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Covering the Bases with FPW 2001

Except for the lucky few teams that made the playoffs, Major League Baseball will soon be history for another season. But, Cover the Bases and Strike Out Fire is one team effort that doesn't end with the baseball season. This is the exciting new Fire Prevention Week (FPW) 2001 campaign that brings together America's favorite pastime with life-saving messages of fire prevention to help children and their families take responsibility for making their homes safer from fire. By covering all the bases, they can prevent a home fire tragedy.

Continuing the success of the three-year Great Escape campaign, this year's FPW program materials use a baseball diamond to focus attention on three of the leading causes of home fires. On first base is cooking safety. Heating safety is on second base and electrical safety, on third. To reinforce the messages of The Great Escape, home plate highlights the importance of smoke alarms and home fire escape planning and practice.

To encourage families to cover all their bases, we've developed a simple home fire safety inspection checklist that we provide free through the official FPW web site, www.firepreventionweek.org. To reach children directly, NFPA has teamed up again with Weekly Reader to deliver classroom instruction on fire safety with materials to take home to their families.

Rounding out the campaign are nearly 40,000 fire departments in the United States and Canada, which spearhead local FPW teams composed of teachers, civic groups, community volunteers, and safety advocates. Although NFPA has served as the national sponsor of Fire Prevention Week since its inception nearly 80 years ago, it's local teams that make FPW a success each year. They know that reaching out to the public with clear, consistent fire prevention advice can reduce their local fire loss numbers.

Last year during FPW, we reached 7 million families with life-saving messages, and 5 million families planned and practiced a home fire escape plan as part of their community's FPW events. Most telling of all, NFPA documented 74 lives saved as a result of The Great Escape campaign.

Although that's a tough act to follow, we've continued the success of the three-year Great Escape effort that doesn't end with the baseball season. This is the exciting new Fire Prevention Week (FPW) 2001 campaign that brings together America's favorite pastime with life-saving messages of fire prevention to help children and their families take responsibility for making their homes safer from fire. By covering all the bases, they can prevent a home fire tragedy.

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Fortunately, we've a lot of help to do that. We're pleased to have the U.S. Fire Administration, Kidde-Fenwal, Underwriters Laboratories, and USAA on our 2001 team, along with former Red Sox "fireman" Dennis Eckersley, who's pitching in to help us. All we need is you.

No matter where you live, you can be part of Fire Prevention Week 2001. As a member of NFPA and as an advocate for NFPA's mission, you have a spot on the FPW team. I hope you'll join us by taking part in FPW at work, in your community, and at home. It isn't too late to get into the game.

George Miller, President
NFPA

Last year, NFPA documented 74 lives saved as a result of The Great Escape Fire Prevention Week campaign.

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We save lives
In the May/June Mail Call, Brian Maltby, division chief of Fire and Emergency Services, Brampton, Ontario Canada, inquired about the motto "We Save Lives" NFPA president George Miller mentioned in his "First Response" column. NFPA is pleased to announce that a "We Save Lives" logo is available to NFPA members at www.nfpa.org under member logos.

Learn Not to Burn question
I read the article "A Community Approach to Safety" by William Peterson of the Plano, Texas, Fire Department in the May/June 2001 issue. The author wrote, "We anticipate that it may take 5 to 10 years, as it did with the Learn Not to Burn curriculum, before we see an appreciable decline in statistics in the targeted injury types."

If possible, I'd like to know the articles or documents which proved the Learn Not to Burn curriculum achieved the reduction of fire deaths and injuries.

Nobuo Mashimo
Japan

The author responds: I appreciate your interest. The article about our success with NFPA's Learn Not to Burn curriculum was an edited version of a paper presented at the International Annual General Meeting of the Institution of Fire Engineers in Belfast, Northern Ireland, in July 2000. The original paper looked at the per capita fire losses and fire/burn hospital records for a 16-year period and showed a more than 86 percent reduction in per capita fire loss and a corresponding "virtual elimination" of fire and burn injuries in high-risk target groups, such as children and seniors. Copies of the paper may be requested by email at billp@gwmail.plano.gov or by mail from Plano Fire Rescue, 1901 Avenue K, Plano, Texas 75074, USA.

William Peterson
Fire Chief, Plano Fire Rescue
Plano, Texas
www.planofire.org

Upholstered furniture statistics
Thanks to John Hall for writing an excellent article on "Targeting Upholstered Furniture Fires" in the March/April 2001 issue. I'd appreciate it if he could answer a question that the article raised.

Table 1 shows a reduction in upholstered furniture fires and deaths between 1980
1997. However, in 1980, there was one fire death for every 27 upholstered furniture fires. In 1997, there was one death for every 18 upholstered furniture fires. Does this mean that the same trend exists for fire injuries, with one injury (for every) 12.5 fires in 1980 and one injury (for every) 8 fires in 1997? Does this mean that fires are more dangerous, even though there are fewer of them?

Why hasn't the combination of better fabric and more detection caused a decrease in the number of deaths, injuries, and fires?

Deputy Chief Joseph Fleming
Fire Marshal
Boston, Massachusetts, Fire Department

The author responds: Chief Fleming is correct in saying that the impressive declines in deaths and injuries due to upholstered furniture fires have been accompanied by an even more impressive decline in the number of such fires, which means the rates of deaths per fire and injuries per fire have increased. So much has changed in and around upholstered furniture that any analysis of reasons for these trends must be somewhat speculative, but here’s one theory.

During the past 25 years, most of the emphasis was on making the furniture covering material resistant to cigarette ignition, since that was, and still is, the leading ignition heat source. The decline in the number of fires is evidence of the success of that approach, and if you focus on cigarette ignitions of upholstered furniture, you can see that success there, as well.

During the same period, changes were made to furniture filling materials, some to reinforce the cigarette-ignition resistance and many for other reasons, such as comfort and durability. Some of the changes made to typical filling materials, such as a shift from cotton to polyurethane foam, meant that fires were more likely to grow quickly and turn deadly. This is how we could get a sharp decline in number of fires combined with a rise in deaths per fire. The downward trend in total deaths and injuries means that the trend of declining fires has strongly dominated the trend of rising deaths per fire.

The statistics tell me that, if we chose to trade fewer fires for a higher average severity in the fires, it was a bargain worth making, because total fires, deaths, AND injuries, which is what we really care about, not rates per fire, are all substantially down.

There are clear opportunities for further improvement, including getting rid of old furniture so modern cigarette resistance is nearly universal, increasing resistance to small open flames, and changing materials to reduce peak and rate of increase in rate of heat release, so more fires grow slowly and peak at a lower severity. However, it’s vital that we don’t
I read Richard Bielen's article "Security Premises Standard" in the July/August 2001 issue and have a comment. We must be careful to describe the subject more precisely.

Precise terminology wanted

John Hall
Assistant Vice President
NFPA Fire Analysis and Research Division

The heading of the article states "Security Premises Standard," and the article refers to "Security Premises Standard," which implies this covers many things, including local and proprietary security alarm systems, closed circuit video, bars on the windows, and other physical security systems.

It's my opinion that we need to be specific and that the title of the standard should be "Security Alarm Systems Standard." It's my opinion it should cover many of the subjects similar to those in NFPA 72, National Fire Alarm Code®, such as fundamentals, initiating devices, protected premises security alarm systems, notification appliances, supervising station security alarm systems, inspection, testing, and maintenance.

Jack Marshall, FPE
Medford, Oregon

The author responds: Mr. Marshall is correct when he says I presented few details of the document’s content. The intent of the article was to update the reader on the status of the project, as it has changed direction several times since 1994. The information presented in the article was the most up-to-date information available at that time. The article was submitted for publication before the first committee meeting, therefore the details and direction of the project were unknown.

However, since the article was published, the committee has met and discussed pursuing a system installation standard, similar to that suggested by Mr. Marshall. Subsequent to the first committee meeting, NFPA's Standards Council reviewed a status report on the project and directed the committee to develop a premises security code first and defer the development of the installation standard until after the code is completed. The next committee meeting is on September 10, 2001, in Baltimore, Maryland.

Stay tuned for future updates on the premises security project as the code takes shape.

Richard R Bielen, RE.
NFPA Chief Systems and Applications Engineer
Calculating occupant loads

Mr. Koffel's July/August 2001 column regarding calculating occupant loads was fantastic, but it should be noted that it seems to be slanted from a designer's point of view.

If a code enforcement officer is asked to determine the occupant load of an existing space, occupant load factors are only one of the criteria taken into consideration. For instance, in an existing space where the occupant load factor would permit 1,500 people, if there were only three exits from the space, the occupant load would be required to be limited to 1,000.

As another example, the model codes generally prohibit more than 50 people occupying a space with only one exit, regardless of the size of the space.

As such, calculating occupant load for existing spaces must take into account the occupant load factor, the number of exits, the physical size of the exits, and the arrangement of the exits.

John R. Waters, CFPS, EFO
Havertown, Pennsylvania

The author responds: While I've seen circumstances in which the occupant load has been revised as suggested by Mr. Waters, the Life Safety Code® doesn't permit such a reduction, except in existing assembly occupancies. Section 7.3.1.2 states that the occupant load shall not be less than the number calculated using the appropriate occupant load factor. However, Section 13.1.7.1 permits the occupant load to be determined based on the available means of egress, provided that measures prevent occupancy by a greater number of people. I'm also aware of various codes designed to encourage the reuse of existing buildings permitting an occupant load based upon the available means of egress. The concern that most code enforcement personnel have with such allowances is the ongoing enforcement of the reduced occupant load.

It should be noted that the provisions permitting alternative methods of compliance and, in the case of the Life Safety Code, modifications permitted for existing buildings, may be two means of accomplishing what Mr. Waters has proposed.

Bill Koffel
President, Koffel Associates

Use of elevators

Thank you for the “Firefighters’ Use of Elevators” in high-rises in the “Structural Firefighting” column in the July/August 2001 issue. The precautions outlined in the
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The HASS Family was of particular interest, but appeared to omit some critical information, which I believe every fire department should be aware of before they make a decision whether to use this equipment. ASME A17.1-1993, Safety Code for Elevators and Escalators, and subsequent standards include a provision that has the potential for firefighter fatalities if adequate precautions aren’t taken. Rule 102.2 [ASME A17.1-1993] applies to buildings where automatic sprinkler protection has been installed in the elevator shaft or machine rooms and states, “Means shall be provided to automatically disconnect the main line power supply to the affected elevator before the application of water. This means shall not be self-resetting. The activation of sprinklers outside of the hoistway or machine room shall not disconnect the main line power supply.” Generally, this is achieved by installing heat detectors within 18 inches (46 centimeters) of sprinkler heads in the shaft and machine rooms, which are rated at 135°F (57°C). Activation of the heat detector results in immediate shut trip of the primary power to the elevator(s). Since the heat detectors are an integral part of the elevator equipment and are powered by a 120-volt source that isn’t part of a fire alarm system, with direct connection to the shunt trip breaker for elevator power, there’s no method available to reset the breaker once it’s tripped.

This situation has the potential to trap firefighters in the elevator car in the shaft if fire exposure raises either the shaft temperature or the machine room temperature significantly. The firefighter Phase II emergency in-car operation further complicates this feature, since it doesn’t override the operation of the heat detector and permits the firefighter to use the elevator until the heat detector operates.

While there are variations to this requirement in different regions of the country, every fire department that considers use of elevators for staging firefighters should be aware of this potential.

Anthony J. Richter, P.E.
Chief Fire Protection Engineer
The Boeing Company
Seattle, Washington

NFPA responds: Entrapment is a valid concern in risk benefit analysis, and the industry is making ongoing efforts to consider and develop provisions to help minimize these risks. With no intention of minimizing the concern, it might be helpful to be aware of a couple of additional points in the evaluation process.
First, NFPA 13, Installation of Sprinkler Systems, includes the following exception in Section 5-13.6.3. "Sprinklers aren't required at the tops of noncombustible hoistways of passenger elevators with car enclosure materials that meet the requirements of ASME A17.1, Safety Code for Elevators and Escalators." Since noncombustible hoistways are becoming common, exposure to shut down may be limited to machine room heat detectors in recently constructed buildings.

Second, the requirements for elevator recall in Section 3-9.3.6 of NFPA 72 (1999), National Fire Alarm Code®, include provisions for notification by separate and distinct visible annunciation to alert firefighters that the elevators are no longer safe to use. These alarms activate when elevator hoistway or machine room smoke detectors used for elevator recall activate. This indication is not provided if only the elevator lobby smoke detectors activate elevator recall.

Although heat detectors used for elevator shut down operate separately from the elevator recall functions, the required notification in many cases help provide early warning. It's still important to remember that firefighter recall features don't override the elevator shut-down that could subsequently occur. Note that resetting the shunt trip breaker is permitted only by manual means, at the breaker, and likely, can only be accomplished if the tripping condition has cleared. Reference is made to NFPA 70, National Electrical Code® Section 620-51.

Finally, a clarification is needed concerning the statement that "the heat detectors are an integral part of the elevator equipment, and are powered by a 120-volt source that isn't part of a fire alarm system, with direct connection to the shunt trip breaker for elevator power." These heat detectors are a part of the fire alarm system and are subject to the requirements of NFPA 72. They activate shut down of the elevator system by interfacing with the fire alarm system. Specific rules for the interface of the fire alarm system with controlled equipment are found in Section 3-9.2.

Lee Richardson
NFPA staff liaison for NFPA 72

In the next issue:
- Stratosphere Tower Retail Shops
- NFPA 96, Ventilation Control and Fire Protection of Commercial Cooking Operations
- NFPA 80A, Exterior Fire Exposures
- U.S. Firefighter Injuries of 2000
- Large-Loss Fires of 2000

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To stay current on the latest developments affecting Occupational Safety and Health Administration (OSHA) regulations, plan to attend NFPA’s OSHA Conference from October 17 to 19, 2001, at the Hilton Minneapolis/St. Paul Airport.

Designed for general industry and health care facility safety professionals, this conference provides training from the same trusted source OSHA turns to for guidance: NFPA. Because NFPA codes and standards form the basis of many of OSHA’s safety requirements, no organization is more qualified to help you keep employees safe or to comply with the law.

Based on feedback about last year’s conference in St. Louis, this year’s conference in Minneapolis, features shorter sessions, more topics, and greater flexibility, so you can pack more learning into your conference experience. Choose from sessions on personal protective equipment, confined-space safe practices, hot work operations, laboratories, electrical safety in the workplace, hazardous materials, atmospheric monitoring instrumentation, means of egress, and more. NFPA code experts, OSHA staff, and industry professionals will offer practical knowledge and workplace safety insights.

A networking lunch and continental breakfast offer opportunities to widen your circle of contacts in a relaxed setting. It’s a great opportunity to get the big picture on workplace safety issues that affect your industry.

Register by September 17 for a discount on pricing, and you’ll receive a free bonus book, either Introduction to Employee Fire and Life Safety or Fire and Life Safety in Health Care Facilities. Call 800-344-3555 today or register online at www.nfpa.org. To make hotel reservations, call 800-Hiltons by September 25.

Annual Meeting TCR Change

Although NFPA’s World Safety Conference and Exposition™ in Minneapolis, Minnesota, isn’t until May 2002, there’s an important change to mark on your calendar. Several documents, including NFPA 5000, Building Code™, will be up for adoption, requiring additional technical committee report (TCR) sessions. For the first time, there will be a TCR session on a Sunday, May 19. Sessions will also be held on Wednesday, May 22, and Thursday, May 23. If the agenda isn’t finished on Thursday, the sessions will continue on Friday, May 24, to handle the Building Code. The draft of the Building Code is available online at www.nfpa.org.

The schedule is as follows:

**Sunday, May 19, 2002**
12:30 p.m.—6:00 p.m. TCR Session I, 47 documents

**Wednesday, May 22, 2002**
1:00 p.m.—6:00 p.m. TCR Session II, 9 documents, including the Building Code

**Thursday, May 23, 2002**
8:00 a.m.—6:00 p.m. TCR Session III, Building Code continuation

**Friday, May 24, 2002**
8:00 a.m.—6:00 p.m. TCR Session IV, Building Code if necessary
**NAC Power Extenders**

**AL802ULADA**
- NFPA 72 Compliant.
- Input 115VAC 50/60 Hz, 3.2 amps.
- Field selectable 24VDC or 12VDC voltage regulated power limited outputs.
- 8 amps total supply current.

**AL602ULADA**
- NFPA 72 Compliant.
- Input 115VAC 50/60 Hz, 3.2 amps.
- Field selectable 24VDC or 12VDC voltage regulated power limited outputs.
- 6.5 amps total supply current.

**Both feature:**
- Two (2) outputs may be paralleled for more power on an indicating circuit.
- Two (2) Class A or Two (2) Class B FACP inputs.
- Two (2) N.C. dry contact trigger inputs.
- Programmable supervised indicating circuit outputs:
  - Four (4) Class B or Two (2) Class A or One (1) Class A and Two (2) Class B.
  - Built-in Programmable features
   - 2-Wire Horn/Strobe Sync Protocol for:
     - System Sensor®
     - Gentex®
     - Faraday
     - Amseco
   - (Sync modules are not required).
- 2-wire horn/strobe Sync mode allows audible notification appliances (horns) to be silenced while visual notification appliances (strobes) continue to operate.
- Temporal Code 3.
- Steady Mode.
- Input to Output Follower Mode
  - (maintains synchronization of notification appliances circuit).
- March Time.

*Gentex® is a registered trademark of Gentex Corporation. System Sensor® is a registered trademark of Honeywell®.*

**Multi-Output Fire Power**

**AL600ULM**
- NFPA 72 Compliant.
- Input 115VAC 60Hz, 1.9 amp.
- Field selectable 12VDC or 24VDC outputs.
- 6 amps continuous supply current at 12VDC or 24VDC.
- Fire Alarm Panel or Access Control System trigger inputs. (N.O. or N.C. supervised trigger input and polarity reversal trigger input)
- Five (5) individual class 2 rated power limited outputs.
- Current limit is 2.5 amps @ 12VDC or 24VDC per output.

**AL400ULM**
- NFPA 72 Compliant.
- Input 115VAC 60Hz, 1.45 amp.
- Field selectable 12VDC or 24VDC outputs.
- 4 amps continuous supply current at 12VDC.
- 3 amps continuous supply current at 24VDC.
- Fire Alarm Panel or Access Control System trigger inputs. (N.O. or N.C. supervised trigger input and polarity reversal trigger input)
- Five (5) individual class 2 rated power limited outputs.
- Current limit is 2.5 amps @ 12VDC or 24VDC per output.

**AL300ULM**
- NFPA 72 Compliant.
- Input 115VAC 60Hz, 1.45 amp.
- Field selectable 12VDC or 24VDC output.
- 2.5 amps continuous supply current at 12VDC or 24VDC.
- Fire Alarm Panel or Access Control System trigger inputs. (N.O. or N.C. supervised trigger input and polarity reversal trigger input)
- Five (5) individual class 2 rated power limited outputs.
- Current limit is 2.5 amps @ 12VDC or 24VDC per output.

**24 Hour Fire Power**

**AL600ULX**
- NFPA 72 compliant.
- Input 115VAC / 60Hz, 1.9 amp.
- Field selectable 12VDC or 24VDC output
  - (non-power limited).
- 6 amp continuous supply current at 12VDC or 24VDC.
- Maximum charge current .7 amp.
- AC fail supervision.
- Battery presence and low battery supervision.

**AL400ULX**
- NFPA 72 compliant.
- Input 115VAC / 60Hz, 1.45 amp.
- Class 2 rated power limited output.
- Field selectable 12VDC or 24VDC output.
- 4 amps continuous supply current at 12VDC.
- 3 amps continuous supply current at 24VDC.
- Maximum charge current .7 amp.
- AC fail supervision.
- Battery presence and low battery supervision.

**AL300ULX**
- NFPA 72 compliant.
- Input 115VAC / 60Hz, 0.9 amp.
- Class 2 rated power limited output.
- Field selectable 12VDC or 24VDC output.
- 2.5 amp continuous supply current at 12VDC or 24VDC.
- Maximum charge current .7 amp.
- AC fail supervision.
- Battery presence and low battery supervision.

**AL300ULXD**
- AL300ULX w/dual input 115VAC 50/60Hz .9 amp or 230VAC 50/60Hz .45 amp.

Autocad drawings of these and other models available on our web site: www.altronix.com.

Altronix® Product CD now available.

Made in U.S.A.
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NFPA Unveils Improved Internet Presence

Web site gives members and visitors quicker access to NFPA online.

As part of its ongoing e-Strategy, NFPA is unveiling a redesigned web site and online catalog to provide members with access to comprehensive fire and life safety information and products. The enhanced web site includes an online version of the award-winning *NFPA Journal*, official magazine of NFPA, as well as access to member information and expanded search capabilities.

The better-organized NFPA Online presents visitors and members with a cleaner interface throughout the site allowing them quicker and better access to NFPA’s web site. The new site also provides visitors with an opportunity to become members and receive personalized information based on their areas of interest. Through a unique profiling function, members can get up-to-date information on their membership status, committee activities, and benefits.

For those seeking more information, an enhanced keyword search function allows visitors to get accurate and precise information with references to NFPA codes and standards, and products. Visitors will also notice a consistent look and feel throughout NFPA Online.

Visitors to the *NFPA Journal* site can read exclusive features available online only, as well as the columns from the current issue of *NFPA Journal*. Upcoming online features include a story on the May 1, “Grand Canyon” roller coaster fire in Bruehl, Germany.

Members will also be able to access features from the print version of *NFPA Journal*.

Coping with a Sprinkler Recall

Manufacturer produces manual to help its customers.

Central Sprinkler Company, an affiliate of Tyco Fire Products, has published a manual, *Responsible Leadership*, to help its customers understand the massive recall of Central’s sprinklers and its voluntary replacement program.

In July, the U.S. Consumer Product Safety Commission and Central announced that the company will provide free parts and labor to replace 35 million Central fire sprinklers with potentially faulty O-ring seals. The program also includes 167,000 O-ring models sold by Gem Sprinkler Company and Star Sprinkler, Inc. The sprinklers were installed nationwide in a variety of buildings, including houses, apartments, hospitals, day-care facilities, schools, dormitories, nursing homes, supermarkets, parking garages, warehouses, and office buildings.

Central will arrange for the installation using its own field service crews or professional sprinkler contractors.

Central voluntarily initiated this action after it discovered the performance of the O-ring sprinklers could degrade over time, causing sprinklers to corrode. Central will provide newer sprinklers that don’t use O-ring seals.

The manual will help customers understand the voluntary replacement program, including the reasons behind the effort and how the program works. A listing of all the models covered under this voluntary replacement program is also included.

In addition, a CD-ROM of the manual is enclosed so customers can e-mail portions of it.

For more information on the recall, the replacement program, or the manual, go to www.SprinklerReplacement.com.
Central Sprinkler Company, an affiliate of Tyco Fire Products LP of Lansdale, PA, and the U.S. Consumer Product Safety Commission (CPSC) are announcing a voluntary recall to replace approximately 35 million Central fire sprinklers with O-ring seals. A limited number of O-ring models sold by Gem Sprinkler Co. and Star Sprinkler, Inc., totaling about 167,000 sprinkler heads, are also included. Under certain circumstances, these sprinklers may fail to activate in a fire. These sprinklers were installed in a wide variety of buildings, including houses, apartments, hospitals, day care facilities, schools, dormitories, nursing homes, supermarkets, hotels, parking garages, warehouses and office buildings.

Example of “Wet” Sprinkler
Example of “Dry” Sprinkler

**OBTAINING REPLACEMENTS**

Central will provide free of charge replacement sprinkler heads and the labor needed to replace the sprinklers. The program will be phased in over time in an orderly process that best serves the public interest.

For Help Identifying Your Sprinklers and to Obtain Your Complete Notice Packet, Please Call:

1-800-871-3492
(24 hours a day, 7 days a week)

or visit www.sprinklerreplacement.com
People say that "fire safety" is in our blood.

Now, we've put it in our name.

Cerberus is now Siemens Fire Safety.

For 50 years, Cerberus has focused on protecting virtually every kind of environment, from the Space Shuttle to Rockefeller Center to your local school. Now, we have a new name to best reflect who we are today. Siemens Fire Safety, the world's largest maker of fire detection systems, backed by the strength of Siemens and the unbeatable expertise of Cerberus. Using this rich heritage, we promise to deliver an even greater array of products to make your world a safer place. For details on Siemens Fire Safety, Siemens Building Technologies, Inc., call 973-593-2600, or visit cerbyro.com
Causes of Fires and Direct Property Damage in Industrial and Manufacturing Structure Fires

1994–1998 Annual

<table>
<thead>
<tr>
<th>Cause</th>
<th>Fire</th>
<th>Property Damage (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other equipment</td>
<td>6,600</td>
<td>$277.4</td>
</tr>
<tr>
<td>Open flame, ember, or torch</td>
<td>2,300</td>
<td>$101.0</td>
</tr>
<tr>
<td>Electrical distribution</td>
<td>1,700</td>
<td>$86.8</td>
</tr>
<tr>
<td>Heating equipment</td>
<td>1,200</td>
<td>$32.3</td>
</tr>
<tr>
<td>Natural causes</td>
<td>1,100</td>
<td>$40.6</td>
</tr>
<tr>
<td>Incendiary or suspicious</td>
<td>1,000</td>
<td>$158.6</td>
</tr>
<tr>
<td>Appliance, tool, or air conditioning</td>
<td>800</td>
<td>$21.5</td>
</tr>
<tr>
<td>Other heat source</td>
<td>700</td>
<td>$16.2</td>
</tr>
<tr>
<td>Cooking equipment</td>
<td>500</td>
<td>$24.1</td>
</tr>
<tr>
<td>Exposure</td>
<td>500</td>
<td>$17.1</td>
</tr>
<tr>
<td>Smoking materials</td>
<td>400</td>
<td>$13.1</td>
</tr>
<tr>
<td>Child playing</td>
<td>100</td>
<td>$1.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>16,900</strong></td>
<td><strong>$789.6</strong></td>
</tr>
</tbody>
</table>

**Source:** National estimates based on NFIRS and NFPA. The categories are based on a hierarchy developed by the U.S. Fire Administration.

Structure Fires in Industrial and Manufacturing Properties

1994–1998 Annual Averages

Fires in two categories of facilities—basic industry, utility, and defense properties, and manufacturing properties—are examined together in this section. Basic industry, utility, and defense properties include agriculture, forestry, mining, laboratories, energy production, communication facilities, and defense sites. Manufacturing properties include properties that make products of all kinds or are engaged in processing, assembling, mixing, packing, finishing, decorating, repairing, and similar operations. Only fires reported to public fire departments are included in these statistics.

<table>
<thead>
<tr>
<th>Occupancy</th>
<th>Fire</th>
<th>Civilian Deaths</th>
<th>Civilian Injuries</th>
<th>Direct Property Damage (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy production facility</td>
<td>200</td>
<td>1</td>
<td>6</td>
<td>$22.9</td>
</tr>
<tr>
<td>Laboratory</td>
<td>300</td>
<td>0</td>
<td>17</td>
<td>$4.8</td>
</tr>
<tr>
<td>Communication, defense, or document facility</td>
<td>200</td>
<td>0</td>
<td>4</td>
<td>$7.1</td>
</tr>
<tr>
<td>Energy distribution property or utility</td>
<td>500</td>
<td>1</td>
<td>10</td>
<td>$12.2</td>
</tr>
<tr>
<td>Agricultural or farm production facility</td>
<td>2,300</td>
<td>2</td>
<td>11</td>
<td>$57.0</td>
</tr>
<tr>
<td>Forest, fish hatchery, or hunting area</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>$0.8</td>
</tr>
<tr>
<td>Mine or quarry</td>
<td>200</td>
<td>0</td>
<td>3</td>
<td>$6.5</td>
</tr>
<tr>
<td>Nonmetallic mineral or mineral product manufacturing facility</td>
<td>300</td>
<td>0</td>
<td>10</td>
<td>$15.1</td>
</tr>
<tr>
<td>Unclassified or unknown industry, utility, or defense</td>
<td>200</td>
<td>0</td>
<td>3</td>
<td>$9.7</td>
</tr>
<tr>
<td><strong>Total Industry, Utility &amp; Defense</strong></td>
<td><strong>4,200</strong></td>
<td><strong>3</strong></td>
<td><strong>62</strong></td>
<td><strong>$136.0</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Industry, Utility &amp; Defense</th>
<th>Fire</th>
<th>Civilian Deaths</th>
<th>Civilian Injuries</th>
<th>Direct Property Damage (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food product manufacturing</td>
<td>1,200</td>
<td>1</td>
<td>27</td>
<td>$77.2</td>
</tr>
<tr>
<td>Beverage, tobacco, or related oil product manufacturing</td>
<td>200</td>
<td>0</td>
<td>9</td>
<td>$3.7</td>
</tr>
<tr>
<td>Textile manufacturing</td>
<td>500</td>
<td>1</td>
<td>21</td>
<td>$150.0</td>
</tr>
<tr>
<td>Wearing apparel or leather or rubber product manufacturing</td>
<td>400</td>
<td>0</td>
<td>19</td>
<td>$38.3</td>
</tr>
<tr>
<td>Wood, furniture, paper, or printing product manufacturing</td>
<td>3,000</td>
<td>0</td>
<td>68</td>
<td>$112.8</td>
</tr>
<tr>
<td>Chemical, plastic, or petroleum product manufacturing</td>
<td>1,300</td>
<td>6</td>
<td>106</td>
<td>$54.6</td>
</tr>
<tr>
<td>Metal or metal product manufacturing</td>
<td>3,700</td>
<td>4</td>
<td>166</td>
<td>$140.4</td>
</tr>
<tr>
<td>Vehicle assembly or manufacturing</td>
<td>600</td>
<td>1</td>
<td>28</td>
<td>$22.5</td>
</tr>
<tr>
<td>Other manufacturing</td>
<td>1,000</td>
<td>0</td>
<td>27</td>
<td>$30.9</td>
</tr>
<tr>
<td>Unclassified or unknown manufacturing</td>
<td>800</td>
<td>3</td>
<td>23</td>
<td>$23.1</td>
</tr>
<tr>
<td><strong>Total Manufacturing</strong></td>
<td><strong>12,700</strong></td>
<td><strong>15</strong></td>
<td><strong>494</strong></td>
<td><strong>$653.6</strong></td>
</tr>
</tbody>
</table>

**Note:** These are fires reported to U.S. municipal fire departments and so exclude fires reported only to federal or state agencies or industrial fire brigades. Fires are rounded to the nearest hundred, deaths and injuries to the nearest one, and direct property damage to the nearest hundred thousand dollars. Sums may not equal totals due to rounding errors. Damage has not been adjusted for inflation.

**Source:** National estimates based on NFIRS and NFPA survey.

Fires in Industrial and Manufacturing Properties

From 1994 through 1998, the leading cause of fires and direct property damage in industrial and manufacturing structures was “other equipment,” which included shaping machines, processing equipment, furnaces, waste recovery equipment, forging equipment, and conveyors. These machines accounted for an average of 6,600 fires that resulted in $277.4 million in damage.

The second leading category was “open flame, ember, or torch.” Of the 2,300 fires in this category, torches were the leading cause, accounting for an annual average of 1,400 fires that resulted in $75.3 million in damage.

Electrical distribution equipment accounted for 1,700 fires, of which 500 fires were due to fixed wiring problems.

In industrial and manufacturing properties, an average of 16,900 reported structure fires caused 18 civilian deaths, 556 civilian injuries, and $789.6 million in direct property damage annually between 1994 and 1998. Overall, these fires accounted for 3 percent of all reported structure fires during that period. However, NFPA statistics show that, since 1980, these types of structure fires have dropped from 42,100 in 1980 to 16,100 in 1998.
ASSEMBLY

**Electrical fault ignites grandstand**

**Ohio**

A passerby called 911 at 6:00 p.m. to report a fire in the grandstand at a fairground. The blaze spread quickly to the wooden seats, forcing firefighters into a defensive position. The three-story grandstand, built of heavy timber, had a metal roof and covered 4,500 square feet (418 square meters). There were no sprinklers or smoke alarms.

The fire occurred in an east-facing electrical room when a line fault in a panel box ignited the wood frame. Within minutes, the grandstand became fully involved in flames. One firefighter received minor burns to his hand during extinguishment. Losses were estimated at $750,000.

**Careless disposal of ashes destroys restaurant**

**Colorado**

A restaurant was destroyed when ashes removed from a barbecue pit were dropped outside the ash can. Wood wall joists were ignited and the fire spread to concealed spaces in the attic and roof, making it difficult to find, confine, and extinguish. The restaurant was occupied and open for business when the fire broke out.

Early in the evening, the restaurant manager was approached by a customer who commented that the theme restaurant even had smoke coming from fixtures in the bathroom. Knowing this wasn't supposed to happen, the employee investigated and found light smoke filling the bathroom and an odor of burning plastic. Employees in the back of the restaurant also smelled the odor, and heavy black smoke was seen coming from one of the three barbecue pits. The staff called 911 at
A fire is never good news. But if it results in significant downtime, it's worse. Which is why you need DuPont FE-36™ in your portable extinguishers. It leaves absolutely no residue, which makes for less clean-up and greater uptime. Its low toxicity is good news for users and its lack of ozone-depleting properties is good for everyone. And FE-36™ is globally available and universally effective on every kind of fire, making it the best clean-agent extinguishant, anytime, anywhere. For more information, call 1-800-473-7790 or visit our website, www.dupont.com/fire.
6:08 p.m., and employees and patrons evacuated the building.

Firefighters found the fire in a wall space behind the barbecue pits and in a vent on the roof. The first of two teams entered the restaurant and opened the wall behind the pit, extinguishing visible flames. The second team went to the roof, where they used a dry chemical extinguisher in a duct to knock down most of the fire. Because of the possibility of collapse, the roof was evacuated and suppression operations moved. Eventually, the blaze engulfed the roof, collapsing it and destroying the building.

Investigators determined that an employee had removed ash from a barbecue pit and put most of it in a metal can following normal procedure. However, some ash fell outside the can against a wall. In four hours, heat from the ash ignited the wooden wall studs and melted a plastic pipe in the wall cavity that vented to a floor drain. The melting pipe contributed to the fire’s growth through the wall and out through the top plate of the wall assembly. From there, fire spread in several directions, including the area above the restroom. Flames and smoke spread unnoticed until the patron alerted the manager.

No occupants or firefighters were injured. The combined loss of the building and its contents was estimated at $1.2 million.

Electric arc ignites lint in dryer vent

MINNESOTA

An arc in an operating clothes dryer in a residential board-and-care facility ignited lint that had accumulated in the vent, and the flames spread through concealed spaces to an adjacent bedroom. A caregiver immediately closed the closet door, confining the fire and saving the two occupants.

The single-story, wood-frame house was 60 feet (18 meters) wide, 50 feet (15 meters) long, and had a pitched, asphalt roof.

The caregiver was placing laundry in an electric clothes dryer in the first-floor laundry room when she remembered that the vent had come loose from the back of the dryer. She reattached the plastic vent piping and had just turned on the dryer when she saw a spark. A minute later, the smoke alarms in the bedrooms and hallways sounded.

The worker went into a bedroom next door where she saw smoke and flames coming from the closet. She helped the resident from the room and closed the closet door to contain the fire. Then, she found the second resident, and they left the house to call 911 from a neighbor’s home at 10:26 a.m.

Firefighters arrived nine minutes later and extinguished the blaze, which charred the laundry room and seriously damaged the adjacent bedroom.

Investigators determined that the dryer arced, igniting the lint. The resulting fire melted the plastic vent hose, which passed through the bedroom closet before venting to the outside through the wall.

The house, valued at $90,000 sustained estimated losses of $72,000. Contents, valued at $28,000, sustained estimated losses of $20,000. No injuries were reported.

Two die after candle ignites plastic bathtub

MASSACHUSETTS

An unattended candle started an apartment fire that killed two children and injured three occupants. The fire burned rapidly, producing heavy black smoke, after the candle ignited a plastic bathtub enclosure.

The second-floor apartment was in a three-story building containing one 1,275-square-foot (118-square-meter) unit on each floor. The wood-frame building had asbestos on the exterior walls and an asphalt roof. Each apartment had three bedrooms, a bathroom, a kitchen, and front and rear porches. Smoke alarms were present, but the type and their locations in the apartments weren’t reported and it isn’t known if they operated. There were no sprinklers.

A passerby saw smoke on the second floor and called 911 at 11:10 p.m. Firefighters arrived within four minutes to find that the blaze had spread from the second-floor bathroom into the hallway and kitchen. Firefighters from three engines, two ladder companies, and a rescue company brought the fire under control and made several rescue attempts. However, two girls, ages 9 and 5, died, and two other children, ages 7 and 11, were injured, as was a 35-year-old woman.

Investigators determined that a candle in a glass container had been lit and placed on the shelf of the tub enclosure. Heat from the candle ignited the tub enclosure, which burned vigorously, involving the entire bathroom. A closed door initially contained the heat and smoke, but flames broke through the door and into the hall and kitchen.

The fire department conducted flame testing on a similar tub enclosure from another apartment in the building. The sample began to melt within 20 seconds of exposure to an open flame, burning quickly and producing a significant amount of smoke.
of black smoke until it was nearly consumed by the flames.

The building, valued at $91,000, sustained estimated losses of $50,000. Content losses weren't reported. Two firefighters received minor injuries.

- Improper use of kerosene heater sparks deadly fire

**MASSACHUSETTS**

A fire caused by an improperly installed kerosene heater killed a 51-year-old man and damaged his manufactured home. A neighbor discovered the early morning fire, in the rear of the property 200 feet (61 meters) from the street, and called 911 at 3:29 a.m. It was later determined that the heater's flue had been improperly installed and that the heater was within 2 feet (0.6 meters) of combustibles.

The single-story, wood- and steel-frame home, in which the man lived and worked, had no sprinklers or fire detection systems.

Two engine companies and a ladder company arrived within five minutes, and firefighters discovered flames coming from the dwelling. The front portion of the structure, which contained the kitchen and living room, was completely involved in fire, with flames coming from windows. The fire had burned through the side wall, exposing the severely burned body. Crews advanced two 1½-inch hose lines into the structure, but the fire spread to the bathroom and rear bedroom before they managed to extinguish it.

Investigators determined that the man installed the kerosene heater in the living room, venting it with a single-wall metal flue pipe with a metal flange that passed through the exterior wall. The flange provided no clearance between the metal pipe and the combustible wall.

The man died of smoke inhalation and burns. Total losses were estimated at $10,000.

- Incendiary fire kills two, injures five

**NEW YORK**

A fire deliberately set on a second-floor porch above a bar spread rapidly, trapping the occupants of 12 apartments and killing two people. By the time firefighters arrived, a number of occupants had fled to the fire escapes to escape the heavy fire, which was threatening several exposures on two sides of the building. The blaze, which also injured five people, was allegedly set by a former tenant seeking revenge against the building's manager.

The 60-by-30-foot (18-by-9-meter) building had a bar on the first floor and 12 apartments on the two upper floors. Built of wooden, balloon-type framing with a flat, built-up roof, the unsprinklered building had single-station smoke alarms in each apartment. The bar was closed for the night when the fire started, although the apartments were occupied.

A resident called 911 at 3:05 a.m. to report the fire, and firefighters arrived minutes later. Using aerial and ground ladders, they rescued several occupants and advanced hose lines to protect the exposures. Because the fire had been set in a rear-facing, enclosed porch, it blocked the main exits of several apartments and spread to the third floor up the open stairwell.

To the rear of the property was a single-family house, and on the right side was a restaurant, both of which had to be protected. Firefighters from six surrounding communities helped establish five water supply lines to feed the 2½- and 1½-inch hose lines, deluge guns, and ladder pipe needed to extinguish the fire and prevent flame spread.

The case is ongoing, although a former tenant reportedly confessed to starting the fire in a box of newspapers in the rear enclosed porch near the second-floor stairwell. Although the exterior walls of the porch were enclosed, the structure's open wood construction helped the fire to spread to the third floor, up the open stairway.

A 47-year-old man and a 79-year-old woman died in the blaze, which also injured two occupants and three firefighters. The property, valued at $150,000, was a total loss, and the building was demolished.

- Three die when child playing with fire ignites bed

**TENNESSEE**

A 2-year-old boy and his 23-year-old mother died when a fire spread through the house. The children's 28-year-old father, who rescued three of his daughters before reentering the house to search for his wife and son, also died. Firefighters found his body in the front room, where he'd been overcome by smoke and heat.

The single-family, wood-frame house covered 1,600 square feet (148 square meters) and had an asphalt-shingle roof. There were no sprinklers, and the smoke alarm in the kitchen had no batteries.

A neighbor reported the fire at 7:16 p.m., and firefighters arrived three minutes later. Crews quickly advanced a 1½-inch hose line through the front door, as other firefighters performed first-aid on the three rescued girls.

When a witness told the
chief that as many as three people might still be trapped in the building, he checked the fourth side of the house for fire extension and tried to open the rear door, which was padlocked. Forcing the door, the chief and a firefighter found the 2-year-old boy and his mother inside. Firefighters controlled the fire within five minutes, and all the victims were transported to the hospital.

Investigators determined that the fire began in a front bedroom under a bed. They believe that one of the children was playing with a lighter or matches and ignited a foam mattress. Flames then spread to the hallway, living room, and kitchen. The padlocked door prevented the victims from leaving.

The house, valued between $50,000 and $60,000, sustained damages estimated at $20,000. Contents, valued at $3,500, were totally destroyed.

**Fire started after mattress placed against grill**

**COLORADO**

An outdoor charcoal grill ignited a mattress placed against it on a balcony of a three-story apartment building. Wood on the deck was also ignited. Flames spread to the attic and concealed spaces, heavily damaging the 24-unit building.

The wood-frame apartment building was 200 feet (61 meters) long and 50 feet (15 meters) wide. Single-station smoke alarms had been installed in each unit, and there were manual pull stations at points of egress. A wet-pipe sprinkler system provided coverage to all living spaces.

A third-floor resident saw the fire on the porch and tried unsuccessfully to extinguish the flames with a portable fire extinguisher. He called 911 at 12:10 p.m., as did a passerby. The fire spread to the attic above the sprinklers, and flames spread along the roof line; a drop-down fire inside the building was controlled by five sprinklers.

Investigators determined that the unit’s occupant had placed the mattress against the grill he had used 12 hours earlier and heat from the briquettes ignited the mattress. The structure, valued at $1 million, sustained losses of $250,000. Contents, valued at $300,000, had losses of $75,000. There were no injuries.

**SPECIAL**

- **Electrically charged aluminum siding delays fire attack**

**NEW YORK**

While battling an arson fire in a vacant farmhouse, firefighters had to change their extinguishment strategy when the main power supply to the structure arced and energized the building’s exterior metal siding.

The 3½-story, wood-frame farmhouse, which was 60 feet (18 meters) long and 50 feet (15 meters) wide, was unsprinklered and had no fire detection system.

A passing fire official spotted the fire and notified the fire department at 6:31 p.m., sending the first of 65 firefighters to the scene. On arrival, crews found that the front door had been forced open and that the fire was spreading from the basement to the upper floors through concealed voids in the balloon frame. Firefighters attacked the fire aggressively, but withdrew when the house’s siding became energized in a shower of sparks.

Once the crews moved to defensive positions, the structure became heavily involved in flames. Fire crews lost nearly an hour waiting for the utility company to arrive and cut power to the house so they could complete extinguishment.

Investigators determined that the fire had been deliberately set in the basement.

The house, valued at $225,000, sustained structural losses of $150,000. Its contents, valued at $20,000, sustained losses of $10,000. One firefighter was injured.

**HEALTH CARE**

- **Sprinkler contains fire in hospital**

**FLORIDA**

An operating sprinkler, fire-rated construction, and an automatic detection system helped contain a fire in a large hospital, as hospital employees moved patients to areas of refuge. Firefighters then attacked the remaining fire and working with hospital staff, ventilated smoke from a second-floor laundry room near the center of the building.

The four-story, multi-wing regional hospital, built of ordinary construction, was 500 feet (152 meters) long and 275 feet (84 meters) wide, and covered 137,500 square feet (12,774 square meters). It was built of concrete block with a brick veneer, and its floor and roof assemblies were a combination of steel- and wood-frame construction. A wet-pipe sprinkler system with standpipes provided full coverage, and water flow was monitored. Smoke detectors in the hallways were also monitored by a central station alarm company.

Automatic detection systems sounded the alarm at 10:33 a.m. when a fire broke out in a second-floor laundry room. Firefighters arrived within two minutes to find a sprinkler operating inside the fire-rated room. Patients were moved to a safe area, and firefighters attacked the remaining flames with a 1½-inch hose line from a hallway standpipe and hose cabinet. Additional crews supported the first-in engine, setting up positive-pressure ventilation and securing the sprinkler with wedges once the fire was extinguished. Fire crews worked with hospital staff to restore the sprinkler system and control water damage.

Investigators discovered that oily mops had been placed in a dryer, the heat from which ignited the oil. The fire then spread to dust until it was controlled by a single sprinkler.

Fire damage was limited to the dryer and smoke damage to the room of origin. Water damaged the first- and second-floor ceilings, second-floor carpeting, and stairwells. Damage to the building, valued at $16.7 million, was estimated at $1,500. Its contents, valued at $10.3 million, sustained losses of $2,500. No one was injured.
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Keeping an Eye on Sprinkler Performance

A consortium of sprinkler manufacturers takes a look at quality assurance and standards.

The recent Central Sprinkler Company and U.S. Consumer Product Safety Commission recall of 35 million sprinklers has led some to question whether there’s something fundamentally wrong with sprinkler performance.

Fortunately, most view the recall as an isolated incident resulting from the massive introduction of new sprinkler technologies in the 1990s. Sprinklers are still considered the best tool for protecting lives and property.

Nonetheless, sprinkler manufacturers have joined together earlier this year to fund an independent audit of quality assurance practices and testing procedures. Officially known as the Fire Sprinkler Manufacturers Joint Research and Development Consortium and register with the federal government as required by law, the effort is officially titled “Enhancement of Long-Term Field Performance of Automatic Fire Sprinklers.”

The group has asked Battelle Columbus Laboratories to conduct the audit and issue a report of its findings and recommendations later this year. The study will review industry practices and standards for the manufacturing and use of automatic sprinklers, as well as performance data. It will also recommend field sampling and laboratory tests to develop mechanisms for enhancing long-term field performance.

In addition, Battelle will review the basis and assumptions of current performance standards and tests, and assess their relevance.

**Testing’s roots**

Adherence to product safety standards is a process rooted in sprinkler tests performed as early as 1884 by C. J. H. Woodbury of the Factory Mutual Fire Insurance Companies (FM). Underwriters Laboratories (UL) introduced systematic sprinkler product testing in 1901.

Today, FM, UL, and other organizations, such as the Loss Prevention Control Board in the United Kingdom, Verband der Schadenversicherer of Germany, and the Japanese Fire Equipment Inspection Institute, evaluate automatic sprinkler designs against thermal sensitivity, distribution, strength of frame, resistance to impact damage, and corrosion resistance. Sprinklers that qualify as listed products, as defined by NFPA standards, can be installed in accordance with NFPA 13, Installation of Sprinkler Systems, and its sister standards, and maintained in accordance with NFPA 25, Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.

It’s possible that the long-term reliability of automatic sprinklers will benefit from research in a number of areas, including tolerances, component force analysis, material compatibility, and environmental expectations.

**Fine-tuning possible**

Although many factors are considered in the standards currently used to evaluate and list products, refinements may be appropriate. For example, no “reasonably extreme” water supply characteristics, such as chemical composition, debris, or the effects of microbiologically influenced corrosion, are used to evaluate sprinkler components’ ability to withstand exposures over a service life without impairing operation. Some of these issues extend to installation and inspection, testing, and maintenance standards. Even incremental improvements in design, performance testing, and inspection will be valuable.

One of Battelle’s preliminary observations in its ongoing research is that significant changes in indoor air quality have taken place in recent years that may affect sprinklers. Corrosion tests have to be re-evaluated to ensure key elements aren’t missing and changes will be recommended to installation and maintenance standards as needed.

The project’s goal is essentially to make an already well-designed and reliable product even better, and sprinkler manufacturers are to be commended for undertaking this effort to ensure that their products will continue to perform when needed during a fire.
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Because automatic sprinkler systems protect many manufacturing occupancies, both large or small, it's important that fire officials create standard operating procedures (SOPs) and pre-incident plans that make it clear that the firefighters' primary tactic is to support the system and allow it to do its job. Such a plan, which should show the location of the system's risers, fire department intakes, enunciator panels, fire pumps, Manual Initiation Switches and Valves, extinguishing agents, and other system components, will make the incident commander's job easier during a fire and significantly reduce the risk to firefighters.

Industrial occupancies often include processes that, if not properly handled, could pose a danger to firefighters or result in large property loss. Industrial employees spend many hours each week in these complexes; therefore, employees typically have an in-depth knowledge of the plant's layout and its operations. Employees understand how to operate the machinery properly and are often assigned to a plant emergency response team. The employees are the site-based experts; firefighters are the incident-scene experts. Firefighters and plant personnel working together offer the best chance for successful outcomes.

Common errors

A common error firefighters can make that undermines an automatic sprinkler system's effectiveness is depriving the system of water. This generally occurs when firefighters shut the sprinkler system down prematurely or take water away from the system by discharging it through hose lines. Although the calculated water requirement of a properly designed, installed, and maintained sprinkler system should include enough water to support hose streams, a fire department's best practice is to connect attack lines to a water supply that's independent of the sprinkler system source.

If firefighters have to choose between using hose lines or properly supplying the sprinkler system, it's generally best to supply the sprinkler system. If the sprinkler system isn't extinguishing the fire, however, the incident commander may divert water from the sprinkler system to support hose lines.

Once firefighters are certain the blaze is under control, they can shut down the plant's sprinkler system. They should then assign a firefighter with a radio to stand by the valve in case it's necessary to reopen it quickly.

Firefighters shouldn't interfere with an automatic suppression system that's controlling the fire effectively. SOPs and pre-incident planning should always be directed toward supporting a working automatic suppression system.
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NFPA 85, *Boiler and Combustion Systems Hazards*, provides minimum requirements for the design, installation, operation, and maintenance of large commercial and industrial boilers, heat recovery steam generators, and related combustion systems. These requirements help prevent fires, explosions, and implosions, and contribute to overall safety.

What equipment does NFPA 85 address?
It addresses single-burner boilers, multiple-burner boilers, atmospheric fluidized-bed boilers, heat-recovery steam generators, pulverized fuel systems, and stokers.

What's the origin of NFPA 85?

The development and use of these standards can be traced back to 1924 with the first edition of the pulverized fuel systems standard.

Lee Richardson is NFPA's senior electrical engineer, Signaling Systems and former staff liaison for NFPA 85.
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Are there capacity limits?
NFPA 85 is limited to boilers, including stoker-fired boilers, with fuel input ratings of 12.5 M Btu/hr or more. The capacity for pulverized fuel systems and heat recovery steam generators is unlimited.

What are the end-use applications for boilers?
The function of a boiler is to produce steam. Typical applications use the steam to generate commercial electric power and for commercial and industrial heating applications.

How are heat-recovery steam generators used?
Heat-recovery steam generators capture waste heat from combustion turbine exhaust. Combustion turbines, generally used for power generation, are covered in NFPA 37, Installation and Use of Stationary Combustion Engines and Gas Turbines, and NFPA 850, Fire Protection for Electric Generating Plants and High-Voltage Direct-Current Converter Stations. The generator uses the recovered heat, which is either unfired or has supplemental firing, to produce steam, which can be used to generate power or for other heating applications.

What are pulverized fuel systems used for?
Pulverized fuel systems are used to typically process coal for use as fuel in multiple-burner boilers.

What are stokers used for?
Stokers are used for boilers that burn solid fuels, such as coal, wood, refuse-derived fuel, municipal solid waste, and other solid fuels.

What subsystems and support functions does the code address?
NFPA 85 covers structural design, purging systems, and fuel-burning systems, including fuel supplies, the main burner, the reburn fuel supply, combustion control systems, burner management systems, furnace pressure control systems, and other system and function requirements. Procedures for normal and emergency start-up and shut-down, fuel transfer, and firing of more than one fuel are also covered. Some requirements are specific to certain equipment applications.

Does NFPA 85 have any training requirements?
NFPA 85 requires the system owner or the owner's representative to provide formal operator and maintenance training.

What's the basic function of the burner management system, and how does it relate to the combustion control system?
The two control systems are separate and distinct, and, except for a certain circumstance in single-burner boiler applications, must be maintained independently.

The burner management system is defined as "the control system dedicated to combustion safety and operator assistance in the starting and stopping of fuel preparation and burning equipment, and for preventing misuse of, and damage to, fuel preparation and burning equipment." Subsystems can include interlock systems, fuel trip systems, master fuel trip systems, flame monitoring and tripping systems, ignition subsystems, main burner subsystems, warm-up burner subsystems, bed temperature subsystems, and duct-burner systems.

The combustion control system is defined, in part, as "the control system that regulates the furnace fuel and air inputs to maintain the air/fuel ratio within the limits required for continuous combustion and stable flame throughout the operating range of the boiler in accordance with demand."

Are there any significant technical changes in NFPA 85?
To accommodate different technologies used to reduce the levels of undesirable nitrogen oxide compounds, \( NO_x \), furnace emission requirements have been changed, and the coverage has been expanded. These changes include provisions that allow the introduction of overfire air and the use of flue gas recirculation and return technology.

Overfire air is the air supplied for combustion that's introduced into the furnace at a point above the burners or fuel bed. Flue gas recirculation introduces flue gas into the secondary or combustion air supplied to burners. And reburn technology introduces fuel downstream of the main burners, creating a fuel-rich zone where chemical reactions reduce NO\(_x\) to molecular nitrogen.
Those designing and evaluating egress systems are often concerned about rooms or spaces from which the egress path doesn't directly lead to an exit access corridor. This arrangement is typically referred to by codes such as NFPA 101®, Life Safety Code®, as “egress through adjoining areas.”

Recently, I was asked to evaluate such an egress path in a hospital’s administrative area. This path, which provided two hospital employees with their only way out of the area, passed through a cashier space with a locked door. In accordance with Section 7.5.2.1 of NFPA 101, I recommended moving the employees’ work space so they no longer had to pass through the locked area. Section 7.5.2.1 states that the doors in any rooms or space adjoining an egress path through which people have to pass must be unlocked. This requirement is consistent with the basic principles of egress: occupants must control their egress paths, and special knowledge, effort, tools, or keys should never be required to open any door in such a path.

Section 7.5.1.7 further restricts egress through adjoining areas by stating that such spaces may not be used as hazardous areas. If a storage room contains combustibles, for example, the egress path shouldn’t pass through it.

This requirement is often misunderstood. Recently, I was asked whether the exit path from supervisors’ offices in a manufacturing complex could pass through an adjacent industrial area, which some felt posed a higher hazard than the offices. A corridor between the offices and the industrial area wasn’t a desirable option because it would reduce the supervisors’ ability to monitor employees. But was one necessary?

The answer in this case was “no.” Since the industrial area was the primary use of the building and the offices weren’t, the industrial area couldn’t be considered a hazardous area, and the offices’ occupants could pass through it. The various egress requirements for the supervisors’ offices were the same for every other area of the complex.

If the same industrial process were present in an office building, however, I may have required that the process area be identified as a hazardous area, which would’ve prohibited emergency evacuation through it. The primary egress requirements would be based on the hazards anticipated in a business occupancy, rather than those found in an industrial operation. Furthermore, there’s a difference between permitting the supervisors of an industrial area to leave their offices through that area and allowing occupants of an office building to leave through an accessory repair area.

Accessory spaces

Section 7.5.1.7 of NFPA 101 also requires that the space through which egress is required be accessory to the space it serves. This means that the activity performed in the accessory space is related to the activity performed in the space from which individuals will evacuate and that it will be occupied at the same time. Such spaces include office or restaurant waiting areas, small offices adjacent to industrial or mercantile areas, and offices or storage rooms adjacent to classrooms.

For example, the egress path from my office passes
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Workplace Trend: Safety on the Rise

It's no accident that workplaces in the United States are safer today than ever before.

Back when the mining, heavy industry, and construction industries were male-dominated, the most dangerous were known as "widow-makers." A certain number of workers were expected to die on the job every year, and acceptance of the fact was a reflection of the culture of the time and the nature of the work.

I was introduced to this death watch mentality during discussions with workmen's compensation underwriters back in the 1960s shortly after graduating from college. To the underwriters, this fatalistic way of thinking was simply a business reality. To the graduate of an industrial loss-prevention curriculum, it was completely foreign.

In the underwriters' experience, workers died based on the type of work they did and its duration. For example, it was assumed that a two-year bridge construction project across a river would result in "X" number of "accidental" deaths. Turn on the adding machine and decide how much of a premium to charge based on the expected number of accidental deaths. End of story.

Well, not quite.

Our thinking—and many statistics—has changed for the better during the past 30 years. Perhaps we've always known how to prevent accidental deaths in the workplace but lacked the political will to do so. After all, NFPA industrial safety standards have been around for many years and are continually improved to reflect new technology. However, we've only recently begun to make workplaces across the United States safer by enforcing federal Occupational Health and Safety Administration (OSHA) regulations, even though OSHA began publishing them almost 30 years ago.

Let's look at the numbers.

Declining death rates

The Centers for Disease Control (CDC) reported last April that workplace fatalities in the United States decreased by an impressive 45 percent between 1980 and 1997. In 1980, there were 7.4 occupational injury deaths per 100,000 workers. By 1997, that number had dropped to 4.1. While the CDC credits this improvement to better hazard awareness, accident prevention technology, and federal and state regulations, other factors, such as the nationwide movement away from heavy industry to a service-oriented economy, may also have an impact on workplace fatalities.

At 5,800 on-the-job deaths annually, however, the CDC warns that we still have a major problem, though the complexion of the problem has changed. In 1990, for example, homicides accounted for 14 percent of on-the-job fatalities, becoming the second leading cause of worker deaths in service industries. Motor vehicle accidents rose, as well, accounting for 24 percent of all work-related deaths between 1980 and 1997.

Although fatality trends varied from industry to industry during the 18 years covered by the CDC study, one industry consistently recorded the largest number of on-the-job deaths: construction, which was responsible for 19 percent of workplace fatalities. But this, too, may be changing.

Anyone who's visited NFPA headquarters recently has first-hand knowledge of Boston's Central Artery/Tunnel Project, known as the "Big Dig." While you may know that the Big Dig is the largest public works project in United States history, you may not realize that it's also one of the safest, proving that construction can be done safely where there's a commitment to safety. Perhaps the Big Dig will put to rest the outdated assumption that certain industries are, by their very natures, widow-makers.
The NFPA Code 72 states in brief, "that an aerosol may be used to test a smoke detector only if it is listed and has been specifically approved by the smoke detector manufacturer concerned."

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Industrial Facilities: Unique Alarm Challenges

Designers and installers need to be aware of unusual fire and life safety needs in factories.

As designers and installers have sometimes discovered the hard way, industrial facilities often present unique challenges for fire alarm system installations. Understanding these challenges and the impact of the code requirements developed to meet them are integral to effective fire protection.

According to NFPA 101®, Life Safety Code®, industrial occupancies include factories devoted to operations, such as processing, assembling, mixing, packaging, finishing or decorating, and repairing various products. Examples include dry cleaning plants and laundries, power plants, food processing plants, pumping stations, gas plants, refineries, sawmills, service and maintenance hangars for aircraft, and telephone exchanges.

Each of these facilities has some distinct occupancy, structural, or process feature that the fire alarm system designer and installer must address, such as high ambient noise, obstructed ceilings, large quantities of airborne particles, and high-value storage. Some facilities, such as telephone exchanges, aren't normally occupied, while others contain chemicals that can affect the detection devices. Some are in areas in which poor water supplies result in longer-than-normal fire department response times, and others contain highly protected risks (HPR) or processes that require high-speed detection and suppression.

Fortunately, NFPA 72, National Fire Alarm Code®, addresses many of these issues. For instance, it requires a designer to reduce heat detector linear spacing in accordance with Table 2-2.4.5.1 for ceilings 10 to 30 feet (3 to 9 meters) high, with some exceptions for line-type and thermoelectric affect heat detectors. The same table provides a percentage reduction of listed spacing, based on ceiling height.

An industrial facility may also have large structural beams that affect detection. Section 2-2.4.3 of NFPA 72 states that, “If the beams project more than 4 inches (10 centimeters) below the ceiling, the spacing of spot-type heat detectors at right angles to the direction of beam travel shall be not more than two-thirds of the smooth ceiling spacing permitted under 2-2.4.1.1 and 2-2.4.1.2. If the beams project more than 18 inches (46 centimeters) below the ceiling and are more than 8 feet (2 meters) on center, each bay formed by the beams shall be treated as a separate area.”

These two conditions alone require an increase in the number of heat detectors needed for adequate detection.

When a designer uses smoke detection, the options are generally limited to spot-type or linear beam-type smoke detectors. In most high-ceiling environments with an uninterrupted line of sight between walls, a linear beam smoke detector is the only economical choice. However, the amount of ambient airborne particles may reduce the detector’s reliability and may cause false alarms. Certain operations, such as the use of forklifts, may also affect beam smoke detector operation.

Process hazards

Some process hazards require special attention if the detection system is to be designed appropriately. Often, flame detection is the right choice. However, NFPA 72 requires that the type and number of flame detectors “be determined based on the performance
characteristics of the detector and an analysis of the hazard, including the burning characteristics of the fuel, the fire growth rate, the environment, the ambient conditions, and the capabilities of the extinguishing equipment."

In Section 2-4.2.2, NFPA 72 also requires that flame detectors be chosen by matching "the spectral response of the detector to the spectral emissions of the fire or fires to be detected, as well as minimizing the possibility of spurious nuisance alarms from non-fire sources inherent to the hazard zone." Section 2-4.3.2.1 further requires that "the location and spacing of detectors...be the result of an engineering evaluation that includes the size of the fire that's to be detected, the fuel involved, detector sensitivity, the detector's field of view, distance between the fire and the detector, radiant energy absorption of the atmosphere, presence of extraneous sources of radiant emissions, purpose of the detection system, and response time required." Unlike heat and smoke detection devices, the number of flame detectors "shall be based on the detectors being positioned so that no point requiring detection in the hazard area is obstructed or outside the field of view of at least one detector."

Thus, the designer must match the detectors to the expected fire source and should involve the manufacturer's engineering staff in the earliest stages of system design.

Other factors
High ambient noise is often an issue in industrial facilities, and there are various ways to solve this problem, depending on the type and level of the noise. Sections 4-3.1.1 and 4-3.1.2 note that "an average ambient sound level greater than 105 dBA...will require the use of a visible signal appliance(s) in accordance with Section 4-4" and requires that "the total sound pressure level produced by combining the ambient sound pressure level with all audible signaling appliances operating...not exceed 120 dBA anywhere in the occupied area." The type of visible appliances used depends on the facility's operation, the location of the equipment, and the construction of the building.

Many industrial facilities built outside a city's limits may have low water pressures that extend fire department response times. When considering the adverse effects of low water pressure, the designer may want to encourage the owner to install a water supply and automatic sprinklers, monitored by the fire alarm system, even if he or she originally planned only detection.

Finally, HPR insurers may have more stringent requirements than those found in the Life Safety Code or in applicable building and fire codes. Designers and installers must be aware of these requirements, or the system will fail the acceptance test.

Only by understanding both the challenges of protecting industrial facilities from fire and the impact code requirements have on meeting these challenges will system designers and installers be able to ensure that such facilities continue to function effectively. ♦

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We've all lined up at the movie theater, anxious to see the sequel to a movie that we enjoyed. With tickets and popcorn in hand, we've rushed in to get the best seats, confident that revisiting the characters and adventure from the original movie would leave us equally satisfied. More often than not, though, we've left feeling disappointed. The film didn't live up to the hype, and the director somehow failed to duplicate the elusive formula that captured our attention in the original.

Many in the fire service were pleased when someone of Chief Dennis Compton's caliber introduced a leadership manual, *When In Doubt, Lead: The Leader's Guide to Enhanced Employee Relations in the Fire Service*. The book is widely regarded as one of the most articulate discussions of fire service labor-management relations available because it presents a new, more productive leadership direction.

At the time, I wasn't surprised that Chief Compton would capture timely, relevant thoughts and organize them in an easy-to-read volume. Chief Compton is a teacher, a professional communicator, the chief fire executive of the progressive Mesa, Arizona, Fire Department, and a member of NFPA's Board of Directors. His work with the International Fire Service Training Association, his leadership position with the Congressional Fire Service Institute, and his contributions to NFPA's Board of Directors are all illustrations of the regard of his peers.

So it's no surprise that Chief Compton's sequel, *When In Doubt, Lead...Part 2*, is as informative as the original. Published this year, it focuses on personal and organizational development in the fire service.

In it, Chief Compton offers the same treatment of a complex subject that made his first book so helpful, using a simple narrative style reminiscent of his relaxed group presentations.

In *Part 2*, Chief Compton introduces his subject by declaring, "One of the key roles of leadership is to position the people in the organization to be successful. This includes aspects of organizational design, general management, the selection, nurturing, and direction provided to people throughout their careers, providing a conduit to our customers, and tending to our own professional and personal needs."

To illustrate this point, Chief Compton uses the stories of two fire service leaders who retire after long careers. I'm sure that each of us can conjure up the names and faces of these two individuals. One was as positive and fulfilled at the end of her career as she was in the beginning. The other, however, became disenchanted with his work and changes in the fire service. As Chief Compton points out, it's difficult for a team to function well when a member displays such an attitude. But when a team leader displays this behavior, it can be paralyzing.

Suggesting that attitudes are contagious may seem like common sense, but it isn't common practice. As leaders, we make decisions that affect people. When I feel beat up or beaten down, I may vent or seek help, but I have to come back on top. I have to come out swinging because my attitude matters.

As leaders, our choices have a profound influence on those around us. You need to lead by example. You can't make your staff into something that you aren't.

Chief Compton's newest book suggests that the key to our future is personal leadership. While he hastens to acknowledge that there's no "one size fits all" model, he introduces a series of leadership suggestions designed to keep us vital and happy throughout a full and productive career. I know I'll stand in line for Part 3.
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During the late summer and early fall, as the countdown to Fire Prevention Week (FPW) begins, the atmosphere at NFPA resembles that at the North Pole in the weeks before Christmas. There's lots of activity, lots of hands pitching in to create something very special. While NFPA's annual gift to society may not fit in a holiday stocking, it's something everybody deserves: safety from the tragedy of an unwanted fire.

Creating campaigns that contribute meaningfully to public safety is a daunting challenge. Throughout the year, members of almost every NFPA division work as a team to identify a theme targeting an important aspect of the fire problem. We pay particular attention to feedback from local fire departments, since they're at the center of any successful FPW effort.

Avid baseball fan and fire safety expert Art Pullan of the Brockville, Ontario, Fire Department inspired this year's Cover the Bases & Strike Out Fire campaign, which will run from October 7 to 13. Like many who have worked hard for the past three years to promote fire survival skills through NFPA's highly successful Great Escape campaign, Art felt it was time for FPW to return to its roots: fire prevention at home, where 8 out of 10 fire deaths occur.

Our goal this year is to motivate people of all ages to take a few minutes to inspect their homes for common, easily correctable fire hazards relating to cooking, heating, and electrical distribution equipment. As always, we'll rely on the energy and enthusiasm of children to inspire the adults around them to make their homes safer.

Thanks to the generosity of our 2001 FPW funding partners, the Federal Emergency Management Agency's U.S. Fire Administration, Kidde, Underwriters Laboratories, and USAA, we're delivering fire prevention lessons to 110,000 elementary school classrooms and to the homes of 3.3 million students through the classroom periodicals, Weekly Reader and Lifetime Learning Systems.

The FPW team has also created new products to support this year's campaign. Sparky's FPW Value Package comes in a canvas sports bag and contains everything a fire department, company, hospital, and other groups need to get kids and families excited about home fire prevention, including plastic fire hats, stickers, pencils, brochures, and a free educational video.

For the first time ever, we're also releasing the story of how a little Dalmatian puppy grew up to be Sparky the Fire Dog®. The book is designed for kids to read and color, and would be a terrific gift for members to donate to their children and grandchildren's schools.

The Cover the Bases & Strike Out Fire campaign is all about teamwork. NFPA staff has done everything possible to create a winning lineup of messages and materials to support this lifesaving program. Fire departments and other advocates are warming up in the bullpen. Sparky himself, celebrating 50 years of service to the fire safety mission, will throw the first pitch. But we're counting on all of you, our experienced and dedicated members, to drive the message home.
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safety
In 1988, a gas explosion destroyed Occidental Petroleum's Piper Alpha platform in the North Sea, killing 167. Deficient safety practices were cited.

NFPA and the offshore oil industry are helping to resolve dueling federal fire safety standards.

**HALLIE EPHRON TOUGER**

In 1961, when the first subsea oil was drilled, offshore activities were confined to shallow water where help was available during emergencies. As a result, the U.S. Coast Guard's equipment regulations required only basic lifesaving appliances and hand-held portable fire extinguishers. However, the offshore oil industry has grown dramatically since then. The industry was booming in the late 1970s and early 1980s, but was in a downturn by the mid-1980s. It's been on the upswing in recent years, with a current record high of 42 deepwater rigs
operating in the Gulf of Mexico alone and the number of deepwater platforms growing internationally.

Today, an array of drilling and production facilities characterizes the industry. These facilities range from small, unmanned operations in shallow water, to large complexes more than 100 miles (161 kilometers) offshore, floating in water as deep as 7,000 feet (2,133 meters), with hundreds of workers in residence. Platforms in warm waters, such as the Gulf of Mexico, are open, while those in turbulent, frigid waters, such as those of the North Sea, are enclosed to provide protection from the weather.

"You're fairly isolated," says Randall Eberly of the U.S. Coast Guard. "You might be near other rigs or within 20 miles (32 kilometers) of shore, but you can't call the fire department and have them arrive in 10 minutes. Self-sufficiency is a must, which isn't an easy feat. There are fire protection equipment challenges.

"Depending on the rig's design, the platform is anywhere from 50 to 300 feet (15 to 91 meters) above water, so assistance vessels need sufficient water pressure," says Eberly. "If there's a leak or equipment malfunction, you have significant ignition sources. If you took typical firefighting equipment and placed it on an offshore oil rig, it would become so corroded within a month that it wouldn't work."

The primary industry standard for fire safety in this changing industry is the American Petroleum Institute's (API) Recommended Practice 14G (API RP 14G), Fire Prevention and Control on Open Type Offshore Production Platforms. API, the national and international trade association that represents the petrochemical industry, uses the accredited committee method to create ANSI standards and has a policy of reviewing standards every five years to revalidate, revise, or remove them. A committee can extend that review process to seven years.

Recently, API invited NFPA to assist in an update of API RP 14G, along with industry representatives and the federal agencies that share jurisdiction for regulating the U.S. offshore industry: the Coast Guard and the Minerals Management Service (MMS).

Automated fire safety

"If you visited one of these offshore rigs, you'd be taken by the serenity," says Alan Verret, executive director of the non-profit Offshore Operators Committee. "There's no hustle and bustle. There are birds landing on the handrails. These aren't miniature refineries—they're simple complexes."

Regardless of a rig's size or location, the same basic operations take place, says Verret, who has worked in Texaco's offshore division for 30 years.

"The operation hasn't changed much in the last 20 years; it's simple gravity separation and gas diffusion," he says. "We separate oil from gas and water from oil, and discharge treated water. Oil and gas are continuously fed into a pipeline. There are no complex processes. Facilities, by and large, have been engineered to the point that most of the folks on-site are there to monitor processes."

On oil drilling and production platforms, fire protection is based on rapid detection, aggressive suppression, and reliable shutdown of fuel feed to any fire. Platforms are equipped with alarm and automatic detection systems, backed up by fire watches for hot work.

"A common cause of fires is welding or cutting, but with hot work, a fire watch is required to stand by with a detector for gas and appropriate extinguishers," says Joe Levine, chief, Operations Analysis Branch of MMS.

In case of a fire or leak, platforms have several redundant emergency-shutdown devices. These valves "shut in" the flow of oil and gas to the platform. This ensures that fires aren't fed from the well, resulting in a blowout.

Coast Guard regulations require facilities to have full water deluge systems, in addition
to portable chemical extinguishers, to protect personnel and to give them sufficient evacuation time.

Potential for disaster
On an offshore complex, there's always the risk of major fire. Though the incidence of disasters is low, the stakes are high, and the industry takes the threat seriously.

This potential for disaster was graphically demonstrated in July 1988, when Occidental Petroleum's Piper Alpha oil platform, standing 100 feet (30 meters) above some of the fiercest waters in the North Sea, was destroyed by fire, which killed 167. The immediate cause of the blast was a gas explosion, that occurred when a pump was turned on while being repaired. An accident investigation report found, "The safety policy and procedures were in place: the practice was deficient."

Oil producers and regulatory agencies responded by adding standard procedures to prevent similar catastrophes.

In March 2001, the world was reminded again of the potential for human tragedy and financial loss when three explosions ripped through a 40-story production platform owned by Brazil's state-owned oil giant, Petrobras. Eleven of the 175 employees on board died. The platform, worth $480 million, sank five days later despite salvage efforts. Months after the accident, the investigation into the cause hadn't been completed.

Industry safety record
Experts say safety in the petroleum industry is improving. An MMS bulletin, OCS Safety Facts, March 2001 states, "Despite the rise in the number of incidents reported to the MMS through 1997, the overall record for the past 33 years indicates that Outer Continental Shelf (OCS) operations are generally safer."

The International Association of Oil and Gas Producers (OGP), the worldwide association of oil and gas companies involved in exploration and production, has reported encouraging data during the last five years, showing that the lost-time injury rate for the industry is at a record low. Illness and injury rates for workers in the petroleum industry have run about a third lower than for the private sector overall. Although the industry can take credit for the trend of decreasing lost-time injuries, explosion injuries and burns remain the largest cause of fatalities.

"Oil companies spend way more money preventing fires than they spend putting them out," says Verret of the Offshore Operators Committee. "It pays more dividends to stop them before they start or to minimize their impact."

API standards guide the industry in the design and maintenance of fire-safe facilities. "The industry has achieved such a record by meeting some of the world's most rigorous and comprehensive safety standards, which, by virtue of their effectiveness, have also become de facto standards for offshore oil and gas operations around the world," says Peter Velez, chairman of the API Executive Committee on Drilling and Production Platforms. He's referring, in particular, to API RP 14G.

Shared agency responsibility
Since 1953, the Coast Guard and MMS have shared responsibility for activities on the U.S. Outer Continental Shelf with a series of memoranda and agreements defining the agencies' roles. Historically, MMS has been responsible for drilling and production activities and the Coast Guard for vessel and marine activities. As a result, MMS has had lead responsibility for fixed production platforms, while the Coast Guard had had lead responsibility for Mobile Offshore Drilling Units (MODUs).

Advances into deep water and new types of floating facilities made a memorandum of understanding (MOU) signed in 1990 obsolete, according to Peter Hill, P.E., of Risk Reliability Safety Engineering and a consultant to the API. New types of floating facilities with drilling capability only for the initial phase of development had no clear regulatory path, and the Coast Guard wasn't involved in regulating moveable platform drilling rigs, modular units that could be moved among fixed platforms.

The MOU was updated in 1998 establishing a single lead agency, and the ultimate authority for each shared system. Authority was divided to reflect each agency's expertise, with the Coast Guard's jurisdiction resting on its familiarity with the marine environment, and MMS's jurisdiction based on its expertise in managing mineral resources. MMS became responsible for portions of the system support-
ing drilling and production, and the Coast Guard's other portions included those related to workplace safety and health. Dual review remains in only a few areas, such as electrical classification.

Under the terms of the new MOU, all firefighting jurisdiction went to the Coast Guard. Because of manpower shortages, however, the Coast Guard has proposed changes to allow MMS to perform inspections on its behalf on fixed production facilities.

With so much overlapping and shared responsibility, it would seem essential that both regulatory agencies work by the same rules. Although Coast Guard regulations, such as 33 CFR Subchapter N, Outer Continental Shelf Activities, and 46 CFR Subchapter I-A, Regulations for Mobile Offshore Drilling Units, Parts 107-109, and MMS regulations, such as 30 CFR Part 250, Oil and Gas and Sulphur Operations in the Outer Continental Shelf, refer extensively to NFPA standards and API recommended practices, MMS regulations make no reference to NFPA standards, and the MMS and Coast Guard regulations conflict in key areas.

From the owner or operator's view, fire safety is a single system, so having agencies with different sets of rules is a problem. "It's confusing even to us in the industry," says Mark Written, a senior advisor with Chevron.

**Dueling regulations**

One difference between the MMS and Coast Guard regulations is whether some facilities can forego a water deluge system.

Offshore oil industry experts argue that installing and maintaining deluge systems on unmanned platforms is cost-prohibitive and unnecessary. In case of a fire, they say, redundant systems are in place to "shut in" the well so the fire can burn itself out. Furthermore, there wouldn't be anyone on board to activate the water main they say. The occasional maintenance crew can protect itself with portable firefighting systems brought aboard, then evacuate quickly.

Historically, the Coast Guard has been adamant that water deluge systems are essential on all facilities, while under certain circumstances, MMS allows chemical systems instead.

"We want to see water available on all oil drilling rigs that have steel structures and are burning hydrocarbons," says Eberly. The intrinsic disadvantage of chemical systems is limited capacity, whereas the quantity of water in the ocean is unlimited. He adds that water can cool hot metal surfaces to prevent reflash.

However, MMS rules allow for chemical alternatives in lieu of water "if the district supervisor determines that the use of a chemical system provides equivalent fire protection control." When companies have petitioned the MMS in the past to allow for this alternative, especially on unmanned platforms, the MMS has granted approvals.

With firefighting responsibility shifting to the Coast Guard, the issue came to a head. Faced with new requests for exemptions for unmanned platforms, the Coast Guard and MMS looked for consistent criteria to apply in determining how to rule in each case. After examining API standards, NFPA standards, and Coast Guard and MMS regulations, they quickly discovered there were no criteria for determining when chemical fire protection was acceptable in place of water and when it wasn't.

The agencies turned to API for help. Tim Sampson, API coordinator for Drilling and Production Operations, recalls receiving a letter from the MMS "asking us to take a look at API RP 14G, specifically at the section on the use of fire extinguishers and chemical systems, and to put some criteria there that they could use to determine when chemical would be an acceptable alternative to a water system."

**Moving slowly towards consensus**

In December 2000, API updated API RP 14G and invited representatives of NFPA, MMS, the Coast Guard, and the offshore oil industry to participate in the review.

API focused on revising a single area of the standard, deferring a much-needed overhaul.

"We realized a lot of things were out of date, but we shelved a larger to-do list in order to focus on the issue of chemical in lieu of firewater in unmanned facilities," says Hill.

The first review meeting was held in April 2001. With its record of consensus-based code- and standard-setting and technical expertise in fire safety, NFPA found itself welcome at the table.

"Our goal in being invited to participate in other standard developers' revision process is to assist with the technical subject matter in general and help update and add references to our own codes and standards," says Guy Colonna, NFPA's assistant vice president of Hazardous Chemicals and Materials, who is participating in the API standard update.

Once API RP 14G is updated to satisfy the Coast Guard and MMS, the agencies can eliminate their dueling standards.

"We're hoping to take all fire protection requirements out of 46 CFR 108 and refer to this recommended practice by API. Then all fire protection standards would be there, instead of split between API and CFR," says Eberly.

For MMS, working with NFPA to revise API RP 14G was the first of what both organizations hope will be many opportunities to work together.

"Since December, our relationship with NFPA has blossomed, and we're hoping that on our next fire investigation, an inspector from the NFPA will assist us," says investigator Levine.

Federal agencies, such as the Coast Guard and MMS, are striving to change their longstanding practices of defining their own rules and regulations as they adapt to the requirements of the National Technology Transfer and Advancement Act of 1995. That law encourages federal agencies to adopt industry standards rather than create their own wherever possible. NFPA standards are increasingly being referenced by federal and state law, and NFPA expertise in fire protection and standards development is being increasingly sought.

"The MMS, like a lot of other government agencies, is in the process of trying to augment regulations with industry guidance," says Fred Gray of MMS. "We're trying to get away from driving the train and telling people to do A, B, and C. We want standards-developing organizations to keep developing standards, and we'll take them and put them into regulations.

"We're reaching out to NFPA to use their codes and standards, as well as its expertise. They've got a long history of doing this well."
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General Motors customizes NFPA standards to create sophisticated fire safety system. — BILL FLYNN

Paint shop, the term manufacturers use for the painting process at vehicle assembly plants, is as apt a term as cottage is to describe a palatial mansion. Vehicle paint shops are massive, automated, and highly complex industrial operations that typically occupy a heavy steel, multi-level structure ranging from 600,000 to 1,000,000 square feet (55,742 to 92,903 square meters). Construction costs can reach $300 million. Many vehicle painting facilities can handle 60

ILLUSTRATION: ROB DUNLAVEY

Bill Flynn is a freelance writer based in Quincy, Massachusetts.
vehicle bodies an hour, 24 hours a day, six days a week. That's 1,440 vehicles a day, or more than 8,000 cars a week. Clearly, the term paint shop is an understatement.

Paint shops also present unique large-scale fire detection and suppression challenges. They use large quantities of flammable liquids and rely on electrostatic processes as the primary method of paint application. Paints, the vapors they produce, and electrostatic coating processes can present hazardous situations, but sophisticated and redundant fire detection and suppression systems, a zeal for cleanliness, and large ventilation systems generally permit the industry to stop a fire before it becomes serious.

Robert Benedetti, NFPA's principal Flammable Liquids Engineer, says the commitment to preventing fires, even small ones, is only good business for the vehicle manufacturers.

"One paint shop fire can shut down the entire assembly line and cause considerable financial loss," says Benedetti. Lost production time and possible damage to new vehicle bodies are only one aspect of such a loss. Another, according to Benedetti, is the destruction of the coatings used to produce the hard, shiny vehicle finishes.

"Those coatings play a big role in the marketing of new vehicles, but they're expensive," says Benedetti. "Losing a significant amount of coatings can be a big financial loss. It's just too expensive to have a fire."

Fortunately, says John Katunar, who assesses insurance risk in the vehicle manufacturing industry, painting facilities are well protected against fire.

"The insurance loss history of these manufacturing plants is very good," says Katunar, a technical specialist with Industrial Risk Insurers in Michigan. It's a continuous process to keep fire prevention in the forefront of the minds of paint shop managers.

"Before 1986, we had some major events in paint shops, and, as a result, we changed our fire prevention methodology," says Gerald Rosicky, director of Security and Fire Prevention for General Motors (GM). "Now, with all of these measures, a large fire should be a thing of the past."

In 1986, Rosicky says, a GM task force on paint engineering and global plant security produced specifications for fire protection and a commitment to keep the process ongoing.

"We work continuously to refine and improve our fire protection systems," he says. Rosicky, along with William Sheppard, manager of Global Fire Prevention and Protection at GM, supervise fire safety throughout GM, which has more than 40 state-of-the-art vehicle painting facilities globally. Rosicky says GM's European, Latin American, and Asia-Pacific vehicle painting operations are similar to the North American operations, but non-automated painting is still performed in a few smaller GM plants.

**Painting process**

The paint shop is the third stop in the vehicle assembly process, which begins at the stamping plant where steel coils or sheets are stamped into the various parts that make up a vehicle's body. The stampings are then moved by conveyor to the body shop, where they're welded into a single unit and sent by conveyor to the paint shop.

There, the vehicle body continues its journey through a maze of dip tanks, paint spray booths, ovens, and sanding enclosures, emerging at the other end to move on to the general assembly area. By the time it leaves the paint shop, the vehicle body will have traveled 10 miles (16 kilometers) on the conveyor.

Inside the paint shop, the vehicle body is cleaned and coated with a phosphate solution in a 600- to 800-foot-long (183- to 244-meter-long) immersion phosphate operation. The process promotes a stronger bond with the paint used in the electrostatic deposition, or e-coat-step.

At the e-coat dip tank, the conveyor pulls the vehicle body down until it's immersed in 160,000 gallons (605,660 liters) of corrosion inhibitor. The conveyor and body are grounded, but the e-coat is electrically charged, which causes it to adhere to the metal of the vehicle body the way iron fillings adhere to a magnet. Even though the fire hazard in this area is considered minimal, the phosphate tank and the e-coat tank rooms are fully sprinklered.

The vehicle body then goes through a series of rinses, and any e-coat material that didn't bond with the metal is washed off and returned to the e-coat dip tank.

After the rinses are complete, the vehicle body enters a curing oven, where it's dried for 20 minutes at 350°F (176°C).

It then goes into a spot sanding and defect detection zone. This operation is done manually in an enclosure to prevent dust from contaminating the rest of the process. At this point, the joints between the sheet metal panels that enclose the vehicle's interior are sealed to keep dust, water, and exhaust gases out of the vehicle's interior when it's being driven.

Other than some sanding and paint defect detection areas, the entire paint shop process is automated. No production workers are inside the automated coating application areas. Most employees focus on monitoring the computers that run the facility or making sure the paint storage and mix rooms run smoothly.

**Automation**

Before a vehicle body goes on to the robotic spray painting of the undercoat or guidecoat, it must go through a blow-off machine similar to the big blowers used at
The vehicle body journeys through a maze of dip tanks, paint spray booths, ovens, and sanding enclosures, emerging at the other end to move on to the drive train assembly area. By the time it leaves the paint shop, the vehicle body will have traveled 10 miles (16 kilometers) on the conveyor.

vehicle washes. It’s then hand-wiped with tack cloths as it moves along the conveyor toward the paint booth.

A paint booth in a modern vehicle painting operation can be 100 to 200 feet (30 to 61 meters) long and is lined on both sides with paint application equipment. The paint for the undercoat, guidecoat, is applied electrostatically and because highly flammable liquids are being electrically charged, this is where the potential for fire is greatest.

The guidecoat paint is applied using rotary atomizers or bells that direct the electrostatically charged paint to the body. Paint spray operators or robots paint cut-in work that the bells can’t reach, and the vehicle is conveyed into a curing oven.

After a sanding process removes defects, the vehicle body goes through a high-powered blower and an automatic tack machine, better known as a feather duster, because it uses emu feathers to remove most minor defects.

Next, the basecoat, which determines the color of the vehicle, is applied. During the basecoat application, rotary atomizers do most of the work, followed by robots. The basecoat then goes through a heated flash zone, and a solvent-borne clearcoat, or final coat, is applied. The clearcoat application process is similar to the basecoat process. The vehicle body is then conveyed through a flash zone to an oven, where it cures for 20 minutes at approximately 250°F (121°C).

The paints are pumped from the paint mix room through an extensive recirculating piping system that supplies the atomizers and robotic applicators. It’s an efficient and effective manufacturing operation, although it has inherent fire hazards that need to be constantly addressed.

Protecting the paint
Building a large, highly automated storage and mixing area for paint goes beyond the standard requirements of NFPA 30, Flammable and Combustible Metals, and NFPA 33, Spray Application Using Flammable or Combustible Materials, which govern the storage and handling of flammable and combustible liquids. According to GM's
The paint spray booths have similar fire detection and suppression systems that go beyond fire code requirements. The paint booth base density sprinkler protection throughout is 0.35 gpm per square foot (14 l/min/m²) over a 4,000-square-foot (371-square-meter) area of application. Each bell or robotic application zone is also equipped with deluge sprinkler protection designed at 0.60 gpm (24 l/min/m²) for the entire zone, and optical detection is used to activate these systems. Each paint application zone, whether bell or robotic, is equipped with a separate sprinkler system. A carbon dioxide system triggered by optical detectors is provided in the paint machines.

The carbon dioxide system is activated first because, as a gas, carbon dioxide needs virtually no cleanup. If this doesn't contain the fire, the deluge system activates. The closed sprinkler booth protection provides backup if the other systems fail to contain the fire.

In addition to the booth protection systems, the booth exhaust, including the exhaust plenum, is sprinklered using a designed basis of 40 heads, each flowing 30 gpm.

The paint booths are also equipped with a water-wash system to remove excess paint from the exhaust air stream. A 40-head, hydraulically designed, wet-pipe system is considered adequate to control a fire in the rest of the paint shop without overtaxing the water supply.

The base design density for all sprinklers in the paint shop building is 30 gpm per square foot (12 l/min/m²) over a 4,000-square-foot (371-square-meter) area of application. The building sprinkler connections to the yard water main are segregated from the process sprinkler connections so that the building sprinklers will remain in service, even if the process sprinklers are impaired. In addition, the entire process sprinkler supply is fed from the yard mains in two directions. And the systems for the basic paint booth protection are valved separately from those of the deluge system to keep one in service if the other is impaired.

These fire suppression systems are augmented with interlocking that simultaneously shuts down certain systems while making sure others remain running. The interlocks are automatically triggered by either the carbon dioxide system, the deluge system, or wet-pipe system.

The fire interlock system also shuts off high voltage supplies, the conveyor system, the robot units, the automatic paint equipment, and the paint and thinner flow, while ensuring that the sludge removal water, the water wash system, and the air supply and exhaust systems remain on at all times.

"With a paint booth fire, you want to maintain the air movement through the system where protection is provided to keep the fire contained in the process so it doesn't spread to the building," says Sheppard.

Preventing explosions

The main fire protection concerns for the drying ovens is their explosion potential. NFPA 86, Ovens and Furnaces, requires explosion relief for drying chambers of Class A ovens if it can be shown that flammable vapor accumulation may exceed 25 percent of the lower flammable limit (LFL).

Because paint shop curing ovens are of seamless construction to facilitate cleaning and to prevent vapors from accumulating in the insulation through the oven joints, explosion relief is considered almost impossible. But calculations made regularly on each oven to determine the amount of flammable vapors in the chamber if all ventilation fails routinely show that the figure is below 25 percent. As a result, no explosion relief is provided for indirect fired ovens.

However, explosion relief is required for direct-fired ovens. It's also required for heater boxes, unless heat exchangers are used.

These fire protection systems exceed those called for in NFPA 30, which governs the warehousing of paint and mix rooms; NFPA 33; and NFPA 34, Dipping and Coating Processes Using Flammable or Combustible Liquids, but no one is advocating that the codes be tightened. GM's Rosicky, a member of the Technical Committee on Finishing Processes, says tightening the code would make the situation "financially onerous" for a lot of small operators who don't need to provide the level of protection that GM does.

NFPA's Benedetti agrees.

"You wouldn't take these fire suppression measures for a small cabinet shop or for a small vehicle paint shop," he says. "We're talking about a very big building inside another big building with all kinds of robotics and automated equipment." It's a very sophisticated industrial process, and it needs a very sophisticated fire protection system.

Clearly, the robotics, the near-total control of the operation by computer software, and the expensive, long-lasting paints make the average vehicle assembly "paint job" better than it's ever been.

At the same time, the inherent fire safety challenges in such operations have been more than adequately addressed. The fire control and suppression systems that most vehicle assembly operations employ do an excellent job of protecting employees, but they also prevent catastrophic fires that would have a significant impact on a manufacturer's bottom line.
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According to NFPA statistics released last March, smoke inhalation was responsible for 73 percent of structure fire deaths in 1998. And a large share of these victims weren't found in the room where the fire began, meaning that lethal concentrations of smoke had migrated from the point of origin.

"Smoke is a killer, and it usually arrives before the fire," says Steve Younis, senior fire protection engineer at NFPA. "If you can capture smoke before it reaches potential victims who are remote from the fire and protect their escape paths out of the building, you can greatly reduce the hazards of smoke, and let the suppression system and fire department take care of the fire."

Members of the technical committee responsible for NFPA 105, Installation of Smoke-Control Door Assemblies, agree. For that reason, they believe that upgrading NFPA 105 from a recommended practice to a standard that addresses the installation of smoke-control doors required by the model building codes and by NFPA 101®, Life Safety Code®, will save lives.

As a recommended practice, says Harold Hicks, chair of the NFPA 105 Committee and president of Atlantic Code Consultants in Murrysville, Pennsylvania, NFPA 105 is underused.

"Professional engineers should refer to it for design guidance," he says. "Whether they decide to adopt it is their decision, but they should look at it for guidance. However, few people follow NFPA 105 because it's not required."

According to Tom Allen, an NFPA 105 Committee member and principal at Smoke Guard Corporation in Boise, Idaho, there's no industry performance standard for smoke-control doors. Although the model building codes require them, he says, none of the codes

NFPA examines the benefit of creating the industry's only performance standard. • **ANN FREESTONE**

FOR MORE INFORMATION ON NFPA 105 AND NFPA 80.

GO TO WWW.NFPA.ORG.

NFPA MEMBERS ARE SCHEDULED TO DECIDE WHETHER NFPA 105 BECOMES A STANDARD AT NFPA'S FALL EDUCATION CONFERENCE IN NOVEMBER 2002.
gives performance criteria for smoke-control doors. And without a standard, each building code official may have a different understanding of requirements or level of performance for a door, says Allen.

If NFPA 105 became a standard, says Younis, the requirements for smoke-control doors would become more uniform across jurisdictions. The doors would also perform more consistently, in part because they'd have to be tested in accordance with UL 1784, Air Leakage Tests of Door Assemblies, to comply with the proposed standard.

According to the draft, NFPA 105, which would apply to new construction and to remodeling projects, would incorporate side-hinged swinging, horizontal sliding, vertical sliding, rolling, folding, and accordion smoke door assemblies.

"From my point of view, NFPA 105 is an important document because it adds consistency to the interpretation of building code requirements," Allen says.

The long and winding road
Not everyone is as enthusiastic about the proposed change in NFPA 105's status as Allen, however. This is evident in the time it's taken the proposal to make its way through the NFPA code-making process.

The committee first proposed adding NFPA 105's side-hinged swinging door requirements to NFPA 80, Fire Doors and Fire Windows, at the 1999 Fall Education Conference in Atlanta, Georgia, but the recommendation was sent back to the committee. The next year, the committee proposed that an amended NFPA 105 become a standard, but the document was again sent back to the committee because of language problems.

Members of the health-care industry, in particular, feel NFPA 105 needs more work. Many believe that the requirements as proposed would apply to all doors, not just those installed during new construction and not just side-swinging doors, as proposed in 1999.

"We'd like to see it as a standard, but one that could be used, not abused," says Paul Coleman, a committee member and Director of Regional Technical Support Services at Sisters of Providence Hospital in Portland, Oregon.

Coleman's also concerned about the use of certain phrases, such as "smoke-tight," that might be difficult for the health-care industry to address. And he's concerned that authorities having jurisdiction might require existing hospitals to bring all their doors up to the protection levels required by the new standard. This could be prohibitively expensive for many institutions.

The NFPA 105 Committee will work with the health-care industry representatives to resolve their concerns.

"Controversy forges change and change takes that extra bit of debate, and demand for supporting documents that result in great decisions." Hicks says.
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Industrial Section teams slug it out for top honors in this year's Fire Prevention Week contest.

PAMELA R. WEIGER

For many years, NFPA's Industrial Section members have used Fire Prevention Week (FPW) activities to enhance their employee safety messages and help their communities spread the word about fire safety. In addition, these businesses add special emphasis during FPW with newsletters and bulletin board articles devoted to home safety, and by competing in NFPA's Industrial Fire Protection Section (IFPS) FPW Contest.

"Safety involves behavior and attitude," says Guy Colonna, NFPA's assistant vice president of Fire Protection Applications and Chemical Engineering. "This makes for a good connection between work and home. Together, adults and their children learn about safe behavior."

To encourage involvement in FPW, the IFPS began an annual contest among its members. Members' entries outline their company's FPW program. Entries are judged on several key elements, including use of the FPW theme, materials used in the promotion, integration of industry-specific information into the campaign, community involvement, and participation with fire departments.

IFPS Board members judge contest entries in January, and winners are announced at NFPA's World Safety Congress and Exposition™ held in May.

Winning results

Merck and Company, Inc. of West Point, Pennsylvania, won the 2000 contest. The pharmaceutical company entered the contest for the first time last year, even though it has participated in FPW for years.

"We got many people involved last year due to our advertising and activities," says Robin Drace, a compositor in the company's graphic services department and a member of Merck's safety and motivational committee. The company's internal advertising blitz included posters placed around the workplace and flyers sent to employees.

Joining Drace on the committee were Ralph Missimer, a graphic services pressman who handled scheduling with fire departments, and Greg Jakubowski, a senior project engineer. It was Jakubowski, an NFPA member, who suggested the company enter the competition.

"It was great to get some peer recognition," Jakubowski says of the first place award. "Now some of the other sites within the company are motivated to apply as part of the friendly competition among sites and among corporations."

The week-long FPW activities at Merck started with a Main Street carnival for employees and the sale of coupons for a special lunch, which raised $1,300 for the region's burn foundation.

One day, the company helped demonstrate a new fire truck at a day-care center, and on the following day, company officials dedicated the truck and hosted Emergency Response Appre-
Millionaire?" game show. Westvaco also created a fire safety program for babysitters that supplemented home economics classes at local schools. Even the community's senior citizens got involved when Westvaco took Fire Safety Bingo to senior housing developments.

The company won the first place award in 1998 and 1999.

"Part of our success is that we don't publicize the events as being from Westvaco," says May. "Instead the fire departments took credit and fostered relationships with their communities."

When the Potomac, Maryland, Fire Department sponsored a safety movie in the park program, for example, Westvaco joined them and expanded the evening with games and prizes. Westvaco's support was "definitely a positive PR experience," May says.

What the judges want

"We're looking for good penetration in meeting your market," says Stephen Daily, manager of risk control for Anheuser-Busch and past chair of NFPA Industrial Section.

"We like to see how a company has reached out and touched a large number of people in its plant and in its community. People are our assets, and it can be difficult to maintain good assets," he says. "We try to keep employees safe at work, but we have to keep employees safe at home so they can come to work."

Money doesn't have to be a major factor in FPW community involvement. For example, Westvaco has reached large audiences with less than a $1,000 in out-of-pocket expenses. Through donations, gifts, and some unique skits and delivery mechanisms, Westvaco's program serves as a model to others looking to get involved.

Planning is essential

Although not everyone takes home the contest trophy, all the participants create big wins for their communities.

"When you educate employees and their families about fire safety, you give the employees something they can take home," says Craig Remsburg, manager of fire services for the Boeing Company in St. Louis, Missouri. "When we make an impact, we have a win all the way around."

Remsburg, a member of the IFPS Board, believes planning is the key to a successful FPW.

To promote FPW, the company posts banners at work locations, places ads in paycheck message boxes, and posts on-line messages daily during the week. Even the cafeteria cooks get into the act with theme-related menu items, such as "firehouse chili dogs" and "smoking hot french fries."

Remsburg's 15 years of participation have taught him some important lessons. First, he says, keep site managers apprised of activities. Second, make sure you have enough giveaways, whether they're pencils engraved with the theme or coloring books to take home, for each employee. As for giveaway items outside the plant, Boeing asks hospitals how many gifts are needed before they visit.

"We definitely don't want to leave anyone out," Remsburg says.

And finally, don't forget about alternative work-shift personnel.

"At a 24-hour plant we have second- and third-shift workers who sometimes get overlooked," Remsburg says. "You need to be cognizant of where people are and how to gain access to them."

FPW 2001

This year's FPW theme, Cover the Bases & Strike Out Fire, has generated fresh ideas for industry participation. About 50 members of the Industrial Section attended a session at NFPA's annual meeting in Anaheim, California, to hear past contest participants and brainstorm ideas for this year. Some suggested using corporate softball teams to challenge fire department teams to raise money for a fire prevention-related cause.

During Boeing's presentation, the two biggest questions were about finding funding and whether employees should be given time off to participate in FPW activities.

To obtain funding, Boeing's FPW team waves the banner of "corporate citizenship" and the benefits to the company of participating in these types of activities. But employee time off is a costly issue, so the company takes advantage of scheduled breaks, lunch times, and after-work periods to reach its workers with the FPW message.

For industrial organizations, FPW is all about drafting the same safety messages in different ways for its various audiences: employees, their families, and their communities. From churches, schools, and Boys and Girls Clubs to senior centers, there are unlimited outlets for spreading the FPW fire prevention message. All agree that safety is paramount in maintaining a good physical plant, and sharing the safety message is an integral part of becoming a good corporate neighbor.

FPW activities help industrial employees become a part of their community.

Like baseball, FPW is a team sport, and the nation's industries can be key players in striking out fire.
Preventing melt
A raging wildfire threatened the Los Alamos National Laboratory in New Mexico. The prescribed burn went out of control, burning 47,000 acres.
On May 4, 2000, a prescribed fire was set in the Bandelier National Monument in New Mexico to reduce the fuel load in the region and help mitigate any damage that might occur during a wildland fire. Unfortunately, the strategy backfired, and the fire soon raged out of control, burning 47,000 acres (19,020 hectares) and destroying or damaging 400 structures and 37 million trees.

This blaze, which became known as the Cerro Grande fire, was one of the most significant wildland fires in recent history, requiring an extensive deployment of personnel and equipment. But there was one factor that made it significantly different from other wildland fires: It directly threatened the Los Alamos National Laboratory (LANL).

Established in 1943 as part of the Manhattan Project to develop the atomic bomb, LANL is now run by the University of California for the U.S. Department of Energy, using “the core technical competencies developed for defense and civilian programs to carry out both our national security responsibilities and our broadly based programs in energy, nuclear safeguards, biomedical science, environmental protection and cleanup, computational science, materials science, and other basic sciences.”

The complex, which comprises between 1,100 and 2,000 separate facilities covering 6 million square feet (557,418 square meters), is spread over 43 square miles (111 square kilometers) on a series of mesas separated by canyons 400 feet (122 meters) deep. Some of these facilities are built down into the canyons, which are filled with combustible vegetation that can create severe fire conditions, providing a variety of fire protection challenges. Between full-time staff, seasonal employees, and contractors, about 10,000 people work at LANL daily.

**History repeats itself**

The Cerro Grande fire wasn’t the first wildland fire to endanger LANL. In fact, four major fires have encroached upon the complex. In 1954, the Water Canyon fire broke out, followed in 1977 by the La Mesa fire, in 1996 by the Dome fire, and in 1998 by the Oso fire.

After the La Mesa fire, says Deputy Chief Doug Tucker of the Los Alamos, New Mexico, Fire Department (LAFD), the facility made an effort to protect itself from wildland fires.

“The La Mesa fire reached the borders [of the lab] and burned up two of the high-explosive buildings,” he says. “After that fire, they took great lengths to install fire roads and fuel breaks.”

Unfortunately, the roads and fuel breaks weren’t maintained in the 20 years following the La Mesa fire.

When the Dome fire broke out southwest of LANL in 1996, it threatened a tritium facility.

“Officials realized that they had to re-address the idea of fuel breaks and fire breaks around the buildings,” says Tucker.

An interagency wildfire management team was formed that included representatives of LAFD, LANL, the U.S. Forest Service, the National Park Service, Los Alamos County, several Native American tribes, the state of New Mexico, and the U.S. Department of Energy (DOE).

“The whole intent was to have a community-wide defensive plan that looked at mitigation and forest health,” says Tucker. “Using the scientific background of the biologists at the lab, they were able to come up with a prescription that looked at the forest and the buildings at LANL.”

Part of the problem was that the forests surrounding LANL had changed. In the past, small fires periodically cleared the land of smaller trees, downed limbs, and other fuel loads that are inevitable in a forest with large, fire-tolerant trees that has no significant amount of continuous fuel at the ground level. However, changes in U.S. Forest Service policy dictated that such fires were to be extinguished, rather than left to burn. As a result, fuel loads accumulated, presenting an ever-growing threat of conflagration.

In addition, logging operations around LANL resulted in the removal of the larger, fire-tolerant trees, leaving behind smaller, more fire-intolerant species. According to a report published by the DOE, the forest stands became overgrown with unhealthy trees, including large amounts of standing and fallen deadwood that created a significant fire hazard.

Following the 1996 Dome fire, LAFD convinced LANL that one of the biggest dangers to the lab wasn’t a fire in one of the buildings, but a fire outside them.

“We became aggressive in 1996 in terms of defensible space and determining how LANL could protect those spaces and still allow for endangered species in the area,” says Tucker.

“About a year before the fire, we changed the inspection program,” says James R. Gourdoux, Laboratory Fire Marshal at LANL. “It includes the exte-
The success of these mitigation efforts was demonstrated during the Cerro Grande fire.

When the fire burned out of control on May 5, 2000, bulldozers were immediately sent to increase the defensible space around the perimeter of the building. The inspectors used industry standards to recommend clearing and cutting. The facility managers would then prioritize the projects based on funding and other priorities.”

Tucker pointed to the example of five explosives-testing areas. Following the Dome fire, the sites were cleared of trees, which provided a visual barrier for the buildings and lab operations, to eliminate the continuous fuel load, and the grass was mowed to reduce the amount of combustible material present. In addition, employees were forbidden to use the areas for barbecues, and designated smoking areas were instituted.

“They went from a lax attitude to heightened awareness,” Tucker says.

Mark Ghilarducci, the federal coordinating officer for the Federal Emergency Management Agency during the Cerro Grande fire, agrees.

“Los Alamos has an aggressive fire suppression plan,” he says. “They’d done a tremendous amount of mitigation work before the fire season, when they cleared out the slash and wooded area where the fire would be minimized.” This reduced the impact of the Cerro Grande fire by reducing the fuel load.

The burn

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The aftermath

Following the Cerro Grande fire, the U.S. government made hundreds of millions of dollars available to beef up the mitigation efforts that were already underway when the fire broke out.

One of the difficult factors in fighting this fire was coordinating the different agencies involved in the incident, a responsibility that fell to Ghilarducci.

“I don’t tell them how to fight the fire,” he says. “I ensure that all of the agencies come under one coordinating umbrella and develop priorities with the governor’s office to work effectively in a unified way to mitigate the emergency.”

Because of the national security issues surrounding this fire, Ghilarducci was in regular contact with the White House.

“During an incident like this, the White House Situation Room moves to the highest level of alert,” he says. “The National Security Council is advised, and decisions affecting national security are made at the White House.”

Because the release of airborne radiation was a particular concern, the New Mexico Environment Department, the U.S. Environmental Protection Agency, the U.S. DOE, and LANL all monitored the air during the fire. According to Ghilarducci and to a report published by LANL, no abnormal radiation levels were detected at any of the 75 air monitoring stations during the fire, which was finally contained on June 6.

Another nuclear facility, another fire beaten back

Shortly after the Cerro Grande fire that threatened Los Alamos, another fire broke out in the area surrounding the Hanford Site, a nuclear waste-processing facility in eastern Washington state. This fire demonstrated the importance of planning and preparation in protecting such facilities.

The blaze started on June 27, 2000, when a motor vehicle accident on a nearby highway ignited brush on both sides of the roadway. By the time the fire was brought under control four days later, thousands of acres had burned.

“It spread incredibly fast,” says Fire Chief Don Good of the Hanford, Washington, Fire Department, “moving across 20 miles (32 kilometers) in 90 minutes.” Helping the fire along was the steep terrain, which ranged from 400 to 3,600 feet (122 to 1,097 meters).

Despite the size of the fire and the speed with which it moved, the fire department successfully protected the buildings at Hanford.

“We follow NFPA guidelines, such as NFPA 299, Protection of Life and Property From Wildfire, Chapter 8, for defensible spaces, and we’re pretty aggressive about enforcing them,” says Good.

In addition, the roofs of many of Hanford’s 500 buildings are noncombustible, which reduced their ignition potential.

The type of fuels that burned at Hanford were different than at Los Alamos, too.

“We don’t have the tree problem they have at LANL,” says Good. “Our fuel loads are primarily grasses and sagebrush, what’s known as Type I and Type II fuels.”
were primarily around buildings that had been built to HPR criteria. Anything valued at more than $1 million is total dollar value at risk," says Gourdoux. "Mitigation efforts are really about taking out trees where they shouldn't be," adds Gourdoux. "This is done with the ecology staff at LANL, who pick out the diseased and weakened trees. Those that can't be sold or given away are burned in special units that generate low quantities of smoke and debris.

At the time the fire erupted, the mitigation program had managed to address only 800 acres (324 hectares). Fortunately, these were primarily around buildings that had been given a high priority during the vulnerability study that preceded the introduction of the mitigation plan.

"We didn't lose any building that met the criteria for highly protected risk (HPR) protection," says Gourdoux, since they had been built using strong construction because of their function. "The mode of construction isn't necessarily based on nuclear operations but on the total dollar value at risk," says Gourdoux. "Anything valued at more than $1 million is built to HPR criteria."

At least one of the buildings at LANL featuring this type of construction has concrete exterior walls 36 inches (91 centimeters) thick. To make sure the doors of its loading dock can't be breached, they are protected by a deflecting structure designed to withstand a force equivalent to a large pine tree rammed into it at 100 miles (161 kilometers) per hour. Trucks have to negotiate the structure to deliver their loads.

The only LANL building that was significantly damaged during the Cerro Grande fire contained an ultra-clean room, and it was the victim of smoke, not flames. "The fire never reached it," says Gourdoux. "But the smoke was so thick that when the power and ventilation went out, they couldn't keep the positive pressure up, and the smoke seeped in." The facility sustained $8 million in damage.

The building ventilation systems drew in outside air across the filters, which had to be replaced after the fire, resulting in a significant expense.

"One area where we could've saved a lot of money was by shutting down the ventilation," says Gourdoux. Smoke intrusion was one hazard that isn't being adequately addressed according to a DOE Joint Review of Wildland Fire Safety, which was issued last December after fires at Los Alamos and other DOE sites.

The review also noted that although the analytical tools are in place, all the wildland fire hazards at a particular DOE site may not have been cataloged, and therefore mitigation and response plans may not be adequate. Since the number of response vehicles and equipment is based on previous incidents, not potential hazard threat, there's no way of knowing if DOE sites have adequate resources.

Additional steps in any wildland fire mitigation project should include maintaining adequate water supplies and making sure there's a reliable means of getting the water to the fire. Access routes must be developed and maintained so that other responding agencies can access the site easily, and the personnel responsible for providing fire protection should be trained in all aspects of firefighting, including wildland firefighting. Solid contingency planning is a must, as are cooperative agreements with other agencies that can provide whatever help is needed in the event of a major conflagration.

Wildland fires used to be just that: fires that occurred in the wild and threatened only forests. With the increase in the wildland/urban interface, however, they've become issues of more widespread concern. Because facilities are now being built in areas that present a serious potential for external fire danger, it's critical that the proper steps be taken to minimize the danger. Detailed pre-in incident planning, along with sound engineering, can play a major role in reducing the loss to nuclear facilities.

**DOE report cites failure to apply NFPA standards**

In the wake of wildland fires last year that threatened the Hanford Site, Los Alamos National Laboratory, and the Idaho National Engineering and Environmental Laboratory, the Department of Energy (DOE) conducted a joint review of fire safety programs with the Offices of Independent Oversight and Performance Assurance, Security and Emergency Operations, and Environment, Safety and Health.

The Joint Review of Wildland Fire Safety at DOE sites found that although the wildland fire prevention and response programs cover the basics to protect facilities, they need to be comprehensive and beefed up in certain areas in order to provide more efficient and effective protection to fully protect the assets of the lab sites.

The report recommended establishing clear expectations for creating wildland fire management programs. A lack of guidance at the Department level has led to a lack of clarity about wildland fire prevention and response programs at DOE field offices, leaving most DOE sites without a comprehensive program. NFPA was the only organization named specifically as having formal requirements to provide such identification. The report stated that DOE Work Smart Standards had not applied NFPA 299, Protection of Life and Property from Wildfire; NFPA 295, Wildfire Control; and NFPA 1051, Wildland Fire Fighter Professional Requirements.
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catastrophic fires of 2000
ROBERT S. McCarthy
Early one morning last December, a Rhode Island fire department received a 911 call reporting a fire in a three-story apartment building. When firefighters arrived, they discovered the first floor and rear stairwell of the building well involved in fire and five of the 10 occupants dead. In Massachusetts, acrid smoke from a late-morning fire in an office building killed another five people, who had no audible alarms to warn them. And 12 people camping alongside a river in New Mexico died when a high-pressure underground natural gas line ruptured violently nearby.

These are 3 of the 34 catastrophic multiple-death fires and explosions that occurred in 2000, killing 176 people, a significant decrease from the 44 catastrophic fires in 1999 that killed 214.

Catastrophic residential fires

The term "catastrophic" refers to fires that kill five or more people in a residential property or three or more in a nonresidential or nonstructural property. In 2000, residential fires were responsible for the largest share of catastrophic fire deaths. Last year, 18 of the 34 catastrophic incidents reported to NFPA, or 53 percent, were residential fires, 15 of which occurred in single-family dwellings and 3 occurred in apartment buildings. Together, these 18 fires were responsible for 99 reported deaths, or 16 fewer than the previous year. Twenty-five of the victims were children under the age of six.

The deadliest residential fire of 2000 occurred in a manufactured home in Georgia when the power cord from an electric dryer short-circuited and ignited nearby combustibles. The fire spread rapidly throughout the home, killing its eight occupants, including a child under six. Seven of the eight victims were found in bedrooms, and the eighth in a bathroom.

The second-deadliest catastrophic residential fire of the year, this one in North Carolina, killed seven people. The blaze started near the rear of a center hallway in a one-story, single-family house and spread quickly to the second floor, trapping seven children and a woman. The home’s smoke alarm sounded, but the woman apparently ignored it because it had sounded a nuisance alarm the day before. The bodies of five children were found in a second-floor bedroom, and that of the sixth child was found in a bathroom. Three of the children were under the age of six. The children started the fire while playing with smoking materials. A woman and child escaped through a second-floor window.

A second six-victim fire began in the ceiling of a single-family, one-story house with a tin roof, filling the structure with intense heat and smoke. The six victims, two of whom were under the age of six, were found in various bedrooms.

A third catastrophic residential fire started on the first floor of a two-story house in a...
LAST YEAR, 176 PEOPLE DIED in 34 multiple-death fires, more than half of which were residential.

rural area with limited water supply and spread to the second floor, where it trapped 12 people. Six of them managed to jump out the bedroom windows to safety. After examining the debris, investigators determined that all six victims, one of whom was under the age of six, died in bedrooms.

The fourth residential fire that claimed six lives occurred in the bathroom of a manufactured home and quickly spread throughout the structure. Four of the victims were found in bedrooms, one was found in a bathroom, and the body of the sixth was found outside. One of the victims was under the age of six.

Five people died in each of the remaining 12 catastrophic residential fires, two of which occurred in apartment buildings. When firefighters arrived at one of these two fires, both

the front and rear stairwells of the three-story building were involved in flames, trapping the five victims. Firefighters found four bodies on the first-floor landing in the front stairwell, and located the fifth on the third-floor landing. All five victims lived on the third floor. The fire, which was of undetermined cause, began in the living room of a first-floor apartment. Five other residents escaped or were rescued from the first floor.

The second apartment building fire also began in the living room of a first-floor apartment. After extending throughout the unit, the blaze spread out the living room window to the balcony and entered the living room of the second-floor apartment directly above the unit of origin. From there, it spread into the attic through a soffit. One victim was found in the living room of the first-floor apartment, and four were found in the second-floor unit. One of the victims was under six.

Two more five-victim fires occurred in manufactured homes. One began in the living room of a beach house that sat on stilts 10 feet (3 meters) high. Fueled by high winds, the fire spread rapidly, threatening the house next door and several vehicles. After they extinguished the fire, firefighters found one victim near the home's bathroom, two near a bedroom, and two in a bedroom, although the house was so badly damaged it was difficult to determine their precise location. One of the victims was under the age of six.

The other manufactured home fire began in the furnace and spread quickly throughout the structure. The residents were unable to escape in part because the rear door had been nailed shut. The locations of the victims, two of whom were under the age of six, weren't reported.

Another 2 of the 12 fires that claimed the lives of five people each were incendiary. The first occurred in a two-story, single-family house when someone ignited two 40-ounce (118-centiliter) bottles filled with gasoline and threw them through a first-floor living room window. The room's contents ignited, and flames spread up the stairwell to the second floor. Four bodies

Five people died when a fire broke out in a second-floor office and spread rapidly throughout the three-story building that housed several businesses. Although there were notification appliances on the second floor, they didn't operate.
were found in second-floor bedrooms, and the fifth in the second-floor hallway.

The second incendiary fire began on the front porch of a two-story, single-family home. By the time firefighters arrived, the front porch and the front of the house were fully involved, and the fire was spreading up to the second-floor dormer. All five victims, two of whom were under six, were found in bedrooms.

Catastrophic nonresidential fires

In 2000, there were also five catastrophic fires in nonresidential occupancies. Two occurred in care facilities, two in stores or offices, and one in a manufacturing property. Together, these fires resulted in 19 deaths. This is a considerable decrease from the year before, when 16 such fires killed 63 people.

The two deadliest fires claimed five lives each. The first began in an office on the second floor of a three-story building that housed several occupancies and spread rapidly, filling the building with smoke and causing parts of the structure to collapse. Arriving firefighters, who found the building heavily involved in flames, used ladders to rescue several occupants. There were no audible alarms on the floor of origin to warn the occupants of a fire.

The second fire occurred in a state-approved foster home providing care to mentally handicapped or developmentally disabled children. A child playing with a lighter ignited bedding. After ordering the children to leave the house, an adult resident tried to extinguish the fire as it spread up the wall and into the attic. Instead of leaving, the children retreated to another bedroom, where they were trapped when the fire burned between them and the back door. One child was under the age of six.

Three people died in a fire that began in a sofa in a patient's room on the third floor of a four-story assisted living facility. The fire spread down the hallway, where firefighters later found one victim. A second was found in a room at the end of the hall, and the third in the stairwell. There were no smoke alarms in the room of origin.

The fourth fire occurred in a motor vehicle manufacturing plant when molten metal came into contact with a flammable gas in the basement. The ignition caused a shock wave, which stirred up dust, causing a second blast that killed three workers.

The fifth nonresidential catastrophic fire occurred in a motor vehicle repair shop when a portable droplight fell to the floor, igniting spilled gasoline. Three workers removing the gasoline tank from a vehicle were killed as the fire spread to the fuel tank and other vehicles in the building.

Catastrophic nonstructural fires

As deadly as the catastrophic residential and nonresidential structure fires of 2000 were, the deadliest fire of the year occurred outside a structure when a high-pressure natural gas line ruptured, killing 12 people camped alongside the banks of the Pecos River. The victims may have been unaware of the pipeline, since part of it was buried 15 feet (4.5 meters) below ground.

All together, 11 catastrophic fires outside
### Table 1 - Catastrophic Residential Fires in the United States in 2000

<table>
<thead>
<tr>
<th>State</th>
<th>Date, Time of Alarm, Number of Deaths</th>
<th>Fire Origin and Path</th>
<th>Number of Stories, Occupancy Type, Construction Type</th>
<th>Smoke Detectors and other Fire Protection Devices</th>
<th>Contributing Factors and Victim Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Georgia</strong></td>
<td>March, 3:12 a.m. Eight (one under age six)</td>
<td>Undetermined</td>
<td>One story, single-family manufactured home of unprotected wood-frame construction.</td>
<td>None</td>
<td>Everyone was asleep and there were no smoke alarms to warn the occupants of fire. The fire occurred in a rural area with a limited water supply. There was no telephone on the second floor and one of the occupants drove a quarter of a mile to a neighbor’s home to notify the fire department.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Smoke Detectors and other Fire Protection Devices</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>None</td>
<td></td>
</tr>
<tr>
<td><strong>Michigan</strong></td>
<td>December, 10:15 a.m. Six (three under age six)</td>
<td>Undetermined</td>
<td>Two-story, town-house style apartment building of unprotected wood-frame construction.</td>
<td>Smoke alarms operated Fire Origin and Path The fire began in a first-floor bedroom and traveled up the stairway to the second-floor, trapping the occupants.</td>
<td>Everyone was asleep when the fire broke out and it’s unclear if there were smoke alarms present to warn the occupants of the fire. Four victims were found in various bedrooms, one victim in a bathroom, and the sixth outside the structure.</td>
</tr>
<tr>
<td><strong>North Carolina</strong></td>
<td>November, 11:30 p.m. Seven (three under age six)</td>
<td>Undetermined</td>
<td>One-story, single-family dwelling of unprotected wood-frame construction.</td>
<td>Smoke Detectors and other Fire Protection Devices</td>
<td>Everyone was asleep and there were no smoke alarms to warn the occupants of fire. The fire occurred in a rural area with a limited water supply. There was no telephone on the second floor and one of the occupants drove a quarter of a mile to a neighbor’s home to notify the fire department.</td>
</tr>
<tr>
<td><strong>Missouri</strong></td>
<td>September, 11:00 p.m. Six (two under age six)</td>
<td>Undetermined</td>
<td>One story, single-family house of unprotected wood-frame construction.</td>
<td>Smoke Detectors and other Fire Protection Devices</td>
<td>The fire began as children played with smoking materials. The adult occupant ignored the smoke alarms, which had gone off in the absence of a fire the previous day. Five children were found in a second-floor bedroom and the sixth child in a second-floor bathroom.</td>
</tr>
<tr>
<td><strong>Kansas</strong></td>
<td>October, 6:00 a.m. Six (one under age six)</td>
<td>Undetermined</td>
<td>Two-story, single-family dwelling of unprotected wood-frame construction.</td>
<td>Smoke Detectors and other Fire Protection Devices</td>
<td>The fire started in the bathroom and extended throughout the structure. The cause of the fire is undetermined.</td>
</tr>
<tr>
<td><strong>Illinois</strong></td>
<td>January, 00:57 a.m. Five</td>
<td>Undetermined</td>
<td>Three-story, single-family dwelling of unprotected wood-frame construction.</td>
<td>Smoke Detectors and other Fire Protection Devices</td>
<td>Everyone was asleep when the fire broke out and it’s unclear if there were smoke alarms present to warn the occupants of the fire. Four victims were found in various bedrooms, one victim in a bathroom, and the sixth outside the structure.</td>
</tr>
</tbody>
</table>
Table 1 - Catastrophic Residential Fires in the United States in 2000 (continued)

<table>
<thead>
<tr>
<th>State</th>
<th>Date, Time of Alarm, Number of Deaths</th>
<th>Number of Stories, Occupancy Type, Construction Type</th>
<th>Fire Origin and Path</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ohio</td>
<td>January, 9:45 p.m., Five (one under age 6)</td>
<td>Two-story, single-family structure of unprotected wood-frame construction.</td>
<td>A tobacco cigarette ignited a hall carpet. The fire spread to the second floor.</td>
</tr>
<tr>
<td>Kentucky</td>
<td>March, 11:24 p.m., Five</td>
<td>Two-story, single-family dwelling of unprotected wood-frame structure.</td>
<td>An intentional setting of a fire caused by an appliance.</td>
</tr>
<tr>
<td>Texas</td>
<td>July, 4:28 a.m., Five (two under age 6)</td>
<td>One-story, single-family dwelling of unprotected wood-frame construction.</td>
<td>A fire extinguisher was used to extinguish the fire.</td>
</tr>
<tr>
<td>Michigan</td>
<td>April, 11:39 p.m., Five</td>
<td>Two-story, single-family dwelling of unprotected wood-frame construction.</td>
<td>A smoke alarm didn’t operate because the battery had been removed.</td>
</tr>
<tr>
<td>Maryland</td>
<td>October, 3:48 a.m., Five (one under age six)</td>
<td>Two-story, 20-unit apartment building of unprotected wood-frame construction.</td>
<td>A fire extinguisher was used to extinguish the fire.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Smoke Detectors and other Fire Protection Devices</td>
<td>A fire extinguisher was used to extinguish the fire.</td>
</tr>
</tbody>
</table>

There were no smoke alarms to warn the occupants of the fire. Three of the victims were found in first-floor bedrooms, a fourth in the first-floor dining room, and the last in a second-floor bedroom. Neighbors rescued five other residents.

Texas

Date, Time of Alarm, Number of Deaths
October, 3:48 a.m.
Five (one under age six)
Number of Stories, Occupancy Type, Construction Type
Two-story, 20-unit apartment building of unprotected wood-frame construction.
Smoke Detectors and other Fire Protection Devices
None
Fire Origin and Path
A fire extinguisher was used to extinguish the fire. A fire extinguisher was used to extinguish the fire.

Contributing Factors and Victim Locations
Everyone was asleep at the time of the fire. The fire blocked the exits and there were bars on the second-floor windows. The dwelling’s gas and electric service had been disconnected and the occupants were using candles for light. All five victims were found in a second-floor bedroom.

Maryland

Date, Time of Alarm, Number of Deaths
September, 9:45 p.m.
Five (one under age six)
Number of Stories, Occupancy Type, Construction Type
Two-story, single-family dwelling of unprotected wood-frame construction.
Smoke Detectors and other Fire Protection Devices
None
Fire Origin and Path
A fire extinguisher was used to extinguish the fire. A fire extinguisher was used to extinguish the fire.

Contributing Factors and Victim Locations
Everyone was asleep at the time of the fire. The fire blocked the exits and there were bars on the second-floor windows. The dwelling’s gas and electric service had been disconnected and the occupants were using candles for light. All five victims were found in a second-floor bedroom.

Michigan

Date, Time of Alarm, Number of Deaths
April, 11:39 p.m.
Five
Number of Stories, Occupancy Type, Construction Type
Two-story, single-family dwelling of unprotected wood-frame construction.
Smoke Detectors and other Fire Protection Devices
None
Fire Origin and Path
A fire extinguisher was used to extinguish the fire. A fire extinguisher was used to extinguish the fire.

Contributing Factors and Victim Locations
Everyone was asleep at the time of the fire. The fire blocked the exits and there were bars on the second-floor windows. The dwelling’s gas and electric service had been disconnected and the occupants were using candles for light. All five victims were found in a second-floor bedroom.

Texas

Date, Time of Alarm, Number of Deaths
October, 3:48 a.m.
Five (one under age six)
Number of Stories, Occupancy Type, Construction Type
Two-story, 20-unit apartment building of unprotected wood-frame construction.
Smoke Detectors and other Fire Protection Devices
None
Fire Origin and Path
A fire extinguisher was used to extinguish the fire. A fire extinguisher was used to extinguish the fire.

Contributing Factors and Victim Locations
Everyone was asleep at the time of the fire. The fire blocked the exits and there were bars on the second-floor windows. The dwelling’s gas and electric service had been disconnected and the occupants were using candles for light. All five victims were found in a second-floor bedroom.

Maryland

Date, Time of Alarm, Number of Deaths
September, 9:45 p.m.
Five (one under age six)
Number of Stories, Occupancy Type, Construction Type
Two-story, single-family dwelling of unprotected wood-frame construction.
Smoke Detectors and other Fire Protection Devices
None
Fire Origin and Path
A fire extinguisher was used to extinguish the fire. A fire extinguisher was used to extinguish the fire.

Contributing Factors and Victim Locations
Everyone was asleep at the time of the fire. The fire blocked the exits and there were bars on the second-floor windows. The dwelling’s gas and electric service had been disconnected and the occupants were using candles for light. All five victims were found in a second-floor bedroom.

Michigan

Date, Time of Alarm, Number of Deaths
April, 11:39 p.m.
Five
Number of Stories, Occupancy Type, Construction Type
Two-story, single-family dwelling of unprotected wood-frame construction.
Smoke Detectors and other Fire Protection Devices
None
Fire Origin and Path
A fire extinguisher was used to extinguish the fire. A fire extinguisher was used to extinguish the fire.

Contributing Factors and Victim Locations
Everyone was asleep at the time of the fire. The fire blocked the exits and there were bars on the second-floor windows. The dwelling’s gas and electric service had been disconnected and the occupants were using candles for light. All five victims were found in a second-floor bedroom.

Texas

Date, Time of Alarm, Number of Deaths
October, 3:48 a.m.
Five (one under age six)
Number of Stories, Occupancy Type, Construction Type
Two-story, 20-unit apartment building of unprotected wood-frame construction.
Smoke Detectors and other Fire Protection Devices
None
Fire Origin and Path
A fire extinguisher was used to extinguish the fire. A fire extinguisher was used to extinguish the fire.

Contributing Factors and Victim Locations
Everyone was asleep at the time of the fire. The fire blocked the exits and there were bars on the second-floor windows. The dwelling’s gas and electric service had been disconnected and the occupants were using candles for light. All five victims were found in a second-floor bedroom.

Maryland

Date, Time of Alarm, Number of Deaths
September, 9:45 p.m.
Five (one under age six)
Number of Stories, Occupancy Type, Construction Type
Two-story, single-family dwelling of unprotected wood-frame construction.
Smoke Detectors and other Fire Protection Devices
None
Fire Origin and Path
A fire extinguisher was used to extinguish the fire. A fire extinguisher was used to extinguish the fire.

Contributing Factors and Victim Locations
Everyone was asleep at the time of the fire. The fire blocked the exits and there were bars on the second-floor windows. The dwelling’s gas and electric service had been disconnected and the occupants were using candles for light. All five victims were found in a second-floor bedroom.

Michigan

Date, Time of Alarm, Number of Deaths
April, 11:39 p.m.
Five
Number of Stories, Occupancy Type, Construction Type
Two-story, single-family dwelling of unprotected wood-frame construction.
Smoke Detectors and other Fire Protection Devices
None
Fire Origin and Path
A fire extinguisher was used to extinguish the fire. A fire extinguisher was used to extinguish the fire.

Contributing Factors and Victim Locations
Everyone was asleep at the time of the fire. The fire blocked the exits and there were bars on the second-floor windows. The dwelling’s gas and electric service had been disconnected and the occupants were using candles for light. All five victims were found in a second-floor bedroom.

Texas

Date, Time of Alarm, Number of Deaths
October, 3:48 a.m.
Five (one under age six)
Number of Stories, Occupancy Type, Construction Type
Two-story, 20-unit apartment building of unprotected wood-frame construction.
Smoke Detectors and other Fire Protection Devices
None
Fire Origin and Path
A fire extinguisher was used to extinguish the fire. A fire extinguisher was used to extinguish the fire.

Contributing Factors and Victim Locations
Everyone was asleep at the time of the fire. The fire blocked the exits and there were bars on the second-floor windows. The dwelling’s gas and electric service had been disconnected and the occupants were using candles for light. All five victims were found in a second-floor bedroom.

Maryland

Date, Time of Alarm, Number of Deaths
September, 9:45 p.m.
Five (one under age six)
Number of Stories, Occupancy Type, Construction Type
Two-story, single-family dwelling of unprotected wood-frame construction.
Smoke Detectors and other Fire Protection Devices
None
Fire Origin and Path
A fire extinguisher was used to extinguish the fire. A fire extinguisher was used to extinguish the fire.

Contributing Factors and Victim Locations
Everyone was asleep at the time of the fire. The fire blocked the exits and there were bars on the second-floor windows. The dwelling’s gas and electric service had been disconnected and the occupants were using candles for light. All five victims were found in a second-floor bedroom.
and spread out the living room window and doorway. The fire burned up and around the balcony and entered the second-floor living room and into the attic through the soffit. The fire’s cause is undetermined.

**Table 1 - Catastrophic Residential Fires in the United States in 2000 (continued)**

<table>
<thead>
<tr>
<th>Date, Time of Alarm, Number of Deaths</th>
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<th>Number of Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delaware</td>
<td></td>
<td>December, 1:52 a.m. Five (one under age six)</td>
<td>Five</td>
</tr>
<tr>
<td>Occupation, Construction Type</td>
<td></td>
<td>December, 2:30 a.m. Five (two under age six)</td>
<td>Five</td>
</tr>
<tr>
<td>Smoke Detectors and other Fire Protection Devices</td>
<td>Smoke alarms were present but it's unknown if they operated.</td>
<td>Smoke alarms were present, and the absence of smoke alarms to warn the occupants of the fire.</td>
<td></td>
</tr>
<tr>
<td>Victim Locations</td>
<td></td>
<td>Everyone was asleep at the time of the fire and there were no smoke alarms to warn the occupants of the fire.</td>
<td>Everyone was asleep and there were no smoke alarms present to warn the occupants.</td>
</tr>
<tr>
<td>Fire Origin and Path</td>
<td></td>
<td>The fire began in the furnace near the center of the structure and spread throughout the home.</td>
<td>The fire began in the living room of the first-floor apartment where it intensified and vented out the front window onto the porch. An open rear door allowed the fire to travel up the stairwell and into the attic.</td>
</tr>
<tr>
<td>Fire Protection Devices</td>
<td></td>
<td>The fire began in the living room of the first-floor apartment where it intensified and vented out the front window onto the porch. An open rear door allowed the fire to travel up the stairwell and into the attic.</td>
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<td></td>
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</tr>
</tbody>
</table>
Table 2 - Catastrophic Nonresidential Fires in the United States in 2000

<table>
<thead>
<tr>
<th>Location</th>
<th>Date, Time of Alarm, Number of Deaths</th>
<th>Occupancy Type and Use, Construction Type, Operating Status</th>
<th>Detection Systems</th>
<th>Suppression Systems</th>
<th>Fire Origin and Path</th>
<th>Contributing Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Massachusetts</strong></td>
<td>February, 12:07 p.m., Five</td>
<td>Office building of unprotected ordinary construction with three stories visible from the front and a basement level accessible from the rear because of an elevation of the property; operating.</td>
<td>Second-floor notification appliances were installed but didn't operate and there were no pull stations.</td>
<td>None</td>
<td>None</td>
<td>Excess molten metal was poured into the basement by a mold press.</td>
</tr>
<tr>
<td><strong>New York</strong></td>
<td>March, 6:33 a.m., Three</td>
<td>One-story, motor vehicle repair shop of unprotected construction; operating.</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Unsafe working conditions.</td>
</tr>
<tr>
<td><strong>Virginia</strong></td>
<td>March, 9:35 p.m., Three</td>
<td>Four-story, motor vehicle manufacturing facility of unprotected non-combustible/limited combustible construction; operating.</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td><strong>Tennessee</strong></td>
<td>September, 6:00 p.m., Five (one under age six)</td>
<td>One-story, foster home that provided care to mentally handicapped and developmentally disabled children, of unprotected wood-frame construction; operating.</td>
<td>Smoke alarms operated.</td>
<td>None</td>
<td>None</td>
<td>Excess molten metal was poured into the basement by a mold press.</td>
</tr>
<tr>
<td><strong>Pennsylvania</strong></td>
<td>December 30, 5:31 p.m., Three</td>
<td>Four-story, assisted living residence of unprotected construction; operating.</td>
<td>Smoke alarms were present, but not in room of origin and operated.</td>
<td>Wet-pipe sprinkler system was present, but not in the room of origin.</td>
<td>None</td>
<td>Excess molten metal was poured into the basement by a mold press.</td>
</tr>
</tbody>
</table>

Five people died when a fire began in the first-floor living room of a three-story apartment building and spread quickly up the stairwell. All five victims lived on the third floor. Five people on the first floor escaped or were rescued.
Table 3 - Catastrophic Nonstructural Fires in the United States in 2000

<table>
<thead>
<tr>
<th>Missouri</th>
<th>Date, Time of Alarm, Number of Deaths</th>
<th>January, 1:13 p.m.</th>
<th>Eight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting</td>
<td>Vehicle was found an eighth of a mile off the highway in a ditch.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climate Conditions</td>
<td>Icy road conditions.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire Origin and Path</td>
<td>A truck jackknifed causing a fiery multiple-vehicle accident.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factors Hindering Occupant Escape</td>
<td>Many of the vehicles burst into flames on impact. A truck leaking hydrochloric acid may have contributed to the post-impact fires.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| California | Date, Time of Alarm, Number of Deaths | March, 7:15 p.m. | Seven |
| Setting  | One-vehicle crash on paved public road. |
| Climate Conditions | Unreported |
| Fire Origin and Path | When firefighters arrived, they found the vehicle on its top and fully involved in flames. The area of origin was the fuel line or fuel tank area. |
| Factors Hindering Occupant Escape | The position of the vehicle impeded escape, although a male passenger managed to escape. One victim was found outside and six children were trapped inside. |

| Arizona | Date, Time of Alarm, Number of Deaths | November, 11:11 a.m. | Five (one under age six) |
| Setting  | Two-vehicle crash on state highway |
| Climate Conditions | Unreported |
| Fire Origin and Path | A head-on collision between an automobile and a van carrying 18 passengers caused the van to overturn and burst into flames. |
| Factors Hindering Occupant Escape | The collision pushed the van off the road where it burst into flames. Five of the victims were in the van while 13 others managed to escape. |

| Florida | Date, Time of Alarm, Number of Deaths | March, 10:35 a.m. | Four |
| Setting  | Runway at international airport. |
| Climate Conditions | Visual meteorological conditions prevailed. |
| Fire Origin and Path | A helicopter making a sharp left turn crashed into the ground and the post-impact fire killed three. |
| Factors Hindering Occupant Escape | The crash and subsequent fire rendered the victims helpless. |

| Minnesota | Date, Time of Alarm, Number of Deaths | October, 12:30 a.m. | Four |
| Setting  | Two-vehicle crash on a limited highway. |
| Climate Conditions | Unreported |
| Fire Origin and Path | An automobile collided with a refrigeration truck and burst into flames, trapping its occupants. |
| Factors Hindering Occupant Escape | The car lodged under the trailer of the truck, bursting into flames making escape impossible. |

| New Mexico | Date, Time of Alarm, Number of Deaths | August, 5:26a.m. | Twelve (five under age six) |
| Setting  | A high-pressure 30-inch (76-centimeter) natural gas pipeline. |
| Climate Conditions | Unreported |
| Fire Origin and Path | A violent rupture of a high-pressure natural gas pipeline with subsequent ignition of flowing product under pressure. The ensuing fireball could be seen 20 miles (32 kilometers) away. The explosion created a crater 86 feet long, 46 feet wide, and 20 feet deep (26 meters long, 14 meters wide, and 6 meters deep.) The ignition source is undetermined and is under investigation by NTSB. |
| Factors Hindering Occupant Escape | Two families camping near the pipeline may have been unaware of its location because part of it had been buried 15 feet (4.5 meters) underground. The victims had no chance to escape as flames swept through their tents. |

| New Mexico | Date, Time of Alarm, Number of Deaths | March, 8:00 a.m. | Three |
| Setting  | Multi-vehicle crash on interstate highway. |
of structures last year killed 58 people. Ten involved vehicles, including two aircraft.

In the first aircraft incident, two Cessnas collided on an airport runway during takeoff, bursting into flames and killing the two pilots and their two passengers. In the second, a helicopter crashed into the ground, and the post-impact fire killed the pilot and both passengers.

The remaining vehicle fires all occurred on highways. The deadliest was a multi-vehicle crash on an icy roadway, which killed eight. A truck leaking hydrochloric acid may have contributed to the post-impact fires.

In a second incident, seven people, six of whom were children, died when their vehicle overturned and became engulfed in flames. Six other people died in a vehicle fire that began when their van's engine overheated after it went off the road into a ditch, igniting brush. Five of the victims were mentally challenged.

The fourth vehicle fire was the result of a head-on collision between a car and an 18-passenger van. The impact caused the van to roll onto its side and burst into flames. Thirteen of the van's occupants managed to escape, but five were trapped in the vehicle.

The fifth vehicle fire occurred when a car collided with a refrigeration truck, became lodged under the trailer, and burst into flames. Escape was impossible for the four people trapped in the car.

The last three vehicle fires killed three people each. In the first, smoke from a forest fire caused a multi-vehicle pileup, and one of the vehicle's gas tank ignited, killing the driver. Two Good Samaritans who stopped to help were also killed.

The other fires occurred when one car crashed into a guardrail and another into a tree in separate accidents. In the first accident, the car burst into flames, trapping all three victims in the front seat.

Two Good Samaritans who stopped to help were also killed.

The other fires occurred when one car crashed into a guardrail and another into a tree in separate accidents. In the first accident, the car burst into flames, trapping all three victims in the front seat.

**What would have made a difference?**

While it's impossible to say that following proper prevention practices would have eliminated all of last year's catastrophic fires, it's possible to say that doing so could have brought the fatality levels down considerably. Such practices include making sure that electrical alterations have been properly done, that electrical cords are undamaged, and that children—not to mention cooking and heating equipment—are never left unattended.

They also include installing equipment specifically designed to protect occupants from fire, such as sprinklers and smoke alarms. None of the homes that experienced catastrophic fires last year was protected by a sprinkler system. And 10 of the 18 homes didn't have a smoke alarm. Of the remaining eight, three had alarms, but their performance is unknown; the operational status of the alarms in three other homes couldn't be determined; and the alarm in another didn't operate because it had no battery. In one home, the alarm operated, but the only adult in the house ignored the alarm.

A smoke alarm is clearly the first line of defense once a fire begins, particularly since many fires occur at night or very early in the morning. In fact, 16 of the 18 catastrophic residential fires of 2000 occurred between 11:00 p.m. and 7:00 a.m. These fires demonstrate the need for interconnected, hard-wired smoke alarms that will alert all occupants to a fire anywhere in a house.

However, smoke alarms are only effective if people take them seriously and leave the building when they sound. Children, in particular, should be familiar with the sound of a properly operating smoke alarm. They should also be taught to follow a practiced escape plan that emphasizes two ways out and has a designated meeting place. Exit drills in the home are part of many school curriculums.

Sound safety programs in nonresidential properties would also go a long way toward reducing fire losses, as would an adequate number of fire extinguishers. Particularly important is the installation of automatic suppression systems with alarms. The properties involved in three of last year's nonresidential catastrophic structure fires were unsprinklered, and those involved in the other two had only partial sprinkler systems, without coverage in the room of origin.

In the coming years, residential sprinklers will play an important role in home fire protection, too. New construction and major renovations lend themselves to sprinkler installations.

The declining death toll from catastrophic multiple-death fires is encouraging and a sign of the effectiveness of steps already taken. But so many of the remaining deaths are currently preventable. We need to be safer—and we can be.}

### Table 3 - Catastrophic Nonstructural Fires in the United States in 2000 (continued)

<table>
<thead>
<tr>
<th>Climate Conditions</th>
<th>Number of Deaths</th>
<th>Factors Hindering Occupant Escape</th>
<th>Date, Time of Alarm, Number of Deaths</th>
<th>Florida</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor visibility from a forest fire causes a multi-vehicle pileup. One vehicle's gas tank ignited, killing the driver. Two other people were killed when they stopped to help.</td>
<td>July, 11:38 p.m.</td>
<td>The impact and ensuing fire trapped the driver.</td>
<td>December, 2:34 a.m.</td>
<td>The impact of the crash and resulting fire made it impossible for the victims to act.</td>
</tr>
<tr>
<td>Vehicle crash on interstate highway. Roads were dry.</td>
<td>Three</td>
<td>Three</td>
<td>Three</td>
<td></td>
</tr>
<tr>
<td>Fire Origin and Path</td>
<td>A vehicle slammed into a guardrail and burst into flames. The fire began in the rear of the vehicle at the fuel tank. The post-impact fire trapped three victims, all in the front seat.</td>
<td>Setting</td>
<td>Setting</td>
<td></td>
</tr>
<tr>
<td>Iowa</td>
<td>Unreported</td>
<td>A vehicle swerved off the interstate and hit a tree, exploding into fire.</td>
<td>A vehicle swerved off the interstate and hit a tree, exploding into fire.</td>
<td></td>
</tr>
<tr>
<td>Date, Time of Alarm,</td>
<td>Setting</td>
<td>Factors Hindering Occupant Escape</td>
<td>Factors Hindering Occupant Escape</td>
<td></td>
</tr>
<tr>
<td>July, 11:38 p.m.</td>
<td>Unreported</td>
<td>The impact of the crash and resulting fire made it impossible for the victims to act.</td>
<td>The impact of the crash trapped three occupants in the automobile. Two of the victims were found in the front seat, the other was found in the rear.</td>
<td></td>
</tr>
<tr>
<td>Setting</td>
<td>Unreported</td>
<td>Vehicle crash off interstate highway.</td>
<td>Unreported</td>
<td></td>
</tr>
<tr>
<td>Poor visibility from a forest fire causes a multi-vehicle pileup. One vehicle's gas tank ignited, killing the driver. Two other people were killed when they stopped to help.</td>
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<td>Setting</td>
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<td>A vehicle swerved off the interstate and hit a tree, exploding into fire.</td>
<td></td>
</tr>
<tr>
<td>Date, Time of Alarm, Setting</td>
<td>Unreported</td>
<td>Factors Hindering Occupant Escape</td>
<td>Factors Hindering Occupant Escape</td>
<td></td>
</tr>
<tr>
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<td></td>
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<tr>
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<td>Unreported</td>
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<td>Unreported</td>
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<td>Setting</td>
<td>Vehicle crash on interstate highway.</td>
<td>Setting</td>
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<td>Unreported</td>
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<td></td>
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</tr>
<tr>
<td>Date, Time of Alarm, Setting</td>
<td>Unreported</td>
<td>Factors Hindering Occupant Escape</td>
<td>Factors Hindering Occupant Escape</td>
<td></td>
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<td></td>
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<tr>
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<td>Unreported</td>
<td>Vehicle crash off interstate highway.</td>
<td>Unreported</td>
<td></td>
</tr>
</tbody>
</table>
In 2000, a moderate decrease in fires across the United States didn't stop a sharp increase in civilian deaths in home fires. Although structure fires continued their two-decade decline, reaching half of their 1977 peak number, home fire deaths jumped 18 percent after dropping the previous three years.

Last year, fire departments responded to 1,708,000 fires, or 6.3 percent fewer than 1999, based on data NFPA received from fire departments responding to its 2000 National Fire Experience Survey (see Tables 1 and 2). Of these, an estimated 505,500 were structure fires in 2000, a decrease of 3.3 percent from the year before. Between 1977 and 2000, the number of structure fires peaked in 1977, when there were 1,098,000 structure fires (see Figure 1). Such fires decreased steadily, dropping to 688,000 by the end of 1989, for an overall decrease of 37.3 percent. They dropped another 26.8 percent during the 1990s, until they reached 505,500 by the end of 2000.

Of these 505,500 fires, 379,500, or 75.1 percent, were residential fires, virtually the same number that occurred in 1999. The 283,500 fires that occurred in one- and two-family dwellings accounted for 56.1 percent of structure fires, while 84,500 fires that occurred in apartments accounted for 16.7 percent.

For nonresidential structures, all property types showed decreases in 2000, except those in the special structure category, which remained the same. Sizable decreases occurred in educational properties, in which the number of fires decreased 17.7 percent to 7,000; stores and offices, in which the number dropped 17.5 percent to 23,500; and industrial properties, in which the number dropped 14.3 percent to 15,000.

Between 1977 and 2000, the number of fires that occurred outside structures was at a high in 1977 of 1,658,500. Outside fires then decreased steadily over the next six years to 1,011,000 in 1983, for a total decrease for the period of 39 percent. The number remained fairly constant for the rest of the 1980s, except in 1988, when it jumped to 1,214,000. By 1993, however, the number of outside fires had dropped to 910,500, and it stayed near the 1 million level for the next three years. In 1997 and 1998, outside fires again dropped to 850,000, then rose 8.7 percent to 931,500 in 1999, before dropping back to 854,000 in 2000. Brush and grass fires in particular decreased in 2000 by 8.6 percent to 455,000.

**Civilian deaths**

Despite the decrease in the number of fires last year, the number of civilian deaths they caused rose. Overall, fires in the United States in 2000 killed an estimated 4,045 civilians, or 13.3 percent more than 1999. The nature of this increase is better understood when results are examined by property type (see Table 4).

The largest number of civilians deaths last year occurred in residential properties, where an estimated 3,445 people died. This represents a significant increase of 18 percent over the year before. Of these, 500 deaths occurred in apartment fires and 2,920 occurred in one- and two-family dwellings. This represents a decrease of 3.8 percent in apartment fires from the year before, but a significant increase of 22.9 percent, or 545 deaths, in one- and two-family home fires. In fact, this is a return to 1997-1998 levels.

### SOME 3,445 FIRE DEATHS OCCURRED in U.S. homes in 2000, 18 percent more than the year before.

<table>
<thead>
<tr>
<th>TABLE 1 - Estimates of 2000 Fires, Civilian Deaths, Civilian Injuries and Property Loss in the United States</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of Fires</strong></td>
</tr>
<tr>
<td><strong>Number of Civilian Deaths</strong></td>
</tr>
<tr>
<td><strong>Number of Civilian Injuries</strong></td>
</tr>
<tr>
<td><strong>Property Loss</strong>&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

---

<sup>1</sup> The estimates are based on data reported to NFPA by fire departments that responded to the 2000 National Fire Experience Survey. These are 95 percent confidence intervals. This includes overall direct property loss to contents, structures, vehicles, machinery, vegetation, and anything else involved in a fire. It doesn't include indirect losses. No adjustment was made for inflation in the year-to-year comparison. **Change was statistically significant at the .01 level.** This figure includes the Cerro Grande (Los Alamos) New Mexico Wildland Fire with an estimated total property loss of $1 billion. Loss by specific property type for this fire was unavailable.

Michael J. Karter, Jr. is a senior statistician with NFPA's Fire Analysis and Research Division.
TABLE 2 - Estimates of 2000 Fires and Property Loss by Property Use

<table>
<thead>
<tr>
<th>Type of Property</th>
<th>Number of Fires</th>
<th>Percentage Change From 1999</th>
<th>Property Loss</th>
<th>Percentage Change From 1999</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fires in Structures</td>
<td>505,500</td>
<td>-3.3</td>
<td>$8,501,000,000</td>
<td>+0.1</td>
</tr>
<tr>
<td>Fires in Highway Vehicles</td>
<td>325,000</td>
<td>-5.9*</td>
<td>1,187,000,000</td>
<td>+3.3</td>
</tr>
<tr>
<td>Fires in Other Vehicles</td>
<td>23,500</td>
<td>0</td>
<td>194,000,000</td>
<td>+10.9</td>
</tr>
<tr>
<td>Fires outside of structures with value involved but no vehicle</td>
<td>68,500</td>
<td>+7.0</td>
<td>214,000,000</td>
<td>+74.0</td>
</tr>
<tr>
<td>Fires in Brush, Grass Wildland (excluding crops and timber)</td>
<td>455,000</td>
<td>-8.6**</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Fires in Rubbish including dumpsters (outside of structures), with no value or loss involved</td>
<td>215,000</td>
<td>-5.1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>All Other Fires</td>
<td>115,500</td>
<td>-19.2*</td>
<td>111,000,000</td>
<td>+27.6</td>
</tr>
<tr>
<td>Total</td>
<td>1,708,000</td>
<td>-6.3**</td>
<td>$10,207,000,000</td>
<td>+1.8</td>
</tr>
</tbody>
</table>

The estimates are based on data reported to NFPA by fire departments that responded to the 2000 National Fire Experience Survey. This includes overall direct property loss to contents, structure, a vehicle, machinery, vegetation or anything else involved in a fire. It does not include indirect losses, e.g., business interruption or temporary shelter costs. No adjustment was made for inflation in the year-to-year comparison. This includes trains, boats, ships, aircraft, farm vehicles and construction vehicles. This figure and table don’t include the Cerro Grande (Los Alamos) New Mexico Wildland Fire with an estimated total property loss of $1 billion. Loss by property type for this was unavailable. *Change was statistically significant at the .05 level. **Change was statistically significant at the .01 level.

When residential fire death rates declined sharply in 1999, we advised caution in drawing conclusions because death rates can vary considerably from year to year, particularly in smaller communities. The same caution applies to the 2000 increase. The long-term trend is still downward.

Looking at trends in civilian deaths since 1977 and 1978, several things are worth noting (see Figure 2). Home fire deaths peaked in 1978, when 6,015 people died in apartments and one- and two-family dwellings. They then declined a substantial 20 percent between 1979 and 1982 to 4,820. From 1982 to 1988, the number stayed in the 4,655 to 4,955 range, except in 1984, when 4,075 civilians died in home fires. In the past 11 years, home fire deaths moved well below the 1982 to 1988 plateau, staying in the 3,220 to 3,720 range between 1991 and 2000. The exceptions were 1996, when 4,035 deaths occurred, and 1999, when 2,895 occurred.

In addition to civilian deaths, 102 firefighters died in the line of duty in 2000. This represents a drop of 8.9 percent from 1999.

Civilian fire injuries

NFPA’s survey results also indicate that 22,350 civilians were injured in 2000, an increase of 2.2 percent from 1999.

Estimates of civilian injuries are low because many aren’t reported to the fire service. For example, many injuries occur at small fires to which fire departments don’t respond, and firefighters are sometimes unaware of injured persons they don’t transport to medical facilities.

NFPA estimates that most of these injuries occurred in residential properties, where 17,400 civilians were hurt, an increase of 5.9 percent from the year before. Of these, 12,575 occurred in one- and two-family dwellings, and 4,400 occurred in apartments. Overall, 77.9 percent of all civilian injuries occurred in residential properties, which includes, besides dwellings, hotels, motels, college dorms, and boarding houses.

Between 1977 and 2000, the number of

A worker looked down at the fire as it destroyed a New York warehouse in September 2000. The fire started in the roof area and caused heavy damage to the third and fourth floors.
84 by specific property type wasn’t available, we know that this figure includes an estimated loss of $1 billion that resulted from the Cerro Grande (Los Alamos) wildland fire in New Mexico. Where loss by specific property type was known, the loss figure for structure fires at $8.5 billion remained close to 1999’s total.

The average loss per fire was $6,561, up 19.2 percent from a year ago, and the average loss per structure fire was $16,817, up 3.6 percent. Between 1977 and 2000, the average loss per structure fire ranged from a low of $3,757 in 1977 to a high of $16,817 in 2000, for an overall increase of 347 percent. When adjusted for inflation, the increase in average loss per structure fire between 1977 and 2000 was 58 percent.

An estimated $5.6 billion of the property loss in 2000 occurred in residential properties, up a significant 11.4 percent from 1999. Of this, an estimated $4.6 billion occurred in one- and two-family dwellings, up 12.5 percent from the previous year, and an estimated $886 million occurred in apartments.

Also worth noting are substantial increases in property damage in educational properties and special structures, as well as a significant decrease in damage in industrial properties. Losses of $108 million in educational properties represent an increase of 52.1 percent, while losses of $275 million in special structures represent a jump of 47.1 percent. A 43.4 percent decrease to $778 million in industrial property losses reflects the absence of particularly large fires in this category in 2000, like the two power plant fires that resulted in a combined loss of $515 million in 1999.

One should keep in mind that property loss totals can change dramatically from year to year because of the impact of occasional large-loss fires. NFPA analyzes these fires in the November/December issue of NFPA Journal every year.

Incendiary fires
Based on data reported by fire departments, NFPA estimates that 75,000 of the structure fires in the United States during 2000 were of an incendiary or suspicious nature (see Table 5). These fires took the lives of 505 civilians, a significant increase of 36.5 percent from the year before. They also resulted in an estimated $1.3 billion in property damage, up 4.6 percent from 1999.

There were also 46,500 incendiary or suspicious vehicle fires, up 3.3 percent from 1999. These fires resulted in an estimated $186 million in property damage, a decrease of 4.6 percent from the year before.

Losses by region
Fire loss rates nationwide and by region3 can be seen in Table 6. The South had the highest rate, at 7.2 fires per thousand population. At 17.7 deaths per million, it also had the highest death rate per million population, followed by the Northeast at 17.3.

The Northeast had the highest injury rate per million population at 111.7, while the West had the lowest at 62.2. However, the West had the highest property loss per capita at $46.2, and the highest property loss rate, due to the Cerro Grande fire.

### TABLE 3
Estimates of 2000 Structure Fires and Property Loss by Property Use

<table>
<thead>
<tr>
<th>Property Use</th>
<th>Structure Fires</th>
<th>Property Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimate</td>
<td>Percent Change</td>
</tr>
<tr>
<td>Public Assembly</td>
<td>15,000</td>
<td>-6.3</td>
</tr>
<tr>
<td>Educational</td>
<td>7,000</td>
<td>-17.7</td>
</tr>
<tr>
<td>Institutional</td>
<td>7,000</td>
<td>-12.5</td>
</tr>
<tr>
<td>Residential (Total)</td>
<td>379,500</td>
<td>-0.9</td>
</tr>
<tr>
<td>One- and Two-Family Dwellings</td>
<td>283,500</td>
<td>-0.4</td>
</tr>
<tr>
<td>Apartments</td>
<td>84,500</td>
<td>-4.5</td>
</tr>
<tr>
<td>Other Residential</td>
<td>11,500</td>
<td>-4.2</td>
</tr>
<tr>
<td>Stores and Offices</td>
<td>23,500</td>
<td>-17.5</td>
</tr>
<tr>
<td>Industry, Utility, Defense</td>
<td>15,000</td>
<td>-14.3*</td>
</tr>
<tr>
<td>Storage in Structures</td>
<td>33,000</td>
<td>-8.3</td>
</tr>
<tr>
<td>Special Structures</td>
<td>25,500</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>505,500</td>
<td>-3.3</td>
</tr>
</tbody>
</table>

The estimates are based on data reported to NFPA by fire departments that responded to the 2000 National Fire Experience Survey. This includes overall direct property loss to contents, structure, a vehicle, machinery, vegetation or anything else involved in a fire. It doesn’t include business interruption or temporary shelter costs. No adjustment was made for inflation in the year-to-year comparison. This includes manufactured homes. Includes hotels and motels, college dormitories and boarding houses. Incidents handled by private fire brigades or fixed suppression systems aren’t included here. This decrease reflects a $315 million loss in a Michigan power plant and a $200 million loss in a Missouri generating plant in 1999. *Change was statistically significant at the 0.05 level. **Change was statistically significant at the 0.01 level.
Strategy needed

With home fire deaths accounting for 84.5 percent of all fire deaths, fire safety initiatives targeted at the home remain the key to any reduction in the overall fire death toll. Five major strategies are appropriate.

The first is a more widespread public fire safety education effort aimed at teaching the public how to prevent fires and avoid serious injury or death should a fire occur. Fire safety education messages should continue to use information on the common causes of fatal home fires.

In addition, more people must use and maintain smoke detectors and develop and practice escape plans. Wider use of residential sprinklers must be aggressively pursued, and additional ways sought to make products used in the home more fire-safe.

The regulations requiring more child-resistant lighters are a good example of fire-safe products, as are less fire-prone cigarettes. The wider use of upholstered furniture and mattresses that are more resistant to cigarette ignitions is also an example of change that has already accomplished much and will continue to do more.

Finally, the special fire safety needs of high-risk groups, such as the young, the elderly, and the poor, must be addressed.

Acknowledgments

NFPA thanks the many fire departments that responded to the 2000 National Fire Experience Survey for their continuing efforts to provide us with the data necessary to make national projections in a timely manner. The author would also like to thank the many NFPA staff members who worked on the 2000 survey, including Frank Deely, John Baldi, and Joseph Molls for editing the forms and making follow-up calls to fire depart-

![TABLE 4](image)

**Estimates of 2000 Civilian Fire Deaths and Injuries by Property Use**

<table>
<thead>
<tr>
<th>Property Use</th>
<th>Civilian Deaths</th>
<th>Civilian Deaths</th>
<th>Civilian Injuries</th>
<th>Civilian Injuries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential (total)</td>
<td>3,445</td>
<td>+18.0%</td>
<td>17,400</td>
<td>+5.9%</td>
</tr>
<tr>
<td>One-and Two-Family Dwellings</td>
<td>2,920</td>
<td>+22.9%</td>
<td>12,575</td>
<td>+8.9%</td>
</tr>
<tr>
<td>Apartments</td>
<td>500</td>
<td>-3.8%</td>
<td>4,400</td>
<td>-2.2%</td>
</tr>
<tr>
<td>Other Residential</td>
<td>25</td>
<td>0.6%</td>
<td>425</td>
<td>+13.3%</td>
</tr>
<tr>
<td>Non-residential Structures</td>
<td>90</td>
<td>-25.0%</td>
<td>2,200</td>
<td>+4.8%</td>
</tr>
<tr>
<td>Highway Vehicles</td>
<td>450</td>
<td>0.1%</td>
<td>1,325</td>
<td>-17.2%</td>
</tr>
<tr>
<td>Other Vehicles</td>
<td>15</td>
<td>-25.0%</td>
<td>275</td>
<td>+10.0%</td>
</tr>
<tr>
<td>All Other</td>
<td>45</td>
<td>-25.0%</td>
<td>1,150</td>
<td>-23.3%</td>
</tr>
<tr>
<td>Total</td>
<td>4,045</td>
<td>+13.3%</td>
<td>22,350</td>
<td>+2.2%</td>
</tr>
</tbody>
</table>

 Estimates are based on data reported to NFPA by fire departments that responded to the 2000 National Fire Experience Survey. Note that most changes were not statistically significant, considerable year-to-year fluctuation is to be expected for many of these totals because of their small size. This includes manufactured homes. *Includes halls and motels, college dormitories, boarding houses, etc. This includes public assembly, educational, institutional, store and office, industry, utility, storage, and specialty structure properties. **This includes trains, boats, ships, aircraft, farm vehicles, and construction vehicles. This includes outside properties with value, as well as brush, rubbish, and other outside locations. *Statistically significant at the 0.05 level.

![TABLE 5](image)

**Estimate of 2000 Losses in Incendiary and Suspicious Structure Fires**

<table>
<thead>
<tr>
<th>Type of Fire</th>
<th>Number of Fires</th>
<th>Number of Fires</th>
<th>Number of Civilian Deaths</th>
<th>Number of Civilian Deaths</th>
<th>Direct Property Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure Fires of Incendiary Origin</td>
<td>45,500</td>
<td>+4.6%</td>
<td>375</td>
<td>+29.3%</td>
<td>$792,000,000</td>
</tr>
<tr>
<td>Structure Fires of Suspicious Origin</td>
<td>29,500</td>
<td>+3.5%</td>
<td>130</td>
<td>+62.5%</td>
<td>548,000,000</td>
</tr>
<tr>
<td>Total Structure Fires of Incendiary or Suspicious Origin</td>
<td>75,000</td>
<td>+4.2%</td>
<td>505</td>
<td>+36.5%</td>
<td>1,340,000,000</td>
</tr>
</tbody>
</table>

The estimates are based on data reported to NFPA by fire departments that responded to the 2000 National Fire Experience Survey. This includes overall direct property loss to contents, structure, a vehicle, machinery, vegetation, or anything else involved in a fire. It doesn't include indirect losses, e.g., business interruption or temporary shelter costs. No adjustment was made for inflation in the year-to-year comparison. *Change was statistically significant at the 0.05 level.
TABLE 6 - Fire Loss Rates Nationwide and by Region, 2000

<table>
<thead>
<tr>
<th>Region</th>
<th>Number of Fires per Thousand Population</th>
<th>Civilian Deaths per Million Population</th>
<th>Civilian Injuries per Million Population</th>
<th>Property Loss per Capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nationwide</td>
<td>6.2</td>
<td>14.8</td>
<td>81.6</td>
<td>$40.9</td>
</tr>
<tr>
<td>Northeast</td>
<td>6.2</td>
<td>17.3</td>
<td>111.7</td>
<td>36.5</td>
</tr>
<tr>
<td>Northcentral</td>
<td>6.4</td>
<td>15.6</td>
<td>92.1</td>
<td>36.8</td>
</tr>
<tr>
<td>South</td>
<td>7.2</td>
<td>17.7</td>
<td>70.5</td>
<td>42.2</td>
</tr>
<tr>
<td>West</td>
<td>4.5</td>
<td>7.0</td>
<td>62.2</td>
<td>46.2</td>
</tr>
</tbody>
</table>


Footnotes
1. NFPA changed its survey methodology in 1977-78, and meaningful comparisons can't be made with statistics estimated before 1977.
4. As defined by the U.S. Bureau of the Census, the four regions are the Northeast (Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont), the North Central region (Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin), the South (Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia), and the West (Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming).
DEFINITION OF TERMS

**Civilian**: The term "civilian" includes anyone other than a firefighter and covers public service personnel, such as police officers, civil defense staff, non-fire service medical personnel, and utility company employees.

**Death**: Death is the direct result of a fire that's fatal or becomes fatal within one year.

**Fire**: Any instance of uncontrolled burning, including combustion explosions and fires that are out when the fire department arrives. It excludes controlled burning, whether authorized or not; over pressure ruptures without combustion; mutual aid responses; smoke scares; and hazardous responses, such as oil spills without fire.

**Incendiary**: Legally defined as a fire that was deliberately set or for which the physical evidence indicates that it was deliberately set.

**Injury**: Physical damage suffered by a person as a direct result of fire that requires, or should require, treatment by a physician, nurse, paramedic, or EMT within one year of the incident, regardless of whether treatment was actually received, or that results in at least one day of restricted activity immediately following the incident. Examples of injuries resulting from fire are smoke inhalation, burns, wounds and punctures, fractures, heart attacks resulting from stress under fire condition, strains, and sprains.

**Property Damage**: Includes all forms of direct loss to contents, structure, machinery, vehicles, vegetation, or anything else involved in a fire. It doesn't include indirect losses, such as business interruption or temporary shelter provisions.

**Structure**: An assembly of materials that form a construction for occupancy or use in such a manner as to serve a specific purpose. A building is a form of structure. Open platforms, bridges, roof assemblies over open storage or process areas, tents, air-supported buildings, and grandstands are other forms of structures.

**Vehicles, Highway and Other**: Fires in vehicles may be associated with an accident, but casualties and property loss should be the direct result of the fire only. Highway vehicles include any vehicle designed to operate normally on highways, such as automobiles, motorcycles, buses, trucks, and trailers. Other vehicles include trains, boats and ships, aircraft, and farm and construction vehicles.
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In November, NFPA members gather to debate changes to 31 documents.

**JOHN NICHOLSON**

When NFPA members gather in November in Dallas, Texas, for the Fall Education Conference 2001, they'll be asked to adopt 31 revised standards and recommended practices, including NFPA 25, *Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*, and the comprehensive NFPA 99, *Health Care Facilities*. The Technical Committee Reporting Session is scheduled for Wednesday, November 14, from 8:30 a.m. to 6:00 p.m.

NFPA codes and standards are reviewed every three to five years to keep current with new fire protection technologies, and many are amended to include lessons learned.
Annex A. These changes alone create a new Manual of Style documents. Following NFPA's new clarity and continuity with other NFPA definitions in Chapter 2 were revised for appearance and make the standard easier to understand. Many of the requirements have moved to different chapters to be renumbered. The section on electrical wiring addressed the storage of compressed air cylinders with a total volume equal to or less than 300 cubic feet (8.5 cubic meters).

Changes proposed to NFPA 25

NFPA 25 has been adopted by 35 states and is one of NFPA's most frequently used standards, says David R. Hague, senior fire protection engineer and staff liaison for NFPA 99 Technical Committee and senior NFPA fire protection specialist for health care.

According to the revision, flammable and combustible liquids can't be stored or transferred from one vessel to another, and equipment that releases ignitable vapors will require monitored visual and audible alarms.

The chapter on hyperbaric facilities, which covers the protective features separating a hyperbaric facility and contiguous structure has been clarified, he says. Emergency depressurization requirements, duties of the hyperbaric facility safety director, and emergency procedure performance were revised.
For NFPA's Fall Education Conference, the Technical Committee on Inspection, Testing, and Maintenance of Water-Based Systems is recommending a series of changes to testing frequency, says Hague. Language has been added to the test sprinkler requirements for so-called harsh environments for which previous editions didn't specify a frequency. The new edition will recommend testing these sprinklers every five years.

The technical committee also recommended harmonizing NFPA 25 with NFPA 72, National Fire Alarm Code®. NFPA 25 calls for quarterly testing of water flow regulators, and NFPA 72 would require semi-annual testing. The revisions call for electronic flow regulators to be tested semi-annually and mechanical flow regulators, quarterly.

In Chapter 5, the revised section dealing with fire pumps now requires that the pressure-relief valve be closed during testing, and coupling alignments are now part of the annual fire pump test. Currently, water storage tanks have to be tested every five years, which require the tank to be drained.

“This wasn’t a problem if the tank was small but if you have a million-gallon (3,785-kiloliter) tank, it can be costly,” says Hague. “The revisions allow for underwater inspections, which will save the property owner a considerable amount of money.”

Addressing MIC

New language dealing with sprinkler system obstruction investigations and microbiological influenced corrosion (MIC) includes general inspection and MIC treatment strategies. “There’s a list of triggers that will now prompt an investigation. Pin-hole leaks have been added because they’re often a symptom of MIC,” says Hague.

Another trigger is an increase of 50 percent in the time it takes water to flow through the system. The average time is 60 seconds, says Hague.

“We’re also allowing for other methods of testing. For example, ultrasounds are now acceptable,” says Hague.

A recent spate of product recalls prompted the technical committee to add language dealing with recalled items. A new paragraph notes that, “In those cases where it’s determined that an existing situation may involve a distinct hazard to life or property, the Authority Having Jurisdiction (AHJ) shall be permitted to require inspection, testing, and maintenance methods in excess of those required by the standard.”

Currently, NFPA 25 doesn’t provide the AHJ with the power to require additional testing when a known problem may affect the performance of the system. Another major revision includes adding the definitions of sprinklers used in NFPA 13 to NFPA 25. The technical committee hopes this will help explain the different types of sprinklers to building owners and will help them identify dry sprinklers.

The committee also recommended restructuring the document to comply with the Manual of Style. Chapter One will contain administrative text only. Chapter Two will contain only referenced publications cited in the mandatory portions of the standard. Chapter Three will only include definitions. All mandatory sections of the document must be evaluated for usability, adaptability, and enforceable language. In addition, all units have been converted to SI units, with inch/pound units in parentheses.

“This restructuring makes the document more user-friendly and this is something that enhances the standard for the user,” says Hague.

Other codes and standards

Other codes and standards up for a vote at the Fall Conference include NFPA 37, Installation and Use of Stationary Combustion Engines and Gas Turbines. It covers portable engines that remain connected for use in the same site for a week or more and are used instead of, or to supplement, stationary engines.

The Technical Committee on Internal Combustion Engines also recommends revising the text to read: “Glass sight gauges or sight feeds for lubricating oil, of which if broken will permit the escape of oil, shall be protected against physical damage to prevent the escape of oil.”

In addition, the committee is recommending revising the text to read: “Fuel tanks within structures located above the lowest story, cellar, or basement shall be provided with spill containment consisting of either a wall, a curb, or a dike having a capacity at least equal to that of the largest surrounding tank.” This was recommended because the committee members believe that any fuel tank in a building, regardless of location, requires spill containment.

NFPA 68, Guide for Venting of Deflagrations, provides information for the design and use of vents to limit pressures developed by explosions of dusts or gases in buildings, rooms, bins, and equipment to prevent or reduce structural or mechanical damage.

The Technical Committee on Explosion Protection Systems proposes to completely revise NFPA 68 and reorganize the document based on the Manual of Style and the editorial revision of Chapter 4. The committee also wants to incorporate the errata published for the current edition.

NFPA 76, Fire Protection of Telecommunications Facilities, offers minimum requirements for fire protection of telecommunications facilities, which provide telephone, data, cellular, Internet, and video services. Although the Technical Committee on Telecommunications originally proposed a new document, the committee members instead changed the document from a standard to a recommended practice, which they felt would be more appropriate. The committee expects future editions of NFPA 76 will be proposed as a standard.

Among other recommendations are excluding telecommunications facilities with less than 500 square feet (46 square meters) of equipment space and defining a central office as a facility that houses primary control functions for telecommunications networks.

For clarification, the committee added wording that states a “large telecommunications facility includes operations, such as switching, transmission, and routing of voice, data and/or video signals within an enclosed area greater than 2,500 square feet (232 square meters) of equipment space. A small telecommunications facility includes operations such as transmission and routing of voice, data, or video signals within an enclosed area of 500 square feet (46 square meters) to 2,500 square feet (232 square meters).
meters) of equipment space."

The committee also recommended revising the text to state the "purpose of this standard is to establish minimum requirements to provide a reasonable degree of fire protection for telecommunications facilities, telecommunications equipment and the associated telecommunications network from fire and to provide a reasonable degree of life safety for the occupants of the telecommunications facilities."

The committee added "fire" to better match the text and the scope of Section 1-1 and to reduce the possibility of misunderstanding, since 'protection' could imply either physical or electrical protection.

**Related to the fire service**


NFPA 471 outlines the minimum requirements that should be considered when dealing with responses to hazardous materials incidents and to specify operating guidelines for responding to hazardous materials incidents. NFPA 472 covers the requirements for first responder, hazardous materials technician, and hazardous materials specialist, while NFPA 473 identifies the levels of competence required of EMS personnel who respond to hazardous materials incidents. It covers the requirements for basic life support and advanced life support personnel in the prehospital setting.

Also related to the fire service are NFPA 1041, *Fire Service Instructor Professional Qualifications*, and NFPA 1051, *Wildland Fire Fighter Professional Qualifications*.


**Subject to approval**

Anyone dissatisfied with an action taken during the codes- and standards-making process can file an appeal with the Standards Council. Appeals may cover the Council’s decision to develop a certain document; the Association’s action on a proposed Committee Report at an NFPA meeting, the technical validity or fairness of a document or part of a document; and the Council’s decision to appoint a nominee to a committee.

Notification of an intent to file an appeal must be filed within 20 days of the debate that occurs at an Association meeting. The Standards Council considers all the information that was presented, as well as the vote of the membership and the disposition of any appeals, and decides whether to issue the document. If a code or standard is approved, it’s issued in the form of a pamphlet and published in the appropriate volume of NFPA’s National Fire Codes.
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**Codes and standards in this area**

NFPA 20 covers the minimum requirements to select and install pumps that supply water for private fire protection. It provides the requirements and other information on fire pumps, as well as tips on pump design, installation, testing and maintenance, including trouble shooting. It's scheduled for revision in 2003.

NFPA 25 establishes the minimum requirements necessary to inspect, test, and maintain water extinguishing systems. These systems include sprinklers, standpipes and hose, fire service piping, fire pumps, water storage tanks, fixed water spray, foam-water, and valves. The document also addresses impairment handling and reporting.

NFPA 25 requires that a preventive maintenance program be performed according to the manufacturer's recommendations and initiated immediately after the pump assembly has passed its acceptance tests. NFPA 25 is adopted into state law in some areas. Revisions are being proposed at NFPA's Fall Education Conference in November.

To learn more about NFPA's codes and standards development, visit www.nfpa.org. To obtain a current edition of NFPA 20 or NFPA 25, go to www.nfpa.org or contact the NFPA Fulfillment Center by mail at 11 Tracy Drive, Avon, MA 02322; by telephone at (800) 344-2555 or (508) 895-8300.
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<th>Company</th>
<th>Address</th>
<th>Phone Numbers</th>
<th>Website</th>
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<tbody>
<tr>
<td>Mercedes Textiles Ltd.</td>
<td>16633 Hymus Boulevard Kirkland, Quebec, Canada</td>
<td>H9H 4R9, (514) 697-0817</td>
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<td></td>
<td></td>
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<td>National Fire Fighter Corp.</td>
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<td>Patterson Pump</td>
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<td><a href="http://www.pattersonpumps.com">www.pattersonpumps.com</a></td>
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<td><a href="http://www.sterlingfluidsystems.com">www.sterlingfluidsystems.com</a></td>
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<td><a href="http://www.robwen.com">www.robwen.com</a></td>
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<td><a href="http://www.syncroflo.com">www.syncroflo.com</a></td>
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<td>Waterous Company</td>
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<td><a href="http://www.waterousco.com">www.waterousco.com</a></td>
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<td>3951 Development Drive Sacramento, CA 95838 (800) 426-5209</td>
<td><a href="http://www.wildfire-equipment.com">www.wildfire-equipment.com</a></td>
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<td>Williams Fire and Hazard Control</td>
<td>P.O. Box 1359 Mauriceville, TX 77626 (800) 231-4613</td>
<td></td>
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</table>
Fire Alarm Systems
SimplexGrinnell has introduced a new network system suitable for high-rise office towers and multi-building facilities. The 4100U system can be used to upgrade older Simplex systems and can support up to 392,000 addressable analog points.
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Horizontal Sidewall Sprinkler
The Viking Corporation has added the Quick Response Concealed Horizontal Sidewall Sprinkler to its product line. This sprinkler is ideal for college dormitory, hospital, and hotel applications and is UL-listed as quick response for light and ordinary hazard occupancies.
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Image Sensing
Image Sensing Systems, Inc., a developer and manufacturer of video-based traffic management systems and global distributor of wireless video and data transmission systems, has entered into an agreement with Detector Electronics Corporation, a supplier of fire and gas detection solutions, to develop an integrated vehicular traffic and fire detection system to add to its Autoscope product family. The combined traffic and flame detection product is based on the popular ISS Autoscope Solo Pro.
Circle Reader Service Card No. 102
Smoke Detectors
A new line of photoelectric smoke detectors is available from System Sensor. The new detectors in the i series are easy to install, feature state-of-the-art technology, and are easily inspected. They also feature two- and four-wire photoelectric detectors.
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Fire Extinguishant
DuPont Fluoroproducts has begun U.S. production of FE-227™, its newest fire extinguishant to meet the growing demand for non-halon fire extinguishants. FE-227 is a clean-agent fire extinguishant that replaces Halon 1301 in flooding systems in telecommunications rooms, data centers, and process control rooms.
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Certification Program
The National Institute for Certification in Engineering Technology is now offering a certification testing for Level III in inspection and testing of water-based systems. The program provides a credential for technicians who work with physical and mechanical aspects of water-based systems.
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Safety Systems
A new line of fire alarm control panels from Edwards Systems Technology, Inc. liberates small and medium-sized buildings from the all-or-nothing approach to system design. QuickStart's support for intelligent and conventional circuits positions this innovative control panel for upgrading an existing system communications-grade cable and costly rewiring isn't required in most retrofits.
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Explosion Venting
Fike Corporation announces FlamQuench II, flameless explosion venting devices, the latest extension to Fike's total concept explosion protection product line. This device extinguishes the heat and flame from a vented explosion and eliminates the need for explosion vent ducts. After ventilating an explosion, FlamQuench II is refurbished easily.
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SEPTEMBER/OCTOBER 2001
NFPA JOURNAL 97
Building Riser
Ames Company is manufacturing a new stainless steel in-building riser that's easy to install and UL- and FM-approved. The riser is connected to the primary water supply through the building's overhead fire system.
Circle Reader Service Card No. 108

Drum Heater
Benko Product's Sahara Hot Box is an energy efficient way to heat 55-gallon (208-liter) drums. The stainless steel hot box has a 90-gallon (340-liter) spill capacity.
Circle Reader Service Card No. 109

Exit Devices
DORMA Architectural Hardware is offering its 9000 series of exit devices for commercial and industrial doors. The series offers a variety of options including surface, concealed, and less bottom rod configurations.
Circle Reader Service Card No. 110

Gas Monitors
MSA Instrument Division is manufacturing a new infrared gas monitor, featuring photoacoustic infrared sensing technology. The Chemgard Monitor detects nearly 100 major industrial compounds, including heat transfer fluids, solvents, and fuel vapors.
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Telguard Databurst Products are now UL-approved for supplemental use with listed security systems, and commercial and residential burglary and fire applications. These products are used in conjunction with security systems to back up primary communications.

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Control Panels
A new notification circuit expander for use with Cerberus Pyrotechnics fire alarm control panels is available from Siemens Cerberus. The PAD-3 has built-in synchronization capabilities and offers a 3-amp auxiliary output for driving portions of fire alarm systems.

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Alarm Receivers
Radionics is manufacturing a new alarm receiver with enhanced capabilities and an inexpensive cost. Unlike previous receivers, the D6600 Receiver/Gateway allows alarm signals from any brand of alarm panel to be sent over the Internet.

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All information in “What’s Hot” is provided by the manufacturers. NFPA doesn’t endorse any of these products. Readers can get additional information by circling the corresponding numbers on the reader service card in this issue.
NFPA Sprinkler Systems Seminar
September 10–12 • New Orleans, LA
September 24–26 • Fort Lauderdale, FL
Keep up with the latest sprinkler technology and get a handle on NFPA 13, Installation of Sprinkler Systems. Qualify for 0.7 CEUs for each day you attend.

NFPA 2001 Life Safety Code® Seminar
September 10–14 • New Orleans, LA
September 24–28 • Fort Lauderdale, FL
October 1–5 • Atlanta, GA
Attend a 5-, 3-, or 2-day seminar on NFPA 101®, Life Safety Code®, and get a better understanding of the 2000 edition. Qualify for 0.7 CEUs for each day you attend.

NFPA National Fire Alarm Code® Seminar
September 12–14 • New Orleans, LA
September 26–28 • Fort Lauderdale, FL
This seminar covers the key aspects of the installation, use, and maintenance of fire alarm systems. Qualify for 0.7 CEUs for each day you attend.

NFPA Fire and Life Safety Seminar for Facility Managers
October 8–12 • Philadelphia, PA
October 15–19 • Boston, MA
October 22–26 • Atlanta, GA
October 29–November 2 • Dallas, TX
This new seminar is designed to increase safety managers' awareness of NFPA codes and standards that prevent loss and protect employees in existing facilities.

Meeting OSHA Requirements with NFPA Codes and Standards
October 17–19 • Minneapolis, MN
Stay ahead of the curve on OSHA compliance issues and learn how NFPA's codes and standards affect OSHA requirements.

NFPA National Electrical Code® Seminar
September 24–28 • Fort Lauderdale, FL
October 1–5 • Atlanta, GA
Learn about the latest revisions to the NFPA 70, National Electrical Code®, and learn more about the 2002 edition. Qualify for 0.7 CEUs for each day you attend.

For registration, further information, or a complete list of NFPA's continuing education seminars and workshops, contact:
NFPA Continuing Education Department
P.O. Box 9101
Quincy, MA 02269-9101
www.nfpa.org
(800) 344-3555

International Association of Electrical Inspectors
September 9–12 • Portland, OR
The 2001 NW section meeting for the International Association of Electrical Inspectors provides an opportunity for inspectors to learn about the changes to NFPA 70, National Electrical Code®. For information, contact M and M Productions, Inc. at (503) 335-3336.

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SFPE Professional Development Week
September 10–14 • Baltimore, MD
The Society of Fire Protection Engineers is offering a professional development week for its members. For information, contact SFPE at education@sfpe.org.

ASFA 20th Annual Convention and Exhibit
September 12–16 • Boca Raton, FL
This event is the American Fire Sprinkler Association’s show for manufacturers. For more information, contact Marlene Garrett at (214) 349-5965.

9th International Interflam Conference
September 17 • Edinburgh, Scotland
The Interflam conference includes computer modeling demonstrations, exhibitions and a new initiative: “consultants surgery,” where delegates can have private consultations with industry leaders. The conference web site, www.intercomm.dial.pipex.com, contains details.

Tank Firefighting In Focus
September 20 • Edinburgh, Scotland
This seminar will present the findings of Foamspec, an independent research project focusing on extinguishing major storage tank fires. For more information, go to www.intercomm.dial.pipex.com.

Energy/Electric South China 2001
September 26–28 • Guangzhou, China
The focus is on international power generation and there’s an exhibition on electrical engineering and energy industries. For more information, go to www.montnet.com.

Virginia Department of Emergency Management Haz-Mat Conference
September 27–29 • Virginia Beach, VA
The conference features more than 72 workshops in handling hazardous materials. For information, contact Conventions Plus, Inc. at (757) 474-3096.

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Circle No. 043 on Reader Service Card
Circle No. 046 on Reader Service Card
IN COMPLIANCE FROM PAGE 36

through an administrative area before it reaches an exit access corridor. Since I often walk through this area, I'm familiar with its use and operation, and this familiarity makes the area an accessory space for my office. However, it isn't an accessory space for other tenants in my building because they don't routinely pass through it and thus aren't familiar with what happens there. We could be in the process of replacing the carpet in that area, which would impede travel, and they would have no way of knowing that anything was amiss.

When egress is provided through an adjoining area, the occupant load of the area becomes cumulative. If the occupant load reaches 50 people, Section 7.2.1.4.2 says that the doors that serve those 50 people must swing in the direction of egress travel. In assembly occupancies with large occupant loads, latching doors serving the aggregate area through which all the occupants will pass in an evacuation must have panic hardware.

Finally, NFPA 101 allows egress paths to pass through several accessory areas if they meet the various egress arrangement requirements, such as common path of travel and remoteness from the suite. The exception is health care occupancies, in which the allowable distance to the door of a suite is reduced when the egress path passes through multiple intervening rooms—and only two intervening rooms are permitted. In most other occupancies, as many intervening rooms as possible are permitted, as long as the occupancy meets all other egress requirements.

In sum, then, NFPA 101 permits egress paths to pass through adjoining spaces, provided certain code requirements are met. As long as the paths are designed to meet Life Safety Code requirements, they'll provide a reasonable degree of safety.
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Looking Back

This year is the 90th anniversary of the Triangle Shirtwaist Company fire in New York City, one of the worst fires in an industrial occupancy in the United States. The fire, which killed 146 people, marked a turning point in the way U.S. fire protection codes address such occupancies.

The fire began on Saturday, March 25, 1911, at the Triangle Shirtwaist Company’s sweatshop for 625 workers on the eighth, ninth, and tenth floors of the Asch Building, at the intersection of Washington Place and Greene Street. Its cause has never been established, but investigators suspect that ash from a garment cutter’s cigar or cigarette ignited a piece of material in a scrap bin on the eighth floor.

The 10-story building had only one exterior fire escape and just two staircases when it should have had three. In addition, one of its two freight elevators was out of service. To prevent what some supervisors thought was an increase in pilferage, they’d further reduced the odds of escape by locking many of the exit doors.

As the fire spread unchecked, workers grabbed the standpipe hose line and tried to extinguish it—but quickly found that the hose had rotted and the valves were frozen shut. In a panic, the workers surged toward the most familiar exits, where they were met with a wall of flame racing up the stairs. Those who could scrambled to another exit and discovered that the door was locked. When they tried to force it open, they found that the door swung inward, and the press of people jammed it shut.

Faced with a horrible death by fire, many of the workers, most of whom were young women, leapt to their deaths from the windows.

Two months after the Triangle Shirtwaist fire, NFPA held its 15th annual meeting in New York City. R.H. Newbern, superintendent of insurance for the Pennsylvania Railroad, supplemented his scheduled discussion of private fire brigades with information on fire drills. NFPA members, as conscious then of the effects of tragic fires as now, pushed to publish Newbern’s presentation as an informational pamphlet, which became NFPA’s first “safety-to-life” publication. At the NFPA annual meeting the following year, the committee on private fire departments and fire drills presented the second part of Newbern’s paper, Suggestions for the Organization and Execution of Fire Drills in Factories, Schools, and Theatres.

At the 1913 annual meeting, Frances Perkins, executive secretary of New York’s Factory Investigating Commission, called on NFPA to use its influence to address life safety issues in factories, loft buildings, and other industrial occupancies. NFPA’s Committee on Life Safety was formed the following year, and in 1927, it produced the Building Exits Code, the predecessor of NFPA 101®, Life Safety Code®.
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