focus on presenting new solutions to the safety and health challenges of today's construction projects.

**Contact:** Construction Safety Council; telephone (800) 552-7744

### Environmental Project Management

**Date:** February 16-17, 1999  
**Place:** Orlando, Fla.

**Description:** This practical course is designed to help you with the complexities of planning and managing environmental compliance, investigation, and remediation projects.

**Contact:** Government Institutes, 4 Research Place, Suite 200, Rockville, MD 20850-3226; telephone (301) 921-2323; fax (301) 921-0264; Internet <http://www.govinst.com>; E-mail [giinfo@govinst.com](mailto:giinfo@govinst.com)

### The Environmental Audits Course

**Date:** February 22-24, 1999  
**Place:** Orlando, Fla.

**Description:** This course offers effective tools and practical tips for an environmental audit.

**Contact:** Government Institutes, 4 Research Place, Suite

200, Rockville, MD 20850-3226; telephone (301) 921-2323; fax (301) 921-0264; Internet <http://www.govinst.com>; E-mail [giinfo@govinst.com](mailto:giinfo@govinst.com)

### EPCRA Compliance

**Date:** February 24-25, 1999  
**Place:** Scottsdale, Ariz.

**Description:** EPCRA requirements have been revised and expanded. This course will provide a thorough understanding of the very latest regulatory changes, including the new expansion rules and revised thresholds.

**Contact:** Government Institutes, 4 Research Place, Suite 200, Rockville, MD 20850-3226; telephone (301) 921-2323; fax (301) 921-0264; Internet <http://www.govinst.com>; E-mail [giinfo@govinst.com](mailto:giinfo@govinst.com)

### IFAI Canada Midwinter Conference

**Date:** February 25-27, 1999  
**Place:** Toronto, Ontario

**Description:** The Industrial Fabrics Association International (IFAI) Canada Midwinter Conference will feature tours, workshops, educational opportunities, and a new products seminar.

**Contact:** Elizabeth Newman, IFAI Canada, 1801 Country Road B.W., Roseville, MN 55113-4061; telephone (612) 225-6926 or (800) 636-4973; fax (612) 631-9334

*If you'd like us to include your event in "Date Book," please submit full details at least four months before the event to NFPA Journal, One Batterymarch Park, Quincy, MA 02269-9101, or fax the information to (617) 984-7090.*

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specializing in fire protection consulting, is seeking a qualified person to handle fire protection plan review and inspections. The applicant needs knowledge in hydraulic calculations, NFPA standards, and BOCA codes. Minimum of 3 years' experience preferred. Please send resumes to Judy Schiffliti; 1025 W. Wise Road, Schaumburg, IL 60193 or fax (847) 891-3932.

### The F.P. Connection

A fire protection resource web site, offering employment opportunities for, and resumes of, fire protection professionals. If, as a fire protection service provider or equipment manufacturer, your web site is difficult to locate using search engines and key words, let us post your banner and provide a direct link for our visitors who may require your services. Please visit us at [www.fpconnect.com](http://www.fpconnect.com)

For posting information, e-mail [jdumont@fpconnect.com](mailto:jdumont@fpconnect.com) or call (724) 746-8855; fax (724) 746-8856.

### Faculty, Fire Protection/Safety

UNC Charlotte Department of Engineering Technology invites applications for the position of Associate or Assistant Professor of Fire Protection/Safety. Reporting to the Chairman of the Department of Engineering Technology, the person selected will provide leadership in developing detailed curricula in fire protection and safety, as well as teach and perform research in the discipline.

The successful candidate should hold at least a Master's Degree in Fire Protection/Safety Engineering, or another appropriate discipline, or Engineering Technology and five years' relevant experience. A record of scholarly achievement, a proven ability to attract external funding, and Internet and Distance Education experience are desirable.

Nominations and applications, including a letter of interest that addresses qualifications, a curriculum vitae, and a list of five professional references with addresses and phone numbers should be sent to the Department of Engineering Technology Faculty Search Committee, The University of North Carolina at Charlotte, 9201 University City Boulevard, Charlotte NC 28223-0001. UNC Charlotte is an affirmative action, equal opportunity employer.

### Fire Protection Engineer—Stanford University

Stanford University is seeking a Fire Protection Engineer to conduct plans reviews and inspections of campus facilities construction projects as needed to ensure code compliance. The FPE maintains mandated records/reports and has extensive contact with University clients and regulatory agency staff. Requires a B.S. in FPE or a related field with 4-6 years of relevant experience; ICBO Plans Examiner Certification or FPE Registration is desired.

Send resume to Stanford University, Department of Environmental Health & Safety, ESF, 480 Oak Road, Stanford, CA 94305-8007, Attn: Harvey Chock/Re. #982186. For information on this and other positions, see us on the Web at <http://jobs.stanford.edu>. AA/EOE

Join our team! NFPA, a nonprofit educational/technical standards-making organization, has the following employment opportunities:

### Chief Electrical Engineer

This person is responsible for the overall development, production and promotion of the National Electrical Code. This is a highly visible position which requires someone to have excellent communication and presentation skills. A BSEE is required with a minimum of 15 years of experience and a proven track record of managing people. Knowledge of the NFPA code making process, PE license and computer skills are an asset. Travel is required.

### Fire Protection Engineer - Health Care

This position handles the codes and standards associated with the health care field. Candidates must have a working knowledge of 99 and other related NFPA codes. A BS degree in Engineering and 8-10 years of experience in the health care environment are required. A PE license is a plus.

Please send/fax your resume to:  
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continued from page 20

plates," are occasionally prescribed where sprinklers are suspended too far below a ceiling or where there are other concerns about timely response. Ironically, they can do more harm than good.

Work done at Factory Mutual showed that convective heat typically supplies more than 80 percent of the heat sprinklers need for activation. However, convective heat requires a flow of air past the sprinkler, and testing has shown that heat collectors with edges, such as inverted boxes, can actually delay sprinkler response, presumably because they create dead air space. Even flat heat collectors are only effective where the edge of the heat collector picks up the fire plume and acts like a small ceiling. To work effectively, the combined areas of heat collectors need to make up a large percentage of the floor area.

The shields used on in-rack sprinklers shouldn't be confused with heat collectors. They're sized to prevent water discharge from higher sprinklers from wetting and cooling the lower sprinkler operating mechanisms, thus inhibiting proper activation.

## 5. Sprinklers can only be effective if they activate before the fire gets past them.

It's obvious that less damage will be done if a sprinkler responds fast enough to stop a fire in its tracks. But it would be a mistake to think that a sprinkler's effective only when it activates ahead of a fire. If this were the case, dry-pipe sprinkler systems would be nearly impossible.

In sprinklers' traditional fire control role, the important thing is to ensure that each sprinkler can control the fire in its protection area and that the water supply can provide water to the number of sprinklers expected to operate. Consider, for example, in-rack sprinklers in high-piled storage. Testing has shown that, although a fire may proceed upward through the racks ahead of sprinkler operation, the in-rack sprinklers control the fire in their immediate vicinity as they operate, and ceiling sprinklers control the fire at the top of the racks. Working together, the in-rack and ceiling sprinklers control the fire. ♦

*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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## NFPA'S ADVERTISING ACCEPTANCE GUIDELINES

### Objectives

NFPA solicits and accepts advertising for its publications to fulfill two objectives: 1) for income to support the Association's mission; and 2) to impart information to NFPA members and other readers on the availability of products, systems, and services.

### Conditions of Acceptance

In general, NFPA uses the following criteria in deciding which advertisements to accept for its publications, but reserves the right to reject any advertising for any reason whatsoever. All accepted advertising is subject to the conditions listed.

1. NFPA will not accept advertising when it finds any reason to believe that the advertised product, system, or service does not conform to NFPA policies as stated in its codes and standards.
2. NFPA will not accept advertising when it finds any reason to believe that the advertised product, system, or service constitutes a fire or related hazard.
3. NFPA will not accept advertising that deals with disputed technical issues relating to its codes and standards; this applies to previously adopted standards and to standards being considered for adoption by NFPA.
4. NFPA will not accept advertising unless the advertiser is prepared to validate any claims made in the advertisement about the product, system, or service being advertised.
5. NFPA will not accept advertising that contains derogatory comments about the advertiser's competitors or about the competitors' products or organizations.
6. The advertiser understands that an advertisement in an NFPA publication does not constitute, nor shall it be interpreted as constituting, an endorsement by NFPA of the advertiser or of the advertiser's organization, product, system, or service.
7. The advertiser understands that the fact of advertising in an NFPA publication is not to be used to market or promote the advertiser or the advertiser's organization, product, system, or service.
8. The advertiser understands that NFPA's name and image are not to be used in any commercial activities in any manner that would indicate, either directly or indirectly, NFPA's endorsement of the advertiser or of the advertiser's organization, product, system, or service.
9. NFPA will not accept advertising that is discriminatory because of race, religion, color, national origin, sex, age, or physical handicap.

# School Fire Drills

*After the school shootings in 1998, some U.S. students were afraid to participate in school fire drills. While understandable, this isn't acceptable. School fire drills serve an important function.*

Judy Comoletti

Last year, several school shootings caused the school fire drill to come under scrutiny. While it's understandable that children may feel vulnerable in these circumstances, it's essential that school officials understand the importance of fire drills in maintaining and improving fire safety in U.S. schools.

Toward that end, consider the following facts about the risks our school-age children face, then consider how options already recognized by national fire safety organizations can keep students safe while addressing their fears.

## Schools are fire-safe, but children aren't

Nursery schools, elementary schools, and high schools average more than 6,000 reported structure fires a year, but there are, on average, fewer than one death in those fires annually. Compare this with the average of 136 school-aged children who are awake and have no special impairments or

limitations who die in fires in their homes each year.

Since children split their waking time fairly evenly between school and home, the enormous difference in fire experience must be attributable to differences in fire safety provisions.

Most schools have smoke alarms, but so do most homes. Most homes lack fire sprinklers, but so do most schools in which fires occur. The biggest difference between the two settings is supervision and preparation—including school fire drills.

## School fire is a real threat

More than 6,000 school structure fires are reported every year—6,000 fires in a possible 112,000 public and private elementary and secondary schools in the United States. That means fire hits 1 in every 19 schools each year. If we want to keep those fires from killing our children, we must prepare them to react appropriately, and that means conducting school fire drills.

NFPA 101®, *Life Safety Code*®, provides many requirements whose widespread use has been essential to the level of fire safety in our schools. These requirements include conducting a fire drill at least once a month, making sure that classrooms are no more than 150 feet (46 meters) from the nearest exit, and keeping the classrooms

**Effects of Fire in U.S. Public Schools, Annual Average, 1992–1996**

| School       | Fires | Civilian Injuries | Estimated direct property damage |
|--------------|-------|-------------------|----------------------------------|
| Nursery      | 146   | 2                 | \$654,836                        |
| Kindergarten | 41    | 0                 | \$373,986                        |
| Elementary   | 1,665 | 32                | \$19,496,715                     |
| Junior high  | 1,248 | 29                | \$14,408,305                     |
| High         | 2,428 | 72                | \$28,653,862                     |

of preschool, kindergarten, and first-grade students on the ground floor.

NFPA recommends that fire drills be scheduled and announced to students before the alarm sounds. This has traditionally allowed teachers and students to plan their escape in advance and to address students' questions, such as what to do if they encounter smoke on their way out and where to assemble outside. In today's climate, part of that discussion can be devoted to exposing and calming children's fears.

Some schools may find that allowing children to talk about their fears will be enough. Others may find that stationing uniformed firefighters or police officers outside during drills—and announcing in advance that this will be done—will assure kids that the grounds are safe and that the drill needn't be feared. Certain members of the school staff might even be designated to go out first, without waiting to escort a group of students, to pro-

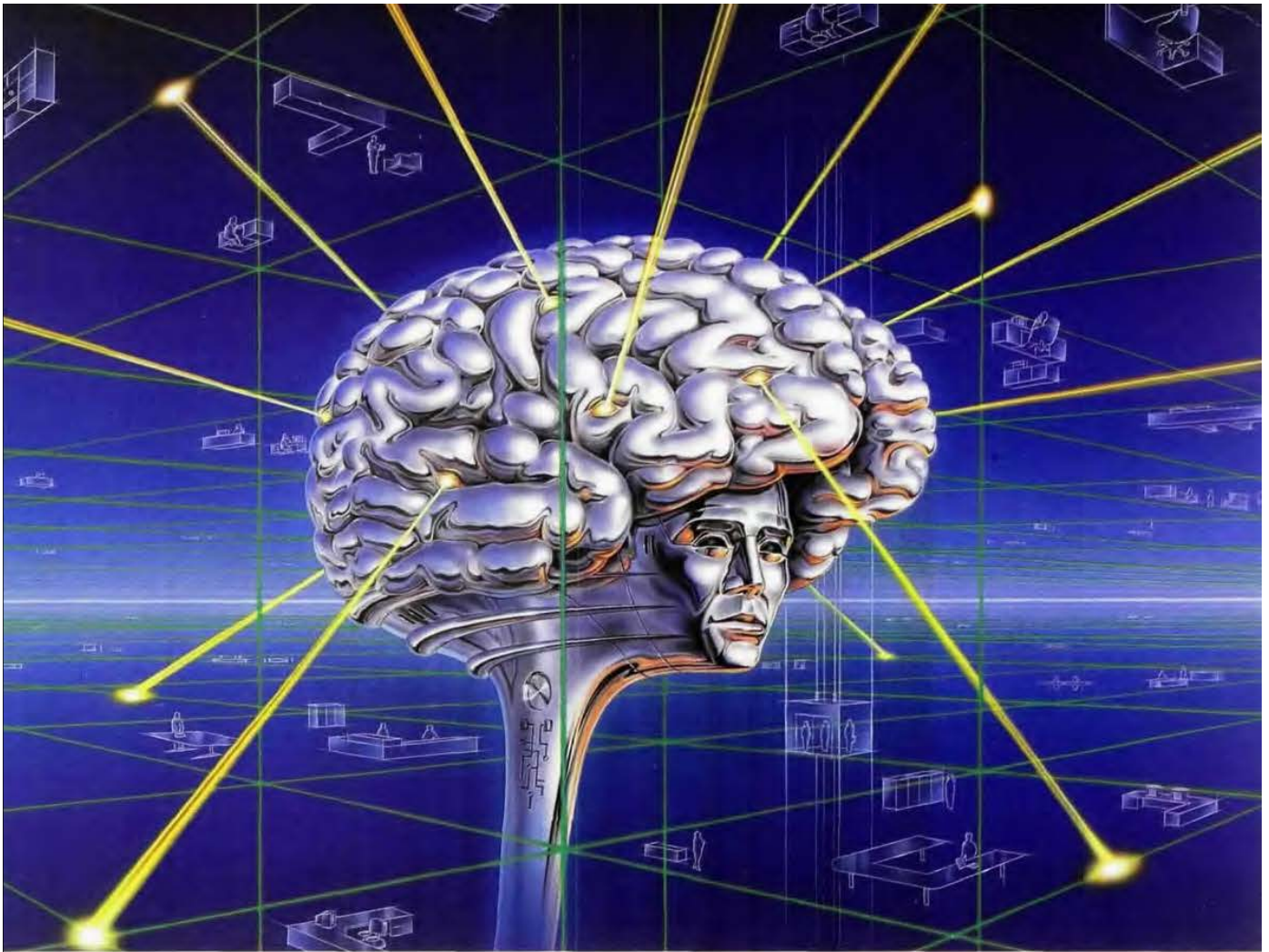
vide the reassuring sight of familiar, trusted, responsible people in the area.

Some communities delay complete evacuation until on-site authorities can investigate the cause of the alarm and confirm an emergency. However, it's important to understand that people have died in fires—not in schools, but in other public properties, such as hotels—as a result of such delays.

America's schools have long had a strategy for fire safety, and it's prevented catastrophic loss of life in fires for nearly 40 years. But those lessons were learned at the expense of hundreds of young lives earlier in this century, and we never want to have to pay that price again. It's essential that school officials continue to do what safety requires, including using school fire drills to train our children to be safe when fire strikes. ♦

*Judy Comoletti is the public education director for Safety Education Programs in NFPA's Public Education Department.*



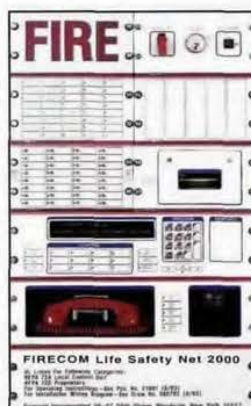


# DISTRIBUTED INTELLIGENCE

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features result in substantial cost savings for the distributor and customer.

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